



Ultimate Power – Perfect Control

Vehicle Safety, Body and Powertrain Applications



For a comprehensive and reliable portfolio of products for automotive and other applications, look no further than the product range from Infineon. We have used our 40 years of experience of developing and producing products to meet the demands of the automotive market, and our innovative technologies to design and produce a large number of power products that meet all requirements of the automotive industry and also the transportation, lighting and motor-drive industries.

Our commitment to quality is demonstrated through our focus on Automotive Excellence, the most rigorous zero defect program in the industry.

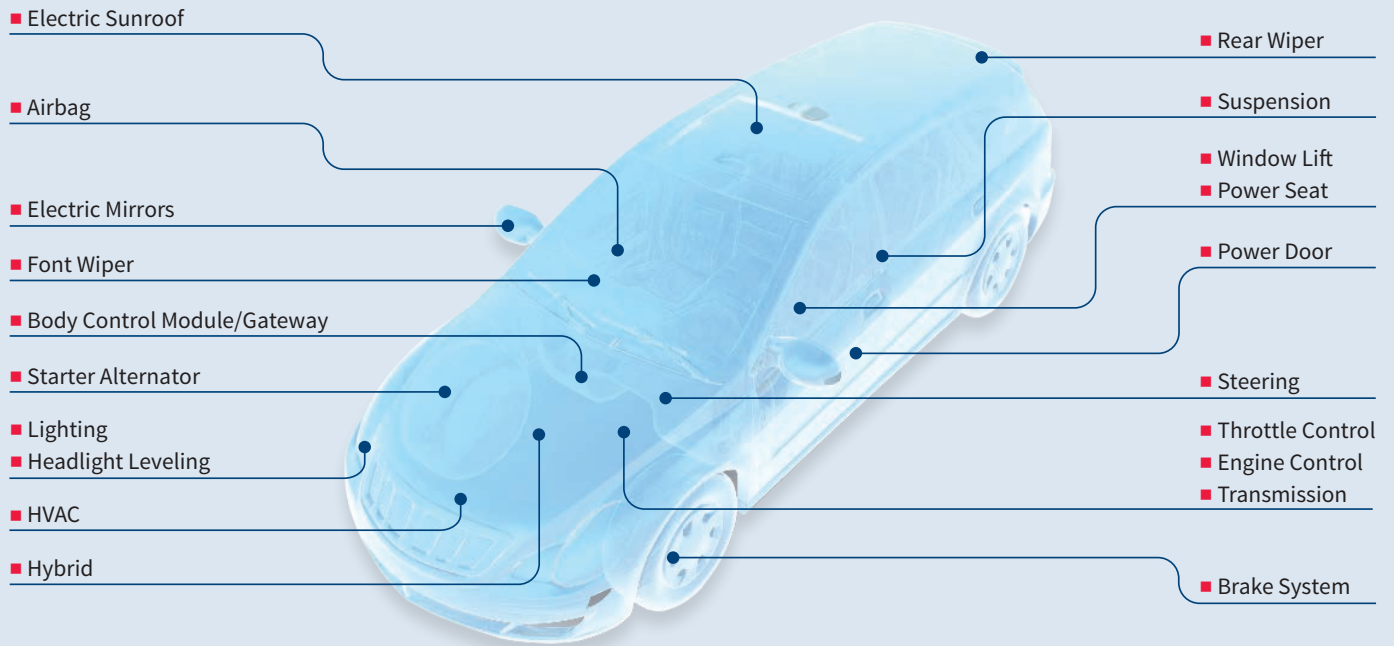
This Selection Guide provides an overview of our ICs and their packages, which are automotive qualified and available for your current and future electronic system designs.

The ultimate power to control your applications including automotive, transportation, industrial, lighting and motor control.

Symbols

I_D	DC Drain Current	R_{thJC}	Thermal Resistance Junction to Case
$I_{GS(TH)}$	Gate Source Threshold Current	V_{CE}	Collector Emitter Voltage
I_{IS}	Current Sense Output Current	$V_{CE(sat)}$	Saturation Collector Emitter Voltage
$I_{L(lim)}$	Load Current Limit	V_{DS}	Drain Source Voltage
$I_{L(NOM)}$	Load Current ($T_a = 85^\circ\text{C}$, specified PCB)	$V_{DS(AZ)}$	Drain Source Voltage (Active Zener)
$I_{L(sat)}$	Saturation Load Current	$V_{GS(th)}$	Gate Threshold Voltage
I_q	Quiescent Current	V_Q	Output Voltage
I_Q	Output Current	V_S	Supply Voltage
Q_G	Total Gate Charge	$V_{S(AZ)}$	Supply Voltage (Active Zener)
R_{IS}	Current Sense Resistor	$V_{S(op)}$	Operation Supply Voltage
$R_{DS(on)}$	Typical Drain Source Resistance in ON-State @ 25°C (multiply by 2 for Max @ 150°C)	Inverse	Normal V_S Polarity and Inverse Load Current
$R_{DS(on) path}$	Typical Drain Source Resistance in ON-State @ 25°C of both High-Side and Low-Side	PWM	Pulse Width Modulation
		Reverse	Reverse V_S Polarity and Reverse Load Current

Automotive Applications



Automotive Power Components Used in Other Applications

Agriculture



Transportation/Navigation



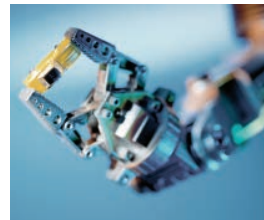
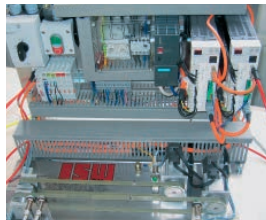
2-4 Wheeler



Lighting



Automation/Industrial



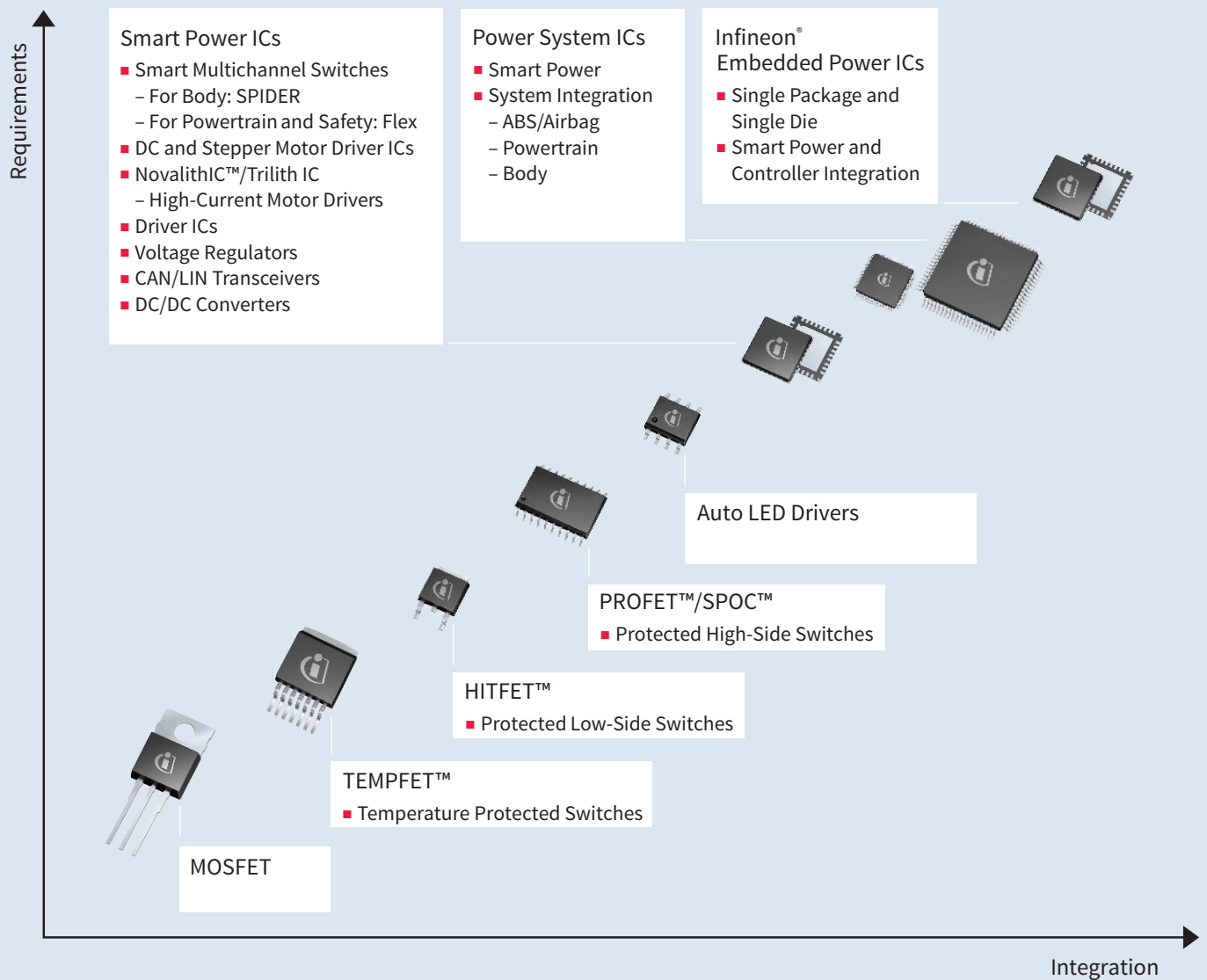
Toys/Games



Electric Tools/Home Appliance/Heating Pump



We meet all requirements for cost-effective application solutions

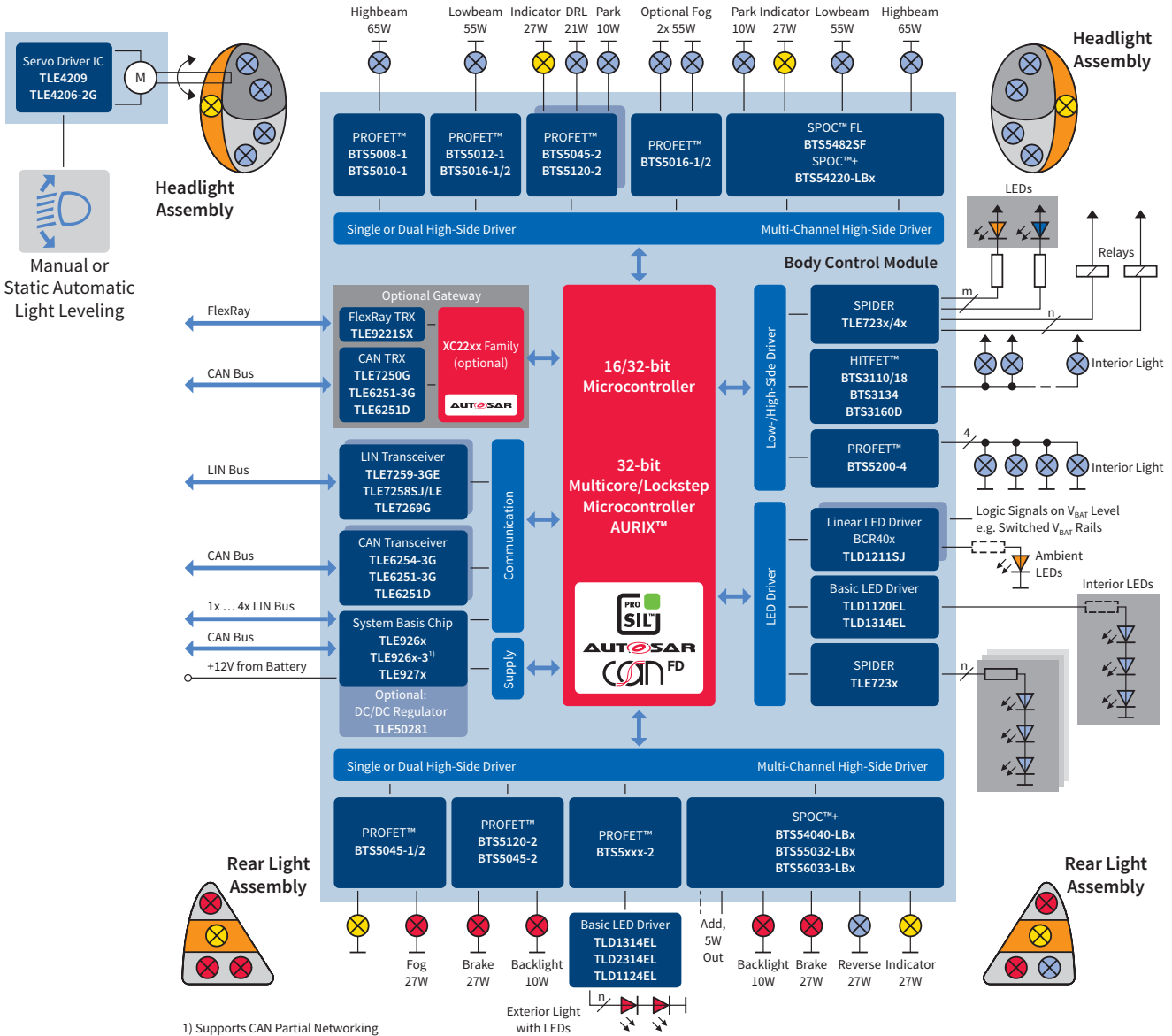


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Body Applications

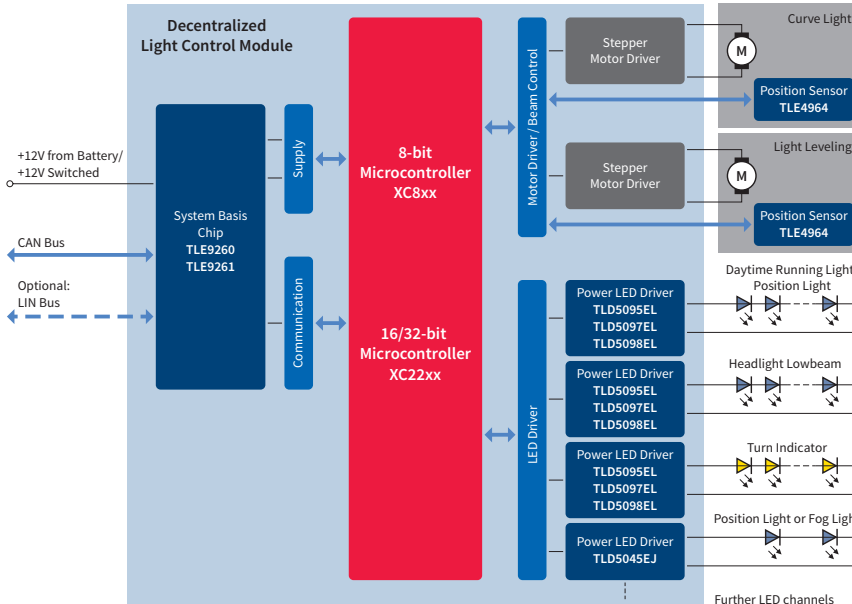
Body Control Module



System Benefits

- Reduced board space due to integrated functionality
- Protected load control with sophisticated diagnostic features
- Supports the “Limp Home” functional safety concept
- High scalability and benchmark short-circuit robustness of power semiconductors (PROFET™)
- Supports a smooth transition to LEDs for interior and exterior lighting

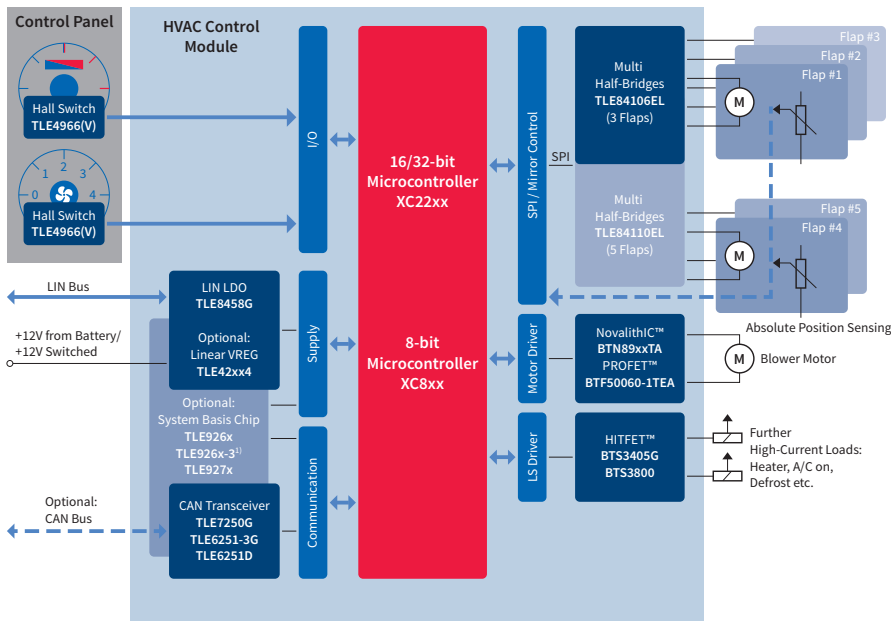
Decentralized Front Light Module



System Benefits

- Automotive LED drivers for high-brightness LEDs
- LED driver ICs supporting various DC/DC topologies (buck, boost, SEPIC, flyback)
- Microcontroller peripherals enable light control with a low CPU load
- System basis chips combine supply, network transceiver and supervision functions in a monolithic device

HVAC Control Module Low to Mid-End/Manual + Semi-Automatic



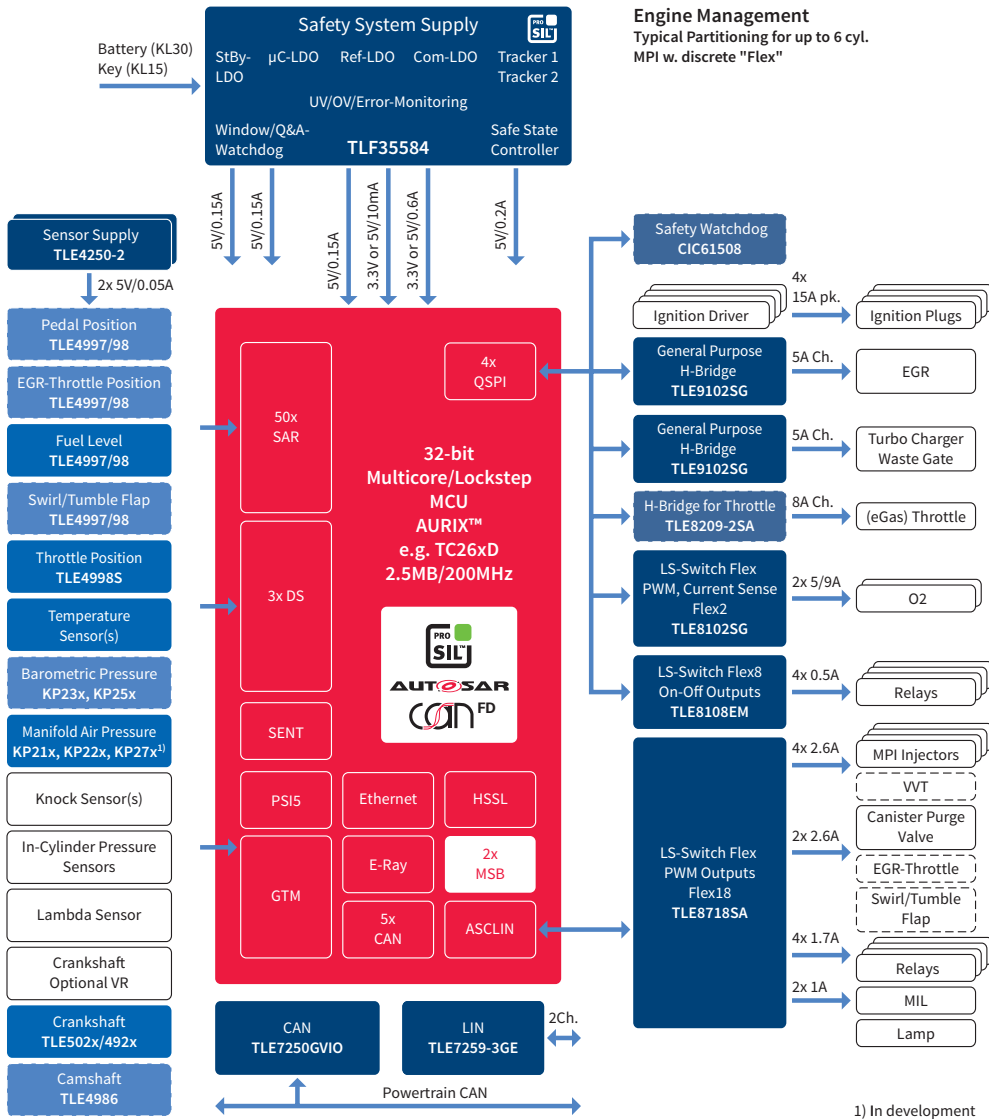
System Benefits

- High-performance, scalable microcontroller family for various classes of HVAC control algorithms
- Integrated motor control with diagnostics
- Dedicated multi half-bridge devices for flap motor control with potentiometer feedback
- Powerful half-bridge devices (NovalithiC™) with high-frequency PWM capability for the blower control

1) Supports CAN partial networking

Powertrain Applications

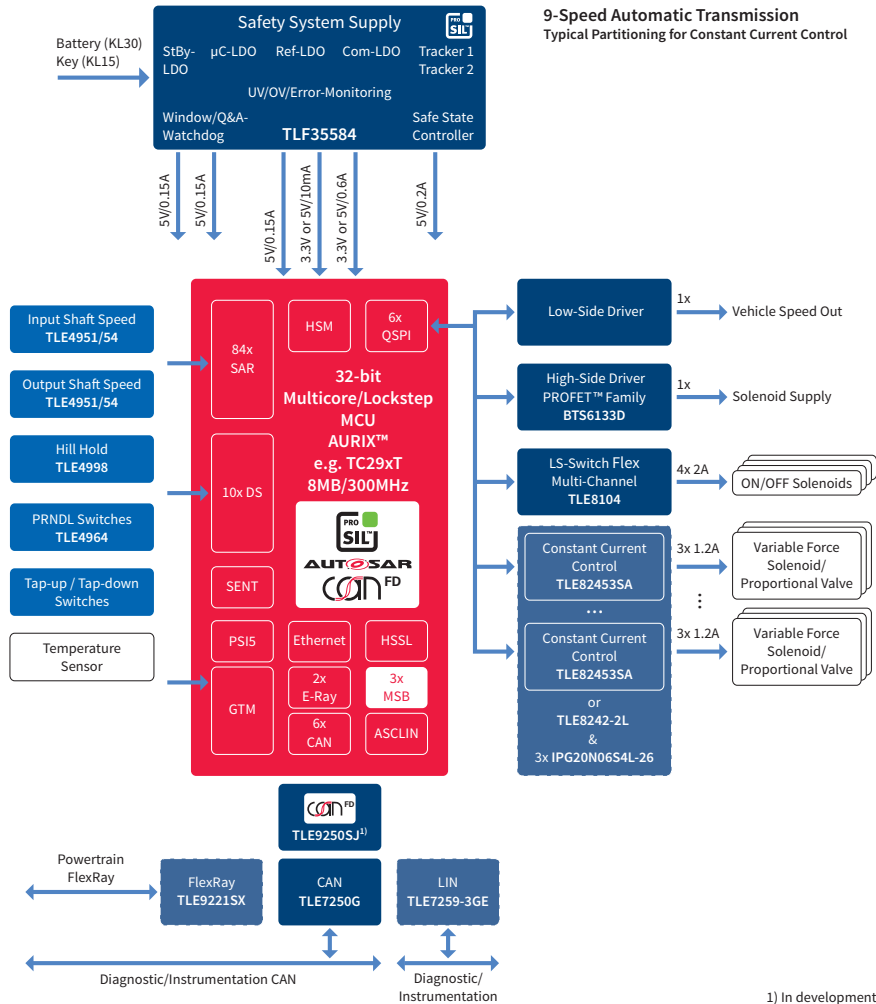
Gasoline Multi-Port Injection – Discrete Solution



System Benefits

- Flexible and scalable product portfolio tailored to the cost and performance needs of the mid-end and entry segments
- Industry benchmark in embedded real-time performance facilitates pumping loss reduction, knock detection and efficient after-treatment
- Conforming with upcoming emission legislation at maximized fuel efficiency and with even more driving pleasure, the new sensor families provide enhanced measurement precision (e.g. ignition control, misfire detection)

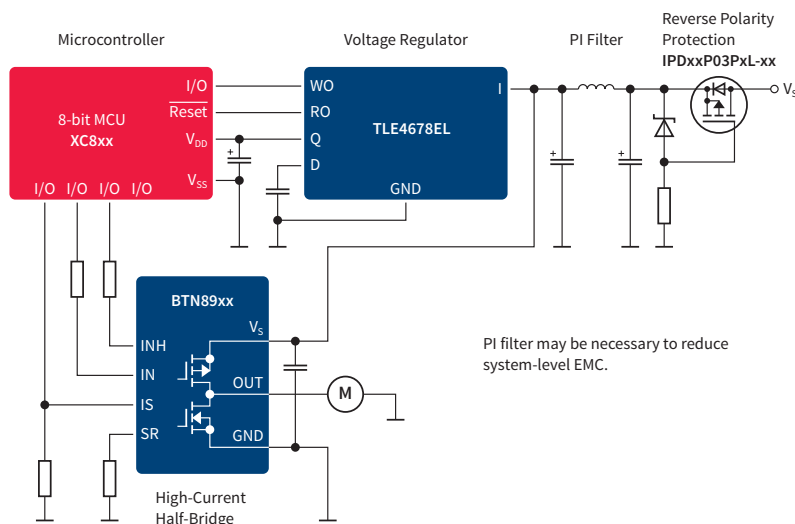
Automatic Transmission – Hydraulic Control



System Benefits

- Full range of products ranging from voltage regulators, transceivers, sensors, microcontrollers and smart power drivers
- Valve actuator ICs supporting highest precision current control
- Optimized sensors providing enhanced disturbance immunity (e.g. vibration) and direction detection
- High-temperature bare die IC supporting integrated transmission control up to the highest torque rate

Fuel Pump

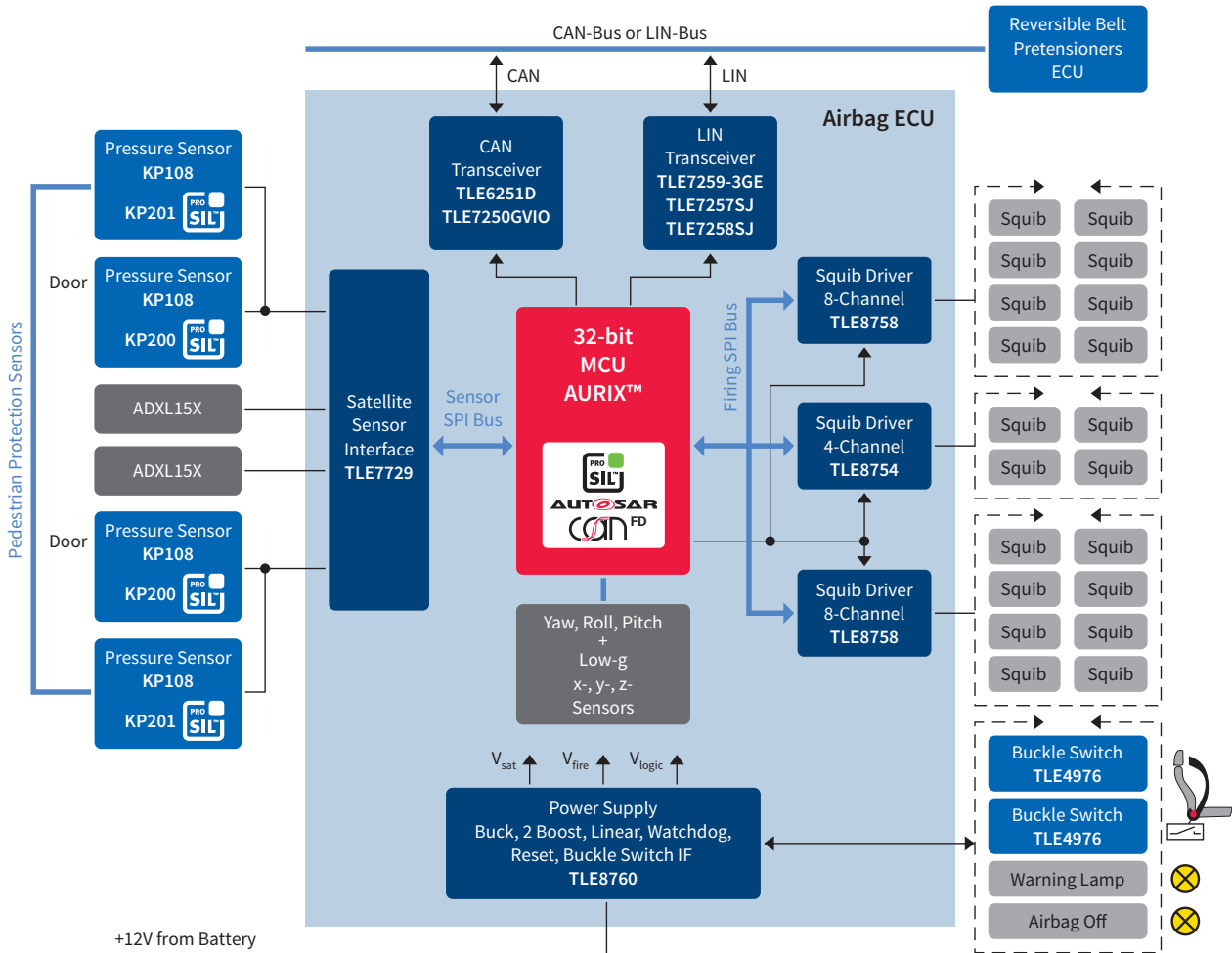


System Benefits

- Large and scalable product portfolio tailored to performance & budget needs
- Fuel saving of > 1% compared to mechanical solution
- Lower hydrocarbon emissions
- Increased lifetime

Safety Applications

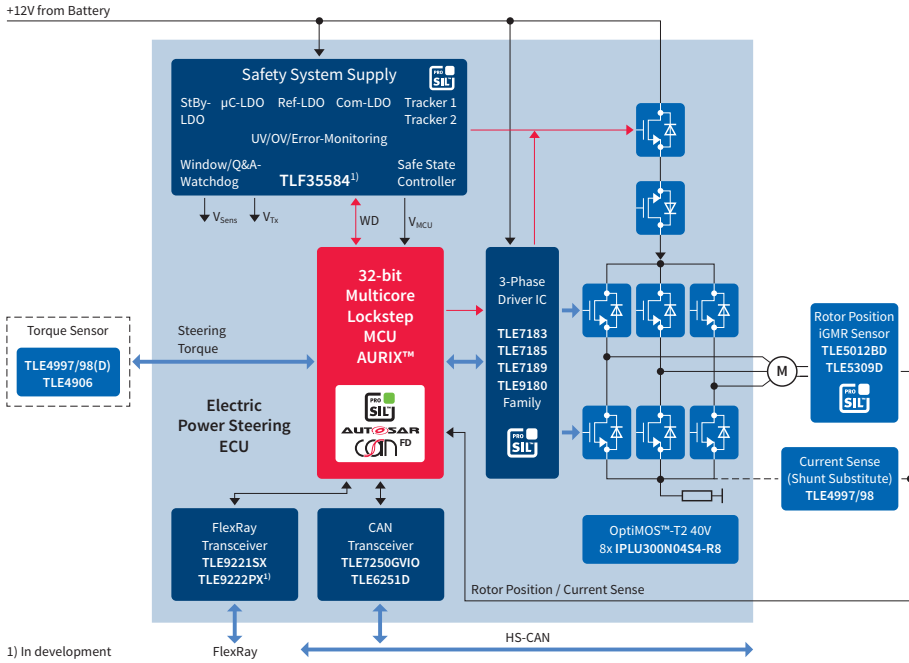
Airbag System



System Benefits

- Airbag systems are standard in most cars and are mandatory equipment in many countries, saving thousands of lives
- Infineon’s broad product spectrum supports scalability and flexibility for building systems from 4 to over 20 firing loops
- Full range of airbag ASSPs ranging from pressure sensors for side crash detection to driver and transceiver ICs
- High performance 32-bit AURIX™ MCU family with dedicated safety enables integration of multiple functions
- The parts are optimized in terms of system interoperability as well as best price-performance ratio
- This systems are mandatory to achieve highest possible scores in the various “New Car Assessment Programs” (NCAP) throughout the world and are even legislated in some countries

Electric Power Steering (EPS)

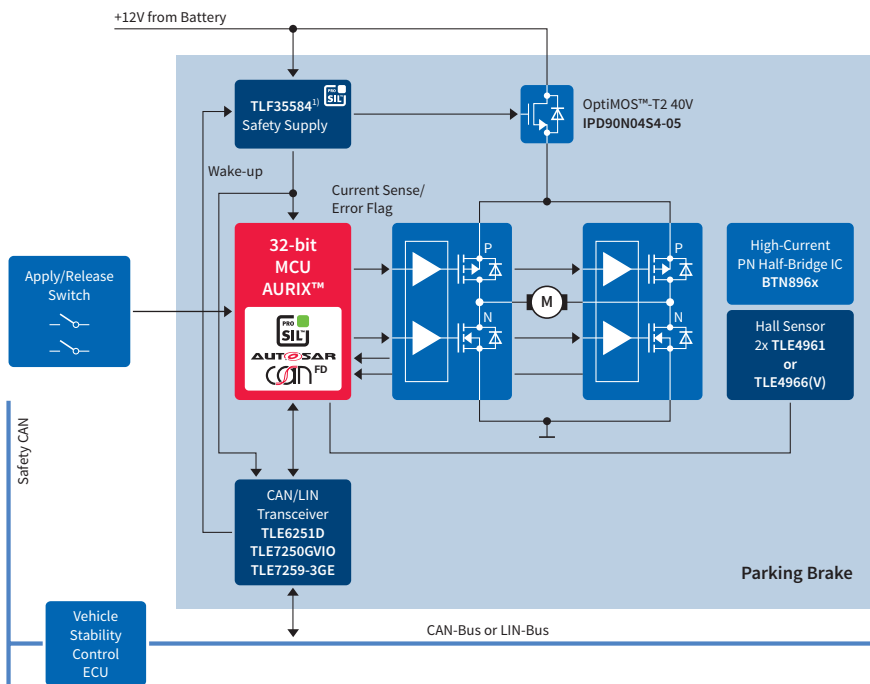


1) In development

System Benefits

- Electric Power Steering (EPS) improves fuel efficiency by approximately 3% while having a positive effect on car handling, the overall driving experience and comfort
- It combines a compact design with reduced mounting costs
- EPS can be adapted via software to suit diverse car models as well as dedicated driving modes
- EPS is the steering technology needed to enable advanced driver assistance systems such as side-wind compensation, lane assist/keeping and parking assistance systems
- Infineon has over ten years of experience in this exciting application and provides the full range of ICs, from sensors to microcontrollers, and from bridge drivers to world-class MOSFETs

Electric Parking Brake



1) In development

System Benefits

- The electric parking brake provides drivers with many more comfort and convenience features than the standard mechanical system
- Hill hold, launch control, roll-away prevention are possible
- These convenience features are in many cases safety-relevant and therefore should be implemented using safety-compliant hardware (according ISO 26262)

Automotive MOSFETs

Infinion OptiMOS™ – Benchmark for Automotive MOSFETs

OptiMOS™ Products are Best in Class

OptiMOS™ superior performance is based on Infineon's leading MOSFET technology combined with the unsurpassed quality of robust package:

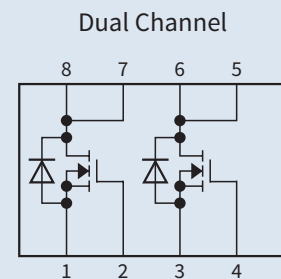
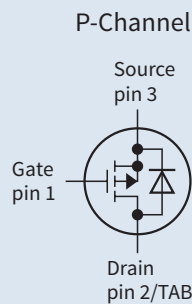
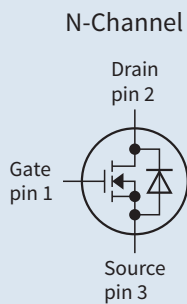
- Best in class $R_{DS(on)}$ performance for increased system efficiency
- Lowest switching and conduction power losses for increased thermal system reliability
- Robust green package for easy process handling

OptiMOS™ Robust Green Package

OptiMOS™ robust package is the benchmark for quality and reliability. Robust package sustains 260°C GREEN reflow processes at MSL1 combined with automotive qualification. No special handling or dry-pack is needed. All green packages are in compliance with RoHS/WEEE guidelines.

OptiMOS™-T2 Product Family

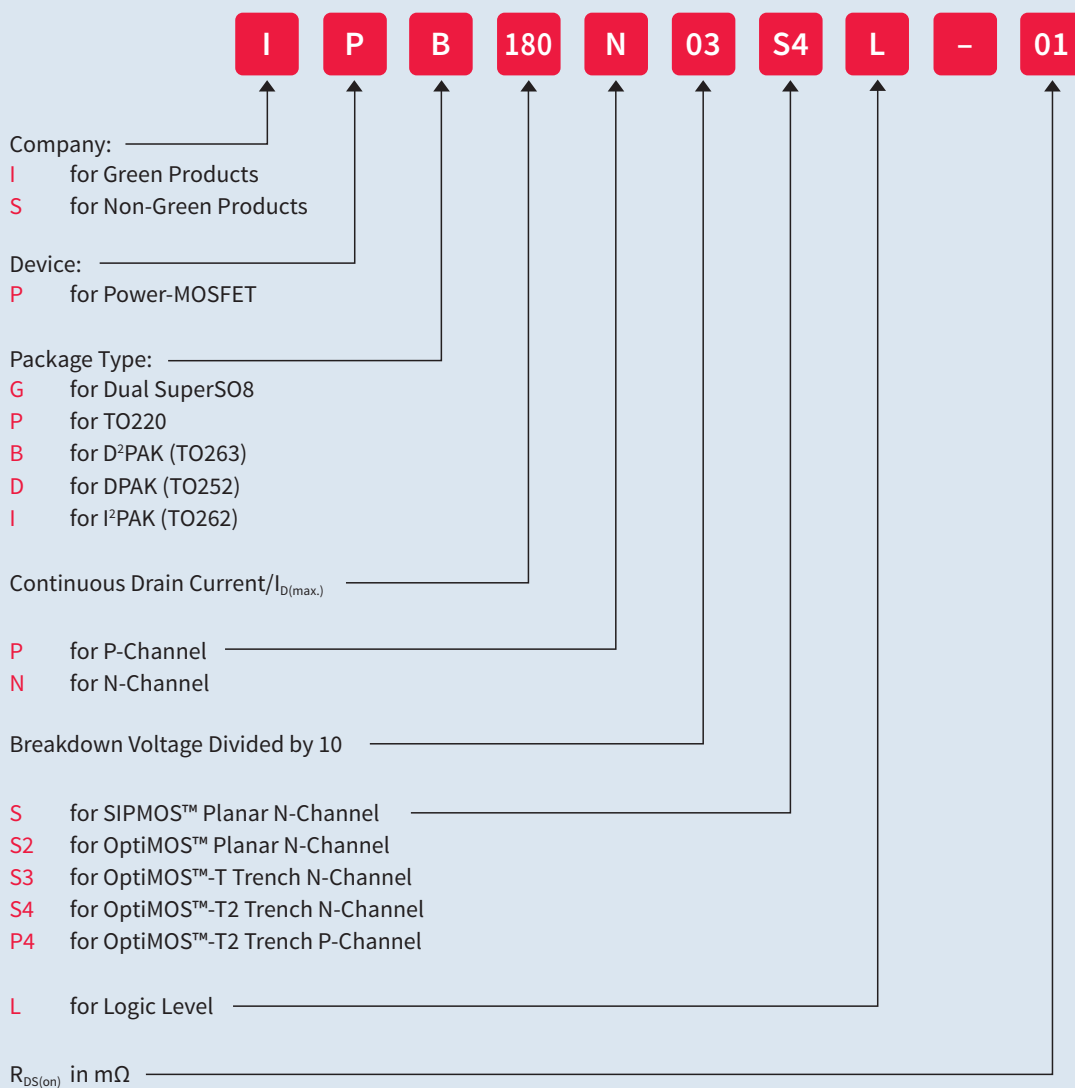
OptiMOS™-T2 trench technology is the benchmark for applications in energy efficiency, CO₂ reduction, electric drives, etc.. The OptiMOS™-T2 product family extends the existing family of OptiMOS™.



		Voltage Class [V]	OptiMOS™-T2 (Trench)	OptiMOS™-T (Trench)	OptiMOS™ (Planar)
Single MOSFET					
N-Channel		30	•		•
N-Channel		40	•		•
N-Channel		55			•
N-Channel		60	•		
N-Channel		75	•		•
N-Channel	NEW!	80	•		
N-Channel		100	•	•	
N-Channel		250		•	
P-Channel		30	•		
P-Channel		40	•		
Dual MOSFET					
Dual N-Channel	NEW!	2 x 40	•		
Dual N-Channel		2 x 55			•
Dual N-Channel	NEW!	2 x 60	•		
Dual N-Channel	NEW!	2 x 100	•		
TWIN MOSFET					
TWIN N-Channel	NEW!	2 x 40	•		



Naming System



Automotive N-Channel MOSFETs

OptiMOS™ 30V (Planar)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{thJC} (max)$ [K/W]	$V_{GS(th)} (min-max)$ [V]	$Q_G (typ)$ [nC]	Package ¹⁾
IPD50N03S2L-06	6.4	50	1.1	1.2 ... 2.0	50	Ⓒ2
IPD30N03S2L-07	6.7	30	1.1	1.2 ... 2.0	51	Ⓒ2
IPD50N03S2-07	7.3	50	1.1	2.1 ... 4.0	52	Ⓒ2
IPD30N03S2L-10	10.0	30	1.5	1.2 ... 2.0	31	Ⓒ2
IPD30N03S2L-20	20.0	30	2.5	1.2 ... 2.0	14	Ⓒ2

OptiMOS™ 40V (Planar)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{thJC} (max)$ [K/W]	$V_{GS(th)} (min-max)$ [V]	$Q_G (typ)$ [nC]	Package ¹⁾
IPB160N04S2L-03	2.7	160	0.5	1.2 ... 2.0	230	Ⓒ8
IPB160N04S2-03	2.9	160	0.5	2.1 ... 4.0	123	Ⓒ8
IPB100N04S2L-03	3.0	100	0.5	1.2 ... 2.0	170	Ⓒ4
IPB100N04S2-04	3.3	100	0.5	2.1 ... 4.0	172	Ⓒ4
IPB80N04S2L-03	3.4	80	0.5	1.2 ... 2.0	170	Ⓒ4
IPB80N04S2-04	3.4	80	0.5	2.1 ... 4.0	127	Ⓒ4
IPB80N04S2-H4	3.7	80	0.5	2.1 ... 4.0	103	Ⓒ4
IPI80N04S2-04	3.7	80	0.5	2.1 ... 4.0	170	Ⓒ9
IPI80N04S2-H4	4.0	80	0.5	2.1 ... 4.0	148	Ⓒ9
IPP100N04S2L-03	3.3	100	0.5	1.2 ... 2.0	163	Ⓒ2
IPP80N04S2L-03	3.4	80	0.5	1.2 ... 2.0	163	Ⓒ2
IPP100N04S2-04	3.6	100	0.5	2.1 ... 4.0	172	Ⓒ2
IPP80N04S2-04	3.7	80	0.5	2.1 ... 4.0	127	Ⓒ2
IPP80N04S2-H4	4.0	80	0.5	2.1 ... 4.0	103	Ⓒ2

OptiMOS™ 55V (Planar)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{thJC} (max)$ [K/W]	$V_{GS(th)} (min-max)$ [V]	$Q_G (typ)$ [nC]	Package ¹⁾
IPD50N06S2L-13	12.7	50	1.1	1.2 ... 2.0	52	Ⓒ2
IPD30N06S2L-13	13.0	30	1.1	1.2 ... 2.0	52	Ⓒ2
IPD50N06S2-14	14.4	50	1.1	2.1 ... 4.0	39	Ⓒ2
IPD30N06S2-15	14.7	30	1.1	1.2 ... 2.0	39	Ⓒ2
IPD30N06S2L-23	23.0	30	1.5	1.2 ... 2.0	33	Ⓒ2
IPD30N06S2-23	23.0	30	1.5	2.1 ... 4.0	25	Ⓒ2
IPD26N06S2L-35	35.0	30	2.2	1.2 ... 2.0	10	Ⓒ2
IPD25N06S2-40	40.0	29	2.2	2.1 ... 4.0	14	Ⓒ2
IPD15N06S2L-64	64.0	19	3.2	1.2 ... 2.0	11	Ⓒ2
IPD14N06S2-80	80.0	17	3.2	2.1 ... 4.0	8	Ⓒ2
IPB100N06S2L-05	4.4	100	0.5	1.2 ... 2.0	170	Ⓒ4
IPB80N06S2L-05	4.5	80	0.5	1.2 ... 2.0	170	Ⓒ4
IPB100N06S2-05	4.7	100	0.5	2.1 ... 4.0	130	Ⓒ4
IPB80N06S2L-H5	4.7	80	0.5	1.2 ... 2.0	145	Ⓒ4
IPB80N06S2-05	4.8	80	0.5	2.1 ... 4.0	130	Ⓒ4
IPB80N06S2-H5	5.2	80	0.5	2.1 ... 4.0	116	Ⓒ4
IPB80N06S2L-06	6.0	80	0.6	1.2 ... 2.0	114	Ⓒ4
IPB80N06S2-07	6.3	80	0.6	2.1 ... 4.0	86	Ⓒ4
IPB80N06S2L-07	6.7	80	0.7	1.2 ... 2.0	95	Ⓒ4
IPB80N06S2-08	7.7	80	0.7	2.1 ... 4.0	72	Ⓒ4

1) See packages on page 112

OptiMOS™ 55V (Planar) (cont'd)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{th,jc}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Package ¹⁾
IPB80N06S2L-09	8.2	80	0.8	1.2 ... 2.0	82	(34)
IPB80N06S2-09	8.8	80	0.8	2.1 ... 4.0	60	(34)
IPB80N06S2L-11	10.7	80	0.95	1.2 ... 2.0	62	(34)
IPB77N06S2-12	11.7	77	0.95	2.1 ... 4.0	45	(34)
IPI80N06S2L-05	4.8	80	0.5	1.2 ... 2.0	170	(59)
IPI80N06S2-07	6.6	80	0.6	2.1 ... 4.0	86	(59)
IPI80N06S2-08	8.0	80	0.7	2.1 ... 4.0	72	(59)
IPI80N06S2L-11	11.0	80	0.95	1.2 ... 2.0	62	(59)
BSP603S2L	33.0	5.2	20.0	1.2 ... 2.0	31	(23)
IPP100N06S2L-05	4.7	100	0.5	1.2 ... 2.0	170	(52)
IPP80N06S2L-05	4.8	80	0.5	1.2 ... 2.0	170	(52)
IPP100N06S2-05	5.0	100	0.5	2.1 ... 4.0	130	(52)
IPP80N06S2L-H5	5.0	80	0.5	1.2 ... 2.0	145	(52)
IPP80N06S2-05	5.1	80	0.5	2.1 ... 4.0	130	(52)
IPP80N06S2-H5	5.5	80	0.5	2.1 ... 4.0	116	(52)
IPP80N06S2L-06	6.3	80	0.6	1.2 ... 2.0	114	(52)
IPP80N06S2-07	6.6	80	0.6	2.1 ... 4.0	86	(52)
IPP80N06S2L-07	7.0	80	0.7	1.2 ... 2.0	95	(52)
IPP80N06S2-08	8.0	80	0.7	2.1 ... 4.0	72	(52)
IPP80N06S2L-09	8.5	80	0.8	1.2 ... 2.0	82	(52)
IPP80N06S2-09	9.1	80	0.8	2.1 ... 4.0	60	(52)
IPP80N06S2L-11	11.0	80	0.95	1.2 ... 2.0	62	(52)
IPP77N06S2-12	12.0	77	0.95	2.1 ... 4.0	45	(52)

OptiMOS™ 75V (Planar)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{th,jc}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Package ¹⁾
IPD30N08S2L-21	20.5	30	1.1	2.1 ... 4.0	43	(32)
IPD30N08S2-22	21.5	30	1.1	2.1 ... 4.0	44	(32)
IPD22N08S2L-50	50.0	22	2.0	1.2 ... 2.0	21	(32)
IPB100N08S2L-07	6.5	100	0.5	1.2 ... 2.0	185	(34)
IPB100N08S2-07	6.8	100	0.5	2.1 ... 4.0	153	(34)
IPB80N08S2L-07	6.8	80	0.5	1.2 ... 2.0	186	(34)
IPB80N08S2-07	7.1	80	0.5	2.1 ... 4.0	182	(34)
IPI100N08S2-07	7.1	100	0.5	2.1 ... 4.0	144	(59)
IPI80N08S2-07	7.4	80	0.5	2.1 ... 4.0	144	(59)
IPP100N08S2L-07	6.8	100	0.5	1.2 ... 2.0	182	(52)
IPP100N08S2-07	7.1	100	0.5	2.1 ... 4.0	144	(59)
IPP80N08S2L-07	7.1	80	0.5	1.2 ... 2.0	183	(52)
IPP80N08S2-07	7.4	80	0.5	2.1 ... 4.0	144	(59)

1) See packages on page 112

Automotive N-Channel MOSFETs

OptiMOS™-T 100V (Trench)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	R_{thJC} (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Package ¹⁾
IPB100N10S3-05 ²⁾	4.8	100	0.5	2.0 ... 4.0	135	Ⓒ34
IPB70N10S3-12	11.3	70	1.2	2.0 ... 4.0	51	Ⓒ34
IPB70N10S3L-12	11.8	70	1.2	1.2 ... 2.4	60	Ⓒ34
IPB50N10S3L-16	15.4	70	1.5	1.2 ... 2.4	49	Ⓒ34
IPB35N10S3L-26	26.3	35	2.1	1.2 ... 2.4	30	Ⓒ34
IPD70N10S3-12 ²⁾	11.1	70	1.2	2.0 ... 4.0	51	Ⓒ32
IPD70N10S3L-12 ²⁾	11.5	70	1.2	1.2 ... 2.4	60	Ⓒ32
IPD50N10S3L-16 ²⁾	15.0	50	1.5	1.2 ... 2.4	49	Ⓒ32
IPD35N10S3L-26	24.0	35	2.1	1.2 ... 2.4	39	Ⓒ32
IPD30N10S3L-34	31.0	30	2.6	1.2 ... 2.4	24	Ⓒ32
IPI100N10S3-05 ²⁾	5.1	100	0.5	2.0 ... 4.0	135	Ⓒ39
IPI70N10S3-12	11.6	70	1.2	2.0 ... 4.0	51	Ⓒ39
IPI70N10S3L-12	12.1	70	1.2	1.2 ... 2.4	60	Ⓒ39
IPI50N10S3L-16	15.7	50	1.5	1.2 ... 2.4	49	Ⓒ39
IPP100N10S3-05 ²⁾	5.1	100	0.5	2.0 ... 4.0	135	Ⓒ52
IPP70N10S3-12	12.1	70	1.2	2.0 ... 4.0	51	Ⓒ52
IPP70N10S3L-12	12.1	70	1.2	1.2 ... 2.4	60	Ⓒ52
IPP50N10S3L-16	15.7	50	1.5	1.2 ... 2.4	49	Ⓒ52

OptiMOS™-T 250V (Trench)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	R_{thJC} (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Package ¹⁾
IPD5N25S3-430	430	5	3.7	2.0 ... 4.0	1.5	Ⓒ32
IPB64N25S3-20	20	64	0.5	2.0 ... 4.0	67	Ⓒ34
IPB17N25S3-100	100	17	1.4	2.0 ... 4.0	5	Ⓒ34
IPP17N25S3-100	100	17	1.4	2.0 ... 4.0	5	Ⓒ52

1) See packages on page 112

2) Not for new design

OptiMOS™-T2 30V (Trench)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{thJC} (max)$ [K/W]	$V_{GS(th)} (min-max)$ [V]	$Q_G (typ)$ [nC]	Package ¹⁾
IPD90N03S4L-02	2.2	90	1.1	1.0 ... 2.2	110	(32)
IPD90N03S4L-03	3.3	90	1.6	1.0 ... 2.2	60	(32)
IPD70N03S4L-04	4.3	70	2.2	1.0 ... 2.2	37	(32)
IPD50N03S4L-06	5.5	50	2.7	1.0 ... 2.2	24	(32)
IPD40N03S4L-08	8.0	40	3.6	1.0 ... 2.2	15	(32)
IPD30N03S4L-09	9.0	30	3.6	1.0 ... 2.2	15	(32)
IPD30N03S4L-14	13.6	30	4.9	1.0 ... 2.2	11	(32)
IPB240N03S4L-R9 ²⁾ NEW!	0.9	240	0.7	1.0 ... 2.2	230	(38)
IPB240N03S4L-R8 ²⁾ NEW!	0.8	240	0.5	1.0 ... 2.2	290	(38)
IPB180N03S4L-H0	1.0	180	0.6	1.0 ... 2.2	230	(38)
IPB180N03S4L-01	1.1	180	0.8	1.0 ... 2.2	187	(38)
IPB120N03S4L-03 ³⁾ NEW!	3.0	120	1.9	1.0 ... 2.2	55	(34)
IPB80N03S4L-02	2.4	80	1.1	1.0 ... 2.2	110	(34)
IPB80N03S4L-03	3.4	80	1.6	1.0 ... 2.2	60	(34)
IPB22N03S4L-15	14.6	22	4.9	1.0 ... 2.2	11	(34)
IPI80N03S4L-03	2.7	80	1.1	1.0 ... 2.2	110	(59)
IPI80N03S4L-04	3.6	80	1.6	1.0 ... 2.2	60	(59)
IPI22N03S4L-15	14.9	22	4.9	1.0 ... 2.2	11	(59)
IPP80N03S4L-03	2.7	80	1.1	1.0 ... 2.2	110	(52)
IPP80N03S4L-04	3.7	80	1.6	1.0 ... 2.2	60	(52)
IPP22N03S4L-15	14.9	22	4.9	1.0 ... 2.2	11	(52)

OptiMOS™-T2 40V (Trench)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{thJC} (max)$ [K/W]	$V_{GS(th)} (min-max)$ [V]	$Q_G (typ)$ [nC]	Package ¹⁾
IPLU300N04S4-R8 NEW!	0.8	300	0.4	2.0 ... 4.0	221	(15)
IPLU300N04S4-1R1 ³⁾ NEW!	1.2	300	0.5	2.0 ... 4.0	116	(15)
IPLU300N04S4-1R7 ³⁾ NEW!	1.7	300	0.8	2.0 ... 4.0	76	(15)
IPD100N04S4-02	2.0	100	1.0	2.0 ... 4.0	91	(32)
IPD90N04S4-02	2.4	90	1.0	2.0 ... 4.0	91	(32)
IPD90N04S4-03	3.2	90	1.6	2.0 ... 4.0	51	(32)
IPD90N04S4L-04	3.8	90	2.1	1.2 ... 2.0	46	(32)
IPD90N04S4-04	4.1	90	2.1	2.0 ... 4.0	33	(32)
IPD90N04S4-05	5.2	90	2.3	2.0 ... 4.0	33	(32)
IPD75N04S4-06	5.9	75	2.6	2.0 ... 4.0	24.5	(32)
IPD50N04S4L-08	7.3	50	3.3	1.2 ... 2.0	23	(32)
IPD50N04S4-08	7.9	50	3.3	2.0 ... 4.0	17.2	(32)
IPD50N04S4-10	9.3	50	3.7	2.0 ... 4.0	14	(32)
IPB240N04S4-R9 ²⁾ NEW!	0.9	240	0.5	2.0 ... 4.0	220	(38)
IPB240N04S4-1R0 ²⁾ NEW!	1.0	240	0.7	2.0 ... 4.0	170	(38)
IPB180N04S4L-H0 NEW!	1.0	180	0.6	1.2 ... 2.2	239	(38)
IPB180N04S4-00	1.0	180	0.5	2.0 ... 4.0	220	(38)
IPB180N04S4-H0	1.1	180	0.6	2.0 ... 4.0	173	(38)

1) See packages on page 112

2) Coming Q4/2014

3) Coming Q2/2015

Automotive N-Channel MOSFETs

OptiMOS™-T2 40V (Trench) (cont'd)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{thJC} (max)$ [K/W]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Package ¹⁾
IPB180N04S4-01	1.3	180	0.8	2.0 ... 4.0	135	(36)
IPB180N04S4L-01 NEW!	1.2	180	0.8	1.2 ... 2.0	188	(36)
IPB160N04S4-H1	1.6	160	0.9	2.0 ... 4.0	105	(34)
IPB160N04S4L-H1 NEW!	1.5	160	0.9	1.2 ... 2.2	146	(36)
IPB120N04S4L-02 NEW!	1.7	120	1.0	1.2 ... 2.2	143	(34)
IPB120N04S4-04 ²⁾ NEW!	3.6	120	1.9	2.0 ... 4.0	42	(34)
IPB120N04S4-02	1.8	120	1.0	2.0 ... 4.0	103	(34)
IPB90N04S4-02	2.1	90	1.0	2.0 ... 4.0	91	(34)
IPB100N04S4-H2	2.4	100	1.3	2.0 ... 4.0	70	(34)
IPB80N04S4-03	3.3	80	1.6	2.0 ... 4.0	51	(34)
IPB80N04S4L-04	4.0	80	2.1	1.2 ... 2.0	46	(34)
IPB80N04S4-04	4.2	80	2.1	2.0 ... 4.0	33	(34)
IPB70N04S4-06	6.2	70	2.6	2.0 ... 4.0	24.5	(34)
IPB45N04S4L-08	7.6	45	3.3	1.2 ... 2.0	23	(34)
IPI120N04S4-01	1.9	120	0.8	2.0 ... 4.0	135	(59)
IPI120N04S4-02	2.1	120	0.95	2.0 ... 4.0	103	(59)
IPI90N04S4-02	2.5	90	1.0	2.0 ... 4.0	91	(59)
IPI100N04S4-H2	2.7	100	1.3	2.0 ... 4.0	70	(59)
IPI80N04S4-03	3.7	80	1.6	2.0 ... 4.0	51	(59)
IPI80N04S4L-04	4.3	80	2.1	1.2 ... 2.0	46	(59)
IPI80N04S4-04	4.6	80	2.1	2.0 ... 4.0	33	(59)
IPI70N04S4-06	6.5	70	2.6	2.0 ... 4.0	24.5	(59)
IPI45N04S4L-08	7.6	45	3.3	1.2 ... 2.0	23	(59)
IPP120N04S4-01	1.9	120	0.8	2.0 ... 4.0	135	(52)
IPP120N04S4-02	2.1	120	1.0	2.0 ... 4.0	103	(52)
IPP90N04S4-02	2.5	90	1.0	2.0 ... 4.0	91	(52)
IPP100N04S4-H2	2.7	100	1.3	2.0 ... 4.0	70	(52)
IPP80N04S4-03	3.7	80	1.6	2.0 ... 4.0	51	(52)
IPP80N04S4L-04	4.3	80	2.1	1.2 ... 2.0	46	(52)
IPP80N04S4-04	4.6	80	2.1	2.0 ... 4.0	33	(52)
IPP70N04S4-06	6.5	70	2.6	2.0 ... 4.0	24.5	(52)
IPP45N04S4L-08	7.6	45	3.3	1.2 ... 2.0	23	(52)
IPC100N04S4-02 ³⁾	2.4	100	1.0	2.0 ... 4.0	79	(43)
IPC80N04S4-03 ³⁾	3.3	80	1.5	2.0 ... 4.0	55	(43)
IPC60N04S4-06 ³⁾	6.0	60	2.4	2.0 ... 4.0	25	(43)
IPC60N04S4L-06 ³⁾	5.6	60	2.4	1.2 ... 2.2	35	(43)

1) See packages on page 112

2) Coming Q4/2014

3) Coming Q1/2015

OptiMOS™-T2 60V (Trench)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{th,jc}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Package ¹⁾
IPD100N06S4-03	3.5	100	1.0	2.0 ... 4.0	99.0	(32)
IPD90N06S4L-03	3.5	90	1.0	1.2 ... 2.0	133.0	(32)
IPD90N06S4-04	3.8	90	1.0	2.0 ... 4.0	99.0	(32)
IPD90N06S4L-05	4.6	90	1.4	1.2 ... 2.0	83.0	(32)
IPD90N06S4-05	5.1	90	1.4	2.0 ... 4.0	62.0	(32)
IPD90N06S4L-06	6.3	90	1.9	1.2 ... 2.0	58.0	(32)
IPD90N06S4-07	6.9	90	1.9	2.0 ... 4.0	43.0	(32)
IPD50N06S4L-08	7.8	50	2.1	1.2 ... 2.0	49.0	(32)
IPD50N06S4-09	9.0	50	2.1	2.0 ... 4.0	36.0	(32)
IPD50N06S4L-12	12.0	50	3.0	1.2 ... 2.0	30.0	(32)
IPD30N06S4L-23	23.0	30	4.2	1.2 ... 2.0	16.1	(32)
IPD25N06S4L-30	30.0	25	5.1	1.2 ... 2.0	12.5	(32)
IPB180N06S4-H1	1.7	180	0.6	2.0 ... 4.0	208	(38)
IPB120N06S4-H1	2.0	120	0.6	2.0 ... 4.0	208	(34)
IPB120N06S4-02	2.4	120	0.8	2.0 ... 4.0	150	(34)
IPB120N06S4-03	2.8	120	0.9	2.0 ... 4.0	125	(34)
IPB90N06S4L-04	3.4	90	1.0	1.2 ... 2.0	133	(34)
IPB90N06S4-04	3.7	90	1.0	2.0 ... 4.0	99	(34)
IPB80N06S4L-05	4.8	80	1.4	1.2 ... 2.0	83	(34)
IPB80N06S4-05	5.4	80	1.4	2.0 ... 4.0	62	(34)
IPB80N06S4-07	5.4	80	1.4	2.0 ... 4.0	62	(34)
IPB80N06S4L-07	6.4	80	1.9	1.2 ... 2.0	58	(34)
IPB45N06S4L-08	7.9	45	2.1	1.2 ... 2.0	49	(34)
IPB45N06S4-09	9.1	45	2.1	2.0 ... 4.0	36	(34)
IPI120N06S4-H1	2.4	120	0.6	2.0 ... 4.0	208	(59)
IPI120N06S4-02	2.8	120	0.8	2.0 ... 4.0	150	(59)
IPI120N06S4-03	3.2	120	0.9	2.0 ... 4.0	125	(59)
IPI90N06S4L-04	3.4	90	1.0	1.2 ... 2.0	133	(59)
IPI90N06S4-04	4.0	90	1.0	2.0 ... 4.0	99	(59)
IPI80N06S4L-05	4.8	80	1.4	1.2 ... 2.0	83	(59)
IPI80N06S4-05	5.4	80	1.4	2.0 ... 4.0	62	(59)
IPI80N06S4L-07	6.4	80	1.9	1.2 ... 2.0	58	(59)
IPI80N06S4-07	7.1	80	1.9	2.0 ... 4.0	43	(59)
IPI45N06S4L-08	8.2	45	2.1	1.2 ... 2.0	49	(59)
IPI45N06S4-09	9.1	45	2.1	2.0 ... 4.0	36	(59)
IPP120N06S4-H1	2.4	120	0.6	2.0 ... 4.0	208	(52)
IPP120N06S4-02	2.8	120	0.8	2.0 ... 4.0	150	(52)
IPP120N06S4-03	3.2	120	0.9	2.0 ... 4.0	125	(52)
IPP90N06S4L-04	3.4	90	1.0	1.2 ... 2.0	133	(52)
IPP90N06S4-04	3.7	90	1.0	2.0 ... 4.0	99	(52)
IPP80N06S4L-05	4.8	80	1.4	1.2 ... 2.0	83	(52)
IPP80N06S4-05	5.4	80	1.4	2.0 ... 4.0	62	(52)
IPP80N06S4L-07	6.4	80	1.9	1.2 ... 2.0	58	(52)
IPP80N06S4-07	7.1	80	1.9	2.0 ... 4.0	43	(52)
IPP45N06S4L-08	8.2	45	2.1	1.2 ... 2.0	49	(52)
IPP45N06S4-09	9.1	45	2.1	2.0 ... 4.0	36	(52)

1) See packages on page 112

Automotive N-Channel MOSFETs

OptiMOS™-T2 80V (Trench)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{th(jc)}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Package ¹⁾
IPD90N08S4-05 NEW!	5.3	90	1.0	2.0 ... 4.0	68	(32)
IPD50N08S4-13 NEW!	13.2	50	2.1	2.0 ... 4.0	30	(32)
IPB180N08S4-02 NEW!	2.2	180	0.5	2.0 ... 4.0	167	(38)
IPB160N08S4-03 NEW!	3.2	160	0.7	2.0 ... 4.0	112	(38)
IPB140N08S4-04 NEW!	4.2	140	0.9	2.0 ... 4.0	80	(38)
IPB120N08S4-03 NEW!	2.5	120	0.5	2.0 ... 4.0	167	(34)
IPB120N08S4-04 NEW!	4.1	120	0.8	2.0 ... 4.0	95	(34)
IPB80N07S4-05 NEW!	5.2	80	1.0	2.0 ... 4.0	69	(34)
IPB80N08S4-06 NEW!	5.5	80	1.0	2.0 ... 4.0	70	(34)
IPI120N08S4-03 NEW!	2.5	120	0.5	2.0 ... 4.0	167	(59)
IPI120N08S4-04 NEW!	4.1	120	0.8	2.0 ... 4.0	95	(59)
IPI80N07S4-05 NEW!	5.2	80	1.0	2.0 ... 4.0	69	(59)
IPI80N08S4-06 NEW!	5.5	80	1.0	2.0 ... 4.0	70	(59)
IPP120N08S4-03 NEW!	2.5	120	0.5	2.0 ... 4.0	167	(52)
IPP120N08S4-04 NEW!	4.1	120	0.8	2.0 ... 4.0	95	(52)
IPP80N07S4-05 NEW!	5.2	80	1.0	2.0 ... 4.0	69	(52)
IPP80N08S4-06 NEW!	5.5	80	1.0	2.0 ... 4.0	70	(52)

OptiMOS™-T2 100V (Trench)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{th(jc)}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Package ¹⁾
IPD90N10S4L-06	6.6	90	1.1	1.1 ... 2.1	75	(32)
IPD90N10S4-06 NEW!	6.7	90	1.1	2.0 ... 3.5	52	(32)
IPD60N10S4L-12	12.0	60	1.6	1.1 ... 2.1	38	(32)
IPD60N10S4-12 NEW!	12.2	60	1.6	2.0 ... 3.5	26	(32)
IPB180N10S4-02	2.5	180	0.5	2.0 ... 3.5	156	(38)
IPB180N10S4-03 NEW!	3.3	180	0.6	2.0 ... 3.5	108	(38)
IPB120N10S4-03 NEW!	3.5	120	0.6	2.0 ... 3.5	108	(34)
IPB120N10S4-05 NEW!	5.0	120	0.8	2.0 ... 3.5	70	(34)
IPI120N10S4-03 NEW!	3.5	120	0.6	2.0 ... 3.5	108	(59)
IPI120N10S4-05 NEW!	5.0	120	0.8	2.0 ... 3.5	70	(59)
IPP120N10S4-03 NEW!	3.5	120	0.6	2.0 ... 3.5	108	(52)
IPP120N10S4-05 NEW!	5.0	120	0.8	2.0 ... 3.5	70	(52)

1) See packages on page 112

Automotive P-Channel MOSFETs

OptiMOS™-P2 30V P-Channel (Trench)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{thJC} (max)$ [K/W]	$V_{GS(th)} (min-max)$ [V]	$Q_G (typ)$ [nC]	Package ¹⁾
IPD90P03P4L-04	4.5	-90	1.1	-2.0 ... -1.0	100	(32)
IPD90P03P4-04	4.5	-90	1.1	-4.0 ... -2.0	100	(32)
IPD80P03P4L-07	6.8	-80	1.7	-2.0 ... -1.0	80	(32)
IPD50P03P4L-11	10.5	-50	2.6	-2.0 ... -1.0	42	(32)
IPB80P03P4L-04	4.1	-80	1.1	-2.0 ... -1.0	125	(34)
IPB80P03P4-05	4.7	-80	1.1	-4.0 ... -2.0	100	(34)
IPB80P03P4L-07	6.9	-80	1.7	-2.0 ... -1.0	63	(34)
IPB45P03P4L-11	10.8	-45	2.6	-2.0 ... -1.0	42	(34)
IPI80P03P4L-04	4.4	-80	1.1	-2.0 ... -1.0	125	(59)
IPI80P03P4L-07	7.2	-80	1.7	-2.0 ... -1.0	63	(59)
IPI45P03P4L-11	11.1	-45	2.6	-2.0 ... -1.0	42	(59)
IPP80P03P4L-04	4.4	-80	1.1	-2.0 ... -1.0	125	(52)
IPP80P03P4L-07	7.2	-80	1.7	-2.0 ... -1.0	63	(52)
IPP45P03P4L-11	11.1	-45	2.6	-2.0 ... -1.0	42	(52)

OptiMOS™-P2 40V P-Channel (Trench)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{thJC} (max)$ [K/W]	$V_{GS(th)} (min-max)$ [V]	$Q_G (typ)$ [nC]	Package ¹⁾
IPB180P04P4L-02	2.4	-100	1.0	-2.2 ... -1.7	220	(38)
IPB180P04P4-03	2.8	-100	1.0	-4.0 ... -2.0	190	(34)
IPB120P04P4L-03	3.0	-120	1.1	-2.2 ... -1.7	180	(34)
IPB120P04P4-04	3.6	-120	1.1	-4.0 ... -2.0	158	(34)
IPB80P04P4L-04	4.2	-90	1.2	-2.2 ... -1.7	135	(34)
IPB80P04P4-05	4.9	-80	1.2	-4.0 ... -2.0	118	(34)
IPB80P04P4L-06	6.4	-80	1.7	-2.2 ... -1.7	71	(34)
IPB80P04P4-07	7.3	-80	1.7	-4.0 ... -2.0	71	(34)
IPB70P04P4L-08	7.5	-70	2.0	-2.2 ... -1.7	63	(34)
IPB70P04P4-09	9.3	-70	2.0	-4.0 ... -2.0	54	(34)
IPD90P04P4L-04	4.3	-90	1.2	-2.2 ... -1.7	135	(32)
IPD90P04P4-05	4.7	-90	1.2	-4.0 ... -2.0	118	(32)
IPD85P04P4L-06	6.4	-85	1.7	-2.2 ... -1.7	80	(32)
IPD85P04P4-07	7.3	-85	1.7	-4.0 ... -2.0	69	(32)
IPD70P04P4L-08	7.8	-70	2.0	-2.2 ... -1.7	63	(32)
IPD70P04P4-09	8.9	-70	2.0	-4.0 ... -2.0	54	(32)
IPD50P04P4L-11	10.6	-50	2.6	-2.2 ... -1.7	45	(32)
IPD50P04P4-13	12.7	-50	2.6	-4.0 ... -2.0	39	(32)
IPP120P04P4L-03	3.4	-120	1.1	-2.2 ... -1.7	180	(52)
IPP120P04P4-04	3.9	-120	1.1	-4.0 ... -2.0	158	(52)
IPP80P04P4L-04	4.7	-80	1.2	-2.2 ... -1.7	16	(52)
IPP80P04P4-05	5.2	-80	1.2	-4.0 ... -2.0	14	(52)
IPP80P04P4L-06	6.7	-80	1.7	-2.2 ... -1.7	71	(52)
IPP80P04P4-07	7.6	-80	1.7	-4.0 ... -2.0	71	(52)
IPP80P04P4L-08	7.9	-80	2.0	-1.2 ... -2.2	71	(59)
IPP70P04P4L-08	8.2	-70	2.0	-2.2 ... -1.7	63	(52)
IPP70P04P4-09	9.4	-70	2.0	-4.0 ... -2.0	54	(52)

1) See packages on page 112

Automotive P-Channel MOSFETs

OptiMOS™-P2 40V P-Channel (Trench) (cont'd)

Product Type	$R_{DS(on)}$ [mΩ]	I_D [A]	$R_{thJC} (max)$ [K/W]	$V_{GS(th)} (min-max)$ [V]	$Q_G (typ)$ [nC]	Package ¹⁾
IPI120P04P4L-03	3.4	-120	1.1	-2.2 ... -1.7	180	Ⓣ9
IPI120P04P4-04	3.9	-120	1.1	-4.0 ... -2.0	135	Ⓣ9
IPI80P04P4L-04	4.7	-80	1.2	-2.2 ... -1.7	16	Ⓣ9
IPI80P04P4-05	5.2	-80	1.2	-4.0 ... -2.0	14	Ⓣ9
IPI80P04P4L-06	6.7	-80	1.7	-2.2 ... -1.7	71	Ⓣ9
IPI80P04P4-07	7.6	-80	1.7	-4.0 ... -2.0	71	Ⓣ9
IPI70P04P4L-08	8.2	-70	2.0	-2.2 ... -1.7	63	Ⓣ9
IPI70P04P4-09	9.4	-70	2.0	-4.0 ... -2.0	54	Ⓣ9

Automotive Dual MOSFETs

OptiMOS™ Dual N-Channel 55V

Product Type	$R_{DS(on)} (max) @ 10V$ [mΩ]/channel	I_D [A]/channel	$R_{thJC} (max)$ [K/W]	$V_{GS(th)} (min-max)$ [V]	$Q_G (typ)$ [nC]	Package ¹⁾
IPG20N06S2L-35	2 x 35	20	2.3	1.2 ... 2.2	18.0	Ⓣ1
IPG20N06S2L-35A NEW!	2 x 35	20	2.3	1.2 ... 2.2	18.0	Ⓣ1
IPG20N06S2L-50	2 x 50	20	2.9	1.2 ... 2.2	12.4	Ⓣ1
IPG20N06S2L-50A NEW!	2 x 50	20	2.9	1.2 ... 2.2	12.4	Ⓣ1
IPG20N06S2L-65	2 x 65	20	3.5	1.2 ... 2.2	10.0	Ⓣ1
IPG20N06S2L-65A NEW!	2 x 65	20	3.5	1.2 ... 2.2	10.0	Ⓣ1

OptiMOS™-T2 Dual N-Channel 40V

Product Type	$R_{DS(on)} (max) @ 10V$ [mΩ]/channel	I_D [A]/channel	$R_{thJC} (max)$ [K/W]	$V_{GS(th)} (min-max)$ [V]	$Q_G (typ)$ [nC]	Package ¹⁾
IPG20N04S4-08	2 x 7.5	20	2.3	2.0 ... 4.0	28.0	Ⓣ1
IPG20N04S4-08A ²⁾ NEW!	2 x 7.5	20	2.3	2.0 ... 4.0	28.0	Ⓣ1
IPG20N04S4-09	2 x 8.6	20	2.8	2.0 ... 4.0	21.7	Ⓣ1
IPG20N04S4-09A ²⁾ NEW!	2 x 8.6	20	2.8	2.0 ... 4.0	21.7	Ⓣ1
IPG20N04S4-12	2 x 12.2	20	3.7	2.0 ... 4.0	14.0	Ⓣ1
IPG20N04S4-12A NEW!	2 x 12.2	20	3.7	2.0 ... 4.0	14.0	Ⓣ1
IPG20N04S4L-07	2 x 7.2	20	2.3	1.2 ... 2.2	39.0	Ⓣ1
IPG20N04S4L-07A NEW!	2 x 7.2	20	2.3	1.2 ... 2.2	39.0	Ⓣ1
IPG20N04S4L-08	2 x 8.1	20	2.8	1.2 ... 2.2	30.0	Ⓣ1
IPG20N04S4L-08A NEW!	2 x 8.1	20	2.8	1.2 ... 2.2	30.0	Ⓣ1
IPG20N04S4L-11	2 x 11.6	20	3.7	1.2 ... 2.2	20.0	Ⓣ1
IPG20N04S4L-11A NEW!	2 x 11.6	20	3.7	1.2 ... 2.2	20.0	Ⓣ1

1) See packages on page 112

2) Coming Q4/2014

Automotive Dual MOSFETs

OptiMOS™-T2 Dual N-Channel 60V

Product Type	$R_{DS(on)}$ (max) @ 10V [mΩ]/channel	I_D [A]/channel	R_{thJC} (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Package ¹⁾
IPG20N06S4-15	2 x 15.5	20	3.0	2.0 ... 4.0	22	(31)
IPG20N06S4-15A ²⁾ NEW!	2 x 15.5	20	3.0	2.0 ... 4.0	22	(31)
IPG20N06S4L-11	2 x 11.1	20	2.3	1.2 ... 2.2	41	(31)
IPG20N06S4L-11A ²⁾ NEW!	2 x 11.1	20	2.3	1.2 ... 2.2	41	(31)
IPG20N06S4L-14	2 x 13.7	20	3.0	1.2 ... 2.2	30	(31)
IPG20N06S4L-14A NEW!	2 x 13.7	20	3.0	1.2 ... 2.2	30	(31)
IPG20N06S4L-26	2 x 26.0	20	4.5	1.2 ... 2.2	20	(31)
IPG20N06S4L-26A NEW!	2 x 26.0	20	4.5	1.2 ... 2.2	20	(31)

OptiMOS™-T2 Dual N-Channel 100V

Product Type	$R_{DS(on)}$ (max) @ 10V [mΩ]/channel	I_D [A]/channel	R_{thJC} (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Package ¹⁾
IPG20N10S4-36A NEW!	2 x 36	20	3.5	2.0 ... 3.5	9.4	(31)
IPG16N10S4-61	2 x 61	16	5.2	2.0 ... 3.5	5.4	(31)
IPG16N10S4-61A NEW!	2 x 61	16	5.2	2.0 ... 3.5	5.4	(31)
IPG20N10S4L-22	2 x 22	20	2.5	1.1 ... 2.1	21.0	(31)
IPG20N10S4L-22A NEW!	2 x 22	20	2.5	1.1 ... 2.1	21.0	(31)
IPG20N10S4L-35	2 x 35	20	3.5	1.1 ... 2.1	13.4	(31)
IPG20N10S4L-35A NEW!	2 x 35	20	3.5	1.1 ... 2.1	13.4	(31)
IPG16N10S4L-61A NEW!	2 x 61	16	5.2	1.1 ... 2.1	8.5	(31)

TWIN MOSFETs

OptiMOS™-T2 TWIN N-Channel 40V

Product Type	$R_{DS(on)}$ (max) @ 10V [mΩ]/channel	I_D [A]/channel	R_{thJC} (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Package ¹⁾
ITD50N04S4L-07 NEW!	7.2	50	3.2	1.2 ... 2.2	25	(33)

1) See packages on page 112

2) Coming Q4/2014

Small Signal MOSFETs

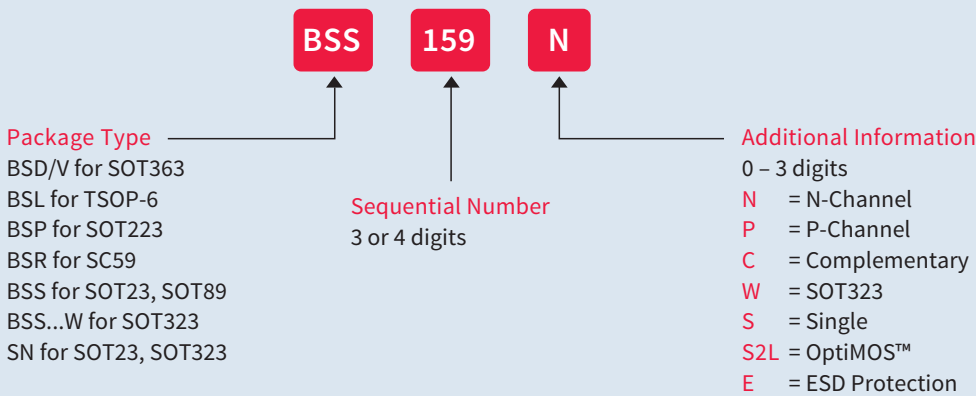
Infiniteon offers a full range of Small Signal MOSFETs qualified according AEC Q101.

The portfolio includes:

- Polarity: N-Channel enhancement, N-Channel depletion and P-Channel MOSFETs
- Voltage classes: -250 ... 800V
- V_{GS} rating: 10V (Normal Level), 4.5V (Logic Level), 2.5V (Super Logic Level), 1.8V (Ultra Logic Level)
- Packages: SOT223, SOT89, TSOP-6 (single and dual), SC59, SOT23, SOT323, SOT363 (single and dual)
- Configuration: single, dual, complementary (n+p pairs)
- Additional features: the products with names ending with “E” have an Integrated ESD protection

SC59 is an enhanced version of the SOT23: it’s footprint compatible with SOT23, but allows a bigger chip inside, therefore a lower $R_{DS(on)}$.

Naming System



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www.infineon.com/complementary
www.infineon.com/pchannel
www.infineon.com/depletion

N-Channel MOSFETs

Voltage	Product Type	$R_{DS(on)}$ (max) [mΩ]	I_D [A]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Technology	Package ¹⁾	
20V	BSL802SN	-	7.5	0.3 ... 0.75	4.7	OptiMOS™2	④6	
	BSL202SN	-	7.5	0.7 ... 1.2	5.8	OptiMOS™2	④6	
	BSL205N	-	2.5	0.7 ... 1.2	2.1	OptiMOS™2	④6(dual)	
	BSL214N	-	1.5	0.7 ... 1.2	0.8	OptiMOS™2	④6(dual)	
	BSL207N	-	2.1	0.7 ... 1.2	2.1	OptiMOS™2	④6(dual)	
	BSL806N	-	2.3	0.3 ... 0.75	1.7	OptiMOS™2	④6(dual)	
	BSR202N	-	3.8	0.7 ... 1.2	5.8	OptiMOS™2	①8	
	BSR802N	-	3.7	0.3 ... 0.75	4.7	OptiMOS™2	①8	
	BSS205N	-	2.5	0.7 ... 1.2	2.1	OptiMOS™2	②1	
	BSS214N	-	1.5	0.7 ... 1.2	0.8	OptiMOS™2	②1	
	BSS806N	-	2.3	0.3 ... 0.75	1.7	OptiMOS™2	②1	
	BSS816NW	-	1.4	0.3 ... 0.75	0.6	OptiMOS™2	②4	
	BSS214NW	-	1.5	0.7 ... 1.2	0.8	OptiMOS™2	②4	
	BSD214NW	-	1.5	0.7 ... 1.2	0.8	OptiMOS™2	②6	
	BSD816SN	-	1.4	0.3 ... 0.75	0.6	OptiMOS™2	②6	
BSD235N	-	0.95	0.7 ... 1.2	0.32	OptiMOS™2	②6(dual)		
BSD840N	-	0.88	0.3 ... 0.75	0.26	OptiMOS™2	②6(dual)		
30V	BSR302N	23	3.7	1.2 ... 2.0	4.4	OptiMOS™2	①8	
	BSL302SN	25	7.1	1.2 ... 2.0	4.4	OptiMOS™2	④6	
	BSL306N	57	2.3	1.2 ... 2.0	1.6	OptiMOS™2	④6(dual)	
	BSS306	57	2.3	1.2 ... 2.0	1.5	OptiMOS™2	②1	
	BSS316N	160	1.4	1.2 ... 2.0	0.6	OptiMOS™2	②1	
55V	BSD316SN	160	1.4	1.2 ... 2.0	0.6	OptiMOS™2	②6	
60V	BSS670S2L	650	0.54	1.2 ... 2.0	1.7	OptiMOS™	②1	
	BSS606N	60	3.2	1.3 ... 2.3	6.1	OptiMOS™3	②2	
	BSL606SN	60	4.5	1.3 ... 2.3	6.1	OptiMOS™3	④6	
	BSR606N	60	2.4	1.3 ... 2.3	6.1	OptiMOS™3	①8	
	BSP318S	90	2.6	1.2 ... 2.0	14.0	SIPMOS™	②3	
	BSP320S	120	2.9	2.1 ... 4.0	9.7	SIPMOS™	②3	
	BSP295	300	1.8	0.8 ... 1.8	14.0	SIPMOS™	②3	
	2N7002DW	3,000	0.3	1.5 ... 2.5	0.4	OptiMOS™	②6(dual)	
	BSS138N	3,500	0.23	0.6 ... 1.4	1.0	SIPMOS™	②1	
	BSS138W	3,500	0.28	0.6 ... 1.4	1.0	SIPMOS™	②3	
	SN7002N	5,000	0.2	0.8 ... 1.8	1.0	SIPMOS™	②1	
	BSS7728N	5,000	0.2	1.3 ... 2.3	1.0	SIPMOS™	②1	
	SN7002W	5,000	0.23	0.8 ... 1.8	1.0	SIPMOS™	②4	
	100V	BSL372SN	220	2.0	4.5	9.5	SIPMOS™	④6
		BSP372N	230	1.8	0.8 ... 2.0	9.5	SIPMOS™	②3
BSL373SN		230	2.0	10.0	6.2	SIPMOS™	④6	
BSP373N		240	1.8	2.1 ... 4.0	6.2	SIPMOS™	②3	
BSL296SN		460	1.4	4.5	4.5	SIPMOS™	④6	
BSP296N		600	1.2	0.8 ... 1.8	4.5	SIPMOS™	②3	
BSS123N		6,000	0.19	0.8 ... 1.8	0.6	SIPMOS™	②1	
BSS119N		6,000	0.19	1.8 ... 2.3	0.6	SIPMOS™	②1	
200V	BSP297	1,800	0.66	0.8 ... 1.8	12.9	SIPMOS™	②3	
240V	BSP89	6,000	0.35	0.8 ... 1.8	4.3	SIPMOS™	②3	
	BSP88	6,000	0.35	0.6 ... 1.4	4.5	SIPMOS™	②3	
	BSS87	6,000	0.26	0.8 ... 1.8	3.7	SIPMOS™	②2	
	BSS131	14,000	0.11	0.8 ... 1.8	2.1	SIPMOS™	②1	

1) See packages on page 112

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Small Signal MOSFETs

N-Channel MOSFETs (cont'd)

Voltage	Product Type	$R_{DS(on)}$ (max) [mΩ]	I_D [A]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Technology	Package ¹⁾
400V	BSP298	3,000	0.5	2.1 ... 4.0	–	SIPMOS™	Ⓒ23
	BSP324	25,000	0.17	1.3 ... 2.3	4.5	SIPMOS™	Ⓒ23
500V	BSP299	4,000	0.4	2.1 ... 4.0	–	SIPMOS™	Ⓒ23
600V	BSP125	45,000	0.12	1.3 ... 2.3	4.4	SIPMOS™	Ⓒ23
	BSS225	45,000	0.09	1.3 ... 2.3	3.9	SIPMOS™	Ⓒ22
	BSS127	500,000	0.023	1.4 ... 2.6	1.4	SIPMOS™	Ⓒ21
800V	BSP300	20	0.19	2.1 ... 4.0	–	SIPMOS™	Ⓒ23

P-Channel MOSFETs

Voltage	Product Type	$R_{DS(on)}$ (max) @ $V_{GS} = -10V$ [mΩ]	I_D [A]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Technology	Package ¹⁾
-20V	BSL207SP	–	-6.0	-1.2 ... -0.6	-13.3	OptiMOS™2 P	Ⓒ46
	BSL211SP	–	-4.7	-1.2 ... -0.6	-8.3	OptiMOS™2 P	Ⓒ46
	BSL215P	–	-1.5	-1.2 ... -0.6	-3.55	OptiMOS™2 P	Ⓒ46(dual)
	BSS215P	–	-1.5	-1.2 ... -0.5	-3.6	OptiMOS™2 P	Ⓒ21
	BSS209PW	–	-0.58	-1.2 ... -0.6	-0.92	OptiMOS™2 P	Ⓒ24
	BSS223PW	–	-0.39	-1.2 ... -0.6	-0.5	OptiMOS™2 P	Ⓒ24
	BSV236SP	–	-1.5	-1.2 ... -0.6	-3.8	OptiMOS™ P	Ⓒ26
	BSD223P	–	-0.39	-1.2 ... -0.6	-0.5	OptiMOS™2 P	Ⓒ25(dual)
-30V	BSL307SP	43	-5.5	-2.0 ... -1.0	-23.4	OptiMOS™2 P	Ⓒ46
	BSL308PE	80	-2.1	-2.0 ... -1.0	-2.9	OptiMOS™3 P + integrated ESD diode	Ⓒ46(dual)
	BSL314PE	140	-1.5	-2.0 ... -1.0	-2.3	OptiMOS™3 P + integrated ESD diode	Ⓒ46(dual)
	BSL315P	150	-1.5	-2.0 ... -1.0	-2.3	OptiMOS™2 P	Ⓒ46(dual)
	BSS308PE	80	-2.1	-2.0 ... -1.0	-5.2	OptiMOS™3 P + integrated ESD diode	Ⓒ21
	BSS314PE	140	-1.5	-2.0 ... -1.0	-2.9	OptiMOS™3 P + integrated ESD diode	Ⓒ21
	BSS315P	150	-1.5	-2.0 ... -1.0	-2.3	OptiMOS™2 P	Ⓒ21
	BSD314SPE	140	-1.5	-2.0 ... -1.0	-2.9	OptiMOS™3 P + integrated ESD diode	Ⓒ26
	BSL303SPE	30	-6.6	4.5	–	OptiMOS™ P + integrated ESD diode	Ⓒ46
	BSL305SPE	50	-5.3	4.5	–		Ⓒ46
	BSS356PWE ²⁾	560	-0.73	4.5	–		Ⓒ24
	BSD356PE ²⁾	560	-0.73	4.5	–		Ⓒ26
-60V	BSP613P	130	-2.9	-4.0 ... -2.1	-22.0	SIPMOS™	Ⓒ23
	BSP170P	300	-1.9	-4.0 ... -2.1	-10.0	SIPMOS™	Ⓒ23
-60V	BSP171P	300	-1.9	-2.0 ... -1.0	-13.0	SIPMOS™	Ⓒ23
	BSP315P	800	-1.17	-2.0 ... -1.0	-5.2	SIPMOS™	Ⓒ23
	BSR315P	800	-0.62	-2.0 ... -1.0	-4.0	SIPMOS™	Ⓒ18
	BSS83P	2,000	-0.33	-2.0 ... -1.0	-2.38	SIPMOS™	Ⓒ21
	BSS84P	8,000	-0.17	-2.0 ... -1.0	-1.0	SIPMOS™	Ⓒ21
	BSS84PW	8,000	-0.15	-2.0 ... -1.0	-1.0	SIPMOS™	Ⓒ24

1) See packages on page 112

2) Coming Q2/2015

P-Channel MOSFETs (cont'd)

Voltage	Product Type	$R_{DS(on)}$ (max) @ $V_{GS} = -10V$ [mΩ]	I_D [A]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Technology	Package ¹⁾
-100V	BSP322P	800	-1.0	-2.0 ... -1.0	-12.4	SIPMOS™	Ⓒ
	BSP321P	900	-0.98	-4.0 ... -2.1	-9.0	SIPMOS™	Ⓒ
	BSP316P	1,800	-0.68	-2.0 ... -1.0	-5.1	SIPMOS™	Ⓒ
	BSR316P	1,800	-0.36	-2.0 ... -1.0	-3.0	SIPMOS™	Ⓓ
-250V	BSP317P	4,000	-0.43	-2.0 ... -1.0	-11.6	SIPMOS™	Ⓒ
	BSP92P	12,000	-0.26	-2.0 ... -1.0	-4.3	SIPMOS™	Ⓒ
	BSS192P	12,000	-0.19	-2.0 ... -1.0	-4.9	SIPMOS™	Ⓒ
	BSR92P	11,000	-0.14	-2.0 ... -1.0	-3.6	SIPMOS™	Ⓓ

Complementary MOSFETs

Voltage	Product Type	$R_{DS(on)}$ (max) @ $V_{GS} = -10V$ [mΩ]	I_D [A]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	Technology	Package ¹⁾
20V	BSL215C/n-ch	-	1.5	0.7 ... 1.2	0.73	OptiMOS™2	Ⓓ(dual)
-20V	BSL215C/p-ch	-	-1.5	-1.2 ... -0.6	-3.0	OptiMOS™2 P	Ⓓ(dual)
20V	BSD235C/n-ch	-	0.95	-1.2 ... -0.6	0.34	OptiMOS™2	Ⓒ(dual)
-20V	BSD235C/p-ch	-	-0.53	0.7 ... 1.2	-0.4	OptiMOS™2 P	Ⓒ(dual)
20V	BSZ15DC02KD/n-ch	-	5.1	0.8 ... 1.4	2.1	OptiMOS™2	Ⓓ(dual)
-20V	BSZ15DC02KD/p-ch	-	-3.2	-1.4 ... -0.7	-3.0	OptiMOS™2 P	Ⓓ(dual)
30V	BSL316C/n-ch	160	1.4	-2.0 ... -1.0	0.6	OptiMOS™2	Ⓓ(dual)
-30V	BSL316C/p-ch	150	-1.5	1.2 ... 2.0	-2.4	OptiMOS™2 P	Ⓓ(dual)
30V	BSL308C/n-ch	57	2.3	1.2 ... 2.0	1.5	OptiMOS™2	Ⓓ(dual)
-30V	BSL308C/p-ch	80	-2.1	-2.0 ... -1.0	-2.9	OptiMOS™3 P	Ⓓ(dual)
30V	BSD356C/n-ch ²⁾	350	0.95	4.5	-	OptiMOS™2	Ⓒ(dual)
-30V	BSD356C/p-ch ²⁾	560	-0.73	4.5	-	OptiMOS™2 P	Ⓒ(dual)

Depletion MOSFETs

Voltage	Product Type	$R_{DS(on)}$ (max) @ $V_{GS} = 0V$ [mΩ]	I_D [A]	Q_G (typ) [nC]	Technology	Package ¹⁾
60V	BSS159N	8.0	0.13	2.2	SIPMOS™	Ⓒ
100V	BSS169	12.0	0.09	2.1	SIPMOS™	Ⓒ
200V	BSP149	3.5	0.14	11.0	SIPMOS™	Ⓒ
240V	BSP129	20.0	0.05	3.8	SIPMOS™	Ⓒ
250V	BSS139	30.0	0.03	2.3	SIPMOS™	Ⓒ
600V	BSP135	60.0	0.02	3.7	SIPMOS™	Ⓒ
	BSS126	700.0	0.007	1.4	SIPMOS™	Ⓒ

1) See packages on page 112

2) Coming Q2/2015

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www.infineon.com/pchannel

www.infineon.com/depletion

Power MOSFETs

600V CoolMOS™ CPA and 650V CoolMOS™ CFDA

After launching the first series of high voltage automotive MOSFET the 600V CoolMOS™ CPA series, Infineon has launched its second generation of market leading Automotive qualified high voltage MOSFET the 650V CoolMOS™ CFDA series. Were the first generation of 600V CoolMOS™ CPA series addresses the well-known attributes of high quality and reliability required by the automotive industry, the new 650V CoolMOS™ CFDA series additional caters to special application needs with its integrated Fast Body Diode. This Fast Body Diode is the key for addressing resonant switching topologies resulting in lower switching losses due to the low gate charge. The softer commutation behavior and consequent reduced EMI appearance gives the 650V CoolMOS™ CFDA series a clear advantage in comparison with competitor parts. Furthermore, limited voltage overshoot during

hard commutation of the body diode enables easier implementation of layout and design.

The basic 600V CoolMOS™ CPA portfolio is now complemented with the broad 650V CoolMOS™ CFDA portfolio which provides all benefits of fast switching Super junction MOSFET fulfilling the enhanced reliability requirements for automotive applications realized with special screening measures in Front End and Back End as well as the qualification compliant to AEC Q100.

Therefore, the combination of both technologies the 600V CoolMOS™ CPA and the new 650V CoolMOS™ CFDA technology is the best choice for switching topologies in Automotive applications.

Common Key Features CoolMOS™ “A”

- First 600V/650V automotive qualified high voltage technologies for automotive market
- Compliant to AEC Q101 standard

Key features 600V CoolMOS™ CPA

- Lowest $R_{ds(on)}$ per package
- Lowest gate charge value Q_g

Key feature 650V CoolMOS™ CFDA

- Limited voltage overshoot during hard commutation – self-limiting di/dt and dv/dt
- Low Q_{rr} at repetitive commutation on body diode & low Q_{oss}

Applications 600V CoolMOS™ CPA

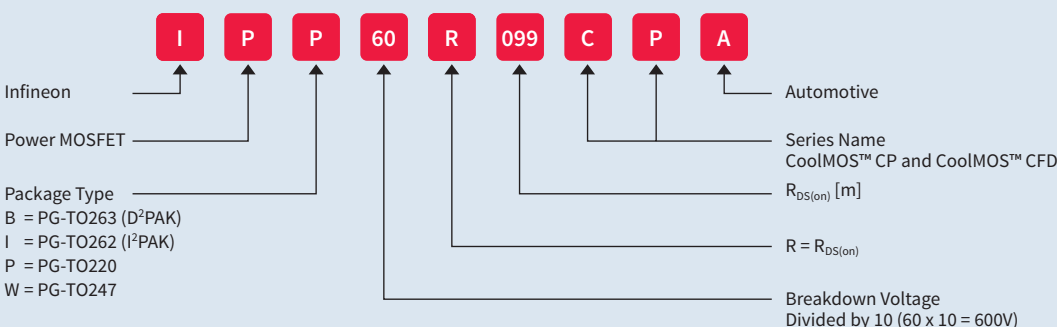
- Hard switching topologies
- PFC boost stages in on board charger
- Active clamp or 2 transistor forward in DC/DC converter

Application 650V CoolMOS™ CFDA

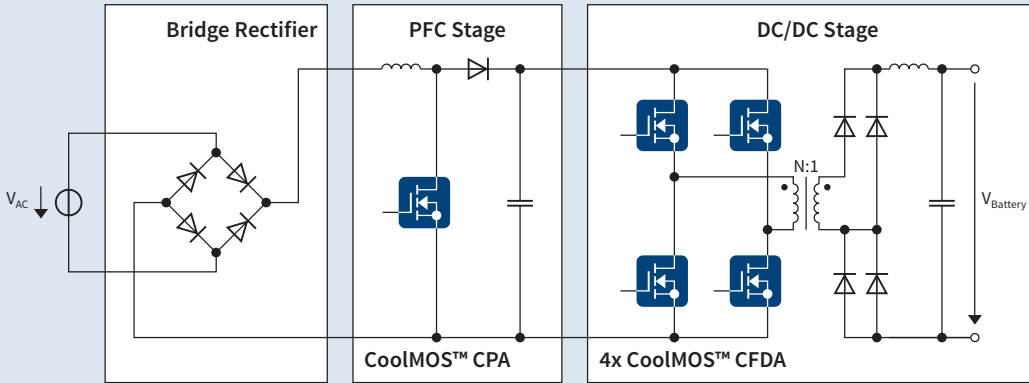
- Resonant switching topologies
- LLC or Full Bridge ZVS in DC/DC converter
- HID lamp



Naming System



Example for Automotive Topology using CoolMOS™ CFDA



On-board battery charger with ZVS phase shifted topology

600V CoolMOS™ CPA Product Portfolio

Product Type	$R_{DS(on)}$ @ $T_J = 25^\circ\text{C}$ $V_{GS} = 10\text{V}$ [mΩ]	I_D (max) @ $T_J = 25^\circ\text{C}$ [A]	I_{Dpuls} (max) [A]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	R_{thJC} (max) [K/W]	Package ¹⁾
IPB60R099CPA	105	31	93	-20 ... 20	60	0.5	Ⓒ34
IPB60R199CPA	199	16	51	-20 ... 20	32	0.9	Ⓒ34
IPB60R299CPA	299	11	34	-20 ... 20	22	1.3	Ⓒ34
IPP60R099CPA	105	31	93	-20 ... 20	60	0.5	Ⓒ52
IPW60R045CPA	45	60	230	-20 ... 10	150	0.29	Ⓒ58
IPW60R075CPA	75	39	130	-20 ... 20	87	0.4	Ⓒ58
IPW60R099CPA	105	31	93	-20 ... 20	60	0.5	Ⓒ58
IPI60R099CPA	105	31	93	-20 ... 20	60	0.5	Ⓒ58

650V CoolMOS™ CFDA Product Portfolio

Product Type	$R_{DS(on)}$ @ $T_J = 25^\circ\text{C}$ $V_{GS} = 10\text{V}$ [mΩ]	I_D (max) @ $T_J = 25^\circ\text{C}$ [A]	I_{Dpuls} (max) [A]	$V_{GS(th)}$ (min-max) [V]	Q_G (typ) [nC]	R_{thJC} (max) [K/W]	Package ¹⁾
IPD65R420CFDA	420	8.7	27.0	3.5 ... 4.5	32	1.5	Ⓒ32
IPD65R660CFDA	660	6.0	17.0	3.5 ... 4.5	20	2.0	Ⓒ32
IPB65R110CFDA	110	31.2	99.6	3.5 ... 4.5	118	0.45	Ⓒ34
IPB65R150CFDA	150	22.4	72.0	3.5 ... 4.5	86	0.64	Ⓒ34
IPB65R190CFDA	190	17.5	57.2	3.5 ... 4.5	68	0.83	Ⓒ34
IPB65R310CFDA	310	11.4	34.4	3.5 ... 4.5	41	1.2	Ⓒ34
IPB65R660CFDA	660	6.0	17.0	3.5 ... 4.5	20	2.0	Ⓒ34
IPP65R110CFDA	110	31.2	99.6	3.5 ... 4.5	118	0.45	Ⓒ52
IPP65R150CFDA	150	22.4	72.0	3.5 ... 4.5	86	0.64	Ⓒ52
IPP65R190CFDA	190	17.5	57.2	3.5 ... 4.5	68	0.83	Ⓒ52
IPP65R310CFDA	310	11.4	34.4	3.5 ... 4.5	41	1.2	Ⓒ52
IPP65R660CFDA	660	6.0	17.0	3.5 ... 4.5	20	2.0	Ⓒ52
IPW65R048CFDA	48	63.3	228.0	3.5 ... 4.5	270	0.25	Ⓒ58
IPW65R080CFDA	80	43.3	127.0	3.5 ... 4.5	161	0.32	Ⓒ58
IPW65R110CFDA	110	31.2	99.6	3.5 ... 4.5	118	0.45	Ⓒ58
IPW65R150CFDA	150	22.4	72.0	3.5 ... 4.5	86	0.64	Ⓒ58
IPW65R190CFDA	190	17.5	57.2	3.5 ... 4.5	68	0.83	Ⓒ58

1) See packages on page 112

TEMPFET™:

Temperature Protected Switches

TEMPFET™ provides the first level of temperature and current protection via its temperature sensor. The temperature sensor is available on external pins and enables direct gate access and flexible temperature response control.

Features

- Logic level input
- Analog driving capability
- Potential-free temperature sensor
- High-speed switching (100kHz)
- Overload protection and thermal shutdown with external circuit
- Avalanche rated



Product Table TEMPFET™: Temperature Protected Switches

Product Type	V _{DS} [V]	R _{DS(on)} [mΩ]	I _D [A]	V _{GS(th)} (min-max) [V]	Q _G (typ) [nC]	Package ¹⁾
BTS282Z	49	6.5	80	1.2 ... 2.0	155	Ⓒ39 Ⓒ55
BTS244Z	55	12.0	35	1.2 ... 2.0	85	Ⓒ37 Ⓒ33 Ⓒ54
BTS247Z	55	18.0	33	1.2 ... 2.0	60	Ⓒ37 Ⓒ33 Ⓒ54

1) See packages on page 112

HITFET™:

Low-Side Protected Switches

HITFET™ provides a high level of protection for overtemperature, short-circuit, overcurrent, overvoltage, open-load and ESD-sensitive circuits. HITFET™ combines all these protection features in one easy-to-use device.

Features

- Overtemperature protection
- Overload protection
- Current limitation
- Short-circuit protection
- Open-load detection (only on BTS3408G)
- Thermal shutdown with auto-restart or latch behavior
- Overvoltage protection
- Logic level input
- Electrostatic Discharge (ESD) protection
- Linear drive capability
- Status feedback
 - Digital flag or with external resistor
 - Analogous with external resistor at input
- Slew rate adjustable (only on BTF3050TE)

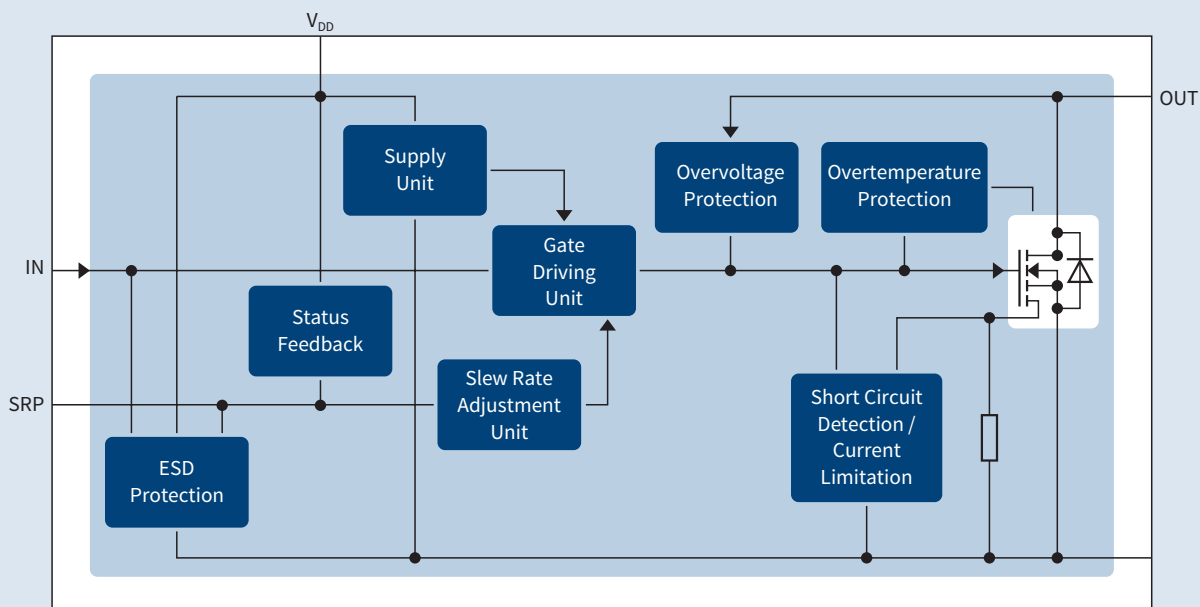
Infiniteon has recently expanded its HITFET™ portfolio with the new product BTF3050TE.

Automotive and Industrial Applications

- Relays
- Fans and pumps
- Solenoids
- Valves
- Heating element
- Bulbs and LEDs
- Fuses
- Line drivers and supply switches

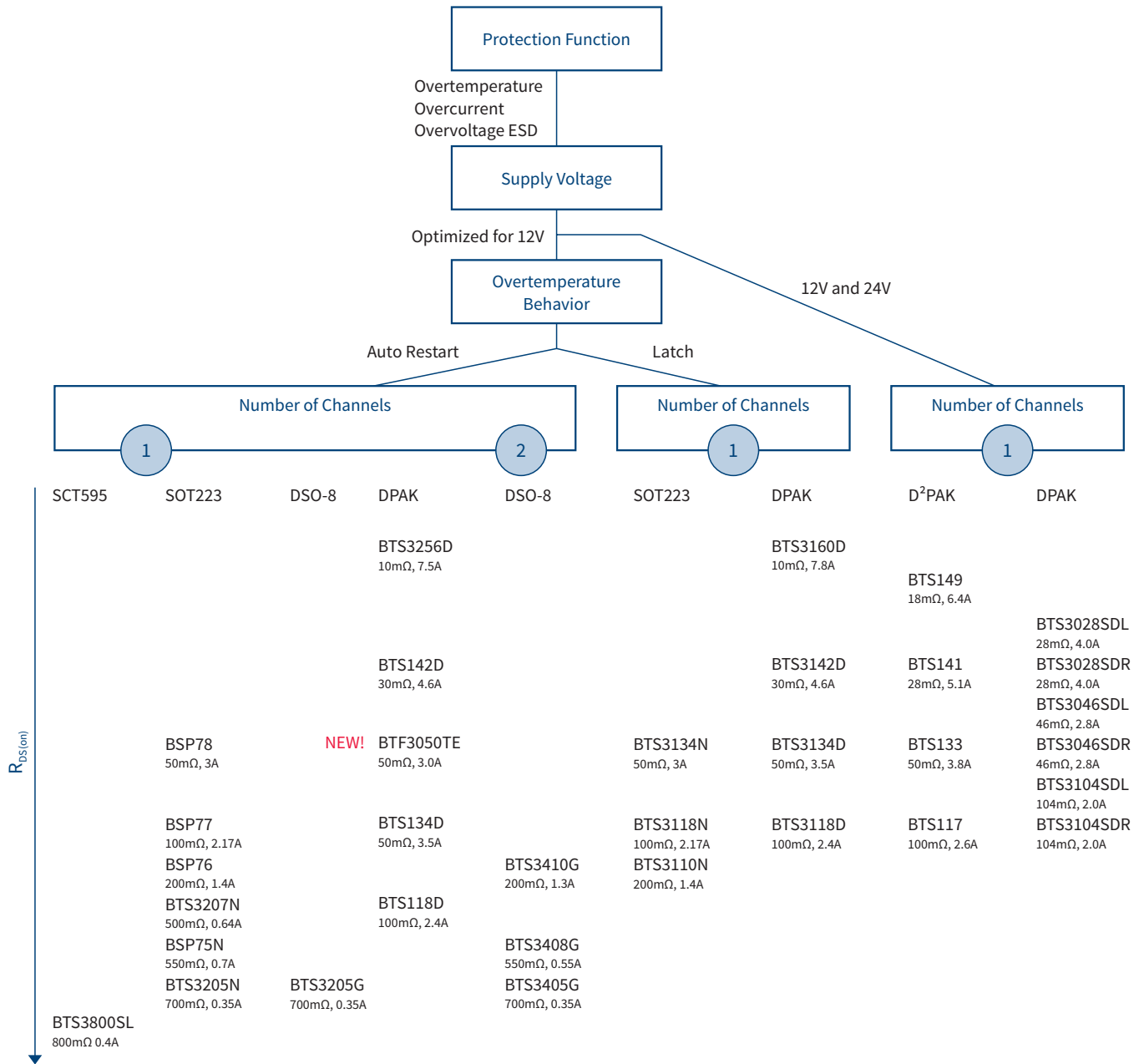


Block Diagram HITFET™+ BTF3050TE



HITFET™: Low-Side Protected Switches

Selection Tree HITFET™



Product Table HITFET™: Low-Side Protected Switches

Product Type	$R_{DS(on)}$ [mΩ]	Channels	$V_{DS(AZ)}$ [V]	$I_{L(nom)}$ [A]	$I_{L(lim)}$ [A]	PWM [kHz]	Diagnostic	Package ¹⁾
BTS3160D	10	1	40	7.8	70.0	1	digital	(33)
BTS3256D	10	1	40	7.5	42.0	10	digital	(33)
BTS3142D	28	1	42	4.6	30.0	1	through input pin	(32)
BTS142D	28	1	42	4.6	30.0	1	through input pin	(32)
BTS3134N	50	1	42	3.0	18.0	1	through input pin	(23)
BTS3134D	50	1	42	3.5	18.0	1	through input pin	(32)
BSP78	50	1	42	3.0	18.0	1	through input pin	(23)
BTF3050TE	50	1	40	3.0	30 (8)	10	through SRP pin	(33)
BTS134D	50	1	42	3.5	18.0	1	through input pin	(52)
BTS3118D	100	1	42	2.4	10.0	1	through input pin	(32)
BTS3118N	100	1	42	2.2	10.0	1	through input pin	(23)
BSP77	100	1	42	2.2	10.0	1	through input pin	(23)
BTS118D	100	1	42	2.4	10.0	1	through input pin	(32)
BSP76	200	1	42	1.4	5.0	1	through input pin	(23)
BTS3410G	200	2	42	1.3	5.0	1	through input pin	(1)
BTS3110N	200	1	42	1.4	5.0	1	through input pin	(23)
BTS3207N	500	1	42	0.7	5.0	1	through input pin	(23)
BTS3205G	700	1	42	0.35	0.6	1	through input pin	(1)
BTS3405G	700	2	42	0.35	0.6	1	through input pin	(1)
BTS3205N	700	1	42	0.35	0.6	1	through input pin	(23)
BTS3800SL	800	1	42	0.35	0.6	10		(20)
BTS149 ²⁾	20	1	60	6.4	30.0	1	through input pin	(52)
BTS141TC	30	1	60	5.1	25.0	1	through input pin	(34)
BTS3028SDL	30	1	60	5.0	18.0	1	through input pin	(32)
BTS3028SDR	30	1	60	5.0	18.0	1	through input pin	(32)
BTS133TC	50	1	60	3.8	21.0	1	through input pin	(34)
BTS3046SDL	50	1	60	3.6	10.0	1	through input pin	(32)
BTS3046SDR	50	1	60	3.6	10.0	1	through input pin	(32)
BTS117TC	100	1	60	3.5	7.0	1	through input pin	(34)
BTS3104SDL	104	1	60	2.0	6.0	1	through input pin	(32)
BTS3104SDR	104	1	60	2.0	6.0	1	through input pin	(32)
BSP75N	550	1	60	0.7	1.0	5	through input pin	(23)
BTS3408G	550	2	60	0.55	1.0	1	through input pin	(1)

Smart Multichannel Switches for Body: SPIDER – SPI Driver for Enhanced Relay Control

SPIDER stands for SPI Driver for Enhanced Relay control. SPIDER products are the smallest relay drivers in the market with innovative features and packages.

With the SPIDER family Infineon offers a wide choice of integrated Multichannel switches specially designed for the control of small loads like relays, LEDs and small motors.

The modular family is scaled by $R_{DS(on)}$, packages and add-on features. They come in 4- and 8-channel low-side

configurations (SPIDER Low-Side), as well as configurable 8-channel high-/low-side configurations (SPIDER High-/Low-Side).

It offers not only the scalability through the number of channels and the current density, but also flexibility regarding enhanced features like parallel inputs for PWM, limp home and low-voltage cranking.

A variety of packages is available in order to serve different applications.

Applications

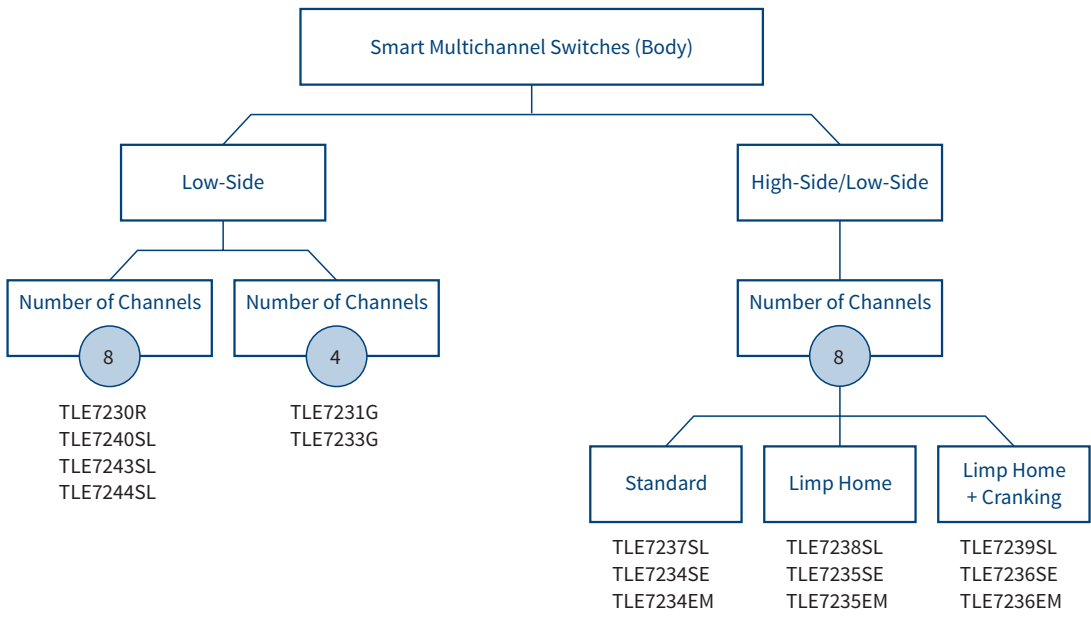
- Relays
- Small LEDs
- Valves
- Solenoids
- DC and stepper motors

Features

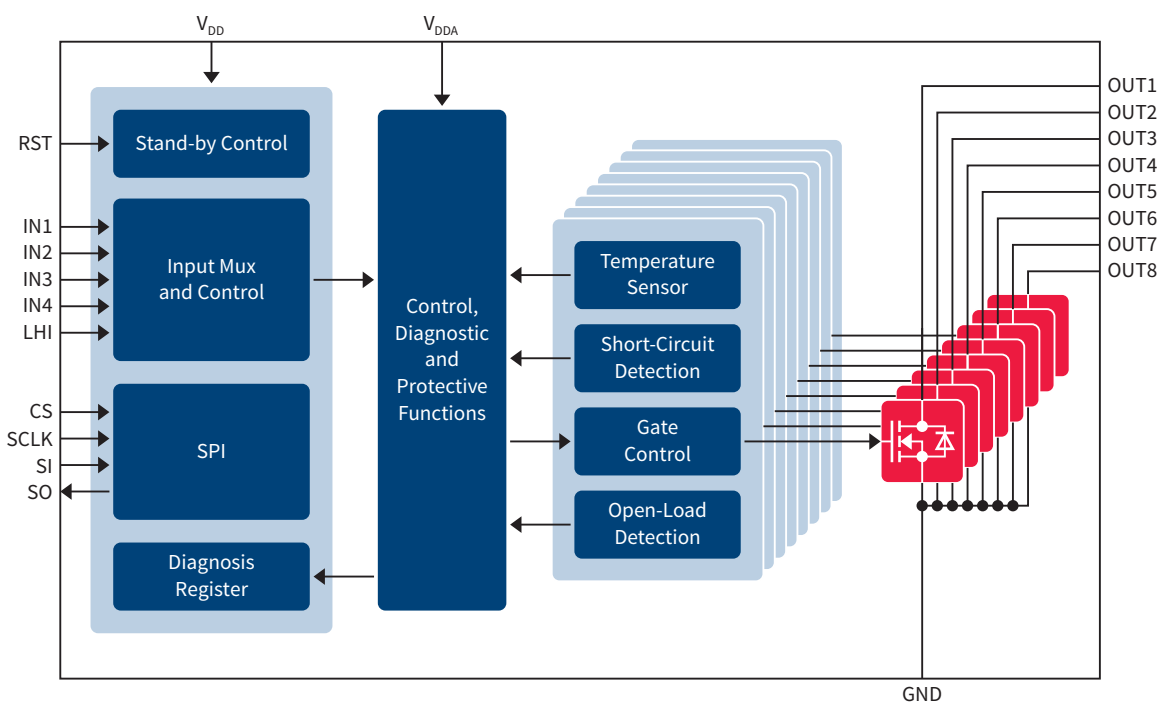
- SPI (Serial Peripheral Interface)
- Daisy-chain and detailed diagnostics via SPI
- Small package
- Four different packages
- Short-circuit, overload protection configurable behavior (limitation or shutdown), thermal shutdown configurable behavior (latch or restart)
- Fail safe mode (limp home)
- Low battery voltage operation (cranking)
- AEC-qualified green robust product (RoHS-compliant)
- Undervoltage shutdown
- Overload shutdown
- Short to GND detection
- Open-load detection
- Stand-by mode
- Daisy-chain capability



Selection Tree SPIDER



Block Diagram TLE7244SL





Smart Multichannel Switches for Body: SPIDER – SPI Driver for Enhanced Relay Control

SPIDER Product Table

	Product Type	High-Side	Small High-Side	Low-Side	Configurable
SPIDER LS	TLE7230R	-	-	8	-
	TLE7240SL	-	-	8	-
	TLE7243SL	-	-	8	-
	TLE7244SL	-	-	8	-
	TLE7231G	-	-	4	-
	TLE7233G	-	-	4	-
SPIDER HS/LS	TLE7237SL	2	2	2	2
	TLE7238SL	2	2	2	2
	TLE7239SL	2	2	2	2
	TLE7234SE	2	2	2	2
	TLE7235SE	2	2	2	2
	TLE7236SE	2	2	2	2
	TLE7234EM	2	2	2	2
	TLE7235EM	2	2	2	2
	TLE7236EM	2	2	2	2

1) See packages on page 112



MOSFETs

TEMPEET™
HITFET™

Smart
Multichannel
Switches

PROFET™

SPOC™_SPI Power
Controller

LED Drivers

Motor Drivers

Power Supply

Automotive
Transceivers

Automotive
System ICs

Glossary

$R_{DS(on)}$ (typ) @25°C [Ω]	Cranking Mode [V]	$V_{DS(AZ)}$ [V]	Limp Home	$I_{L(nom)}$ [mA]	Number of Direct Inputs	Package ¹⁾
0.8	–	48		500	4	(13)
1.5	–	41	●	210	4	(29)
1.2	–	41	●	260	4	(29)
0.8	–	41	●	290	4	(29)
1.0	–	41		320	1	(4)
1.0	–	41	●	390	4	(29)
6 x 0.9; 2 x 1.6	–	41		6 x 260; 2 x 120	3	(29)
6 x 0.9; 2 x 1.6	–	41	●	6 x 260; 2 x 120	2	(29)
6 x 0.9; 2 x 1.6	4	41	●	6 x 260; 2 x 120	2	(29)
6 x 0.85; 2 x 1.6	–	41		6 x 280; 2 x 140	3	(6)
6 x 0.85; 2 x 1.6	–	41	●	6 x 280; 2 x 140	2	(6)
6 x 0.85; 2 x 1.6	4	41	●	6 x 280; 2 x 140	2	(6)
6 x 0.9; 2 x 1.6	–	41		6 x 350; 2 x 175	3	(30)
6 x 0.9; 2 x 1.6	–	41	●	6 x 350; 2 x 175	2	(30)
6 x 0.9; 2 x 1.6	4	41	●	6 x 350; 2 x 175	2	(30)

Smart Multichannel Switches for Powertrain and Safety: Flex

The Flex Multichannel Low-Side Switches family for powertrain, safety and industrial applications is specially designed to drive a various range of loads from relays, injector valves, oxygen probe heaters and general purpose solenoids, through to unipolar stepper motors. We offer a

complete family concept with full scalability from 2 to 18 channels and leading edge technology.

All Flex Multichannel Switches have full certification and are equipped with embedded protection functions and enhanced diagnosis which are used in numerous industry platforms.

Application

- Engine management systems
- Diesel direct injection
- Gasoline direct injection
- Multi port injection
- Industrial applications

Features

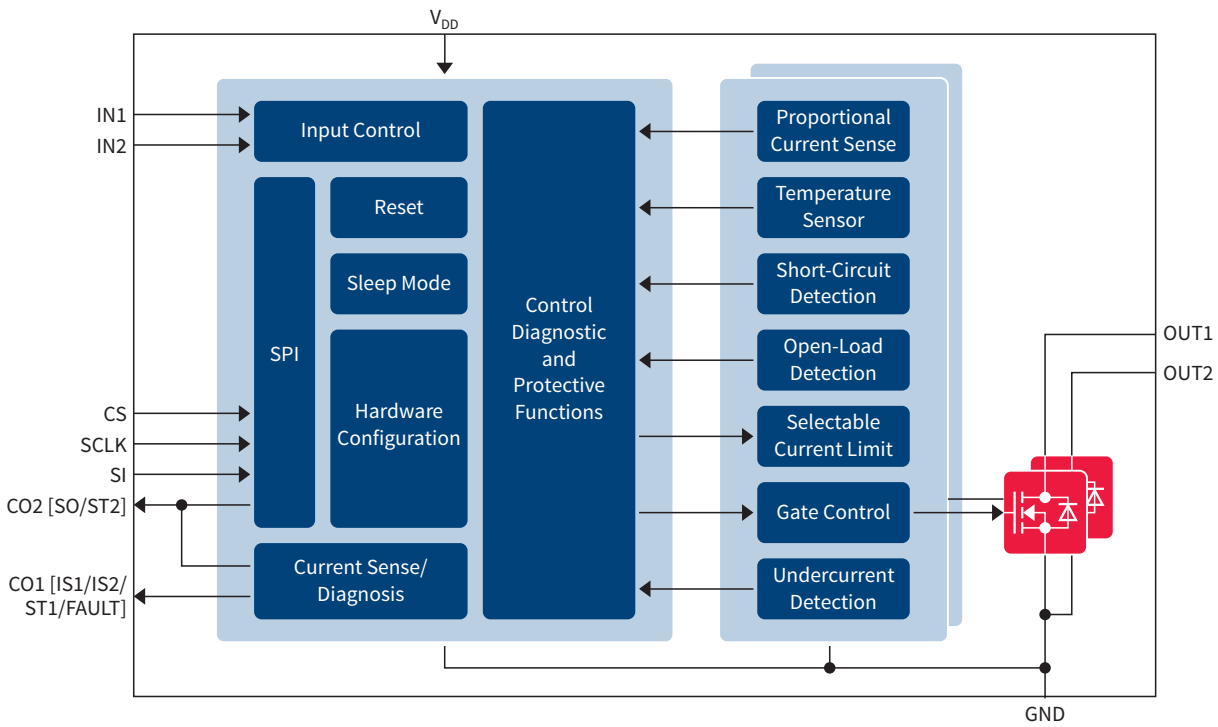
- Overvoltage protection
 - Active clamping for inductive loads
- Undervoltage protection
 - Power-on reset
 - Undervoltage shutdown
- Overcurrent protection
 - Current limitation
 - Overcurrent switch-off
- Overtemperature protection
 - Thermal shutdown
- Electrostatic Discharge (ESD) protection
- Direct input control (for PWM)
- Communication interface (control/diagnosis)
 - Serial Peripheral Interface (SPI)
 - Micro Second Channel (MSC)
- 5V and 3.3V μ C compatibility
- Status flag
- 2-bit diagnosis feedback for:
 - Short-to-GND
 - Open-load
 - Short-to-battery
 - Normal operation

Benefits

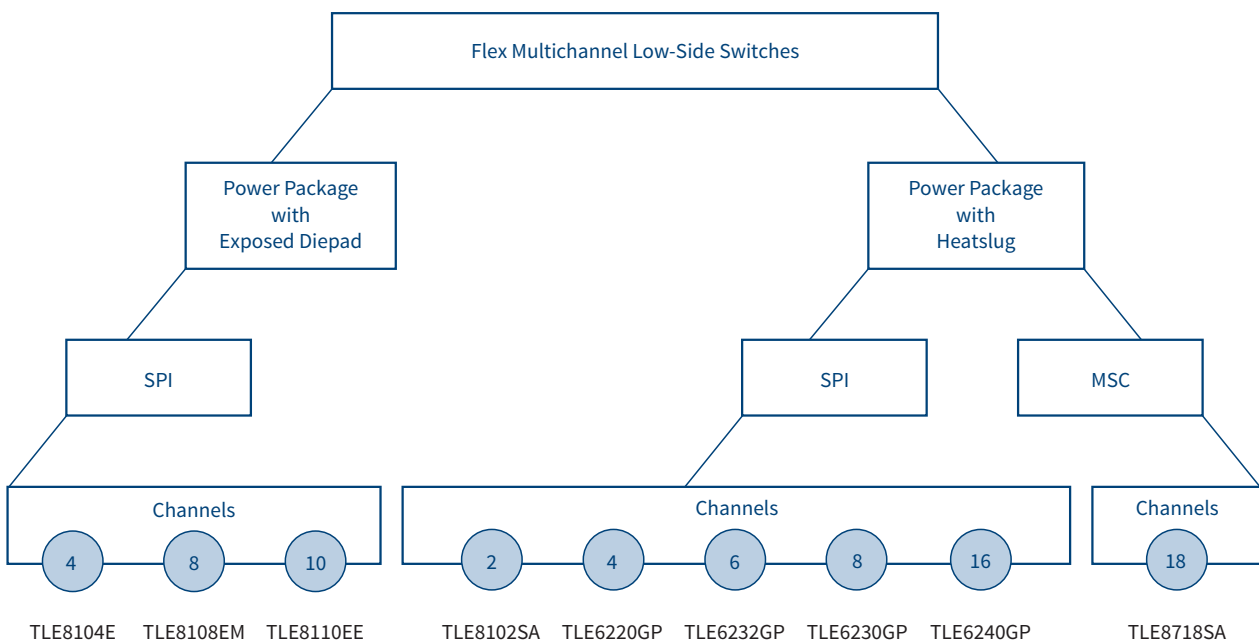
- One family concept
- Designed for dedicated applications, but also available for off-the-shelf use as standard products
- Integrated self-protection and diagnosis
- Enhanced error detection for improved system reliability
- Control via standard SPI Bus or MicroSecond Channel (TLE8718SA) or direct inputs
- Suitable for daisy-chain configuration to save I/O ports
- Support of safety-critical applications by overvoltage protection on all pins (TLE8718SA)
- High quality ensured with automotive excellence program on Zero Defect strategy



Block Diagram Flex (TLE8102SG)



Selection Tree Flex Multichannel Low-Side Switches





Smart Multichannel Switches for Powertrain and Safety: Flex

Product Table

	Target Loads ²⁾	Channels	Electrical Specification			
			#	R _{DS} (max) @ 25°C [mΩ]	I _{L(lim)} (max) [A]	V _{CL} (typ) [V]
TLE8102SG	High-Current-Solenoids, O2-Heater	2	2x	0.18	5.0 (9.0)	54
TLE6220GP	Injectors, High-Current-Solenoids, Stepper-Motor	4	4x	0.32	3.0	53
TLE8104E	Injectors, High-Current-Solenoids, Stepper-Motor	4	4x	0.32	3.0	53
TLE6232GP	High-Current-Relays, Injectors, High-Current-Solenoids	6	4x 2x	0.25 0.45	3.0 1.5	53
TLE6230GP	Relays, High-Current-Relays	8	8x	0.80	1.0	43
TLE8108EM	LEDs, Relays	8	8x	0.80	0.5	45
TLE8110EE	LEDs, High-Current-Relays, Injectors, High-Current-Solenoids, Stepper-Motor	10	4x 2x 4x	0.30 0.25 0.60	2.6 3.7 1.7	55
TLE6240GP	High-Current-Relays, Injectors, High-Current-Solenoids	16	8x 4x 4x	1.00 0.35 0.30	1.0 3.0 3.0	50 53 53
TLE8718SA	LEDs, Relays, Injectors, High-Current-Solenoids, O2-Heater	18	2x 2x 8x 2x 2x 2x	0.15 0.26 0.53 0.35 1.78 0.96	8.0 3.0 2.2 2.2 0.6 0.6	55

1) See packages on page 112

2) Indication only. Devices can drive any kind of inductive/resistive load according to spec

3) Refer to Application Note: TLE8110 – SPI and daisy-chain



- MOSFETs
- TEMPFET™
HITFET™
- Smart
Multichannel
Switches
- PROFET™
- SPOC™_SPI Power
Controller
- LED Drivers
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Direct Input Pins	Interface			Overcurrent Protection		Status Flag	Package ¹⁾
	SPI	MSC	Daisy-Chain	I-limit	Switch-Off		
2	8-bit		•	•	•	•	③
4	8-bit		•	•		•	⑧
4	8-bit		•	•		•	⑥
6	16-bit			•		•	⑬
4	16-bit			•		•	⑬
4	16-bit		•		•		⑩
10	16-bit		• ³⁾		•		⑫
8	16-bit		•	•		•	⑬
		LVDS + LVTTTL		•	•		⑬



PROFET™: Smart High-Side Switches

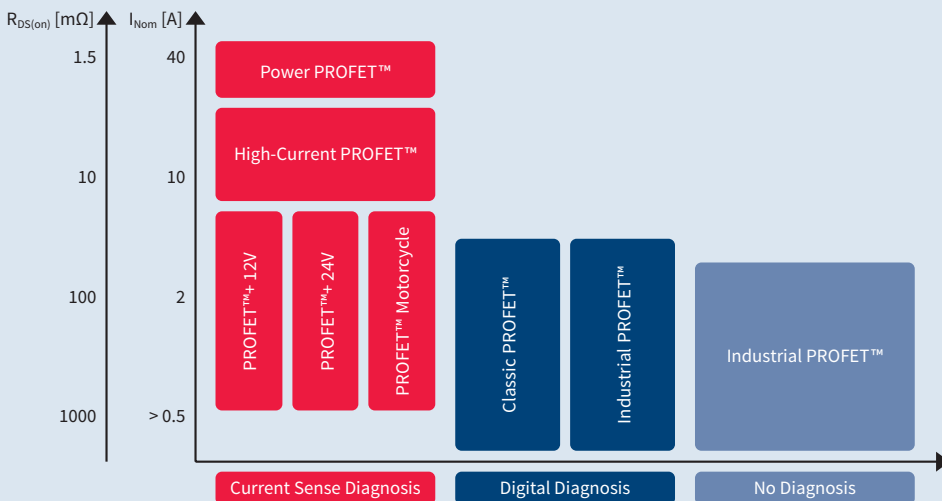
The highly integrated PROFET™ family (PROtected FET) incorporates a broad range of smart features, like diagnosis and protection. PROFET™ intelligent power switches consist of DMOS power transistor and CMOS logic circuitry for complete built-in protection.

The PROFET™ family offers protection against overload, overvoltage, short-circuit, excessive temperature, ground loss, power supply loss and Electrostatic Discharge (ESD). The PROFET™ family products are also capable of protecting against dynamic overvoltage such as load dump and inductive load turn-off. For the benefits and the functionality of the protection features, please refer to www.infineon.com/profet.

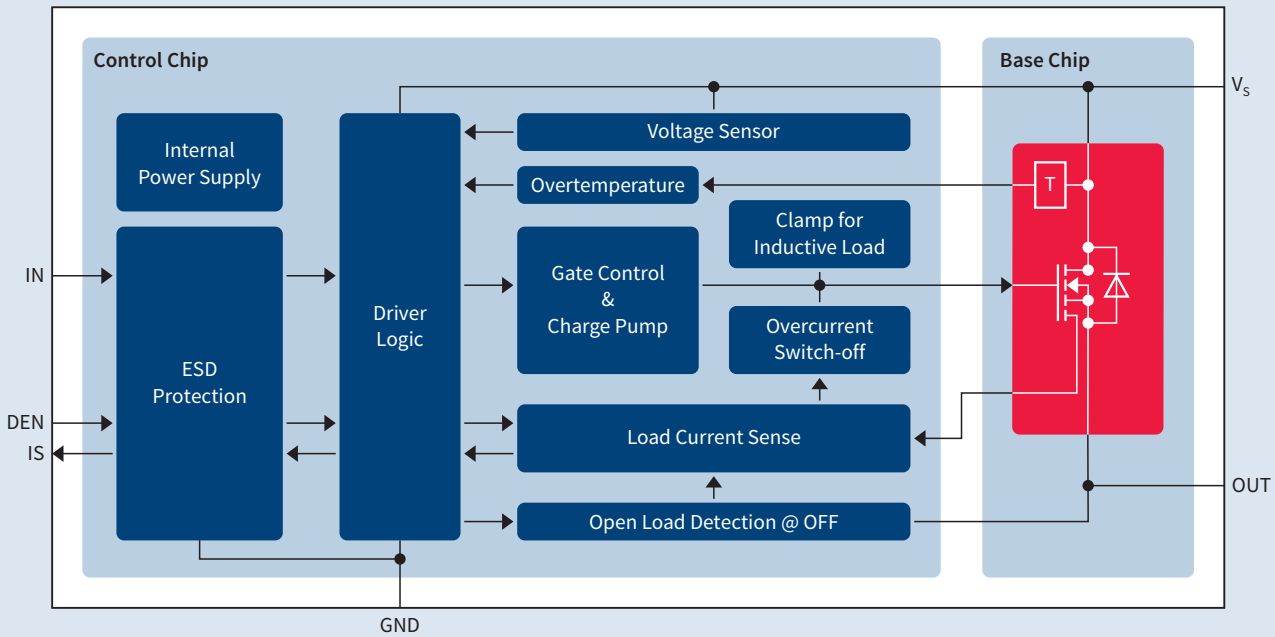
The PROFET™ diagnostics offer the choice of either status or current sense features, or a combination of both. In the event of a malfunction, the status feature is able to diagnose overtemperature or open-load. The PROFET™ diagnostic features also provide the user with precise information about switch and load. Diagnostic feedback and load current sensing minimize risks by eliminating the need for additional discrete circuitry and assembly.

This vast range of smart features makes the PROFET™ ideal for a variety of automotive (12V), trucks & agriculture (24V) and industrial applications.

PROFET™ Family



Block Diagram BTS500x0-1EGA



Application Examples

- Lighting
- Heating
- Power distribution
- Motor control

Application Ranges

- Automotive (12V)
- Transportation (24V)
- Industrial

Load

- Capacitive like lamps and glow plugs
- Resistive like seat heating
- Inductive like solenoids
- Electronic like ECU

Basic Features

- High-side switches (0.5 ... 45A load current)
- RoHS compliant & AEC qualified
- Very low stand-by current
- ESD protection, optimized EMC
- PWM capability
- Very low power DMOS leakage current in OFF
- 3.3V and 5V compatible logic inputs

Protection Features

- Load dump
- Current limitation
- Thermal shutdown
- Loss of ground/battery protection
- Stable behavior at undervoltage
- Overvoltage protection (ext. components)
- Reverse polarity compliant

Diagnostic Features

- Proportional load current sense
- Open-load in ON- and OFF-State
- Short-circuit to battery and ground
- Overtemperature sense

- MOSFETs
- TEMPFET™
HITFET™
- Smart
Multichannel
Switches
- PROFET™
- SPOC™_SPI Power
Controller
- LED Drivers
- Motor Drivers
- Power Supply
- Automotive
Transceivers
- Automotive
System ICs
- Glossary

PROFET™: Smart High-Side Switches

No Diagnosis

Basic Features

- 12V or 24V capable
- Single channel

Protection Features

- Short circuit protection
- Current limitation
- Overvoltage protection
- Overtemperature protection

Product Type	Product Family	$R_{DS(on)}$ (typ) [mΩ]	$R_{DS(on)}$ (max.) @ $T_j = 150^\circ\text{C}$ [mΩ]	Nominal Load Current [A]
Automotive Grade				
BTS4140N ²⁾	Classic PROFET™	1000	3000	0.2
BSP742T	Classic PROFET™	350	700	1.1
BSP452	Classic PROFET™	200	400	0.7
BTS452T	Classic PROFET™	200	380	2.2
BSP752T	Classic PROFET™	200	380	1.2
BTS4141N	Classic PROFET™	200	320	0.7
BTS4142N	Classic PROFET™	200	320	1.4
BSP762T	Classic PROFET™	100	200	2.4
BTS462T	Classic PROFET™	100	200	4.4
BTS730	Classic PROFET™	70	140	3.0
BSP772T	Classic PROFET™	60	120	3.1
BTS441T	Classic PROFET™	20	37	21.0

1) See packages on page 112

2) Current controlled input at $T_j = 125^\circ\text{C}$

E_{AS} [mJ]	Operating Voltage Range [V]	$I_{L(SC)}$ (typ) [A]	24V Capable	Package ¹⁾
1000 @ 0.15A	4.9 ... 60	0.9	●	(23)
100 @ 0.5A	5.0 ... 34	4.0		(1)
500 @ 0.5A	5.0 ... 34	1.5		(23)
150 @ 1A	6.0 ... 52	6.5	●	(33)
125 @ 1A	6.0 ... 52	6.5	●	(1)
700 @ 0.7A	12.0 ... 45	2.1	●	(23)
160 @ 1A	12.0 ... 45	3.0	●	(23)
870 @ 1A	5.0 ... 34	10.0		(1)
4400 @ 1A	5.0 ... 34	14.0		(33)
n.a.	5.9 ... 16	20.0		(6)
900 @ 1.5A	5.0 ... 34	17.0		(1)
700 @ 21A	4.75 ... 41	65.0	●	(36)

MOSFETs

TEMPFET™
HITFET™Smart
Multichannel
Switches

PROFET™

SPOC™_SPI Power
Controller

LED Drivers

Motor Drivers

Power Supply

Automotive
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PROFET™: Smart High-Side Switches

Digital Diagnosis

Basic Features

- 12V or 24V capable
- Single or multi channel

Protection Features

- Overload protection
- Loss of battery / GND
- Short circuit protection
- Overvoltage protection

Diagnosis Features

- Open drain status feedback
- Overtemperature
- Open load
- Current limitation

Product Type	Product Family	$R_{DS(on)}$ (typ) [mΩ]	$R_{DS(on)}$ (max.) @ $T_j = 150^\circ\text{C}$ [mΩ]	Nominal Load Current [A]	E_{AS} [mJ]	Operating Voltage Range [V]	$I_{L(sc)}$ (typ) [A]
Automotive Grade							
BSP742R	Classic PROFET™	350	700	0.4	800 @ 0.3A	5.0 ... 34	1.2
BSP742R ²⁾	Classic PROFET™	350	700	0.4	800 @ 0.3A	5.0 ... 34	1.2
BTS4300SGA	Classic PROFET™	300	600	0.4	800 @ 0.3A	5.0 ... 34	1.2
BSP752R	Classic PROFET™	200	380	1.7	125 @ 1.0A	6.0 ... 52	6.5
BTS712N1	Classic PROFET™	200	400	1.0	150 @ 1.9 A	5.0 ... 34	7.5
BTS711L1	Classic PROFET™	200	400	1.0	150 @ 1.9 A	5.0 ... 35	7.5
BTS4880-R	Classic PROFET™	200	400	0.6	10000 @ 0.625A	11.0 ... 45	1.4
BTS4175SGA	Classic PROFET™	175	350	1.3	125 @ 1.0A	6.0 ... 52	6.5
BTS4160DGA	Classic PROFET™	160	320	1.0	65 @ 2.9A	5.5 ... 20	9.0
BTS452R	Classic PROFET™	150	270	2.2	150 @ 1.0A	6.0 ... 52	6.5
BTS5210G	Classic PROFET™	140	280	1.0	65 @ 2.9A	5.5 ... 40	9.0
BTS5210L	Classic PROFET™	140	280	1.0	84 @ 2.9A	5.5 ... 40	9.0
BTS716G	Classic PROFET™	140	280	1.0	76 @ 2.3A	5.5 ... 40	9.0
BTS716GB	Classic PROFET™	140	280	1.0	76 @ 2.3A	5.5 ... 40	9.0
BTS4130QGA	Classic PROFET™	130	260	1.0	76 @ 2.3A	5.5 ... 20	9.0
BTS723GW	Classic PROFET™	105	210	2.0	110 @ 2.5A	7.0 ... 58	9.0
BTS721L1	Classic PROFET™	100	200	2.0	300 @ 2.9A	5.0 ... 34	14.0
BTS5215L	Classic PROFET™	90	180	2.0	178 @ 3.5A	5.5 ... 40	15.0
BTS724G	Classic PROFET™	90	180	2.0	120 @ 3.3A	5.5 ... 40	15.0
BTS428L2	Classic PROFET™	60	120	7.0	190 @ 7.0A	4.75 ... 41	22.0
BTS432E2	High-Current PROFET™	38	70	11.0	1700 @ 20.0A	4.5 ... 42	44.0
BTS432E2 E3062A	High-Current PROFET™	38	70	11.0	1700 @ 20.0A	4.5 ... 42	44.0
BTS441R	Classic PROFET™	20	37	21.0	700 @ 21.0A	4.75 ... 41	65.0
BTS442E2	High-Current PROFET™	18	35	21.0	2100 @ 20.0A	4.5 ... 42	95.0
BTS442E2 E3062A	High-Current PROFET™	18	35	21.0	2100 @ 20.0A	4.5 ... 42	95.0

1) See packages on page 112

2) Inversed logic for diagnosis

Number of Channels	24V Capable	High Current Limit	Low Current Limit	Overvoltage Shutdown	Short Circuit Diagnosis			Packages ¹⁾
					to GND	to battery	Open Load in ON-State	
1			•		•	•		①
1			•		•	•		①
1			•		•	•		①
1	•	•			•	•		①
4		•		•	•	•		⑥
4		•		•	•		•	⑥
8	•				•			⑮
1	•	•			•	•		①
2		•				•		④
1	•		•		•	•		③③
2		•				•		④
2		•				•		③
4		•				•		⑥
4		•				•		⑥
4		•				•		⑥
2	•		•		•	•		④
4		•		•		•		⑥
2		•				•		③
4		•				•		⑥
1		•			•		•	③③
1	•	•		•	•		•	⑤③
1	•	•		•	•		•	③⑥
1		•				•		③⑥
1	•	•		•	•		•	⑤③
1	•	•		•	•		•	③⑥

MOSFETs

TEMPFET™
HITFET™Smart
Multichannel
Switches

PROFET™

SPOC™_SPI Power
Controller

LED Drivers

Motor Drivers

Power Supply

Automotive
TransceiversAutomotive
System ICs

Glossary

PROFET™: Smart High-Side Switches

Current Sense, Current Input

Basic Features

- 12V or 24V capable
- Single channel

Protection Features

- Current limitation
- Overload protection
- Short circuit shutdown
- ReverSave™
- Loss of GND

Diagnosis Features

- Analog signal proportional to load current
- Overload detection
- Short circuit detection

Product Type	Product Family	$R_{DS(on)}$ (typ) [mΩ]	$R_{DS(on)}$ (max.) @ $T_j = 150^\circ\text{C}$ [mΩ]	Nominal Load Current [A]	E_{AS} @ 20A [mJ]	Operating Voltage Range [V]	$I_{L(sc)}$ (typ) [A]
BTS6163D	High-Current PROFET™	20.0	40	6.5	250	5.5 ... 62	70
BTS443P	High-Current PROFET™	16.0	32	6.5	150	5.0 ... 36	65
BTS5016SDA	High-Current PROFET™	16.0	32	6.5	120	5.5 ... 20	75
BTS5014SDA	High-Current PROFET™	14.0	28	7.0	150	5.5 ... 20	80
BTS5012SDA	High-Current PROFET™	12.0	24	8.0	200	5.5 ... 20	90
BTS6142D	High-Current PROFET™	12.0	22	8.0	250	5.5 ... 24	100
BTS6143D	High-Current PROFET™	10.0	18	10.0	300	5.5 ... 38	105
BTS6133D	High-Current PROFET™	10.0	18	10.0	300	5.5 ... 38	105
BTS50085-1TMA	High-Current PROFET™	9.0	17	11.0	1200	5.5 ... 58	90
BTS50085-1TMB	High-Current PROFET™	9.0	17	11.0	1200	5.0 ... 58	90
BTS50080-1TMA	High-Current PROFET™	8.0	16	12.0	400	5.5 ... 38	130
BTS50080-1TMB	High-Current PROFET™	8.0	16	12.0	400	5.5 ... 38	130
BTS50080-1TMC	High-Current PROFET™	8.0	16	12.0	400	5.5 ... 38	130
BTS50080-1TEA	High-Current PROFET™	8.0	16	10.0	300	5.5 ... 30	125
BTS50080-1TEB	High-Current PROFET™	8.0	16	10.0	300	5.5 ... 30	125
BTS50070-1TMA	High-Current PROFET™	7.0	14	12.0	400	5.5 ... 30	95
BTS50070-1TMB	High-Current PROFET™	7.0	14	12.0	400	5.5 ... 30	95
BTS50055-1TMA	High-Current PROFET™	6.0	11	17.0	1500	5.0 ... 34	130
BTS50055-1TMB	High-Current PROFET™	6.0	11	17.0	1500	5.0 ... 34	130
BTS50055-1TMC	High-Current PROFET™	6.0	11	17.0	1500	5.5 ... 34	130
BTS550P	High-Current PROFET™	3.5	6.5	35.0	3000	5.0 ... 34	220
BTS555	High-Current PROFET™	2.5	4	45.0	3000	5.0 ... 34	400

1) See packages on page 112

PROFET™: Smart High-Side Switches

Current Sense, Voltage Input

Basic Features

- 12V or 24V capable
- Single or multi channel

Protection Features

- Short circuit shutdown with auto-restart or latch
- Overtemperature shutdown with auto-restart or latch
- Reverse polarity protection by Reversave™ or with external components
- Loss of GND

Diagnosis Features

- Analog signal proportional to load current
- Overload
- Open-load in ON
- Overtemperature
- Short-circuit to GND

Product Type	Product Family	R _{DS(on)} (typ) [mΩ]	R _{DS(on)} (max) @ T _j = 150°C [mΩ]	Nominal Load Current [A]	E _{AS} [mJ]	Operating Voltage Range [V]	I _{L(SC)} (typ) [A]
Automotive Grade							
BTS5200-4EKA	PROFET™+ 12V	200.0	400.0	4 x 0.8	50 @ 0.5A	5.0 ... 28	7.3
BTT6200-4EMA ³⁾	PROFET™+ 24V	200.0	400.0	4 x 1.0	20 @ 1A	5.0 ... 36	9.0
BTT6200-1EJA ³⁾	PROFET™+ 24V	200.0	400.0	1.5	20 @ 1A	5.0 ... 36	9.0
BTS5180-2EKA	PROFET™+ 12V	180.0	360.0	2 x 1.0	30 @ 1A	5.0 ... 28	12.0
BTS5120-2EKA	PROFET™+ 12V	120.0	240.0	2 x 1.0	15 @ 2A	5.0 ... 28	12.0
BTT6100-2EKA ³⁾	PROFET™+ 24V	100.0	200.0	2 x 2.2	36 @ 1.5A	5.0 ... 36	20.0
BTS5090-2EKA	PROFET™+ 12V	90.0	180.0	2 x 2.0	42 @ 3A	5.0 ... 28	32.0
BTS5090-1EJA	PROFET™+ 12V	90.0	180.0	2.5	42 @ 3A	5.0 ... 28	32.0
BTS6110-1SJA	PROFET™ Motorcycle	80.0	200.0	2.0	n.a.	8.0 ... 24	27.0
BTT6050-1EKA	PROFET™+ 24V	50.0	105.0	4.5	55 @ 4A	5.0 ... 48	47.0
BTT6050-2EKA	PROFET™+ 24V	50.0	100.0	2 x 3.0	55 @ 4A	5.0 ... 48	47.0
BTS5045-2EKA	PROFET™+ 12V	45.0	90.0	2 x 2.5	35 @ 4A	5.0 ... 28	32.0
BTS5045-1EJA	PROFET™+ 12V	45.0	90.0	3	35 @ 4A	5.0 ... 28	32.0
BTS740S2	Classic PROFET™	30.0	60.0	4	370 @ 5.5A	5.0 ... 34	50.0
BTS640S2G	Classic PROFET™	30.0	60.0	4.5	410 @ 12.6A	5.0 ... 34	50.0
BTT6030-2EKA	PROFET™+ 24V	30.0	64.0	2 x 4.0	50 @ 4A	5.0 ... 48	70.0
BTT6030-1EKA	PROFET™+ 24V	30.0	64.0	6.0	50 @ 6A	5.0 ... 48	70.0
BTT6020-1EKA	PROFET™+ 24V	20.0	42.0	7.0	100 @ 7A	5.0 ... 48	88.0
BTS5030-2EKA	PROFET™+ 12V	30.0	60.0	2 x 3.0	50 @ 6A	5.0 ... 28	47.0
BTS5030-1EJA	PROFET™+ 12V	30.0	60.0	4.0	50 @ 6A	5.0 ... 28	47.0
BTS5020-2EKA	PROFET™+ 12V	20.0	40.0	2 x 4.0	75 @ 6A	5.0 ... 28	65.0
BTS5020-1EKA	PROFET™+ 12V	20.0	40.0	5.0	74 @ 6A	5.0 ... 28	65
BTS5016-2EKA	PROFET™+ 12V	16.0	32.0	2 x 5.0	95 @ 7A	5.0 ... 28	65
BTS5016-1EKB	PROFET™+ 12V	16.0	32.0	6.0	95 @ 7A	5.0 ... 28	65
BTS5012-1EKB	PROFET™+ 12V	12.0	24.0	8.0	110 @ 10A	5.0 ... 28	65.0
BTS5010-1EKB	PROFET™+ 12V	10.0	20.0	9.0	155 @ 10A	5.0 ... 28	65.0
BTT6010-1EKA ⁴⁾	PROFET™+ 24V	10.0	20.0	8.0	100 @ 8A	5.0 ... 36	90.0
BTS5008-1EKB	PROFET™+ 12V	8.0	16.0	10.0	160 @ 11A	5.0 ... 28	65.0
BTS50080-1EGA	High-Current PROFET™	8.0	16.0	13.0	125 @ 50A	6.0 ... 28	150
BTS50070-1EGA	High-Current PROFET™	7.0	14.0	14.0	145 @ 50A	6.0 ... 28	150
BTS50060-1EGA	High-Current PROFET™	6.0	12.0	15.0	170 @ 50A	6.0 ... 28	150.0
BTS50060-1TEA	High-Current PROFET™	6.0	12.0	13.5	280 @ 20A	4.7 ... 28	75.0
BTF50060-1TEA ²⁾	High-Current PROFET™	6.0	12.0	13.5	280 @ 20A	4.7 ... 28	75.0
BTS50050-1EGA	High-Current PROFET™	5.0	10.0	16.0	200 @ 50A	6.0 ... 28	150.0
BTS50040-2SFA	High-Current PROFET™	4.0	8.2	2 x 11.0	411 @ 20A	6.0 ... 28	160.0
BTS50015-1TAA	Power PROFET™	1.5	3.0	39.0	550 @ 33A	5.5 ... 28	135.0

1) See packages on page 112

2) Speed PROFET™, capable for PWM up to 25kHz

3) Product available in November 2014

4) Product available in January 2015

Number of channels	Load Current		Over voltage Shutdown	Sense Enable	Open-load in OFF	Latch	24V	ReverSave™	Packages ¹⁾
	Limit	Trip							
4	•			•	•				(5)
4	•			•	•	•	•		(30)
1	•			•	•	•	•		(2)
2	•			•	•				(5)
2	•			•	•				(5)
2	•			•	•	•	•		(5)
2	•			•	•				(5)
1	•			•	•				(2)
1	•					•			(1)
1	•			•	•	•	•		(5)
2	•			•	•	•	•		(5)
2	•			•	•				(5)
1	•			•	•				(2)
2	•		•						(6)
1	•		•						(38)
2	•			•	•	•	•		(5)
1	•			•	•	•	•		(5)
1	•			•	•	•	•		(5)
2	•			•	•				(5)
1	•			•	•				(2)
2	•			•	•				(5)
1	•			•	•				(5)
2	•			•	•				(5)
1	•			•	•				(5)
1	•			•	•				(5)
1	•			•	•	•	•		(5)
1	•			•	•		•		(5)
1		•		•	•	•		•	(3)
1		•		•	•	•		•	(3)
1		•		•	•	•		•	(3)
1		•		•	•	•			(33)
1		•		•	•	•			(33)
1		•		•	•	•		•	(3)
2		•		•		•		•	(11)
1		•				•		•	(38)

MOSFETs
TEMPFET™
HITFET™
Smart Multichannel Switches
PROFET™
SPOC™_SPI Power Controller
LED Drivers
Motor Drivers
Power Supply
Automotive Transceivers
Automotive System ICs
Glossary



SPOC™: SPI Power Controller

SPOC™ devices are high-side smart power Multichannel switches providing embedded protection diagnosis and intelligence. They are specially designed for standard exterior lighting in automotive applications, but can be used for further automotive and industrial applications such as heating, motor driving or power distribution.

Integration helps reducing the complexity of the electronics, allowing board space reduction and decreasing the need for external components. Control, configuration and diagnosis are carried out via a Serial

Peripheral Interface (SPI), which saves I/Os on the microcontroller and provides flexibility for the solution. Furthermore, Fail Safe modes are supported, which enhances safety in operation.

Re-use and design flexibility is supported through the pin, function and package compatibility of the devices within each SPOC™ family.

SPOC™ provides decisive advantages on system level and for a wide range of applications.

Basic Features

- Serial Peripheral Interface (SPI) (daisy-chain capable) for control and diagnosis
- CMOS-compatible parallel input pins provide straightforward PWM operation and FailSafe
- Very low stand-by current
- Optimized electromagnetic compatibility
- Suitable for bulbs as well as LEDs

Diagnosis Functions

- Multiplexed proportional load current sense signals
- High accuracy of current sense signal at wide load current range
- Latching feedback on overtemperature and overload via SPI
- Diagnosis PWM with small duty cycle possible
- LED mode
- Fail-safe activation via LHI pin and configuration via input pins

Protective Functions

- Reverse battery protection
- Short-circuit and overload protection
- Multistep current or tripping (SPOC™ FL)
- Thermal shutdown with latch
- Overvoltage protection
- Reverse polarity protection (SPOC™ FL)
- Loss of ground protection

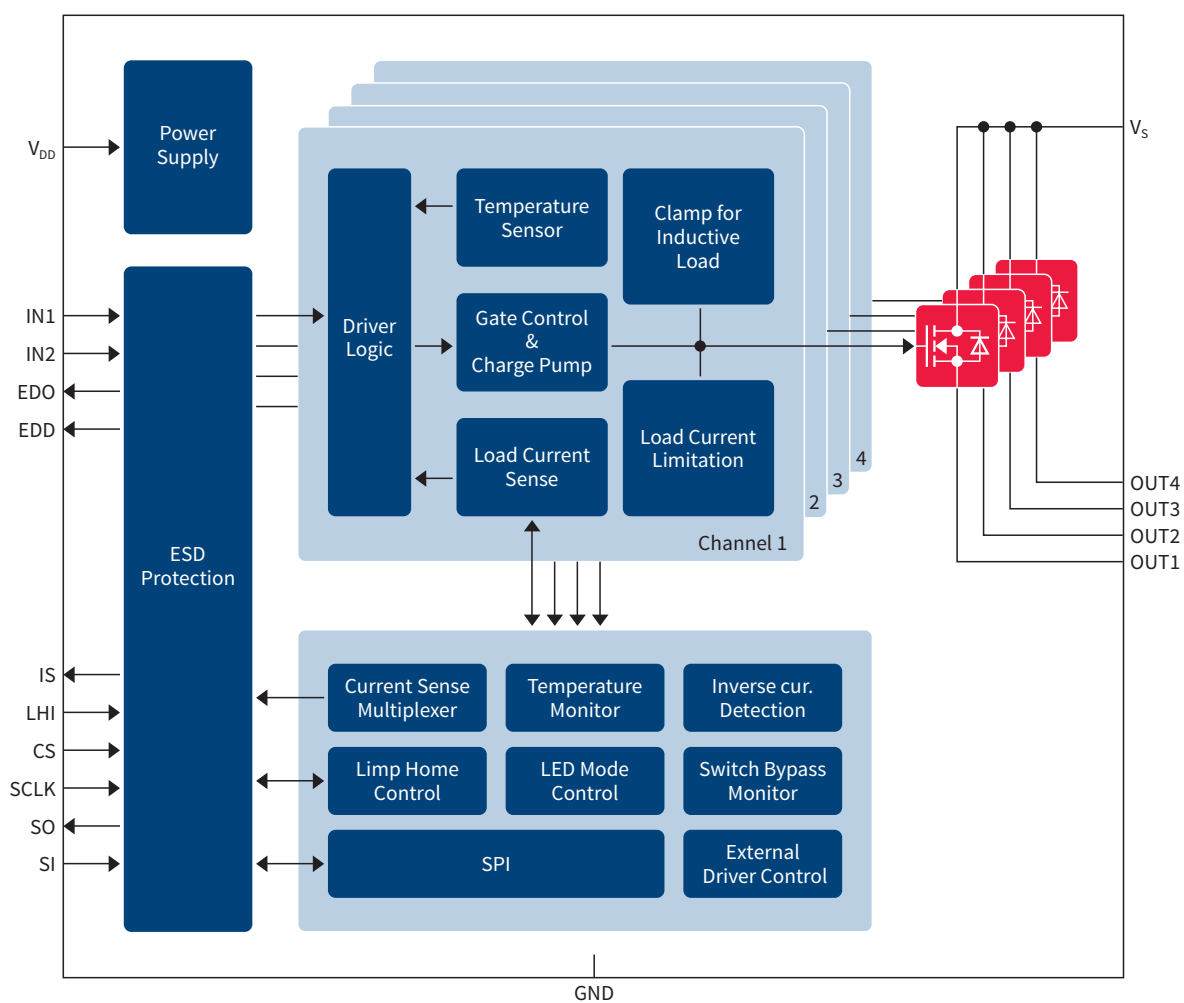
Options

- **LED mode (SPOC™+, SPOC™ FL):** Load type configuration between bulbs and LEDs for products featuring the LED mode option (current sense ratio configurable, very fast diagnosis in LED mode)
- **PWM engine (SPOC™ FL):** autonomous PWM generator to reduce micro controller loading
- **External drive capability (SPOC™+, SPOC™ FL):** ability to control one or two smart power drivers to reduce the I/O usage of the micro controller





Block Diagramm (SPOC™+ Example): BTS54220-LBE

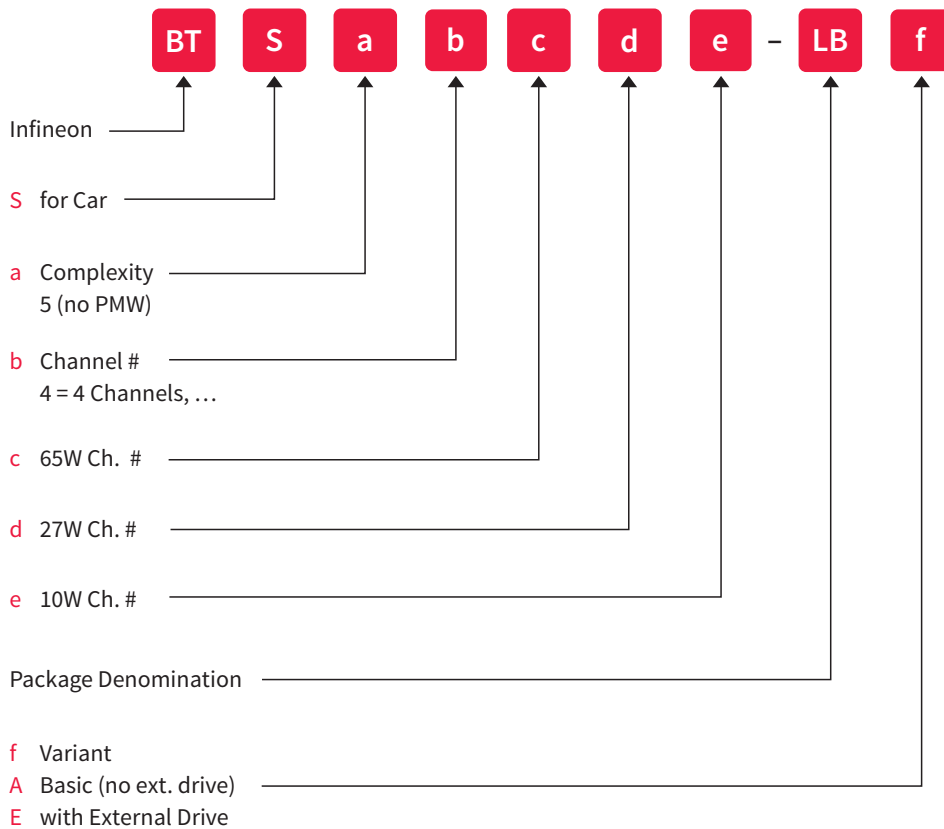


MOSFETs
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Automotive System ICs
Glossary



SPI Power Controller (SPOC™) for Advanced Light Control

SPOC™+ Family Naming System



Product Table

Product Type	Channel mix [mΩ]			LED mode (27W channels)	PWM engine integrated	External drive capability	Package ¹⁾
	65W	27W	10W				
SPOC™ FL (Front Light)							
BTS5482SF	2 x 4.5	2 x 14	-	•		•	Ⓜ
BTS6480SF	2 x 4.5	2 x 14	-	•	•	•	Ⓜ
SPOC™+							
BTS54220-LBA	2 x 9.0	2 x 27	-	•			Ⓔ
BTS54220-LBE	2 x 9.0	2 x 27	-	•		•	Ⓔ
BTS54040-LBA	-	4 x 39	-	•			Ⓔ
BTS54040-LBE	-	4 x 39	-	•		•	Ⓔ
BTS55032-LBA	-	3 x 39	2 x 110	•			Ⓔ
BTS56033-LBA	-	3 x 39	3 x 110	•			Ⓔ

1) See packages on page 112



Infineon® Auto LED Driver

Infineon® Auto LED Driver are an enabler of protected and high performing lighting applications in automotive. In particular the constant current regulation secures the stable brightness of the LED over the whole automotive temperature and voltage range.

Features

- Constant output current, therefore constant brightness and extended LED lifetime
- Wide input voltage range
- Low drop voltage
- Open-load detection
- Overtemperature protection
- Short-circuit proof
- Reverse polarity proof
- Wide temperature range
- Very small SMD packages
- Automotive qualified

The driver as well as the LED are protected against overstress e.g. caused by voltage spikes or overtemperature. Any kind of load conditions are detected by its diagnostic features such as open load or shorted LED. All features are required to drive LEDs in harsh automotive environment conditions.

Applications

The Infineon automotive optimized LED Drivers address interior and exterior, low to high power automotive LED applications such as: high and low beam, fog, DRL, position, tail, stop, CHMSL, RCL, reverse, turn indicator, dome, ambient lighting, status lamps etc.

Infineon® Auto LED drivers are divided in four sub-families

Infineon® Basic LED Driver

- Flexible linear current source family with scalable feature set

Infineon® Linear LED Driver

- BCR400 series is the most cost effective solution to drive low power LED
- Linear Current Sources for Low to Medium Power Applications

Infineon® Power LED Driver

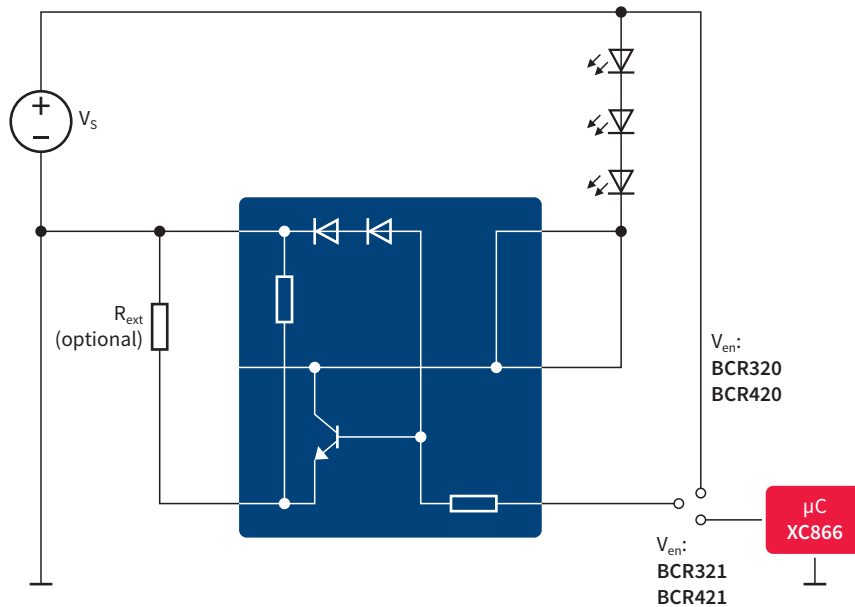
- DC/DC converter & controller for high power applications



Infineon® Linear LED Driver

BCR400 series is the most cost effective solution to drive low power LED

Block Diagram BCR42x-U



Product Table

Product Type	Output Current (max) [mA]	Adjustable Output Current	Supply Voltage (max) [V]	Inhibit	PWM enable	P_{tot} [mW]	Package ¹⁾
BCR401U	65	●	40			750	(19)
BCR401W	65	●	18			500	(25)
BCR402U	65	●	40			750	(19)
BCR402W	65	●	18			500	(25)
BCR405U	65	●	40			750	(19)
BCR320U	250	●	27			1,000	(19)
BCR321U	250	●	27	●	●	1,000	(19)
BCR420U	150	●	40			1,000	(19)
BCR421U	150	●	40	●	●	1,000	(19)

1) See packages on page 112

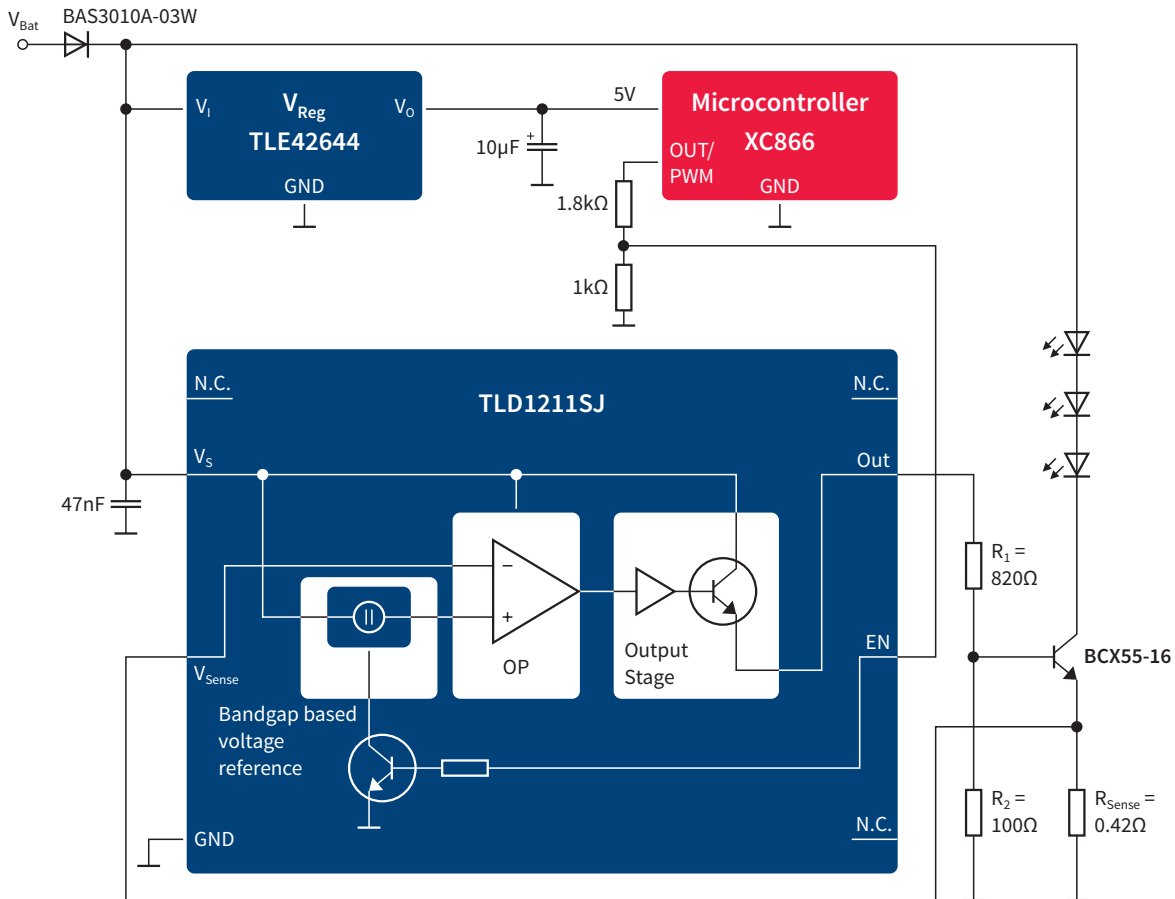
Infineon® Linear LED Driver

Linear Current Sources for Low to Medium Power Applications

LED drivers designed to supply constant current up to 500mA, which enables constant LED brightness and

ensures extended LED lifetime, independently from supply voltage or LED forward voltage class.

Block Diagram TLD1211SJ



Product Table

Product Type	Output Current (typ) [mA]	Adjustable	Driver for External Transistor	Open-Load Detection	PWM/Enable Input	High-Low Current Switch	Package ¹⁾
TLD1211SJ	85	•	•		•		①
TLE4241GM	60	•		•	•	•	①
TLE4242EJ	250	•		•	•		②
TLE4242G	450	•		•	•		③

1) See packages on page 112

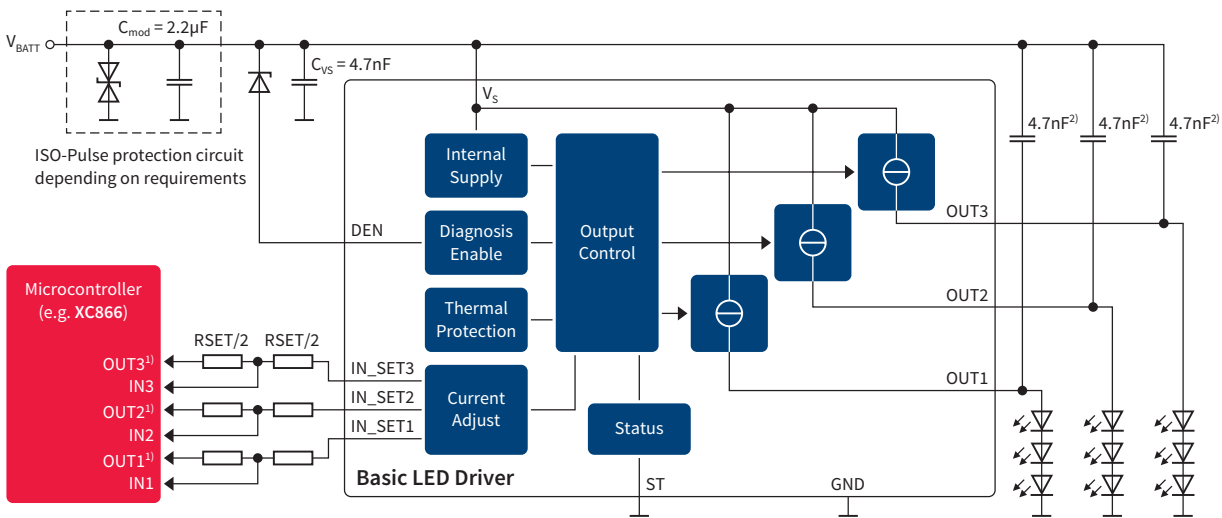
Infineon® Basic LED Driver

Flexible linear current source family with scalable feature set

Infineon's Basic LED driver are optimized for the control of low to medium power LEDs in automotive applications. The whole family of linear constant current sources offers footprint compatibility ranging from 1 to 3 output channels and 60–180mA and enables stable and reliable LED brightness by precise current control.

Its diagnostics and logic feature set enables improved system reliability by significant component reduction on board level, improved system protection (e.g. against ISO pulses), as well as an energy optimized system solution (DC/DC control).

Application Diagram TLD2314EL



- 1) Open Drain
- 2) For EMI improvement, if required

Product Table

Product Type	1 IN 1 OUT	1 IN 3 OUT	3 IN 3 OUT	Output Current (typ.) mA per Channel	PWMI	N - 1	OL & SC Detection	OL & SC with Double Fault Detection	DEN	Matrix	Package ¹⁾
TLD1120EL	•			180							(27)
TLD1310EL		•		60							(27)
TLD2310EL			•	60							(27)
TLD1312EL		•		60	•						(27)
TLD1311EL		•		60		•					(27)
TLD1121EL	•			180			•				(27)
TLD2311EL			•	60			•				(27)
TLD1313EL		•		60				•			(27)
TLD1124EL	•			180			•		•		(27)
TLD1314EL		•		60			•		•		(27)
TLD2314EL			•	60			•		•		(27)
TLD1125EL	•			180	•		•				(27)
TLD1315EL		•		60	•	•	•				(27)
TLD1326EL		•		60	•	•				•	(27)
TLD2326EL			•	60			•			•	(27)

1) See packages on page 112

PWMI = Internal PWM dimming engine
 N - 1 = Complete device deactivation during Open Load
 OL = Open Load Diagnosis

SC = Short Circuit Diagnosis
 DEN = Diagnosis Enable Input
 Matrix = Feedback to DC/DC to optimize efficiency

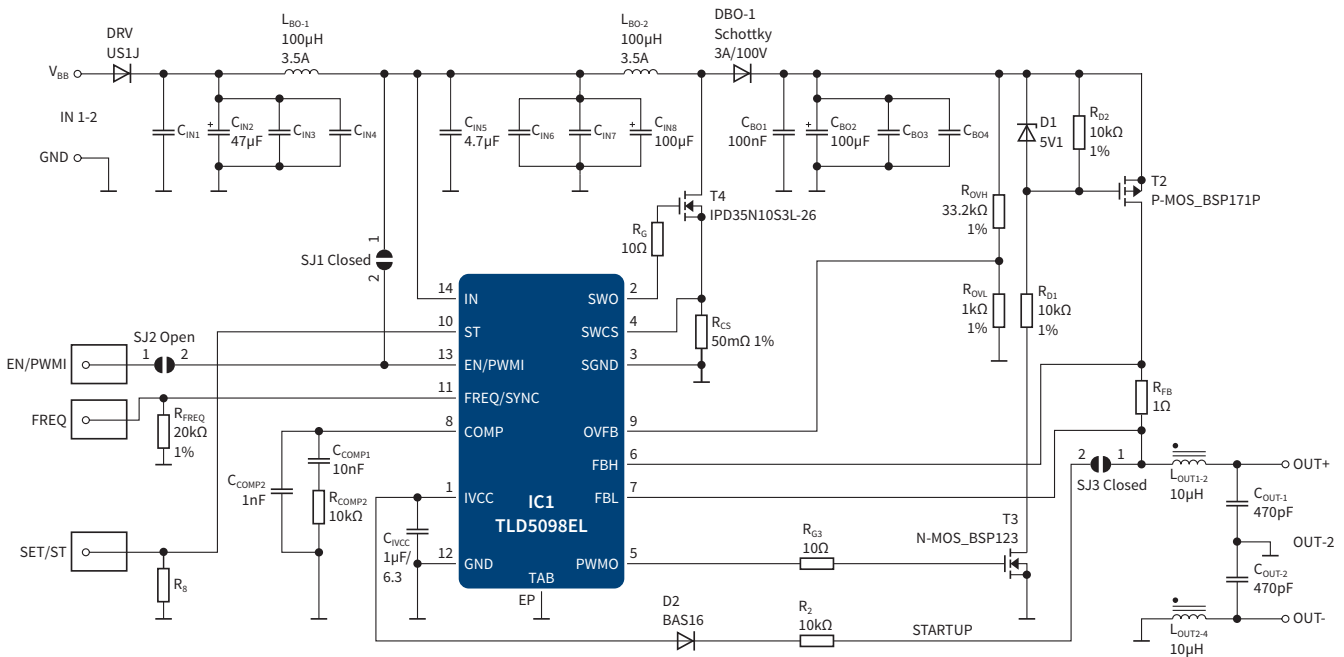
Infineon® Power LED Driver

DC/DC Converter & Controller for High Power Applications

Increasingly, LED lighting solutions are used in the front area of the car, especially in the Premium segment. LED Frontlight solutions are usually implemented using several discrete LEDs in one chain which leads to a string voltage of up to 60V or using less LEDs with high forward

current up to 1.5A. Both implementations are requiring DC/DC solutions either boost, buck or buck-boost architectures are needed. The Infineon® Power LED Driver Family consists of DC/DC devices which are perfectly fulfilling these requirements.

Application Diagram TLD5098EL in Boost Mode with Short to Ground Protection



Product Table

Product Type	Topology	Power Stage	Current (max) [A]	V _{IN} Range [V]	V _{OUT} (max) [V]	LED Current Dimming		Package ¹⁾
						Digital (PWM)	Analogue	
TLD5045EJ	Buck Converter	Internal	0.7	5 ... 40	40	Yes	Yes	②
TLD5095EL	Multitopology Controller IC Buck, Boost, Buck-Boost, SEPIC, Flyback	External	dependant on External MOSFET	4.75 ... 45	45	Yes	No	②⑦
TLD5097EL	Multitopology Controller IC Buck, Boost, Buck-Boost, SEPIC, Flyback	External	dependant on External MOSFET	4.5 ... 45	60	Yes ²⁾	Yes	②⑦
TLD5098EL	Multitopology Controller IC Buck, Boost, Buck-Boost, SEPIC, Flyback	External	dependant on External MOSFET	4.5 ... 45	60	Yes	Yes	②⑦

1) See packages on page 112

2) No dedicated gate driver. Digital dimming done via main switch.



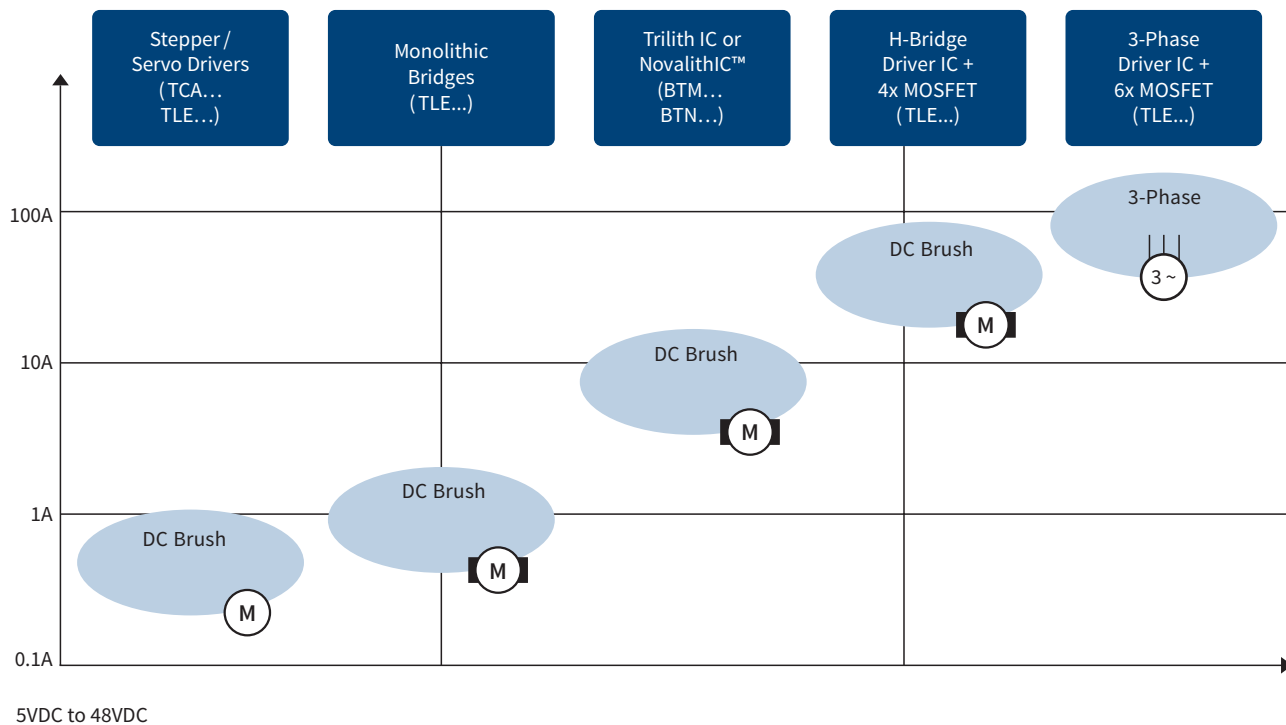
- MOSFETs
- TEMPFET™ HITFET™
- Smart Multichannel Switches
- PROFET™
- SPOC™_SPI Power Controller
- LED Drivers
- Motor Drivers
- Power Supply
- Automotive Transceivers
- Automotive System ICs
- Glossary

Motor Drivers

The Right Driver for Every Motor

The search for a solution to drive applications powered by low-voltage motors ends with Infineon. From 0.1 to 100A, and from steppers to 3-Phase drivers, we offer the

right solution for every current range and application requirement.



Integrated Low-Current Motor Drivers

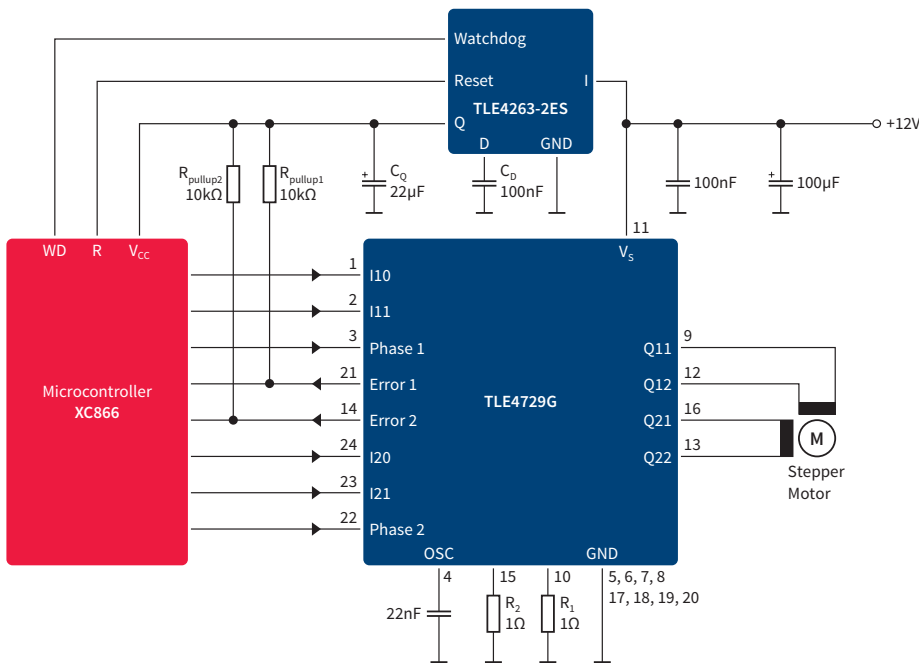
The Infineon low-current DC motor bridge family consists of a broad variety of bridges for stepper and DC brush motors including servo motors. They are designed for use in automotive and industrial applications. Typical applications are light leveling, HVAC flap control, and mirror adjustment.

The products are offered with protection features as well as diagnosis. Depending on the product type the protection ranges from basic protection against overtemperature to a full set of protection against open-load, overvoltage, undervoltage, overtemperature and short-circuit. The diagnosis capabilities range from a simple status flag to communication via a 16-bit SPI.

Stepper Motor Drivers

The TCA3727 and TLE4726 et seqq. cover a broad range of applications from automotive to industry. The TLE4726

can be used in 24V applications. The products are either produced in DOPL, Infineon’s robust bipolar technology, or SPT, a technology combining bipolar CMOS and DMOS cells.



Product Table

Product Type	$I_{L(NOM)}$ [A]	$I_{L(lim)}$ [A]	I_q [μ A]	$V_{S(op)}$ [V]	Step Operations	Protection	Diagnostic Interface	Highlights	Package ¹⁾
Current controlled									
TCA3727G	2 x 0.75	2 x 1.5	200	5–50	Full to mini step	OT	–	High operating voltage, low quiescent current with inhibit	⑨
TLE4726G	2 x 0.75	2 x 1.5	200	5–50	Full to mini step	OT	–		⑨
TLE4729G	2 x 0.7	2 x 1.5	50	6–16	Full to mini step	OL, OT, SC	Status flag	Very low quiescent current with inhibit	⑨
Voltage controlled									
TLE4208G	4 x 0.8	4 x 1.5	20	8–18	Full to half-step	SC, OT, OV, UV	Status flag	Dual Full Bridge	⑩
TLE8444SL	4 x 0.5	4 x 0.9	1	8–18	Full to half-step	SC, OT, OV, UV, OL	Status flag	Open-load detection in ON-State	⑳

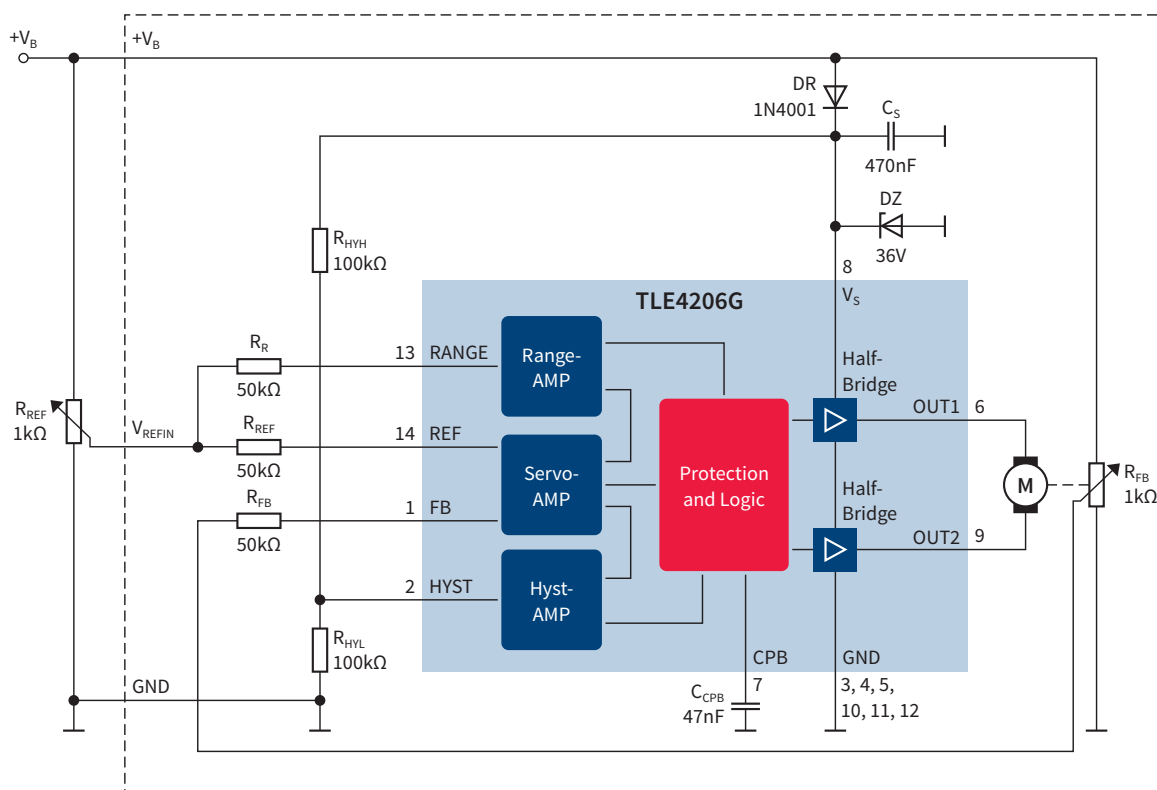
1) See packages on page 112

LO = Lockout
 OL = Open-Load
 OV = Overvoltage
 UV = Undervoltage
 OT = Overtemperature
 SC = Short-Circuit

Servo Drivers

The TLE4205, TLE4206 and TLE4209 are protected H-Bridge drivers for automotive applications like headlight beam control and industrial servo control applications.

The devices are built using DOPL, Infineon's robust bipolar technology.



Product Type	$I_{L(NOM)}$ [A]	$I_{L(lim)}$ [A]	I_q [μ A]	$V_{S(op)}$ [V]	Protection	Inhibit	Highlights	V_{sat} path	Package ¹⁾
TLE4205G ³⁾	0.6	1.0	0.01	6 ... 32	SC	●	Dual power comparator for higher voltage	2.1V at 0.6A ²⁾ supply voltage	⑥
TLE4206G	0.8	1.5	12.0	8 ... 18	OT, OV, UV, LO, SC		Servo driver with current peak blanking	1.2V at 0.4A ²⁾	④
TLE4206-2G	0.8	1.5	12.0	8 ... 18		Switching hysteresis on range input	1.2V at 0.4A ²⁾	④	
TLE4206-4G	0.9	1.6	12.0	8 ... 19		Adapted range input	1.2V at 0.4A ²⁾	④	
TLE4209A ⁴⁾	0.8	1.5	12.0	8 ... 18		Servo driver	1.2V at 0.4A ²⁾	⑤	
TLE4209G	0.8	1.5	12.0	8 ... 18		Servo driver	1.2V at 0.3A ²⁾	④	

1) See packages on page 112

2) Total drop saturation voltage typ. value @ 25°C and 0.4A

3) $R_{DS(on)}$ is typical and specified @ $T_j = 25^\circ\text{C}$

4) Product not intended for new design

LO = Lockout

OL = Open-Load

OV = Overvoltage

UV = Undervoltage

OT = Overtemperature

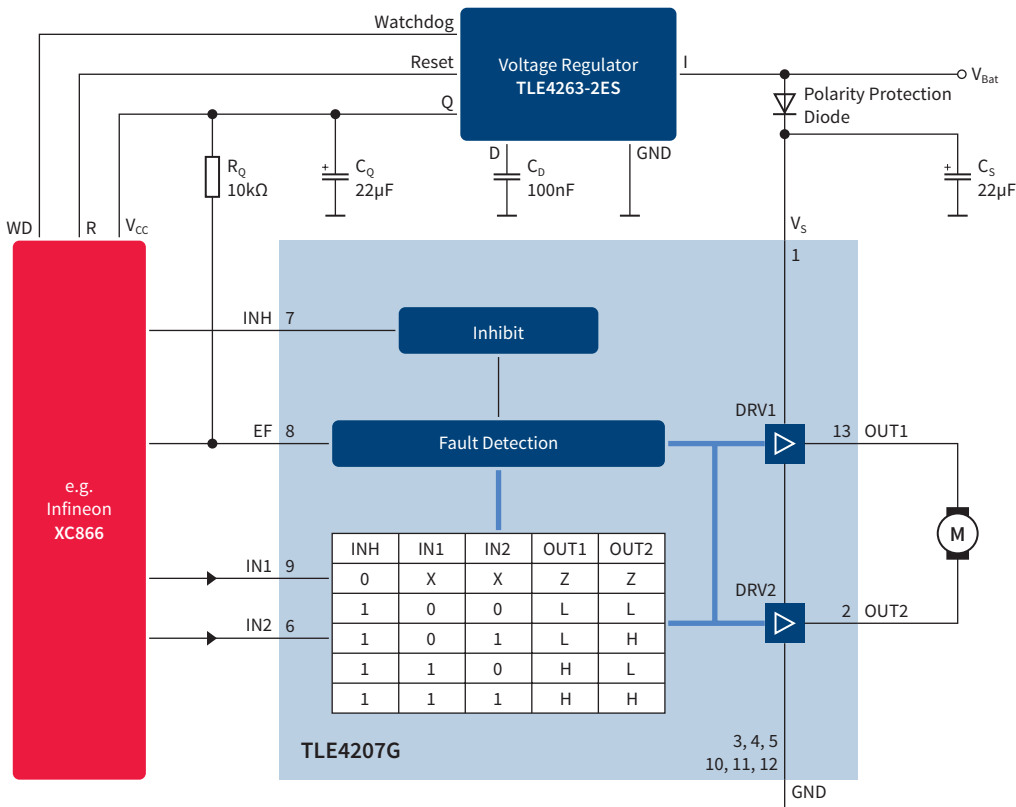
SC = Short-Circuit

Integrated Low-Current Motor Drivers

Motor Control ICs

The TLE4207, TLE4208, TLE6208-3/-6 and TLE841xxEL are multipurpose bridges designed to drive DC brush motors with nominal load currents < 1A for automotive

and industrial applications. The TLE4207 and TLE4208 parts are built using Infineon’s robust bipolar technology DOPL. TLE6208-3/-6 and TLE84xxx use SPT, a technology combining bipolar, CMOS and DMOS cells.



Basic Features

- OV = Overvoltage
- UV = Undervoltage
- OT = Overtemperature
- SC = Short-Circuit

Product Type	Config.	$I_{L(NOM)}$ [A]	$I_{L(LIM)}$ [A]	I_q	$V_{S(op)}$ [V]	Protection	Diagnostic Interface	Highlights	$V_{CE(sat)}/R_{DS(on)}$	Package ¹⁾
TLE4207G	2x Half-bridge	2 x 0.8	2 x 1.5	20	8 ... 18	LO	Status flag	Error det.	1.2V ²⁾	④
TLE4208G	4x Half-bridge	4 x 0.8	4 x 1.5	20	8 ... 18	LO	Status flag	Error det.	1.2V ²⁾	⑩
TLE8444SL	4x Half-bridge	4 x 0.5	4 x 0.9	1	8 ... 18	OL	Status flag	Open-load detection in ON-State	600mΩ/switch	⑳
TLE6208-3G	3x Half-bridge	3 x 0.8	3 x 1.0	10	8 ... 40	LO	16-bit SPI	Detailed diagnosis via SPI	800mΩ ³⁾ /switch	④
TLE6208-6G	6x Half-bridge	6 x 0.8	6 x 1.0	12	8 ... 40	LO	16-bit SPI	Single switch usage possible	800mΩ ³⁾ /switch	⑩
TLE84106EL	6x Half-bridge	6 x 0.3	6 x 0.5	2	7 ... 18	OL	16-bit SPI	Pin compatible to TLE84110EL	800mΩ ³⁾ /switch	⑳
TLE84110EL	10x Half-bridge	10 x 0.3	10 x 0.5	2	7 ... 18	OL	16-bit SPI	Pin compatible to TLE84106EL	800mΩ ³⁾ /switch	⑳

1) See packages on page 112

2) Total drop saturation voltage typ. value @ 25°C and 0.4A

3) $R_{DS(on)}$ is typical and specified @ $T_j = 25^\circ\text{C}$

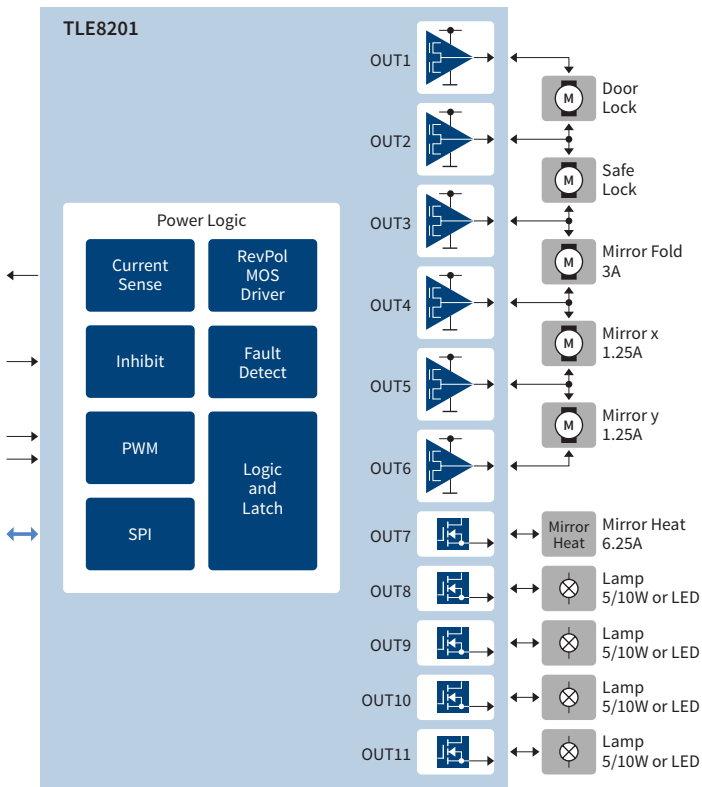
LO = Lockout

OL = Open-Load

Door Module ICs

The TLE8201R is an ASSP for door-module applications. It includes those power stages necessary to drive the following loads in a typical front door: Central lock, mirror fold, mirror position, mirror defrost plus 5 and 10W lamps. It is designed as a monolithic circuit in a SPT technology which combines bipolar and CMOS control circuit with DMOS power devices.

The TLE8203E is a derivative of the TLE8201R for automotive mirror control applications. The following output stages are included in this monolithic device, mirror position, mirror defrost and one lamp driver for 5 or 10W.



Standard Features

- SPI Interface
- $I_Q = 3\mu A$
- Operating Range: 8–20VS

Product Type	Outputs	$I_{L(lim)}$ [A]	$R_{DS(on)}$ [mΩ]	Driver Stage	Operating Range [V]	Protect	Diagnosis	Target Load	Package ¹⁾
TLE8201R ²⁾	1, 2	8.0	120	Half-bridge	8–20	OC, OT, OV, UV	CS	Central lock	⑬
	3, 4	3.0	350	Half-bridge			CS	Mirror folding	
	5, 6	1.25	650	Half-bridge			OC, OT	Mirror X-Y	
	7	6.25	85	High-side switch (mirror defrost)			CS	Mirror defrost	
	8–11	1.8	400	Lamp driver			OC, OT	Repeater	
TLE8203E	4	3.0	350	Half-bridge	8–20	OC, OT, OV, UV	CS	Mirror folding	⑭
	5, 6	1.25	650	Half-bridge			OC, OT	Mirror X-Y	
	7	6.25	85	High-side switch (mirror defrost)			CS	Mirror defrost	
	8, 10	1.8	400	Lamp driver			OC, OT	Repeater	

1) See packages on page 112
2) Product not intended for new design

LO = Lockout
OL = Open-Load
OV = Overvoltage
OC = Overcurrent
UV = Undervoltage
OT = Overtemperature
SC = Short-Circuit

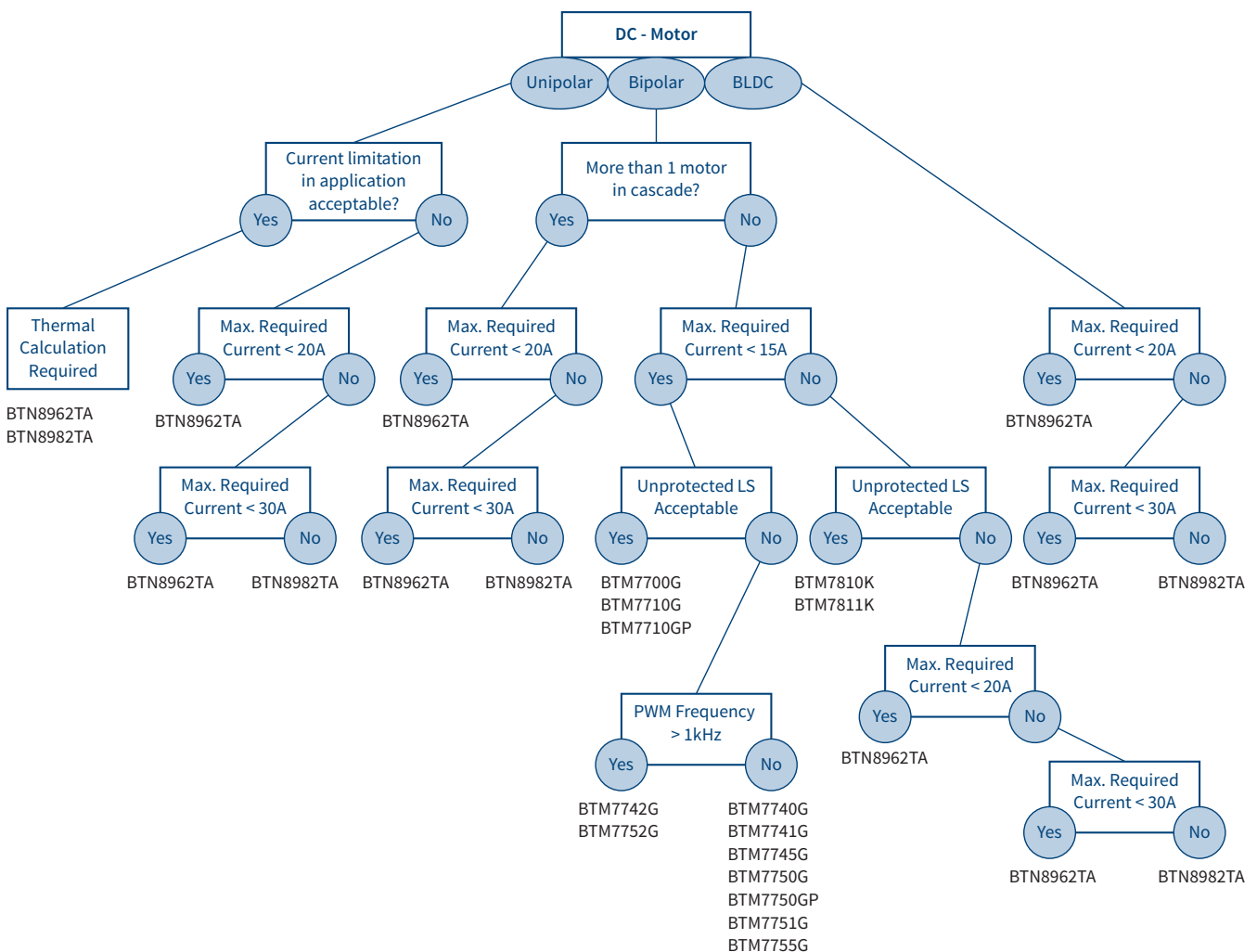
Integrated High-Current Motor Drivers

NovalithIC™/Trilith IC

A NovalithIC™ provides a complete low-ohmic-protected half-bridge in a single package. It can be combined with an additional NovalithIC™ to create an H-Bridge or 3-phase bridge as well. The NovalithIC™ family has the capability to switch fast PWM signals while providing overcurrent, undervoltage and overtemperature protection. Current sense is available to monitor load current. The NovalithIC™ family offers cost-optimized solutions for protected high-current PWM motor drives with very low board-space consumption—scaled to your needs.

The Trilith IC family members combine two high-side and two low-side switches in one package. They are geared to driving high-current DC motors in an H-Bridge configuration but can also be used as single independent switches. All Trilith ICs include overcurrent and overtemperature protection for the high-side switches. For the low-side switches the user can choose between unprotected switches as well as protected switches.

Selection Tree NovalithIC™ (BTNxxxx)/Trilith IC (BTMxxxx)



Trilith IC – Integrated H-Bridge

Basic Features

- Low quiescent current
- Capable for high PWM frequency

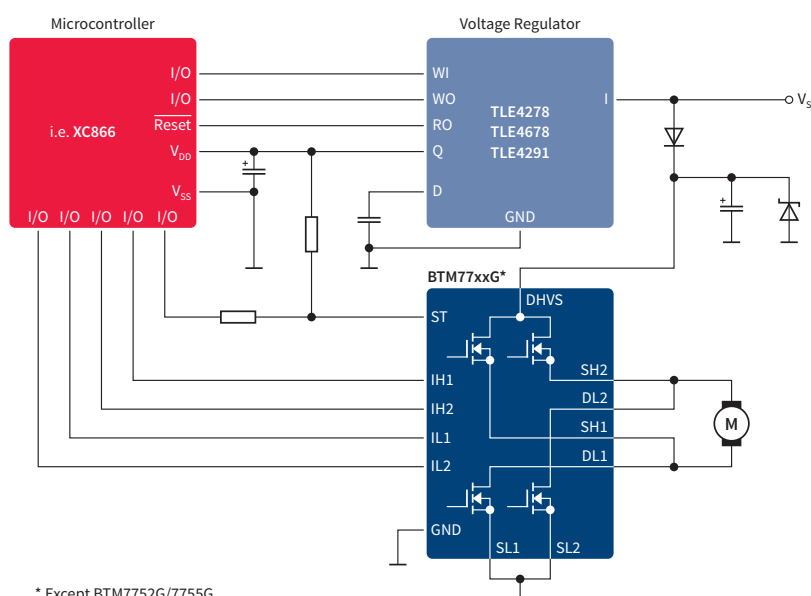
Diagnostic Features

- Overvoltage
- Overtemperature
- Short-circuit/overcurrent
- Current sense/status
- Open-load

Protection Features

- Overvoltage
- Undervoltage
- Overtemperature
- Short-circuit/overcurrent

Application Example Trilith IC



* Except BTM7752G/7755G

Trilith IC Product Overview

Product Type	Operating Range [V]	$R_{DS(on)}$ path (typ) @25°C [mΩ]	$I_{D(lim)}$ (typ) [A]	I_q (typ) [μA]	Switch freq. (typ) [kHz]	Diagnosis	Protect	Package ¹⁾
BTM7740G	4.8 ... 42	210	8.0	5	1	OT	OT, SC	(10)
BTM7741G	4.8 ... 42	210	8.0	5	1	OT, OL	OT, SC	(10)
BTM7700G	4.8 ... 42	190	9.5	5	1	OT	OT, SC	(10)
BTM7750G	4.8 ... 42	115	12.0	5	1	OT	OT, SC	(10)
BTM7750GP ²⁾	4.8 ... 42	115	12.0	5	1	OT	OT, SC	(40)
BTM7751G	4.8 ... 42	115	14.0	5	1	OT, OL	OT, SC	(10)
BTM7710GP ²⁾	4.8 ... 42	110	15.0	5	1	OT	OT, SC	(40)
BTM7710G	4.8 ... 42	110	15.0	5	1	OT	OT, SC	(10)
BTM7810K ³⁾	5.0 ... 42	40	42.0	4	1	OT, OL	OT, SC	(40)
BTM7811K ³⁾	5.0 ... 42	40	42.0	4	20	OT, OL	OT, SC	(40)
BTM7742G	5.5 ... 28	250	12.0	5	25	OV, OT, SC/OC, CS	OV, UV, OT, SC/OC	(11)
BTM7745G	5.5 ... 28	250	12.0	5	1	OV, OT, SC/OC	OV, UV, OT, SC/OC	(11)
BTM7752G	5.5 ... 28	150	12.0	5	25	OV, OT, SC/OC, CS	OV, UV, OT, SC/OC	(11)
BTM7755G	5.5 ... 28	150	12.0	5	1	OV, OT, SC/OC	OV, UV, OT, SC/OC	(11)

1) See packages on page 112

2) AEC std. grade 3, $T_j(max) = 110^\circ C$

CS = Current Sense
OL = Open-Load
OV = Overvoltage

UV = Undervoltage
OT = Overtemperature
SC = Short-Circuit
OC = Overcurrent

Integrated High-Current Motor Drivers

NovalithIC™ – Integrated Half Bridge

Basic Features

- Low quiescent current
- Capable for high PWM frequency
- Logic level input
- Adjustable slew rate
- Cross current protection

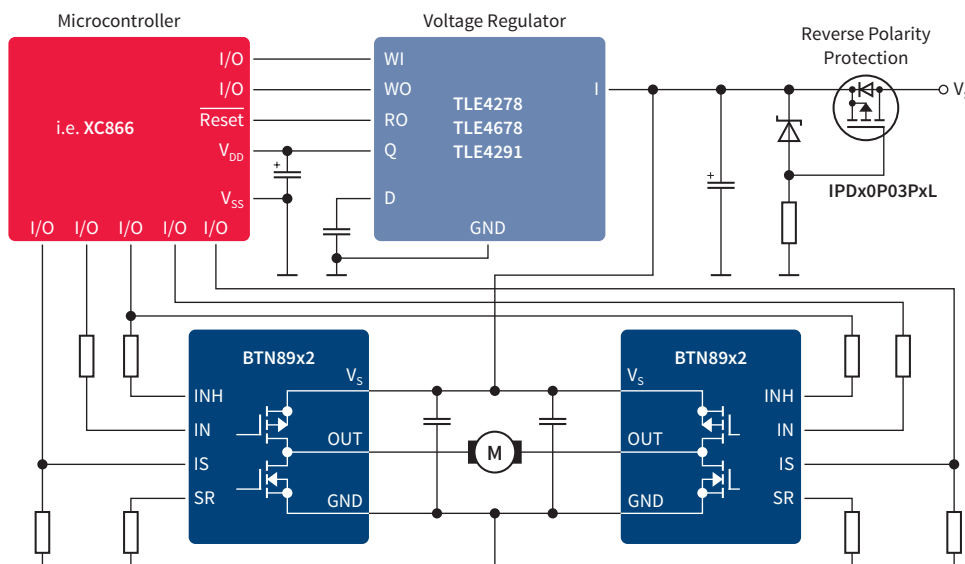
Diagnostic Features

- Overtemperature
- Undervoltage
- Overcurrent
- Current sense and status

Protection Features

- Overtemperature shutdown
- Undervoltage
- Overcurrent

Application Example NovalithIC™



NovalithIC™ Product Overview

Product Type	Operating Range [V]	R _{DS(on)} path (typ) [mΩ]	I _{D(lim)} [A]	I _q (typ) [μA]	Switch time (typ) [μs]	Diagnosis	Protect	Package ¹⁾
BTN8962TA	5.5 ... 40	14.2	42	7	0.25	OT, OC, CS	UV, OT, OC	Ⓒ ³⁹
BTN8982TA	5.5 ... 40	10.0	70	7	0.25	OT, OC, CS	UV, OT, OC	Ⓒ ³⁹

1) See packages on page 112
2) HS switch only

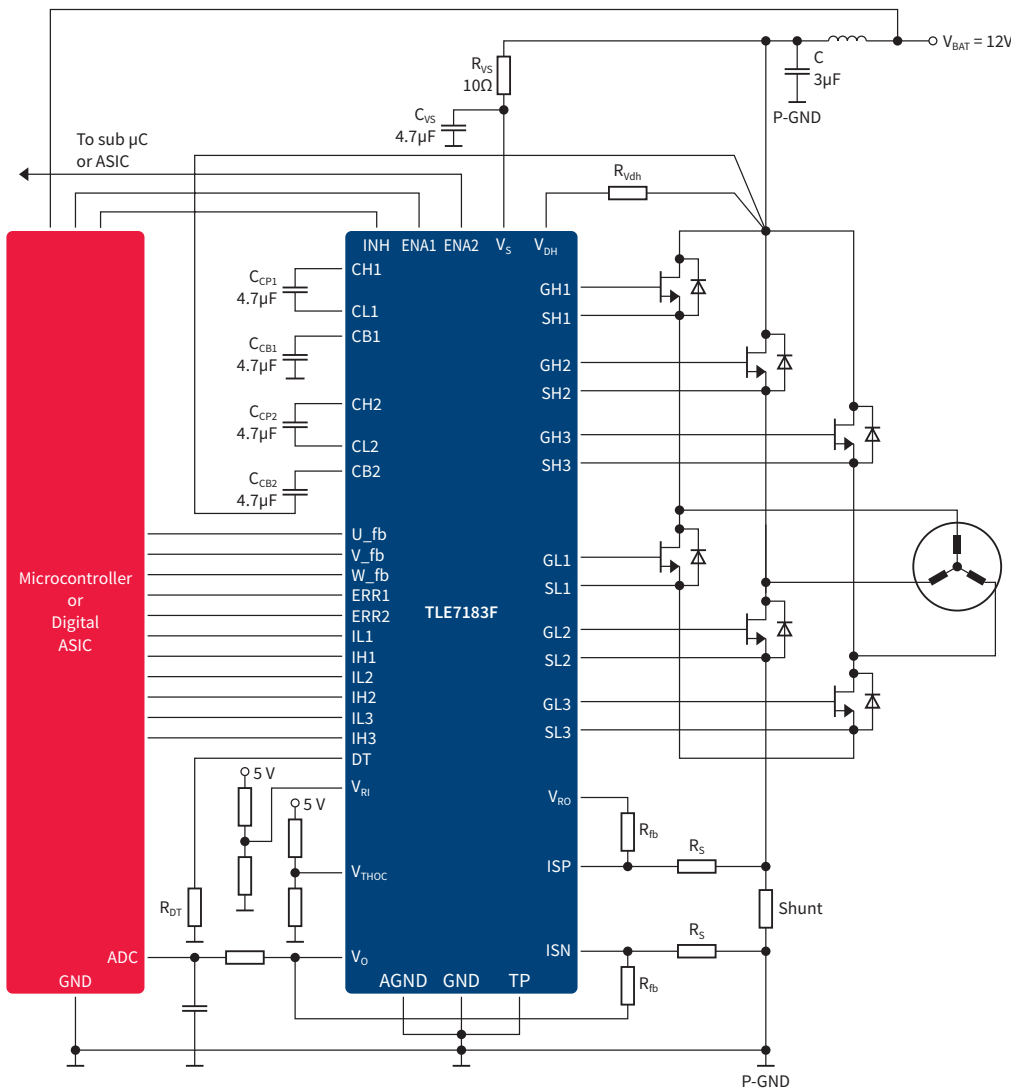
OC = Overcurrent
CS = Current Sense

UV = Undervoltage
OT = Overtemperature

Gate Driver ICs for External MOSFETs

The trend towards greater efficiency in automotive applications also applies to electric motors. Applications such as power steering, HVAC compressors and engine cooling fans will be controlled by electronic motors in the

future. Infineon's family of configurable, H-Bridge and 3-phase gate driver ICs can be combined with MOSFETs to provide the power and efficiency these systems demand.



Applications

- Power steering
- Fan and pump control
- Starter alternator
- Seat belt pretensioner
- VVT
- Electric park brake
- ECMT

Basic Features

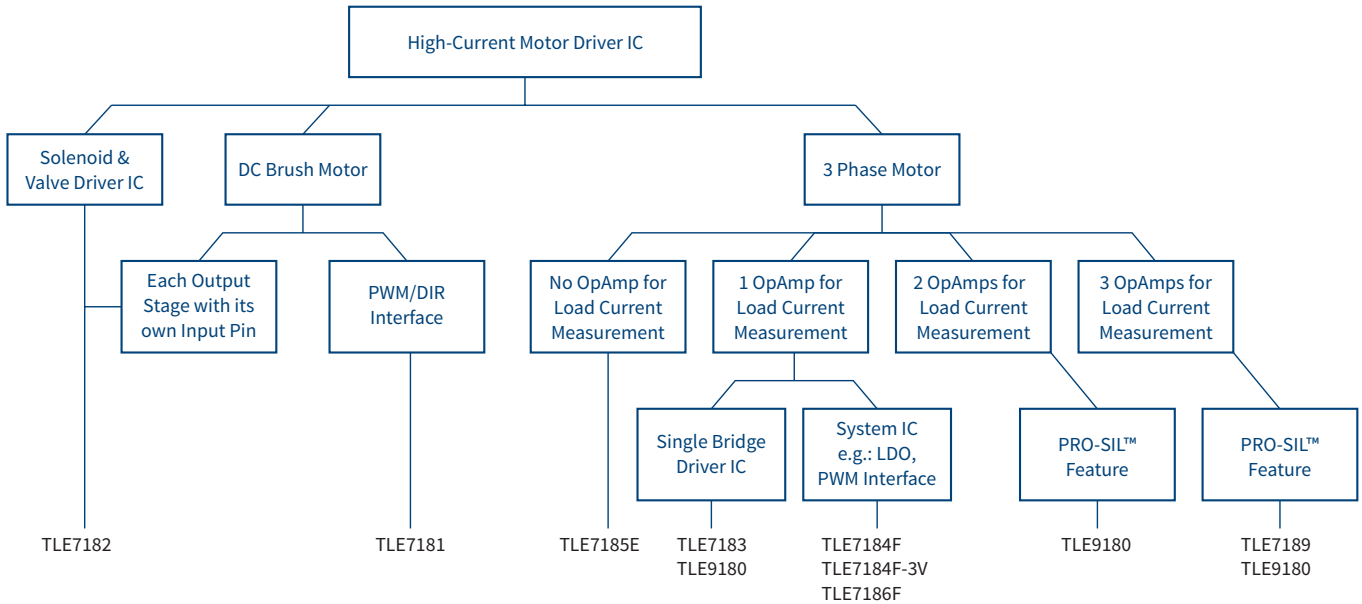
- Strong output stage up to 1.5A
- Precise OpAmp for current shut monitoring
- Operation down to 5.5V
- Duty cycle adjustable up to 100%

Diagnostic Features

- Undervoltage
- Short-circuit
- Overtemperature
- Overvoltage

Gate Driver ICs for External MOSFETs

Selection Tree Gate Drivers



H-Bridge/ Dual Half-Bridge Drivers Family

Product Type	Operating Range [V]	OpAmp	PWM/DIR Input	Reverse Polarity Protection	Diagnostic	Package ¹⁾
TLE7181EM	7 ... 34	1	●	●	UV, OV, OC, SCD, OT	Ⓓ
TLE7182EM	7 ... 34	1		●	UV, OV, OC, SCD, OT	Ⓓ

3-Phase Bridge Driver IC

Product Type	Operating Range [V]	Drives Stage	D.C.-Range @ 20kHz [%]	Numbers of integrated OpAmps for load current measurement	Adjustable dead time	SIL3 features	Diagnosis	Package ¹⁾
TLE7183F	5.5 ... 28	1.5/1.5A	0 ... 100	1	●		OT, UV, OV, OC, OCD	Ⓓ
TLE7183QU	5.5 ... 28	1.5/1.5A	0 ... 100	1	●		OT, UV, OV, OC, SCD	Ⓓ
TLE7184F TLE7184F-3V ²⁾ TLE7186F	7.0 ... 32	12.5/9.0Ω 12.5Ω	0 ... 95	1	●		UV, OV, OC, SCD, OT, VDD supervision	Ⓓ
TLE7185E	5.5 ... 32	12.5/9.0Ω	0 ... 95	0	●		UV, OV, SCD, OT	Ⓓ
TLE7188F	5.5 ... 28	1.5/1.5A	0 ... 100	3			UV, OV, OC, SCD, OT	Ⓓ
TLE7189F	5.5 ... 28	1.5/1.5A	0 ... 100	3		●	UV, OV, SCD, OT, VDD supervision	Ⓓ
TLE7189QK	5.5 ... 28	1.5/1.5A	0 ... 100	3		●	UV, OV, SCD, OT, VDD supervision	Ⓓ
TLE9180-xxQK ³⁾	5.5 ... 60	2.0/2.0A	0 ... 100	1, 2 or 3	SPI	●	UV, OV, OC, SCD OT + others	Ⓓ

1) See packages on page 112

2) System IC for fans and pumps with integrated LDO and PWM interface

3) Coming Q1/2015

LO = Lockout
OL = Open-Load
OV = Overvoltage
OC = Overcurrent

UV = Undervoltage
OT = Overtemperature
SCD = Short-Circuit Detection

PN Driver IC

Additionally to the well established H-Bridge and 3-phase gate driver ICs, Infineon recently released a PN Driver IC. It is designed to drive one high-side p-channel MOSFET and

one low-side n-channel MOSFET. With that approach, new cost optimized drive solutions can be achieved.

Applications

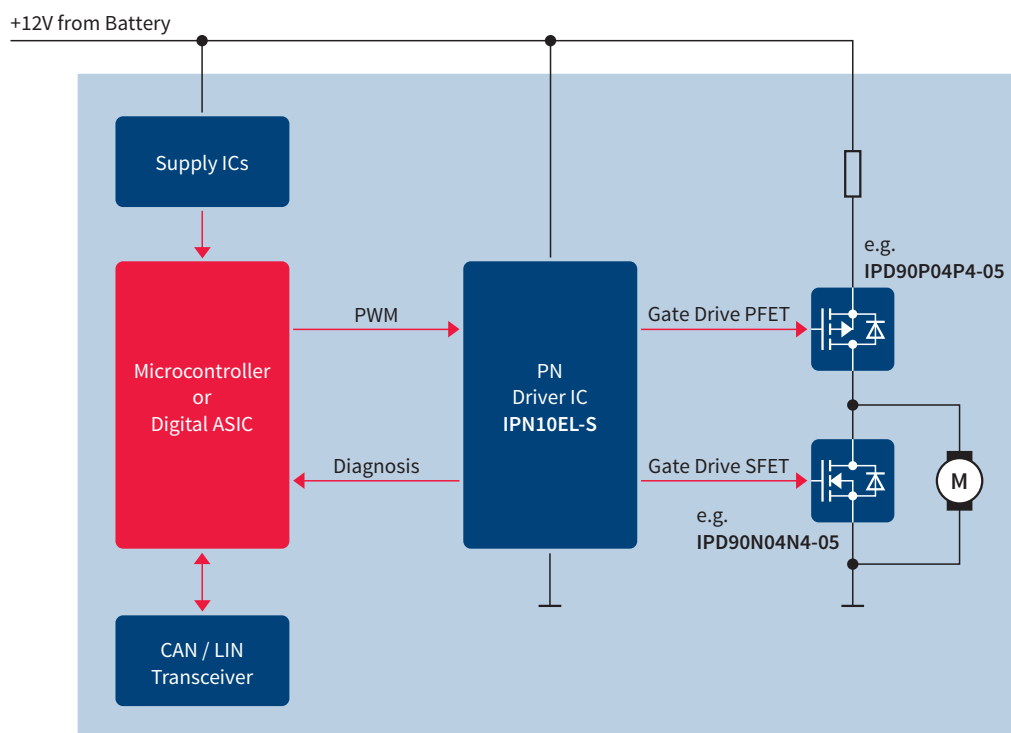
- Fan and pump control
- Wiper
- Electric park brake

Basic Features

- PWM interface drives 1P and 1N Channel Power MOSFETs
- Separate control input for each MOSFET
- 0 ... 100% Duty cycle of High and Low Side MOSFETs
- Adjustable dead time

Diagnostic Features

- One Error output to μC
- Over temperature protection
- Under voltage lock out
- Short circuit protection



Product Type	Operating Range [V]	OpAmp	Adjustable dead time	Reverse Polarity Protection	Diagnostic	Package ¹⁾
IPN10EL-S	4.0 ... 40	0	Yes	No	UV, OT, SCD	Ⓓ

1) See packages on page 112

Infineon® Embedded Power ICs

System on a Chip Motor Control

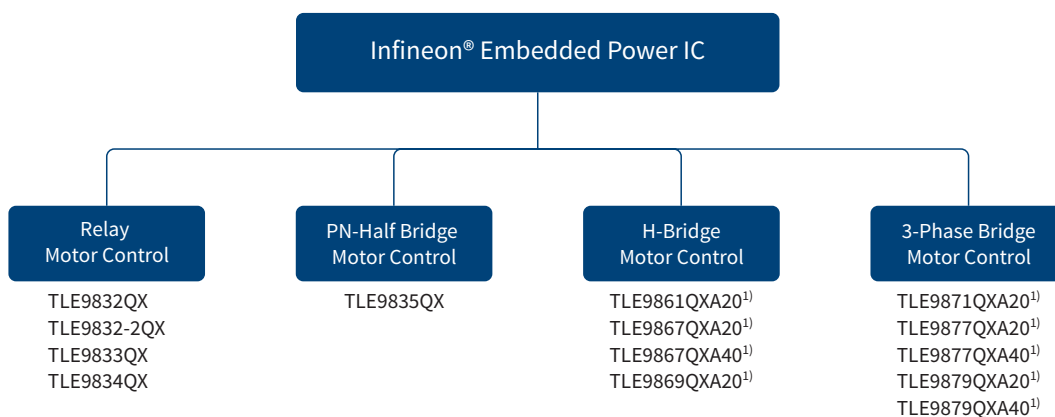
Infineon® embedded power ICs are specifically designed to enable mechatronic motor control solutions for a range of motor control applications, where a small package form factor and a minimum number of external components are essential. Examples applications include window lift, sunroof, wiper, fuel pump, HVAC fans, engine cooling fan, water pumps to name a few.

Produced on Infineon's automotive qualified smart power technologies, the Infineon embedded power System-on-

chip solutions offer an unmatched level of integration of all functions required to sense, control and actuate a motor.

The Infineon® embedded power IC integrate on single die the microcontroller, the non volatile memory, the analog and mixed signal peripherals, the communication interfaces along with the driving stages needed for either relay, or half-bridge or full-bridge DC and BLDC motor applications.

Selection Tree for Infineon Embedded Power IC Motor Control



1) In production, samples available

2nd Generation: Relay Driver IC with Integrated Microcontroller

The 2nd generation of Infineon® embedded power ICs integrates on a single die all the necessary functions to sense, control and actuate motor a via a relay or via a PN MOSFET half-bridge. The TLE983x product family integrates a high performance 8-bit microcontroller derived from the established XC800 microcontroller family with application specific power drivers, control and communication on Infineon's first-in-industry automotive qualified 130nm smart power technology. TLE983x product family improves the microcontroller performance and the product feature set over the first generation (TLE78xx) product offering.

The TLE983x product family is offered in a space saving PG-VQFN-48 package, while the first product generation is realized as a Multi-Chip-Module (MCM) in a DSO-28 package.

The devices are designed for LIN based motor control applications such as window lifts, wipers, sun roofs, power seats, fan/blower control.

General Characteristics

- Operating voltage V_{Bat}: 3.0V to 27V, maximum rating 40V
- Stop mode 85µA & sleep mode 25µA
- ESD performance:
 - up to 2kV / handling on all pins
 - 4kV @ HV inputs
 - 6kV @ LIN pin
 - ECU/car handling ruggedness (gun model for pins directly connected to ECU plug/socket)
- Overvoltage device clamp (load dump ruggedness): ≥ 40V
- Wide operating temperature range:
 - T_j: -40°C up to 150°C

Features of 8-bit Microcontroller, XC8xx

- 8051 compatible, up 40MHz Frequency
- 256byte RAM and 3072byte XRAM
- 36KB to 64KB flash memory for code and data
- 10-bit ADC (5V max.), 8 channels including battery and supply supervision
- Five 16-bit timers
- Capture/compare unit for PWM signal generation (CCU6) with 2 x 16-bits timers

TLE983x Product Family Offers

- LIN transceiver (single wire), compliant with LIN Spec. 2.1, 2.0/SAE J2602 and compatible with LIN 1.3
- Two protected low-side switches (250mA)
- Up to two protected high-side switches (150mA)
- Five high-voltage inputs with wake up functionality
- Full duplex serial interface (UART) with LIN support
- Synchronous serial channel (SSC)
- Two watchdog timers
- Programmable window watchdog
- Measurement unit with 10 channels, 8-bit A/D Converter and data post processing
- Voltage regulator with undervoltage reset
- Power saving modes
 - MCU slow-down mode
 - Stop mode
 - Sleep mode
 - Cyclic wake-up and cyclic sense during stop mode and sleep mode

Applications

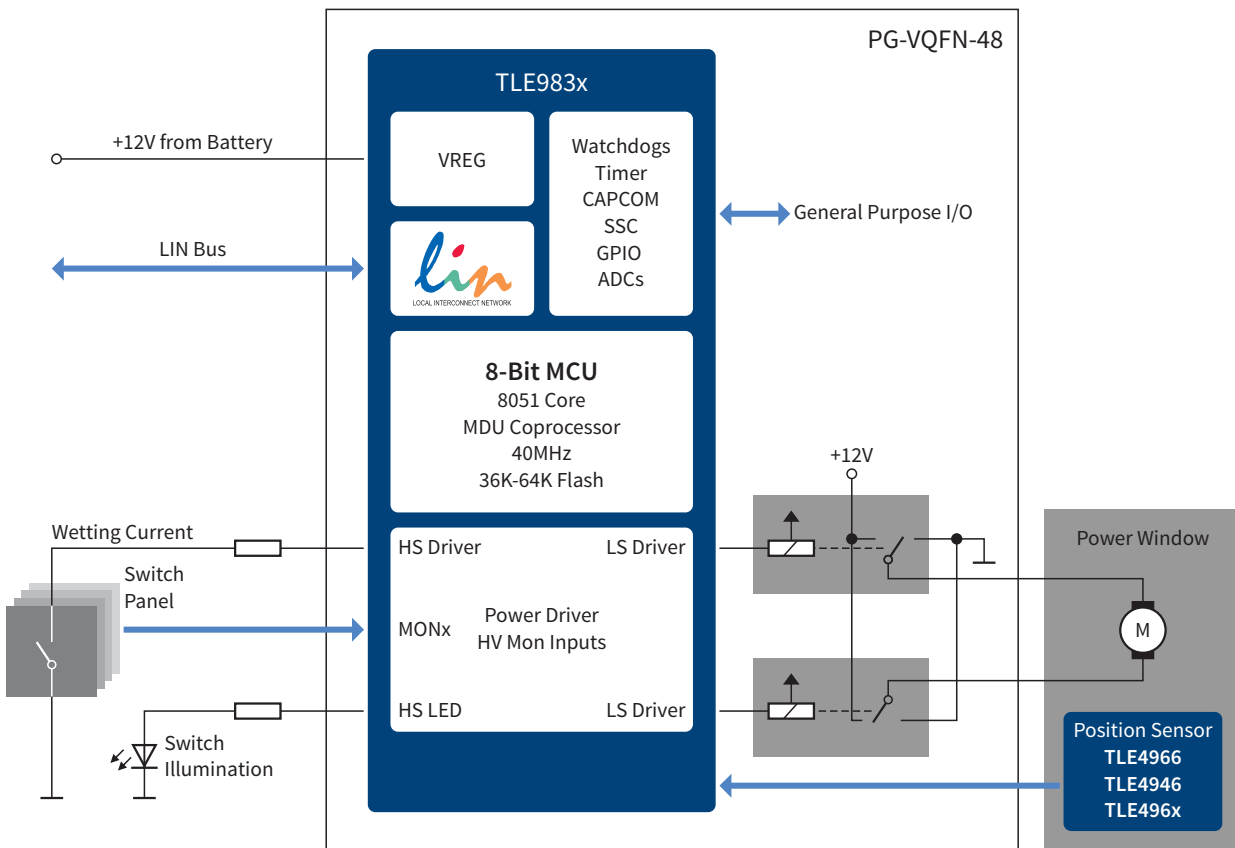
- Window lift
- Sun roof
- Fan control
- Seat control
- Key pad interface
- Switch panel interface

Infineon® Embedded Power ICs

Product Name	Core	Flash [KB]	Freq [MHz]	High-Side Switch	High Voltage Monitor Input	16-bit Timer	GPIO	OP-AMP	PN MOS Driver	Package ¹⁾
TLE983x Product Family										
TLE9835QX	XC800	64	40	2	5	5	11	Yes	Yes	Ⓔ
TLE9834QX	XC800	64	40	2	5	5	11	No	No	Ⓔ
TLE9833QX	XC800	48	40	2	5	5	11	No	No	Ⓔ
TLE9832-2QX	XC800	36	40	2	5	5	11	No	No	Ⓔ
TLE9832QX	XC800	36	40	1	5	5	11	No	No	Ⓔ
TLE9832QV	XC800	36	40	1	5	5	11	No	No	Ⓔ

1) See packages on page 112

Smart LIN-based Relay Driver IC & Switch Panel Interface with Integrated 8-bit Microcontroller



3rd Generation: 2-Phase Bridge Driver IC with Integrated ARM® Cortex® M3 Core

Infineon has combined its wealth of experience in motor control drivers for automotive applications with an industry-standard core. The unique result, our 3rd generation embedded power IC based on ARM® Cortex®-M cores, addresses a wide range of smart 2-phase DC motor control applications like, sunroof, power window lift, electrical pumps, electrical fans.

Produced on Infineon's first-in-industry automotive qualified 130nm smart power technology, the Infineon embedded power system-on-chip solutions offer

an unmatched level integration and system cost to performance to optimization for the target application segments.

The TLE986x family offers scalability in terms of flash memory sizes and MCU system clock frequency supporting a wide range of motor control algorithms. It uses the same MCU and peripherals as the TLE987x family, 3-phase driver, enabling design synergies between DC and BLDC motor control applications

TLE986x Family Offers

- Four current programmable drivers with charge pump for N-Channel MOSFET
- Integrated LIN transceiver compatible with LIN 2.2 and SAE J2602
- Two full duplex serial interface (UART) with LIN support
- Two Synchronous Serial Channel (SSC)
- On-chip OSC and PLL for clock generation
- One high voltage monitoring input with wake up functionality
- High speed operational amplifier for motor current sensing via shunt
- Measurement unit:
 - 8-bit ADC module with 10 multiplexed inputs
 - 10-bit ADC module with 8 multiplexed inputs, 5 external analog inputs
 - On chip temperature and battery voltage measurement unit
- Independent programmable window watchdog
- 5V/1.5V Internal supplies
- External supply (VDDEXT): 5V ±2% @ 20mA
- Power saving modes
 - MCU slow-down mode
 - Sleep mode
 - Stop mode
 - Cyclic wake-up sleep mode

Features of the Microcontroller

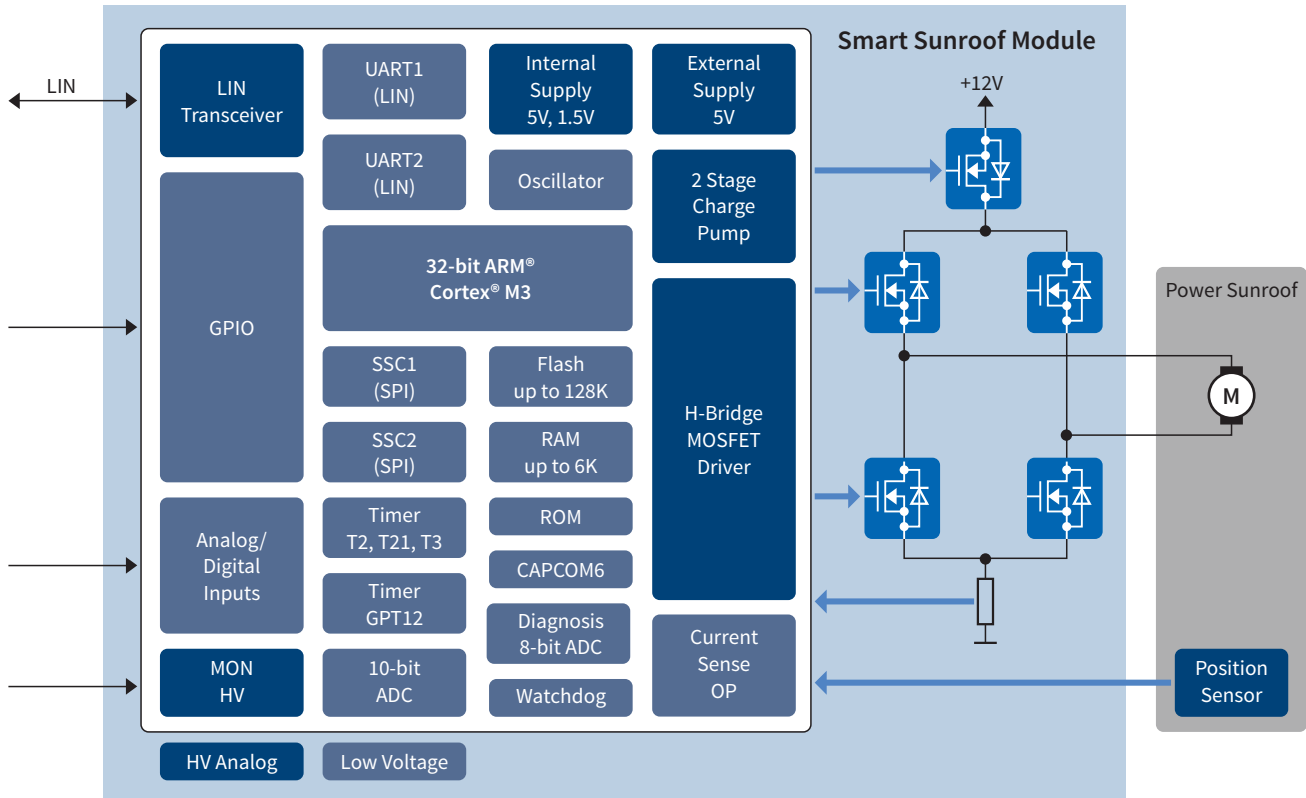
- 32-bit ARM® Cortex® M3 Core, up to 40MHz clock frequency
- 36KB to 128KB flash memory
- Up to 6KB RAM memory
- Harvard architecture
- Thumb®-2 Instruction Set and hardware divide and multiplication unit
- Four 16-bit timers
- Capture/compare unit for PWM signal generation (CCU6) with 2x 16-bits timers

General Characteristics

- Operating supply voltage $V_s = 5.5$ to 28V, maximum rating 40V
- Extended operating range $V_s = 3.0$ to 28V, MCU / Flash fully functional
- ESD performance :
 - up to 2kV / handling on all pins
 - 4kV @ HV inputs
 - 6kV @ LIN pin
- Overvoltage device clamp (load dump ruggedness) up to 40V
- Wide operating temperature range: T_j : -40°C up to 150°C

Infineon® Embedded Power ICs

Block Diagram



Product Summary

TLE986x 32-bit µC with 2-Phase MOSFET Gate Driver for DC Motors									
Product Name	Frequency [MHz]	Interface	RAM [KB]	Flash [KB]	EEPROM Emulation [KB]	OP-AMP	Low Side MOSFET Drivers	High Side MOSFET Drivers	Package ¹⁾
TLE9861QXA20 ²⁾	24	PWM	3	36	4	y	2	2	Ⓔ
TLE9867QXA20 ²⁾	24	PWM + LIN	6	64	4	y	2	2	Ⓔ
TLE9867QXA40 ²⁾	40	PWM + LIN	6	64	4	y	2	2	Ⓔ
TLE9869QXA20 ²⁾	24	PWM + LIN	6	128	4	y	2	2	Ⓔ

1) See packages on page 112

2) In development, samples available

3rd Generation: 3-Phase Bridge Driver IC with Integrated ARM® Cortex® M3 Core

Infineon has combined its wealth of experience in motor control drivers for automotive applications with all the benefits of an industry-standard core. The unique result, our 3rd generation embedded power IC based on ARM® Cortex®-M cores, addresses a wide range of smart 3-phase brushless DC motor control applications like, fuel pumps, HVAC fans, engine cooling fans, electrical water pumps. Produced on Infineon's first-in-industry automotive qualified 130nm smart power technology, the Infineon embedded power system-on-chip solutions offer an unmatched level integration and system cost to performance to optimization for the target application segments.

The TLE987x family offers scalability in terms of flash memory sizes and MCU system clock frequency supporting a wide range of motor control algorithms, either sensor-based or sensor-less. It uses the same MCU and peripherals as the TLE986x family, 2-phase driver, enabling design synergies between DC and BLDC motor control applications.

TLE987x Family Offers

- Six current programmable drivers with charge pump for N-channel MOSFET
- Integrated LIN transceiver compatible with LIN 2.2 and SAE J2602
- Two full duplex serial interface (UART) with LIN support
- Two Synchronous Serial Channel (SSC)
- On-chip OSC and PLL for clock generation
- One high voltage monitoring input with wake up functionality
- High speed operational amplifier for motor current sensing via shunt
- Measurement unit:
 - 8-bit ADC module with 10 multiplexed inputs
 - 10-bit ADC module with 8 multiplexed inputs, 5 external Analog inputs
 - On chip temperature and battery voltage measurement unit
- Independent programmable window watchdog
- 5V/1.5V Internal supplies
- External supply (VDDEXT): 5V ±2% @ 20mA
- Power saving modes
 - MCU slow-down mode
 - Sleep mode
 - Stop mode
 - Cyclic wake-up sleep mode

Features of the Microcontroller

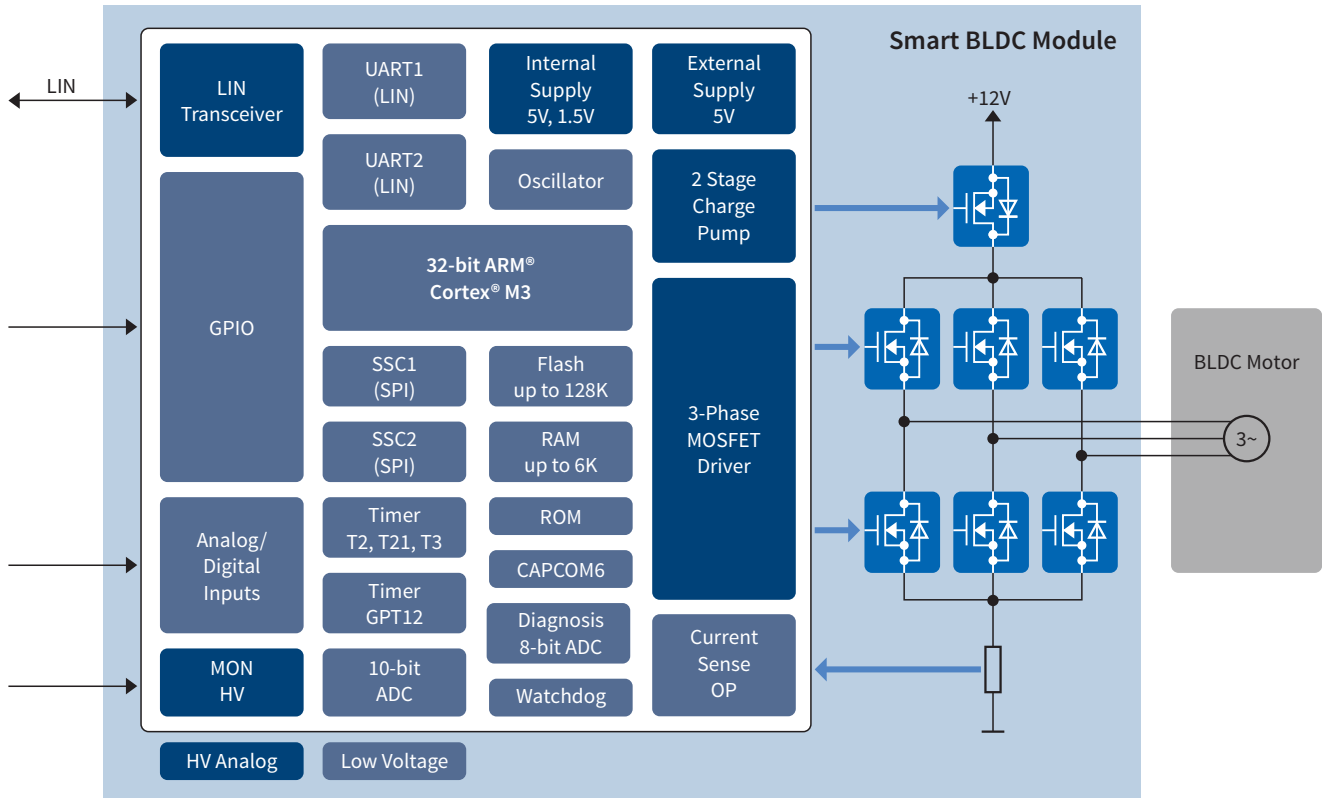
- 32bit ARM® Cortex® M3 Core, up to 40MHz clock frequency
- 36KB to 128KB flash memory
- Up to 6KB RAM memory
- Harvard architecture
- Thumb®-2 Instruction Set and hardware divide and multiplication unit
- Four 16-bit timers
- Capture/compare unit for PWM signal generation (CCU6) with 2x 16-bits timers

General Characteristics

- Operating supply voltage $V_s = 5.5$ to 28V, maximum rating 40V
- Extended operating range $V_s = 3.0$ to 28V, MCU / Flash fully functional
- ESD performance :
 - up to 2kV / handling on all pins
 - 4kV @ HV inputs
 - 6kV @ LIN pin
- Overvoltage device clamp (load dump ruggedness) up to 40V
- Wide operating temperature range: T_j : -40°C up to 150°C

Infineon® Embedded Power ICs

Block Diagram



Product Summary

TLE987x 32-bit µC with 3-Phase MOSFET Gate Driver for BLDC Motors									
Product Name	Frequency [MHz]	Interface	RAM [KB]	Flash [KB]	EEPROM Emulation [KB]	OP-AMP	Low Side MOSFET Drivers	High Side MOSFET Drivers	Package ¹⁾
TLE9871QXA20 ²⁾	24	PWM	3	36	4	y	3	3	Ⓔ
TLE9877QXA20 ²⁾	24	PWM + LIN	6	64	4	y	3	3	Ⓔ
TLE9877QXA40 ²⁾	40	PWM + LIN	6	64	4	y	3	3	Ⓔ
TLE9879QXA20 ²⁾	24	PWM + LIN	6	128	4	y	3	3	Ⓔ
TLE9879QXA40 ²⁾	40	PWM + LIN	6	128	4	y	3	3	Ⓔ

1) See packages on page 112

2) In development, samples available



Glossary

Automotive System ICs

Automotive Transceivers

Power Supply

Motor Drivers

LED Drivers

SPOC™_SPI Power Controller

PROFET™

Smart Multichannel Switches

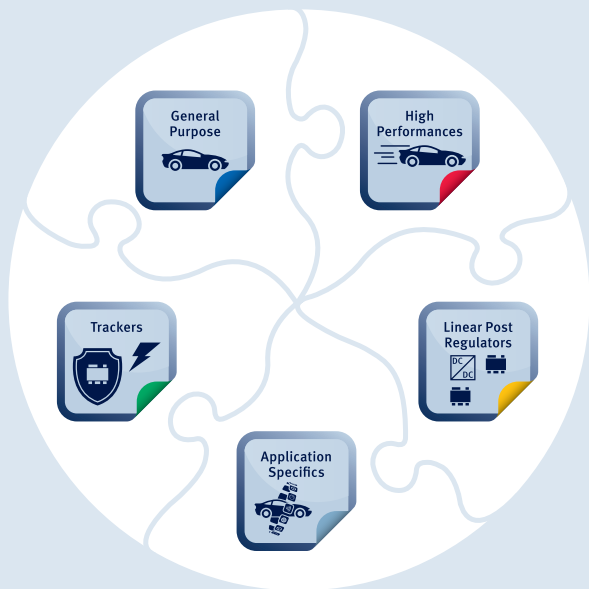
TEMPFET™
HITFET™

MOSFETs



Power Supply

Linear Voltage Regulators

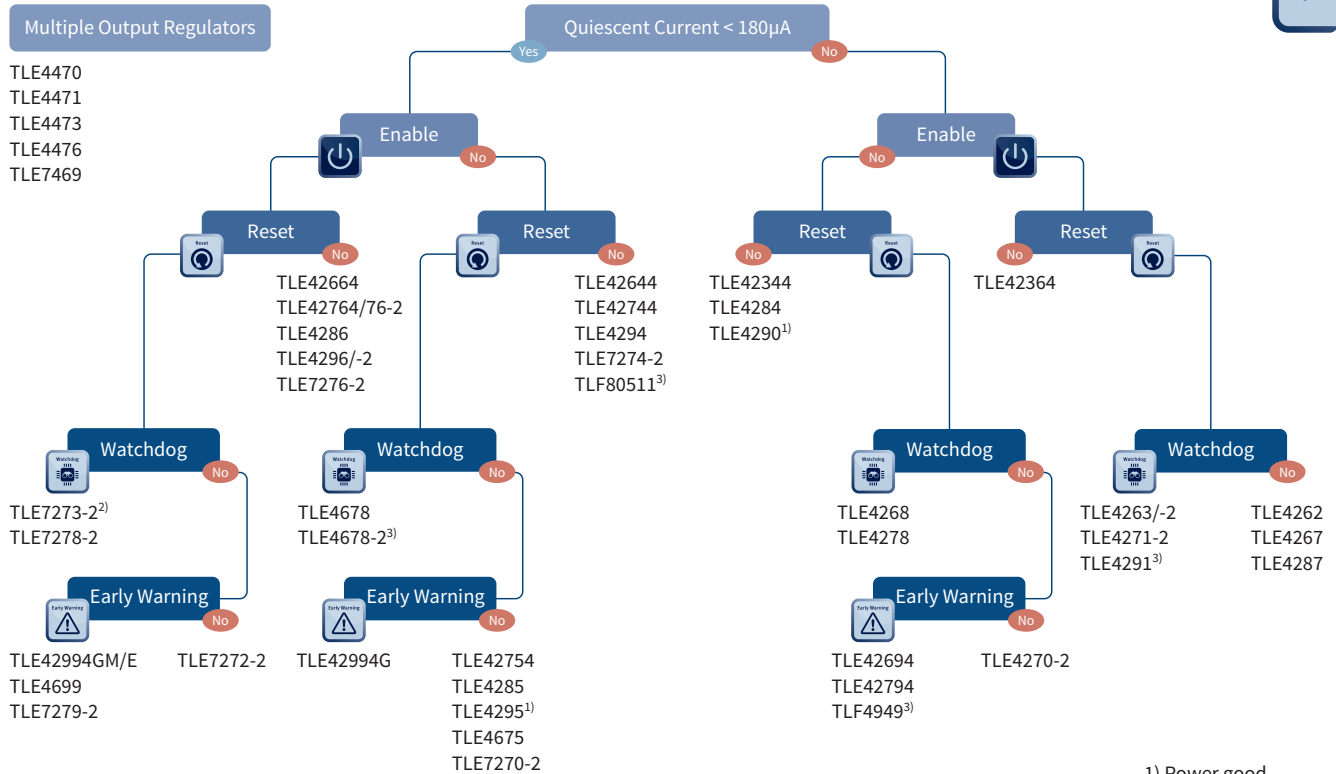


Why do we need linear voltage regulators?

In automotive ECUs, microcontrollers and other parts of the system have to be supplied by a stable and reliable voltage that is lower than the battery voltage (e.g. 3.3V or 5V) and works over the entire temperature range (from -40°C to 150°C).

A linear voltage regulator converts a DC input voltage (e.g. battery line) into a pre-defined lower DC output voltage (e.g. 5V). In spite of input voltage variations, the output voltage remains steady and stable, as long as the input voltage is greater than the output voltage. Linear voltage regulators are the most frequently used electronic power supplies in automotive applications.

Actual Voltage Regulator Family



Standard Features

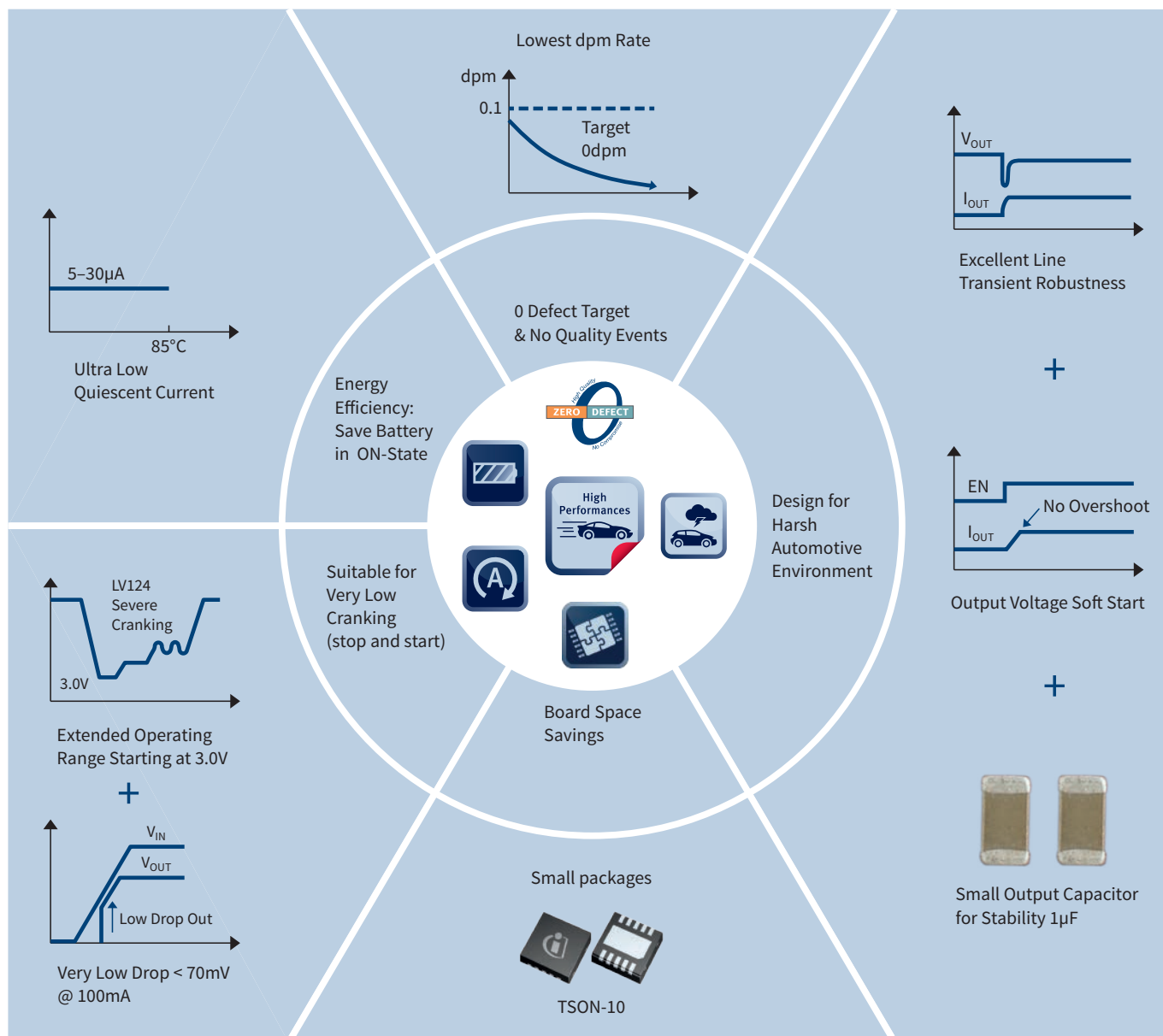
- Wide operation range up to 45V
- Low dropout voltage
- Wide temperature range: -40°C up to +150°C

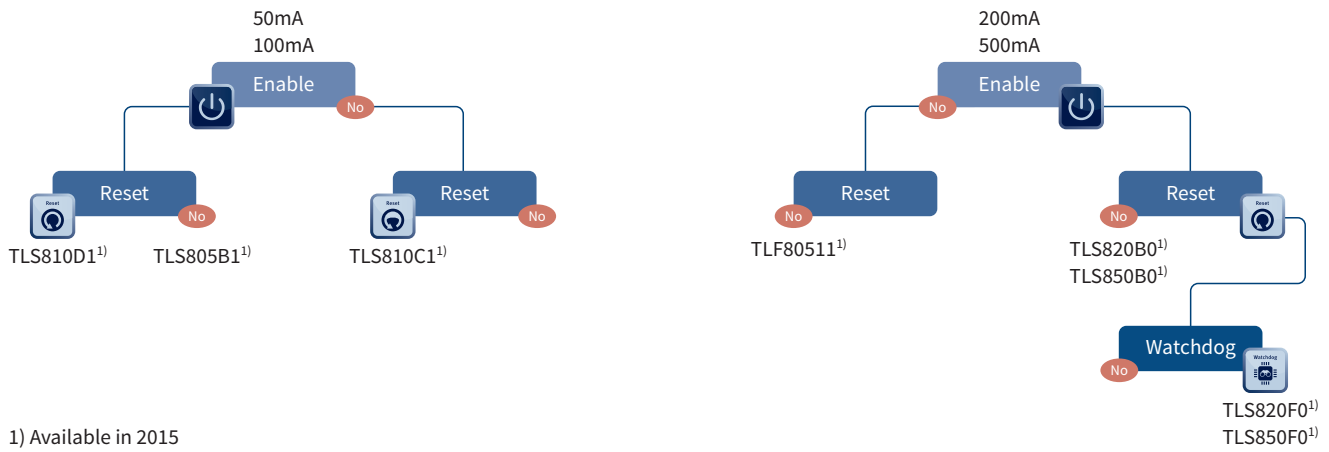
Standard Protections

- Short-circuit protection
- Reverse polarity protection as option
- Overload protection
- Overtemperature protection

Linear Voltage Regulators, Post Regulators, Voltage Trackers and DC/DC Converters

High Performance Family
Best in Performance





1) Available in 2015

Product Type	I_Q [mA]	I_q [μ A]	V_S Range [V]	V_Q [V]	Drop Voltage [V]	Accuracy [%]	Output Capacitance (min) [μ F]	Reset	Adjustable Reset Threshold	Enable	Watchdog	Early Warning	Package ¹⁾
TLF80511 NEW!	400	38	3.3-40	3.3; 5.0	0.25	2	1.0						(2) (3) (35)

1) See packages on page 112

Linear Voltage Regulators, Post Regulators, Voltage Trackers and DC/DC Converters

Linear Voltage Regulators by Output Current

Product Type	I_Q [mA]	I_q [μ A]	V_S Range [V]	V_O [V]	Drop Voltage [V]	Accuracy [%]
TLE4285	15	100	6.0-42	5.0	0.8	4
TLE4286	15	60	6.0-42	5.0	0.8	2
TLE4294	30	120	5.5-45	5.0	0.25	4
TLE4295	30	120	3.5-45	2.6; 3.0; 3.3; 5.0	0.25	4
TLE4296	30	110	4.0-45	3.0; 3.3; 5.0	0.25	4
TLE4296-2	30	130	4.0-45	3.3; 5.0	0.25	4
TLF4949	100	180	3.5-40	5.0	0.3	2
TLE42344	120	300	5.5-45	5.0	0.25	2
TLE42364	120	300	5.5-45	5.0; 10.0	0.25	2
TLE4264-2	150	40	5.5-45	5.0	0.22	2
TLE42644	150	40	5.5-45	5.0	0.22	2
TLE4266-2	150	40	6.0-45	3.3; 5.0	0.25	2
TLE42664	150	40	5.5-45	5.0	0.25	2
TLS202B1 NEW!	150	50	2.7-18	3.3	0.5	3
TLS202A1 NEW!	150	50	2.7-18	adj.	0.5	3
TLE42694	150	210	5.5-45	5.0	0.25	2
TLE42694-2	150	210	5.5-45	5.0	0.25	2
TLE42794	150	150	5.5-45	5.0	0.25	2
TLE42994	150	65	4.4-45	3.3; 5.0	0.25	2
TLE4268	180	300	5.5-45	5.0	0.25	2
TLE7273-2	180	28	4.2-45	2.6; 3.3; 5.0	0.25	2
TLE7278-2	180	28	4.2-45	5.0	0.25	2
TLE7279-2	180	28	4.2-45	2.6; 3.3; 5.0	0.25	2
TLE4262	200	900	6.0-45	5.0	0.35	2
TLE4263/-2	200	900	5.5-45	5.0	0.35	2
TLE4278	200	180	5.5-45	5.0	0.25	2
TLE4678	200	60	3.3-45	5.0	0.25	2
TLE4699	200	70	3.3-45	5.0	0.16	2
TLF4277 ⁴⁾	200	150	5.0-40	adj.	0.25	2
TLE4287	250	1,000	7.5-42	5.0	1.8	2
TLE7270-2	300	20	5.5-42	5.0	0.2	2
TLE7272-2	300	20	5.5-42	5.0	0.25	2
TLE7274-2	300	20	5.5-42	5.0	0.25	2
TLE7276-2	300	20	5.5-42	5.0	0.25	2
TLS203B0 NEW!	300	30	1.8-26	adj.; 3.3	0.3	2
TLF4277-2 ⁴⁾	300	150	5.0-45	adj.	0.2	2
TLE4267-2	400	1,300	5.5-40(60)	5.0	0.3	2
TLE42744	400	100	4.7-40	3.3; 5.0	0.25	2
TLE42754	400	150	5.5-42	3.3; 5.0	0.25	2
TLE42764	400	100	4.5-40	adj.; 5.0	0.25	2
TLE4675	400	65	3.3-45	5.0	0.25	2
TLF80511 ⁵⁾ NEW!	400	38	3.3-40	3.3; 5.0	0.25	2
TLE4290	450	200	5.5-42	5.0	0.25	2
TLE4291	450	220	3.3-42	5.0	0.25	2
TLS205B0 NEW!	500	30	1.8-26	adj.; 3.3	0.3	2
TLE4270-2	550	1,000	5.5-42(60)	5.0	0.35	2
TLE4271-2	550	800	6.0-40(60)	5.0	0.35	2
TLE4284	1,000	1,000	2.9-40	adj.; 1.5; 1.8; 2.6; 3.3; 5.0	1.0	3
TLF1963 NEW!	1,500	1,000	2.5-20	adj.	0.3	2

1) See packages on page 112

2) Power Good

3) Power Fail

4) LDO with current monitor and status output

5) High Performance Voltage Regulator

Output Capacitance (min) [μF]	Reset	Adjustable Reset Threshold	Enable	Watchdog	Early Warning	Package ¹⁾
1.0	• ³⁾					(20)
1.0			•			(20)
2.2						(20)
2.2	• ³⁾					(20)
2.2			•			(20)
3.3			•			(20)
4.7	• ³⁾				•	(1) (2)
10.0						(23)
10.0			•			(23)
10.0						(23)
10.0			•			(23)
10.0			•			(23)
10.0			•			(23)
1.0			•			(20)
1.0						(20)
10.0	•	•			•	(1) (4) (27)
4.7	•	•				(27)
10.0	•	•			•	(1) (4) (27)
22.0	•	•	•		•	(1) (4) (27)
22.0	•	•		•		(1) (6)
0.5	•		•	•		(4) (27)
0.5	•		•	•		(4) (27)
0.5	•		•		•	(4) (27)
22.0	•	•	•			(4) (6)
22.0	•	•	•	•		(1) (2) (4) (6)
10.0	•	•		•		(4)
10.0	•	•		•		(4) (27)
10.0	•	•	•		•	(4) (27)
10.0			•			(27)
0.1	•		•			(4)
0.5	•					(27) (33) (37)
0.5	•		•			(27) (35)
0.5						(27) (32) (35)
0.5			•			(27) (33)
3.3			•			(1) (44)
1.0			•			(27)
22.0	•		•			(4) (39) (35) (36)
22.0						(23) (27) (32) (35)
22.0	•					(27) (33) (37)
22.0			•			(27) (33) (37)
22.0	•					(33) (37)
1.0						(2) (32) (35)
22.0					• ²⁾	(33) (37)
22.0	•	•	•	•		(27)
3.3			•			(1) (44)
22.0	•					(32) (33) (37)
22.0	•		•	•		(39)
10.0						(32)
1.0						(33) (37)

MOSFETs

TEMPFET™
HITFET™Smart
Multichannel
Switches

PROFET™

SPOC – SPI Power
Controller

LED Drivers

Motor Drivers

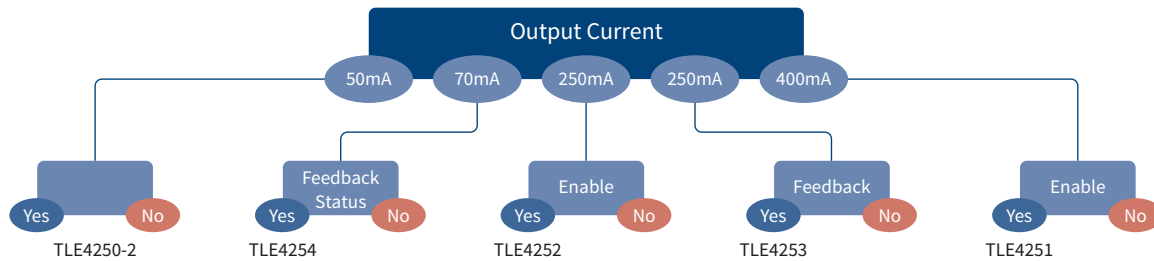
Power Supply

Automotive
TransceiversAutomotive
System ICs

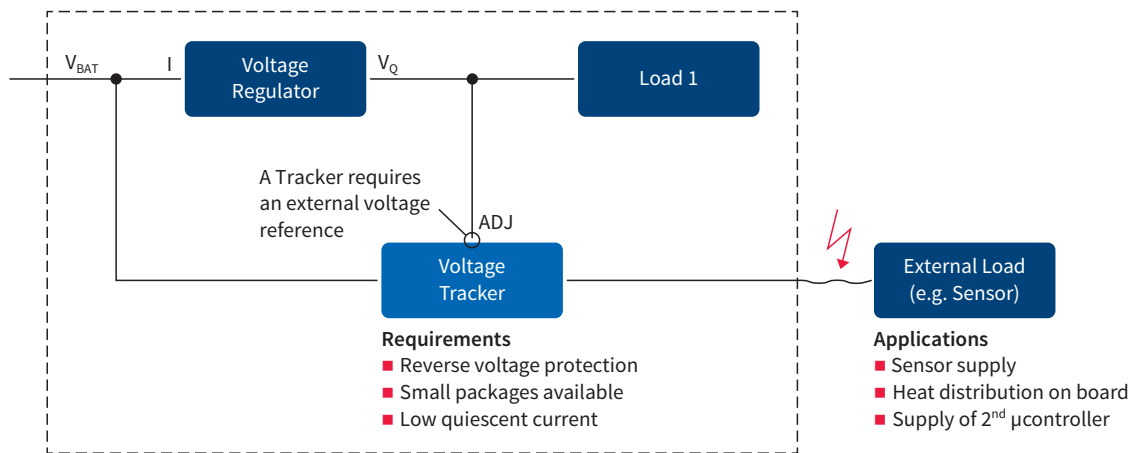
Glossary

Linear Voltage Regulators, Post Regulators, Voltage Trackers and DC/DC Converters

Tracker Family



Block Diagram Trackers



Trackers

Product Type	I_Q [mA]	I_q [mA]	V_S Range [V]	V_Q [V]
TLE4250-2	50	140	4.0–40	adj.
TLE4251	400	230	4.0–40	adj.
TLE4252	250	100	3.5–40	adj.
TLE4253	250	100	3.5–40	adj. ²⁾
TLE4254	70	50	4.0–45	adj. ²⁾

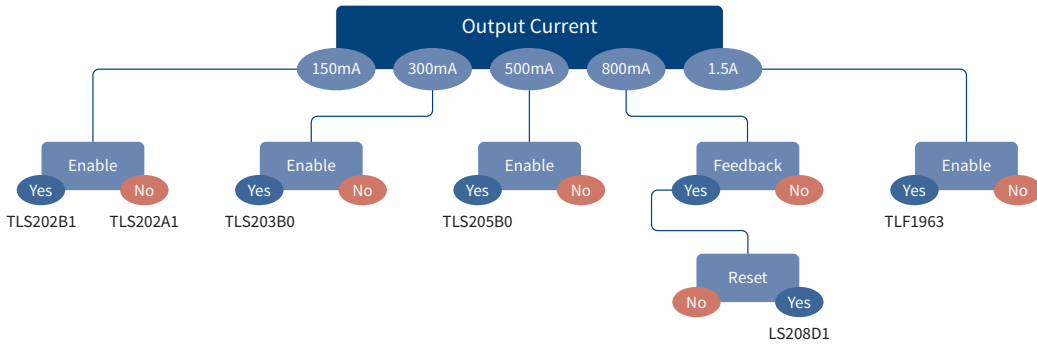
Post Regulators

Product Type	I_Q [mA]	I_q [mA]	V_S Range [V]	V_Q [V]	Drop Voltage [V]	Accuracy [%]
TLS202B1 NEW!	150	50	2.7–18	3.3	0.5	3
TLS202A1 NEW!	150	50	2.7–18	adj.	0.5	3
TLS203B0 NEW!	300	30	2.3–20	adj.; 3.3	0.3	3
TLS205B0 NEW!	500	30	2.3–20	adj.; 3.3	0.3	3

1) See packages on page 112

2) $V_Q > V_{ref}$ possible

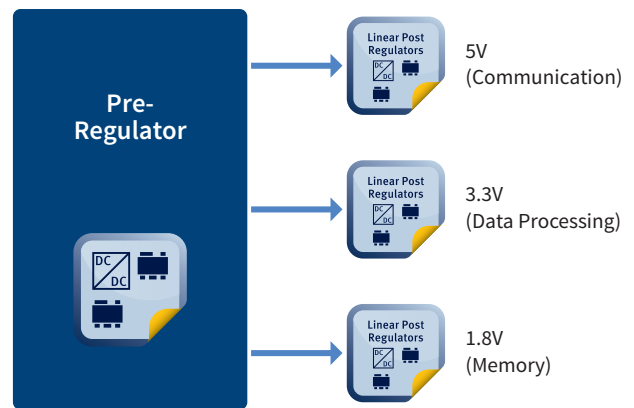
Post Regulator Family



Advantages by Combining DC/DC & Linear Post Regulators

- Less power dissipation than linear regulator only based solutions
- Modular solution by using discrete ICs
 - One simple-single-output DC/DC (ex: 3.3 to 10V)
 - Other voltages generated by discrete post regulators (1.8V, 3.3V, etc.)
- Very reasonable alternative to lower system cost
- Stand-alone DC/DC with discrete post regulators as alternative to highly integrated system IC

Example



Drop Voltage [V]	Accuracy [%]	Output Capacitance (min) [µF]	$V_Q > V_{ref}$ Possible	Package ¹⁾
0.1	0.5	1		(20)
0.28	0.2	22		(33) (37)
0.28	0.2	10		(33) (37)
0.28	0.1	10	•	(1) (2)
0.28	0.1	1	•	(1) (2)

Output Capacitance (min) [µF]	Reset	Adjustable Reset Threshold	Enable	Watchdog	Early Warning	Package ¹⁾
1.0			•			(20)
1.0						(20)
3.3			•			(1) (44)
3.3			•			(1) (44)

Linear Voltage Regulators, Post Regulators, Voltage Trackers and DC/DC Converters

Power Supply Multiple Output Regulators

Product Type	I _Q 1 [mA]	I _Q 2/3 [mA]	I _Q [mA]	V _S Range [V]	V _O 1 [V]	V _O 2/3 [V]	Drop Voltage [V]	Accuracy [%]
TLE4470	350	180	180	5.6–45	5	adj.	0.3	2
TLE4471	450	100/50	1,100	5.5–40(60)	5	5.0 and 5.0	0.25	2
TLE4473/-2	300	180	200	5.6–42	5	3.3 or 5.0	0.3	2
TLE4476	430	350	300	5.7–42(60)	5	3.3	0.3	4
TLE7469G	215	215	55	5.6–45	5	3.3 or 2.6	0.3	3

DC/DC Converters

Product Type	V _{S(op)} [V]	V _O [V]	V _O 2 [V]	V _O 3 [V]	V _O 4 [V]	V _O Additional [V]	Accuracy 1 [%]	Accuracy 2 [%]	Accuracy 3 [%]	Accuracy 4 [%]	Additional Output Accuracy	I _Q [mA]
Buck												
TLE6365	8.0 ... 40.0	5.0					2					400
TLE6389-2GV	5.0 ... 60.0	adj.					3					2,300
TLE6389-2GV50	5.0 ... 60.0	5.0					3					2,300
TLE6389-3GV50	5.0 ... 60.0	5.0					3					2,300
TLE8366	4.75 ... 45.0	adj., 3.3, 5.0					2(4)					1,800
TLF50281	4.75 ... 45.0	5.0					2					500
TLF50251	4.75 ... 45.0	5.0					2					500
TLF50241	4.75 ... 45.0	5.0					2					500
TLF50211	4.75 ... 45.0	5.0					2					500
TLF50201	4.75 ... 45.0	5.0					2					500
TLF51801	4.75 ... 45.0	1.20–D _{max} *V _S					2					adj. max 10,000
Buck plus linear												
TLE7368	4.5 ... 45.0	5.5	5	2.6 or 3.3	1.5	2 x 5	-2 ... +9	2	2	2	1.5	2,500
TLE7368-2	4.5 ... 45.0	5.5	5	2.6 or 3.3	1.2	2 x 5	-2 ... +9	2	2	2	1.5	2,500
TLE7368-3	4.5 ... 45.0	5.5	5	2.6 or 3.3	1.3	2 x 5	-2 ... +9	2	2	2	1.5	2,500
TLE6368	5.5 ... 60.0	5.5	5	2.6 or 3.3	2.6 or 3.3	6 x 5	10	5	5	5	1.0	1,500
Boost												
TLE8386 ³⁾	4.75 ... 45.0	adj. (max 9-times of V _S)					4					dep.on V _Q
TLE8386-2 ⁴⁾	4.75 ... 45.0	adj (max 9-times of V _S)					4					dep.on V _Q
Boost plus buck												
TLE6711	4.0 ... 40.0	adj. up to 33	5				10	2				1,000

1) See packages on page 112

2) Different voltage reset hysteresis

3) HS-sense-booster (preferred as current source)

4) LS-sense-booster

Output Capacitance (min) [μF]	Overshoot Protection	Reset Output	Enable	Adjustable Reset Threshold	Watchdog	Early Warning	Package ¹⁾
6/10		•	•	•		•	④ ⑥
22/10/10	•	•	•	•	•		⑧
10/22		•	•		•		③
10/10	•		•				③③
1/1	•	•	•		•	•	③

I _{Q2} [mA]	I _{Q3} [mA]	I _{Q4} [mA]	I _Q Additional [mA]	I _q [mA]	f _{sw} [kHz]	Stand-by Regulator [V-mA]	PFM Operation	Reset	Watchdog	SPI and Add. Logic	Enable/Disable Possibility	Early Warning	Package ¹⁾
				1.5	100			•					①
				0.120	250 ... 530		•	•			•	•	④
				0.120	250 ... 530		•	•			•	•	④
				0.120	250 ... 530		•	• ²⁾			•	•	④
				7.0	200 ... 530						•		②
				0.045	800 ... 2200		•	•	STD		•		②⑦
				0.045	800 ... 2200		•	•			•		②⑦
				0.045	800 ... 2200		•	•			•		②⑦
				0.045	800 ... 2200		•				•		②⑦
				0.045	800 ... 2200		•				•		②⑦
				<2μA	100 ... 700						•		②⑦
800	700	adj.	105 and 50	120	280 ... 425	1.0/2.6-30		•	WWD		•		⑫ ⑬
800	700	adj.	105 and 50	120	280 ... 425	1.0/2.6-30		•	WWD		•		⑫
800	700	adj.	105 and 50	120	280 ... 425	1.0/2.6-30		•	WWD		•		⑫
800	500	350	6 x 17	30	280 ... 425	2.4-1.0		•	WWD	•	•		⑬
				7,000	100 ... 500						•		②⑦
				7,000	100 ... 500						•		②⑦
250				1,500				•	•				④ ⑥



Automotive Transceivers

Because of the ever-increasing demand for data exchange in modern vehicles, the automotive industry implemented networks like CAN (Controller Area Network), LIN (Local Interconnect Network) and FlexRay protocol-based bus systems.

Infineon is offering a broad product portfolio of automotive transceivers for these different Automotive bus segments, that are perfectly suited and designed to withstand the harsh automotive environment.

Dependent on the respective vehicle network architecture and the related ECU supply path, different transceiver types are used. Infineon Transceivers ensure reliable communication and help minimize the current consumption and the related CO₂-emissions at the vehicle level. The Infineon Transceiver products provide the best value through high performance, ruggedness and reliable communication.

Key Features and Benefits

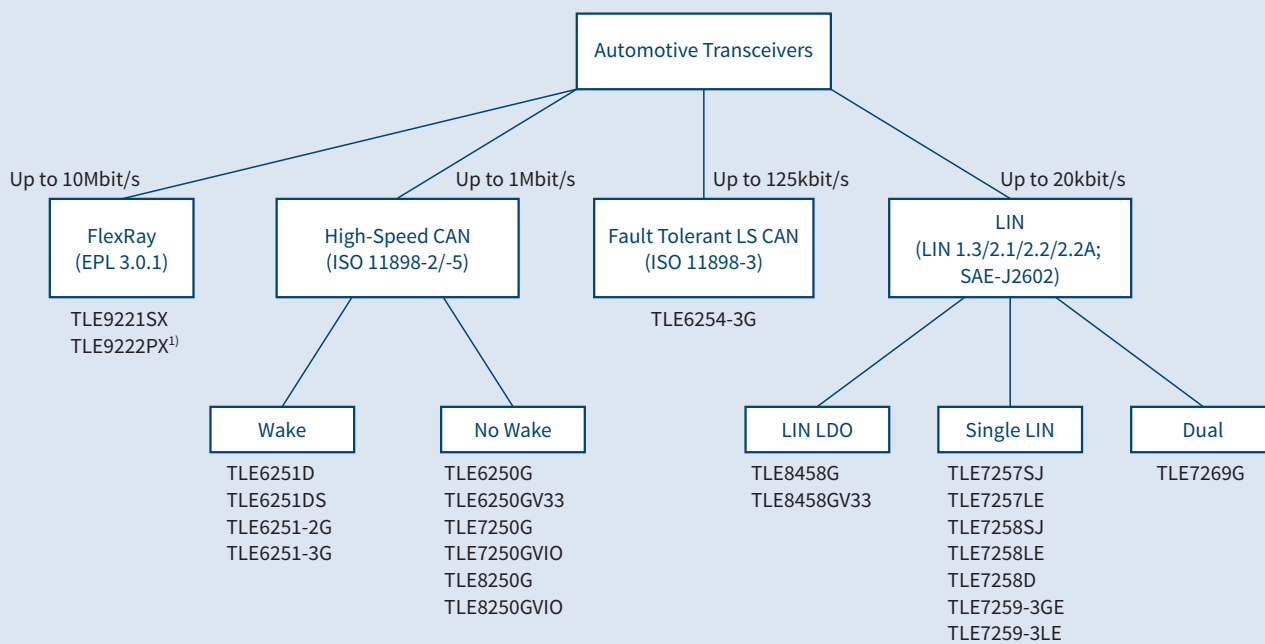
- Broad product portfolio
- Outstanding ESD robustness
- Excellent EMC performance
- Low quiescent currents
- Worldwide OEM approval
- Highest quality
- Transceiver family concept





- MOSFETs
- TEMPFET™
HITFET™
- Smart
Multichannel
Switches
- PROFET™
- SPOC™_SPI Power
Controller
- LED Drivers
- Motor Drivers
- Power Supply
- Automotive
Transceivers
- Automotive
System ICs
- Glossary

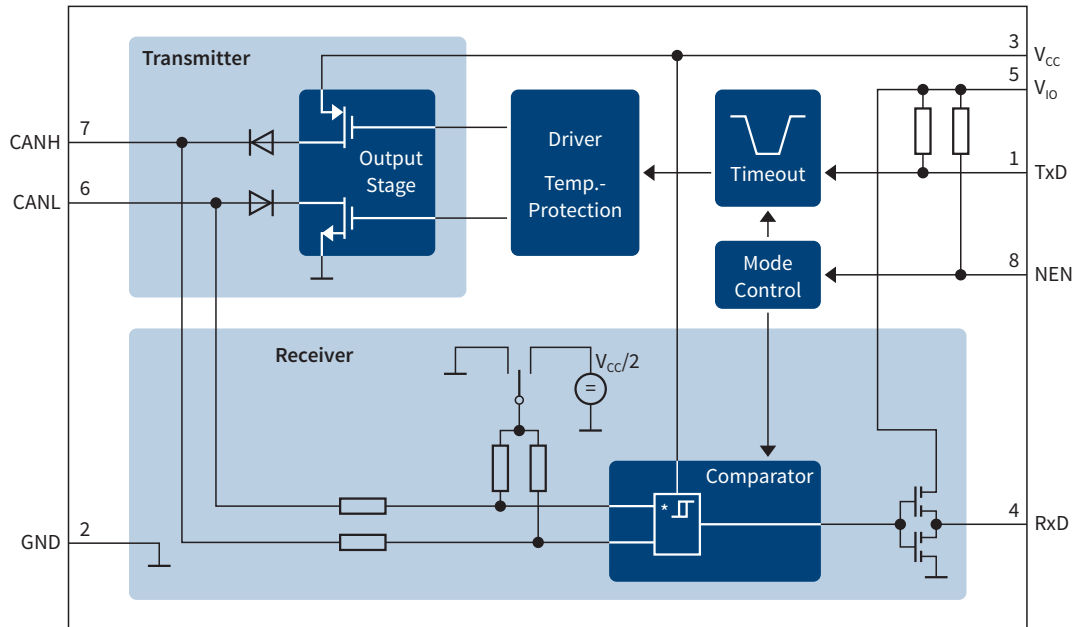
Selection Tree Automotive Transceivers



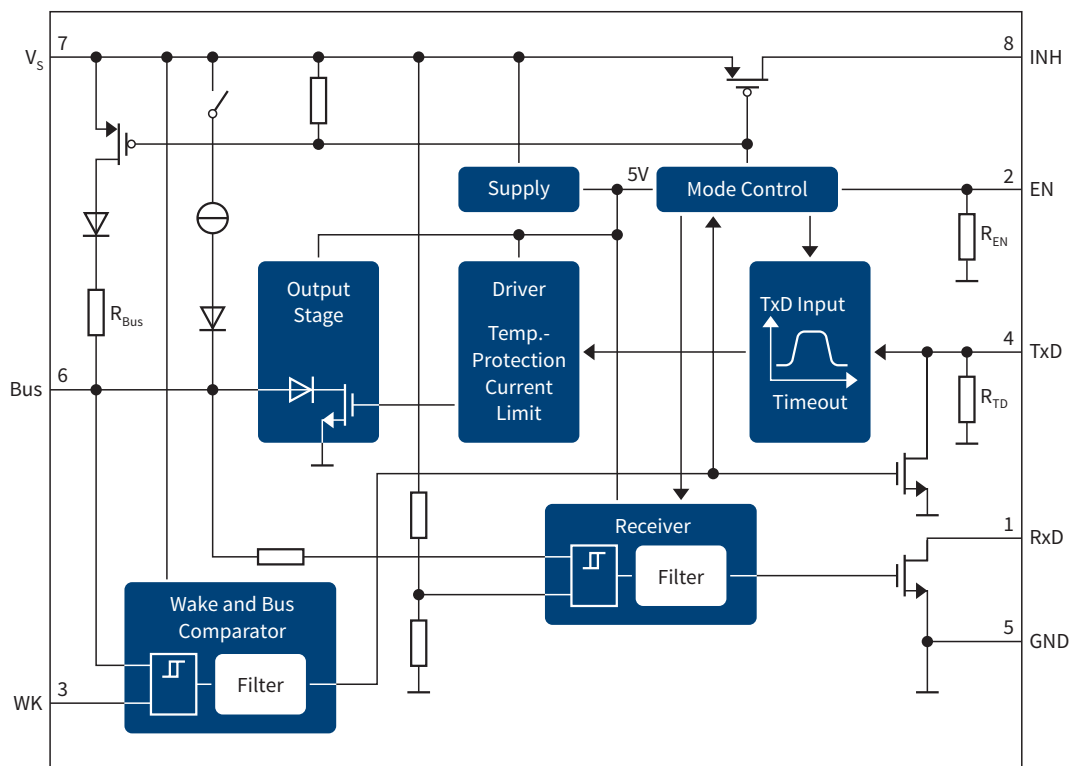
1) In development

Automotive Transceivers

Block Diagram Example High-Speed CAN: TLE7250GVIO



Block Diagram Example LIN: TLE7259-3GE



Product Table

Product Type	Transmission Rate (max)	I_q [μ A]	Bus Wake-up Capability	Wake-up Inputs	Number of Channel	Bus Failure Management	Package ¹⁾
High-speed CAN ISO 11898-2							
TLE6250G	1Mbit/s	< 10 @ 5V stand-by			1		①
TLE6250GV33	1Mbit/s	< 10 @ 5V stand-by			1		①
TLE7250G	1Mbit/s	< 10 @ 5V stand-by			1		①
TLE7250GVIO	1Mbit/s	< 10 @ 5V stand-by			1		①
TLE8250G	1Mbit/s	< 10 @ 5V stand-by			1		①
TLE8250GVIO	1Mbit/s	< 10 @ 5V stand-by			1		①
High-speed CAN ISO 11898-5							
TLE6251-2G	1Mbit/s	< 30 sleep mode	•	•	1	•	④
TLE6251-3G	1Mbit/s	< 30 sleep mode	•	•	1	•	④
TLE6251DS	1Mbit/s	< 30 @ 5V stand-by	•		1		①
TLE6251D	1Mbit/s	< 30 @5V stand-by	•		1		①
Fault-tolerant CAN ISO 11898-3							
TLE6254-3G	125kbit/s	< 65 sleep mode	•	•	1	•	④
LIN/SAE J2602/k-line							
TLE6258-2G	20kbit/s	< 40 stand-by mode			1		①
TLE7257SJ TLE7257LE	20kbit/s	< 10 sleep mode	•		1	•	① ④③
TLE7258SJ TLE7258LE	20kbit/s	< 10 sleep mode	•		1	•	① ④③
TLE7259-3GE TLE7259-3LE	20kbit/s	< 10 sleep mode	•	•	1	•	① ④③
TLE7269G	20kbit/s	< 10 sleep mode	•	•	2	•	④
TLE8458	20kbit/s	< 10 sleep mode	•	•	1	•	①
FLexRay							
TLE9221SX	10Mbit/s	< 45 sleep mode	•	•	1	•	②⑧
TLE9222PX ²⁾	10Mbit/s	< 40 stand-by mode	•		1	•	④⑦

1) See packages on page 112

2) In development

System Basis Chips (SBCs)

The Driver SBCs Family

The driver SBC is the first family of the new generation of Infineon SBC in an exposed pad PG-VQFN-48 (7mm x 7mm) power package. The family offers several variants to meet the different application requirements. The devices are designed for various CAN-LIN automotive body applications as a main supply for the microcontroller and as an interface for a CAN and LIN bus network (optional CAN partial networking). To support these applications, the Driver SBC provides the main functions, such as a 5V low-dropout voltage regulator (LDO) for microcontroller supply, a 5V low-dropout voltage regulator with short circuit protection against supply voltage V_s for e.g. sensor

supply, HS-CAN transceiver and LIN transceiver for data transmission, fully protected Low- and High-Side Switches, and a 16-bit Serial Peripheral Interface (SPI) to control and monitor the device. Also implemented are a Window Watchdog circuit with a reset feature, a fail output and an under voltage reset feature. The device offers low-power modes in order to support applications that are connected permanently to the battery. A wake up from the low-power mode is possible via a message on the buses, via the bi-level sensitive monitoring/wake-up inputs as well as via cyclic wake. The device is designed to withstand the severe conditions of automotive applications.

Features

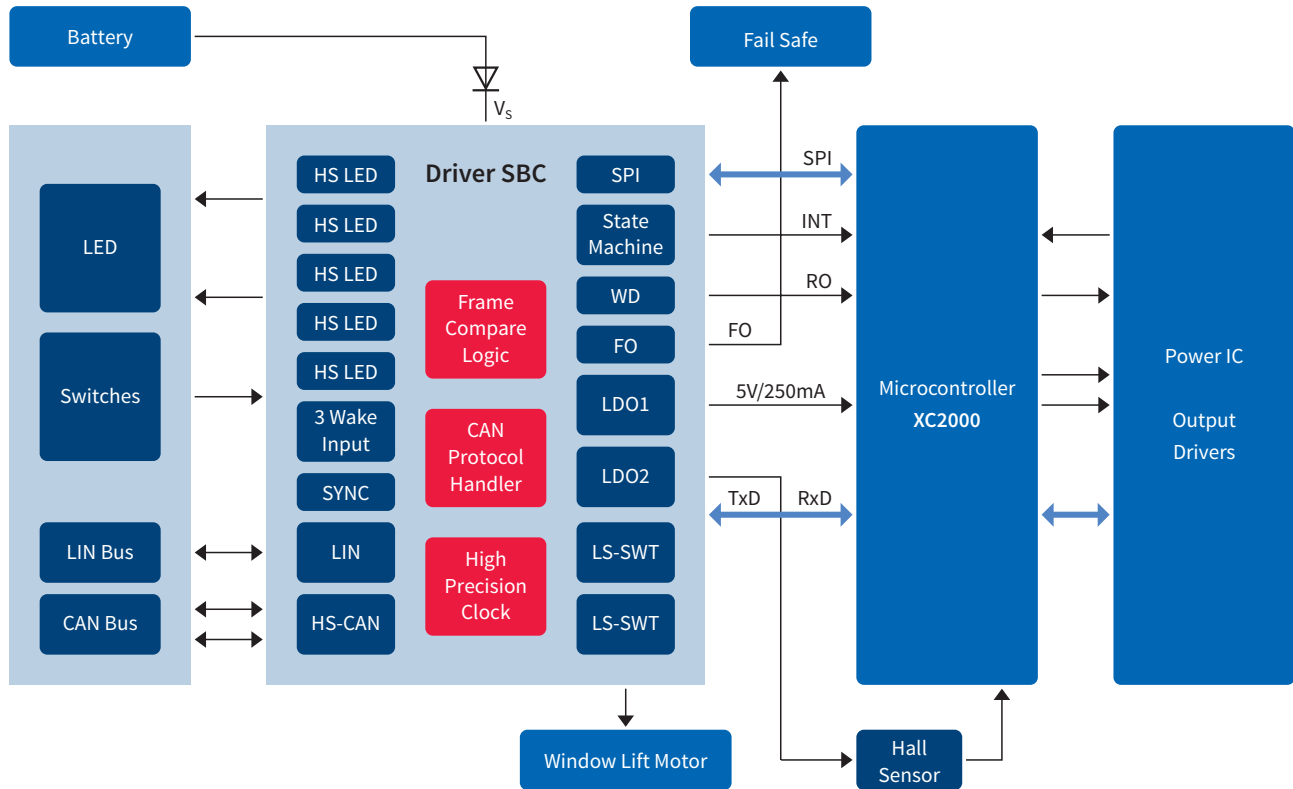
- Low-drop voltage regulator 5V, 250mA
- Low-drop voltage regulator 5V, 100mA, robust against short to V_s
- High-speed CAN transceiver ISO 11898-2/5
- LIN transceiver LIN 2.2, J2602-2
- Fully compliant to “Hardware Requirements for LIN, CAN and FlexRay Interfaces in Automotive Applications” Revision 1.3, 2012-05-04
- Two low-side outputs and six high-side outputs
- Four wake inputs, reset output and fail output
- Overtemperature and short circuit protection feature

Applications

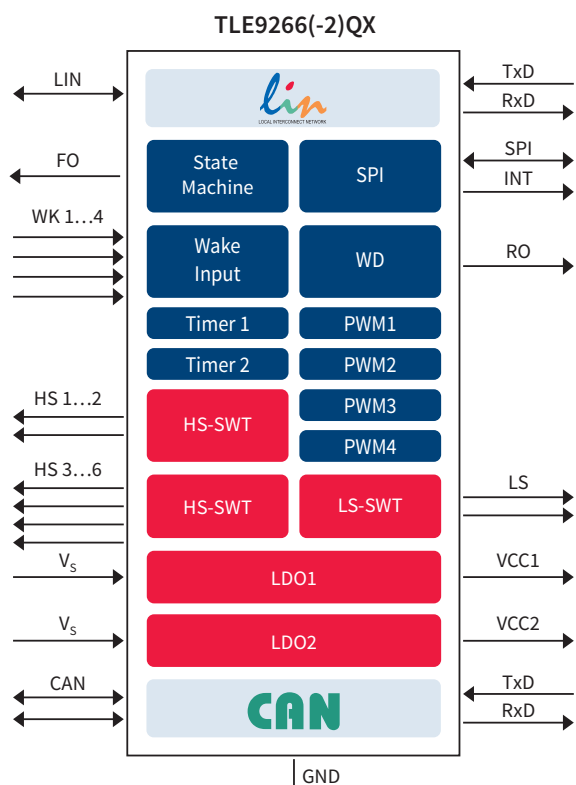
- Door control units
- Central body computer
- Low cost bodycontrol
- HVAC control module
- Trunk control module
- Seat control
- Roof module



Application Diagram



Block Diagram



System Basis Chips (SBCs)

The Mid-Range SBCs Family

Mid-Range SBC family offers a high level of integration, performance and scalability. Up to three low-drop voltage regulators with 5V or 3.3V output voltage, one HS CAN (including partial networking and flexible data-rate) and up to two LIN transceivers complying with the latest automotive standards and OEM requirements.

The devices include fail-safe features to support ECU functional safety concept like under-voltage monitoring, window watchdog with reset, fail-safe operating mode,

fail-safe outputs. There are also available four high-side switches to drive external loads, wake-inputs and general purpose input-outputs (GPIOs) to monitor inputs or activate loads. Mid-Range SBCs offer low-power modes in order to support applications that are connected permanently to the battery. All devices feature an exposed pad PG-VQFN-48 (7mm x 7mm) power package (supporting Automatic Optical Inspection). The entire family is pin-to-pin and software compatible and is designed to withstand the severe conditions of automotive applications.

Features

- Low-drop voltage regulator (5V or 3.3V up to 250mA)
- Low-drop voltage regulator (5V up to 100mA), robust against short to V_s
- Voltage regulator (5V, 3.3V or 1.8V) with external PNP transistor, robust against short to V_s
- High-speed CAN transceiver ISO 11898-2/-5/-6: suitable for chokeless operation up to 500kbit/s
- High-speed CAN transceiver supporting CAN FD communication up to 2Mbit/s featuring CAN Partial Networking FD Tolerant mode¹⁾
- Two LIN transceivers LIN2.2/J2602
- Four high-side outputs 7 Ω typ., two HV GPIOs and three HV wake inputs
- Watchdog, cyclic sensing, interrupt and reset output
- Integrated fail-safe functions: 3 fail-safe outputs, Watchdog, fail-safe operating modes
- Voltage, current and temperature protection and monitoring
- Fully compliant to “Hardware Requirements for LIN, CAN and FlexRay Interfaces in Automotive Applications” Revision 1.3, 2012-05-04

Applications

- Body control modules
- Gateway
- Climate control
- Seat control
- Door control and closures
- Light control modules
- Engine management systems

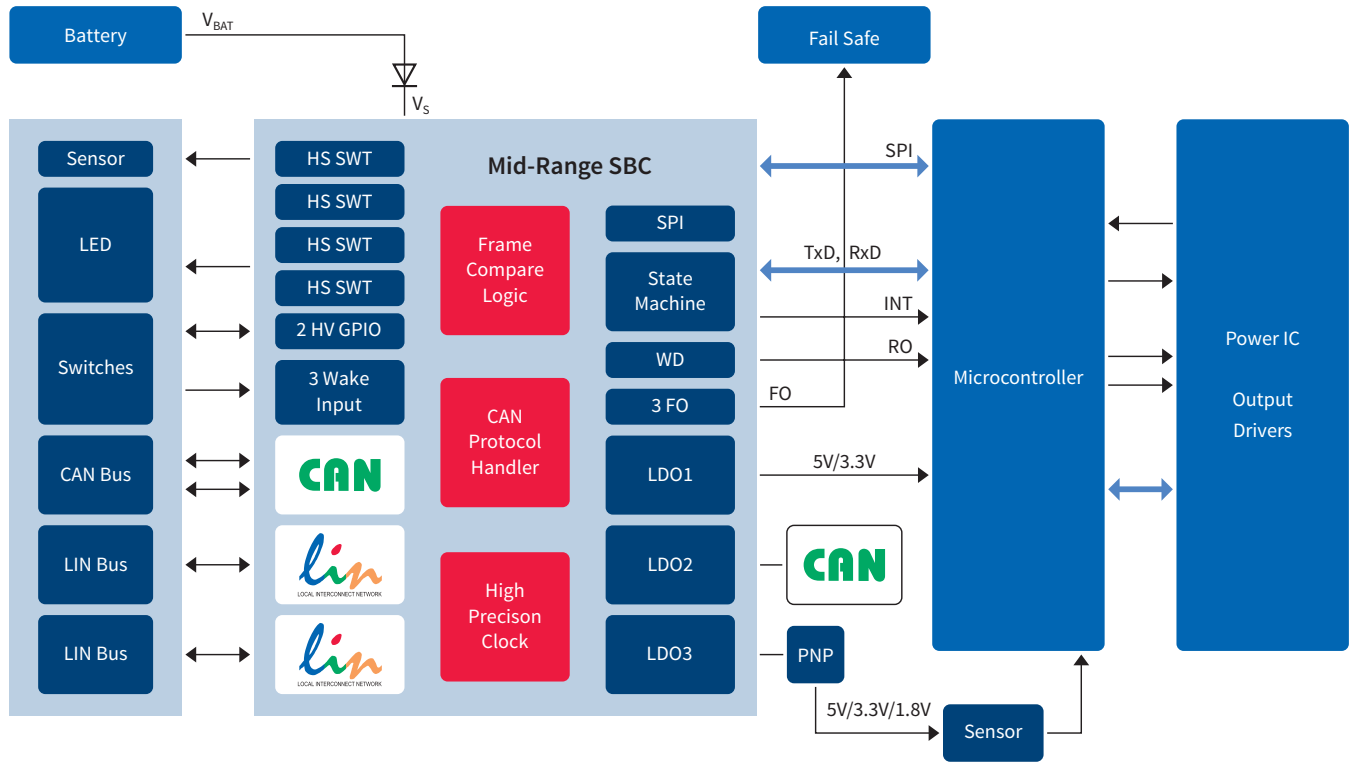
¹⁾ The CAN FD requirements for Transceiver are not finalized. All statements regarding CAN FD are therefore based on Infineon's today's knowledge and expectation on the future CAN FD standard currently being worked out.



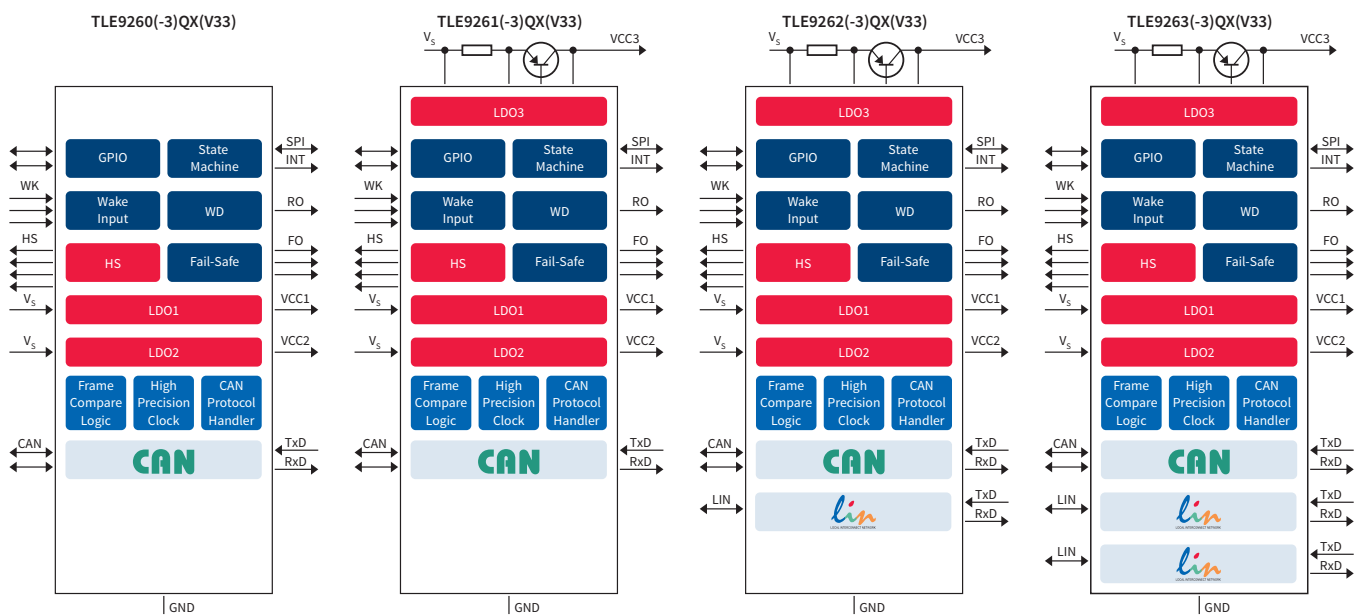
OEM



Application Diagram



The Mid-Range SBCs Family



System Basis Chips (SBCs)

Body System ICs – System Basis Chips Product Overview

Product Type	Family Name	Transmission Rate (max)	I_q [μ A]	I_o [μ A]	$V_{reg\ 1}$ [V]	$V_{reg\ 2}$ [V]
High-Speed CAN ISO 11898-5 / LIN 2.x and SAE J2602						
TLE9266QX	Driver SBC	1Mbit/s (CAN) 20kbit/s 10.4kbit/s (LIN)	25 (typ) Sleep Mode ($V_{reg\ 1}$ off)	53 (typ) Stop Mode ($V_{reg\ 1}$ on)	250mA @ 5V	100mA @ 5V
TLE9266-2QX	Driver SBC	1Mbit/s (CAN) 20kbit/s 10.4kbit/s (LIN)	25 (typ) Sleep Mode ($V_{reg\ 1}$ off)	53 (typ) Stop Mode ($V_{reg\ 1}$ on)	250mA @ 5V	100mA @ 5V
TLE9260QX(V33) ²⁾	Mid-Range SBC	2Mbit/s (CAN) 20kbit/s 10.4kbit/s (LIN)	30 (typ) Sleep Mode ($V_{reg\ 1}$ off)	50 (typ) Stop Mode ($V_{reg\ 1}$ on)	250mA @ 5V (3.3V on V33 variant)	100mA @ 5V
TLE9261QX(V33) ²⁾	Mid-Range SBC	2Mbit/s (CAN) 20kbit/s 10.4kbit/s (LIN)	30 (typ) Sleep Mode ($V_{reg\ 1}$ off)	50 (typ) Stop Mode ($V_{reg\ 1}$ on)	250mA @ 5V (3.3V on V33 variant)	100mA @ 5V
TLE9262QX(V33) ²⁾	Mid-Range SBC	2Mbit/s (CAN) 20kbit/s 10.4kbit/s (LIN)	30 (typ) Sleep Mode ($V_{reg\ 1}$ off)	50 (typ) Stop Mode ($V_{reg\ 1}$ on)	250mA @ 5V (3.3V on V33 variant)	100mA @ 5V
TLE9263QX(V33) ²⁾	Mid-Range SBC	2Mbit/s (CAN) 20kbit/s 10.4kbit/s (LIN)	30 (typ) Sleep Mode ($V_{reg\ 1}$ off)	50 (typ) Stop Mode ($V_{reg\ 1}$ on)	250mA @ 5V (3.3V on V33 variant)	100mA @ 5V
High-Speed CAN ISO 11898-6 / LIN 2.x and SAE J2602						
TLE9260-3QX(V33) ²⁾	Mid-Range SBC	2Mbit/s (CAN) 20kbit/s 10.4kbit/s (LIN)	30 (typ) Sleep Mode ($V_{reg\ 1}$ off)	50 (typ) Stop Mode ($V_{reg\ 1}$ on)	250mA @ 5V (3.3V on V33 variant)	100mA @ 5V
TLE9261-3QX(V33) ²⁾	Mid-Range SBC	2Mbit/s (CAN) 20kbit/s 10.4kbit/s (LIN)	30 (typ) Sleep Mode ($V_{reg\ 1}$ off)	50 (typ) Stop Mode ($V_{reg\ 1}$ on)	250mA @ 5V (3.3V on V33 variant)	100mA @ 5V
TLE9262-3QX(V33) ²⁾	Mid-Range SBC	2Mbit/s (CAN) 20kbit/s 10.4kbit/s (LIN)	30 (typ) Sleep Mode ($V_{reg\ 1}$ off)	50 (typ) Stop Mode ($V_{reg\ 1}$ on)	250mA @ 5V (3.3V on V33 variant)	100mA @ 5V
TLE9263-3QX(V33) ²⁾	Mid-Range SBC	2Mbit/s (CAN) 20kbit/s 10.4kbit/s (LIN)	30 (typ) Sleep Mode ($V_{reg\ 1}$ off)	50 (typ) Stop Mode ($V_{reg\ 1}$ on)	250mA @ 5V (3.3V on V33 variant)	100mA @ 5V

1) See packages on page 112

2) Available in Q4/2014

3) CAN FD up to 2Mbit/s

4) CAN PN FD tolerant

$V_{reg\ 3}$ [V]	CAN	LIN	Wake-up Inputs	Watchdog	Output Drivers	Package ¹⁾
-	1x High-Speed CAN ISO 11898-5	1x LIN 2.x and SAE J2602	3 High-Voltage and 1 Low-Voltage Wake Inputs (cyclic sense)	●	2x Low-Side Switch 250mA, 2x High-Side Switch 250mA, 4x High-Side Switch 150mA	④9
-	1x High-Speed CAN ISO 11898-5	1x LIN 2.x and SAE J2602	3 High-Voltage and 1 Low-Voltage Wake Inputs (cyclic sense)	●	2x Low-Side Switch 250mA with inverted logic, 2x High-Side Switch 250mA, 4x High-Side Switch 150mA	④9
-	1x High-Speed CAN ³⁾ ISO 11898-5	-	3 High-Voltage (cyclic sense)	●	4x High-Side Switch 150mA, 3 Fail-Safe Outputs	④9
400mA @ 5V/3.3V (3.3V/1.8V avail. on V33 variant)	1x High-Speed CAN ³⁾ ISO 11898-5	-	3 High-Voltage (cyclic sense)	●	4x High-Side Switch 150mA, 3 Fail-Safe Outputs	④9
400mA @ 5V/3.3V (3.3V/1.8V avail. on V33 variant)	1x High-Speed CAN ³⁾ ISO 11898-5	1x LIN 2.x and SAE J2602	3 High-Voltage (cyclic sense)	●	4x High-Side Switch 150mA, 3 Fail-Safe Outputs	④9
400mA @ 5V/3.3V (3.3V/1.8V avail. on V33 variant)	1x High-Speed CAN ³⁾ ISO 11898-5	2x LIN 2.x and SAE J2602	3 High-Voltage (cyclic sense)	●	4x High-Side Switch 150mA, 3 Fail-Safe Outputs	④9
-	1x High-Speed CAN ^{3,4)} ISO 11898-6	-	3 High-Voltage (cyclic sense)	●	4x High-Side Switch 150mA, 3 Fail-Safe Outputs	④9
400mA @ 5V/3.3V (3.3V/1.8V avail. on V33 variant)	1x High-Speed CAN ^{3,4)} ISO 11898-6	-	3 High-Voltage (cyclic sense)	●	4x High-Side Switch 150mA, 3 Fail-Safe Outputs	④9
400mA @ 5V/3.3V (3.3V/1.8V avail. on V33 variant)	1x High-Speed CAN ^{3,4)} ISO 11898-6	1x LIN 2.x and SAE J2602	3 High-Voltage (cyclic sense)	●	4x High-Side Switch 150mA, 3 Fail-Safe Outputs	④9
400mA @ 5V/3.3V (3.3V/1.8V avail. on V33 variant)	1x High-Speed CAN ^{3,4)} ISO 11898-6	2x LIN 2.x and SAE J2602	3 High-Voltage (cyclic sense)	●	4x High-Side Switch 150mA, 3 Fail-Safe Outputs	④9

MOSFETs

TEMPFET™
HITFET™Smart
Multichannel
Switches

PROFET™

SPOC – SPI Power
Controller

LED Drivers

Motor Drivers

Power Supply

Automotive
TransceiversAutomotive
System ICs

Glossary

Powertrain System ICs

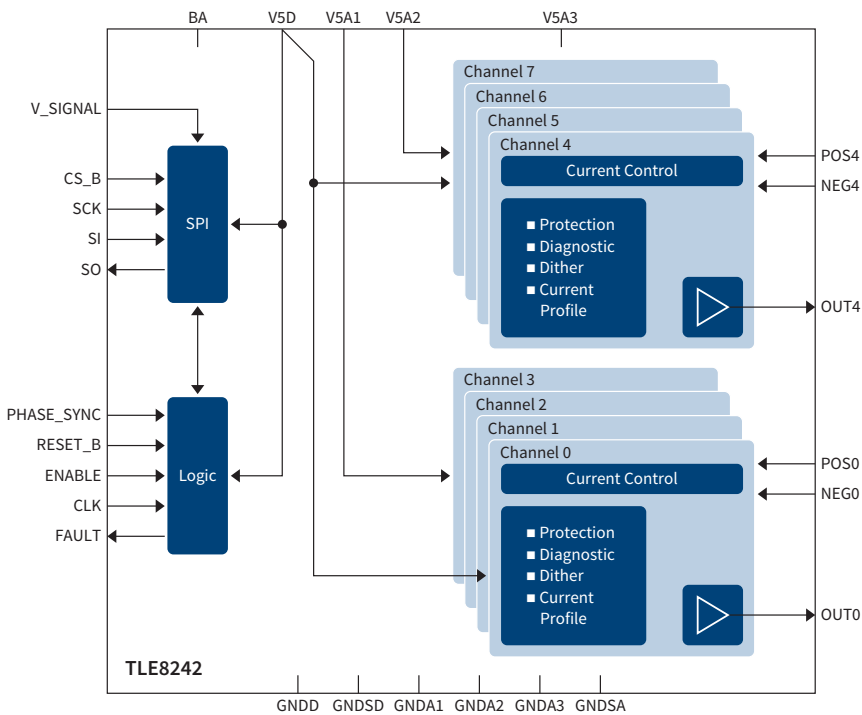
Constant Current Control ICs

Infinion’s solution for variable force or constant current controlled solenoids typically used in automatic transmissions, idle speed-/valve-/suspension control or Exhaust Gas Recirculation (EGR) applications

Features

- Four integrated low-side switches, control logic and outputs for external high-side switches
- Shorted load detection
- Open-load detection in ON-/OFF-State
- Short to ground detection
- Max. output average current approx. 1.2A

Block Diagram TLE8242L



Product Type	Number of Channels	Output Current [A]	$R_{DS(on)}$ [mΩ]	Quiescent Current [mA]	Operational Range V_S [V]	SPI	Comment	Package ¹⁾
TLE6288R	6	2	150	0.05	6.0 ... 16.0	16-bit	Smart 6 Channel Peak & Hold Switch	(15)
TLE7241E	2	1.2	240	1.0	9.0 ... 18.0	16-bit	Dual Channel Constant Current Control Solenoid Driver	(6)
TLE7242-2G	4	NA	NA	0.005	5.5 ... 42.0	32-bit	4 Channel Fixed Frequency Constant Current Control IC	(10)
TLE8242-2L	8	NA	NA	0.005	5.5 ... 42.0	32-bit	8 Channel Fixed Frequency Constant Current Control IC	(16)
TLE82543	3	1.6	250 (max)	0.01	5.5 ... 17.0	32-bit	3 Channel Constant Current Control IC	(12)

1) See packages on page 112

H-Bridges for Powertrain Applications

The Infineon H-Bridge portfolio addresses a broad range of DC brush motor applications. Originally designed and optimized for Electronic Throttle Control (ETC), the H-Bridges can also be used for applications like Exhaust

Gas Recirculation (EGR) valve control, idle control, swirl and tumble flaps, variable intake manifold, turbo charger waste gate, variable turbo geometry or industrial DC brush motor applications.

Product Type	R _{DS(on)} HS [mΩ]	R _{DS(on)} LS [mΩ]	I _{LIM} min. [A]	I _O max. [mA]	V _{S(OP)} [V]	Diagnostic IF	V _{DD} Mon.	Package ¹⁾
TLE5205-2G	220	220	6.0	10	6.0 ... 40.0	Status Flag		Ⓟ39
TLE5206-2	220	220	6.0	10	6.0 ... 40.0	Status Flag		Ⓟ55
TLE5206-2S	220	220	6.0	10	6.0 ... 40.0	Status Flag		Ⓟ57
TLE6209R	140	130	3.4 ... 5.95	0.05	5.2 ... 40.0	SPI		Ⓟ8
TLE7209-2R	150	150	5.5	20	5.0 ... 28.0	SPI & Status Flag		Ⓟ8
TLE7209-3R	150	150	5.5	20	5.0 ... 28.0	SPI & Status Flag		Ⓟ8
TLE8209-2SA	115	125	1.0 ... 7.7	0.02	4.5 ... 28.0	SPI & Status Flag	●	Ⓟ8
TLE8209-2E	115	125	1.0 ... 7.7	0.02	4.5 ... 28.0	SPI & Status Flag	●	Ⓟ7
TLE8209-4SA	115	125	1.0 ... 9.0	0.02	4.5 ... 28.0	SPI & Status Flag	●	Ⓟ8
TLE9201SG	100	100	5.0	0.03	5.0 ... 28.0	SPI & Status Flag		Ⓟ3

1) See packages on page 112

Flex Multichannel Low-Side Switches (Powertrain & Safety)

Multi channel low-side switches are designed for multi purpose loads (solenoids, relays and resistive loads). The so-called Flex products serve in a flexible way the engine requirements with a different number of low-side drivers.

Please refer to page 40 for the product table.



Restraint System ICs

Infineon, a world leading supplier of Airbag ICs with more than 15 years experience, offers several complete solutions, enabling cost efficiency over the entire range from basic up to high end airbag systems. With a product portfolio ranging from high content integrated System ICs, over

Smart Firing ICs and Power Supplies to Satellite Receiver ICs, Infineon is well positioned to meet the market's requirements for cost efficiency, high quality and flexibility.

Features

- 16-bit Serial Peripheral Interface (SPI)
- Squib diagnosis via resistance measurement



Airbag Firing ICs

Product Type	Channels	Warning Lamp Output Driver	Digital Output for Firing Current Detection	3.3V Compatible I/O	Buckle Switch Detection	Number of Analog Output for Signal Monitoring	Firing Loop Enable Inputs	Firing Current (max) [A]	Programmable Deployment Firing Timer	Buck/Boost	Package ¹⁾
TLE6710 ²⁾	4	2	●		●	1	0	1.75	0	●	①7
TLE7714	4	0				1	4+SPI	1.75	4		①4
TLE7718	8	0		●		1	4+SPI	1.75	8		①4
TLE7734	4	0		●		1	4+SPI	1.2	4		①4
TLE7738	8	0		●		1	4+SPI	1.2	8		①4
TLE8754	4	0	●	●		SPI	4+SPI	1.2/1.75	4		④9
TLE8758	8	0	●	●		SPI	4+SPI	1.2/1.75	8		④9

Satellite Receiver IC

Product Type	Channels	Supported Protocol	Microcontroller Data Transfer	3.3V compatible I/O	Data Rate	Number of Supply	Package ¹⁾
TLE7729	4	PAS3, PAS4, ADIFX, PS15	SPI	●	125kbit/s	4	④8

1) See packages on page 112

2) Non green

Glossary

Type List	Product Family	
2N7002DW	Small Signal OptiMOS™ N-Channel 60V	25
BCR320U	Linear LED Driver of BCR400 Series	57
BCR321U	Linear LED Driver of BCR400 Series	57
BCR401U	Linear LED Driver of BCR400 Series	57
BCR401W	Linear LED Driver of BCR400 Series	57
BCR402U	Linear LED Driver of BCR400 Series	57
BCR402W	Linear LED Driver of BCR400 Series	57
BCR405U	Linear LED Driver of BCR400 Series	57
BCR420U	Linear LED Driver of BCR400 Series	57
BCR421U	Linear LED Driver of BCR400 Series	57
BSD214NW	Small Signal OptiMOS™2 N-Channel 20V	25
BSD223P	Small Signal OptiMOS™2 P-Channel -20V	26
BSD235C/n-ch	Small Signal OPTIMOS™2 N-Channel 20V Complementary MOSFETs	27
BSD235C/p-ch	Small Signal OPTIMOS™2 P-Channel -20V Complementary MOSFETs	27
BSD235N	Small Signal OptiMOS™2 N-Channel 20V	25
BSD314SPE	Small Signal OptiMOS™3 P-Channel -30V + integrated ESD diode	26
BSD316SN	Small Signal OptiMOS™2 N-Channel 30V	25
BSD356C/n-ch	Small Signal OPTIMOS™2 N-Channel 30V Complementary MOSFETs	27
BSD356C/p-ch	Small Signal OPTIMOS™2 P-Channel -30V Complementary MOSFETs	27
BSD356PE	Small Signal OptiMOS™ P-Channel -30V + integrated ESD diode	26
BSD816SN	Small Signal OptiMOS™2 N-Channel 20V	25
BSD840N	Small Signal OptiMOS™2 N-Channel 20V	25
BSL2025N	Small Signal OptiMOS™2 N-Channel 20V	25
BSL205N	Small Signal OptiMOS™2 N-Channel 20V	25
BSL207N	Small Signal OptiMOS™2 N-Channel 20V	25
BSL207SP	Small Signal OptiMOS™2 N-Channel 20V	26
BSL211SP	Small Signal OptiMOS™2 N-Channel 20V	26
BSL214N	Small Signal OptiMOS™2 N-Channel 20V	25
BSL215C/n-ch	Small Signal OPTIMOS™2 N-Channel 20V Complementary MOSFETs	27
BSL215C/p-ch	Small Signal OPTIMOS™2 P-Channel -20V Complementary MOSFETs	27
BSL215P	Small Signal OptiMOS™2 P-Channel -20V	26
BSL296SN	Small Signal SIPMOS™ N-Channel 100V	25
BSL3025N	Small Signal OptiMOS™2 N-Channel 30V	25
BSL303SPE	Small Signal OptiMOS™ P-Channel -30V + integrated ESD diode	26
BSL305SPE	Small Signal OptiMOS™ P-Channel -30V + integrated ESD diode	26
BSL306N	Small Signal OptiMOS™2 N-Channel 30V	25
BSL307SP	Small Signal OptiMOS™2 P-Channel -30V	26
BSL308C/n-ch	Small Signal OPTIMOS™2 N-Channel 30V Complementary MOSFETs	27
BSL308C/p-ch	Small Signal OPTIMOS™2 P-Channel -30V Complementary MOSFETs	27
BSL308PE	Small Signal OptiMOS™3 P-Channel -30V + integrated ESD diode	26
BSL314PE	Small Signal OptiMOS™3 P-Channel -30V + integrated ESD diode	26
BSL315P	Small Signal OptiMOS™2 P-Channel -30V	26
BSL316C/n-ch	Small Signal OPTIMOS™2 N-Channel 30V Complementary MOSFETs	27
BSL316C/p-ch	Small Signal OPTIMOS™2 P-Channel -30V Complementary MOSFETs	27
BSL3725N	Small Signal SIPMOS™ N-Channel 100V	25
BSL3735N	Small Signal SIPMOS™ N-Channel 100V	25
BSL606SN	Small Signal OptiMOS™3 N-Channel 60V	25
BSL8025N	Small Signal OptiMOS™2 N-Channel 20V	25
BSL806N	Small Signal OptiMOS™2 N-Channel 20V	25
BSP125	Small Signal SIPMOS™ N-Channel 600V	26
BSP129	Small Signal SIPMOS™ 240V Depletion MOSFETs	27
BSP135	Small Signal SIPMOS™ 600V Depletion MOSFETs	27
BSP149	Small Signal SIPMOS™ 200V Depletion MOSFETs	27
BSP170P	Small Signal SIPMOS™ P-Channel -60V	26
BSP171P	Small Signal SIPMOS™ P-Channel -60V	26
BSP295	Small Signal SIPMOS™ N-Channel 60V	25
BSP296N	Small Signal SIPMOS™ N-Channel 100V	25
BSP297	Small Signal SIPMOS™ N-Channel 200V	25
BSP298	Small Signal SIPMOS™ N-Channel 400V	26
BSP299	Small Signal SIPMOS™ N-Channel 500V	26
BSP300	Small Signal SIPMOS™ N-Channel 800V	26
BSP315P	Small Signal SIPMOS™ P-Channel -60V	26
BSP316P	Small Signal SIPMOS™ P-Channel -100V	27
BSP317P	Small Signal SIPMOS™ P-Channel -250V	27
BSP318S	Small Signal SIPMOS™ N-Channel 60V	25
BSP320S	Small Signal SIPMOS™ N-Channel 60V	25
BSP321P	Small Signal SIPMOS™ P-Channel -100V	27
BSP322P	Small Signal SIPMOS™ P-Channel -100V	27
BSP324	Small Signal SIPMOS™ N-Channel 400V	26
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MOSFETs

TEMPFET™
HITFET™Smart
Multichannel
Switches

PROFET™

SPOC-SPI Power
Controller

LED Drivers

Motor Drivers

Power Supply

Automotive
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IPP120N10S4-03	OptiMOS™-T2 100V (Trench)	20
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MOSFETs

TEMPFET™
HITFET™Smart
Multichannel
Switches

PROFET™

SPOC – SPI Power
Controller

LED Drivers

Motor Drivers

Power Supply

Automotive
TransceiversAutomotive
System ICs

Glossary

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TLE7184F-3V	3-Phase Bridge Driver IC (Gate Driver ICs for External MOSFETs)	70
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TLE7186F	3-Phase Bridge Driver IC (Gate Driver ICs for External MOSFETs)	70
TLE7188F	3-Phase Bridge Driver IC (Gate Driver ICs for External MOSFETs)	70
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MOSFETs

TEMPFET™
HITFET™Smart
Multichannel
Switches

PROFET™

SPOC – SPI Power
Controller

LED Drivers

Motor Drivers

Power Supply

Automotive
TransceiversAutomotive
System ICs

Glossary

Infineon's Next Level of Zero Defect Program

On the Way to Zero Defect Products and Services

The most valuable aspect of cars is the people they carry. Therefore, safety should never be compromised. This is the most important consideration for everybody involved in making automobiles – from the smallest suppliers to the manufacturers themselves. As car components become more and more complex, and as the number of control units in vehicles increases, the likelihood of a product failure becomes greater. Quality performance is a key differentiator for automotive market success. Our target of Zero Defect means:

- No quality events and no deviations
- Defect-free product launches
- All processes are under control
- Highest quality image in the market and more business due to satisfied customers

No compromise when it comes to quality

Infineon established the most comprehensive quality program called “AUTOMOTIVE EXCELLENCE” in the semiconductor industry in 2003. The continuation of the successful “Automotive Excellence” program is “NEXT LEVEL of ZERO DEFECT” in 2011. The Program is founded on four pillars: people, products, processes and production. Due to our “no compromise” policy in all four pillars our program really works. Our employees truly live the credos of Zero Defect, considering the highest quality requirements and understanding the importance of prevention. They are trained to deeply understand the tools and methods used to avoid deviations and to solve problems by addressing both technical and systemic root causes.

On the way to zero defect products

On the way to zero defect products, some examples:

- BEAR (BackEnd Automation Roadmap) project reduces manual handling
- “Top5 Defects Reduction in Backend” deeply addresses technical and systemic root causes
- Quality Firewall project “ensures highest outgoing product quality by intelligent outlier screening”
- Extend “Next Level of Zero Defect” into supplier base

“Next Level of Zero Defect” is your competitive advantage

Many of our partners have expressed their satisfaction with the quality of our products and the way we execute “Next Level of Zero Defect”.

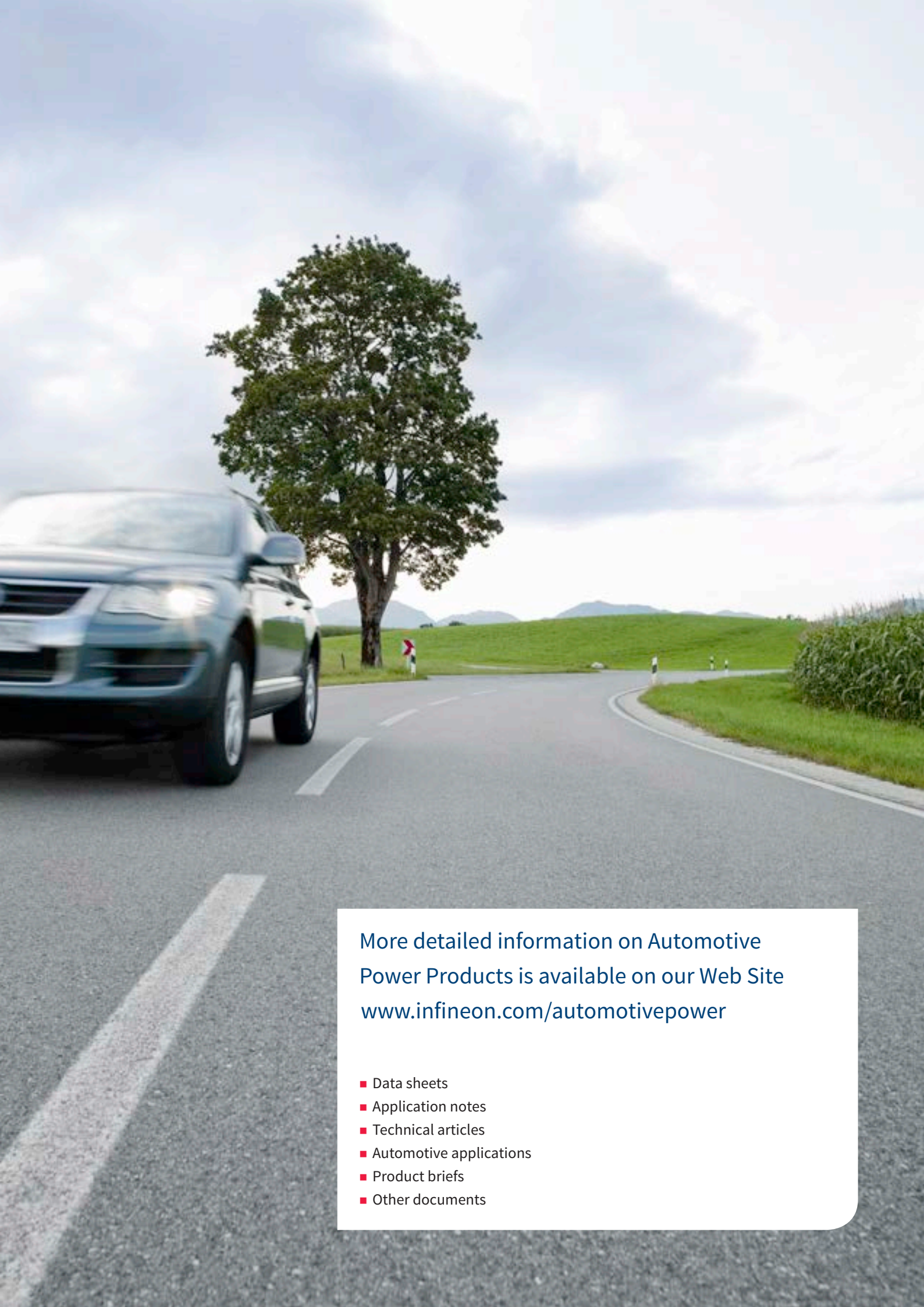
- “Honor Quality Award Toyota Hirose” received in 2010 for zero defect quality for last four years. Infineon is the First non- Japanese company that received this honour in this highest level category.
- 7 quality awards in 2004, 2006, 2007, 2008, 2009, 2010 and 2011 from Toyota’s Hirose plant
- “Supplier Performance Award” for the year 2008 and “Automotive Supplier of the Year 2009, 2010 and 2011” from Continental
- “Technical Development Award 2011” from Denso for quality, pricing, technical development and global collaboration. Infineon is the first non-Japanese component supplier that received this award.



Packages¹⁾

① PG-DSO-8	② PG-DSO-8 (Exposed Pad)	③ PG-DSO-12	④ PG-DSO-14	⑤ PG-DSO-14 (Exposed Pad)	⑥ PG-DSO-20
⑦ PG-DSO-20 (Exposed Pad)	⑧ PG-DSO-20 (Power-SO)	⑨ PG-DSO-24	⑩ PG-DSO-28	⑪ PG-DSO-36	⑫ PG-DSO-36 (Exposed Pad)
⑬ PG-DSO-36 (Power-SO)	⑭ PG-DSO-52	⑮ PG-HSOF-8-1 (H-PSOF)	⑯ PG-LQFP-64	⑰ PG-MQFP-64 (Power)	⑱ SC59
⑲ SC74	⑳ SCT595	㉑ SOT23	㉒ SOT89	㉓ SOT223	㉔ SOT323
㉕ SOT343	㉖ SOT363	㉗ PG-SSOP-14EP	㉘ PG-SSOP-16	㉙ PG-SSOP-24	㉚ PG-SSOP-24 (Exposed Pad)
㉛ PG-TDSON-8 dual	㉜ PG-TO252-3 (DPAK)	㉝ PG-TO252-5 (DPAK 5-leg)	㉞ PG-TO263-3 (TO220-3 (SMD))	㉟ PG-TO263-3 (TO220-3 (SMD))	㊱ PG-TO263-5 (TO220-5 (SMD))
㊲ PG-TO263-5 (TO220-5 (SMD))	㊳ PG-TO263-7 (TO220-7 (SMD))	㊴ PG-TO263-7 (TO220-7 (SMD))	㊵ PG-TO263-15	㊶ PG-TQFP-48 (Exposed Pad)	㊷ PG-TSDSON-8 dual
㊸ TSON-8	㊹ TSON-10	㊺ TSON-24	㊻ TSOP-6/6 dual	㊼ PG-TSSOP-14	㊽ PG-TSSOP-28
㊾ PG-VQFN-48	㊿ PG-DIP-8	① PG-TO218-5	② PG-TO220-3	③ PG-TO220-5	④ PG-TO220-5
⑤ PG-TO220-7	⑥ PG-TO220-7	⑦ PG-TO220-7	⑧ PG-TO247-3	⑨ PG-TO262-3	

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- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.