STR3A151D, STR3A152D, STR3A153D, STR3A154D, STR3A155D

PWM Off-Line Switching Regulator ICs

Features and Benefits

- Current mode PWM control
- Built-in Random Switching function: reduces EMI noise, simplifies EMI filters, and cuts cost by external part reduction
- Built-in Slope Compensation function: avoids subharmonic oscillation
- Built-in Leading Edge Blanking (LEB) function
- Auto Standby function:
  - Input power, P_{IN} < 10 mW at no load with low power consumption shunt regulator
  - Normal load operation: PWM switching
  - Light load operation: Standby mode (Burst oscillation)

Continued on the next page…

Package: DIP8

Not to scale

Description

STR3A100 series are power ICs for switching power supplies, incorporating a power MOSFET and a current mode PWM controller IC in one package.

Including a startup circuit and a standby function in the controller, the product achieves low power consumption, low standby power, and high cost-effectiveness in power supply systems, while reducing external components.

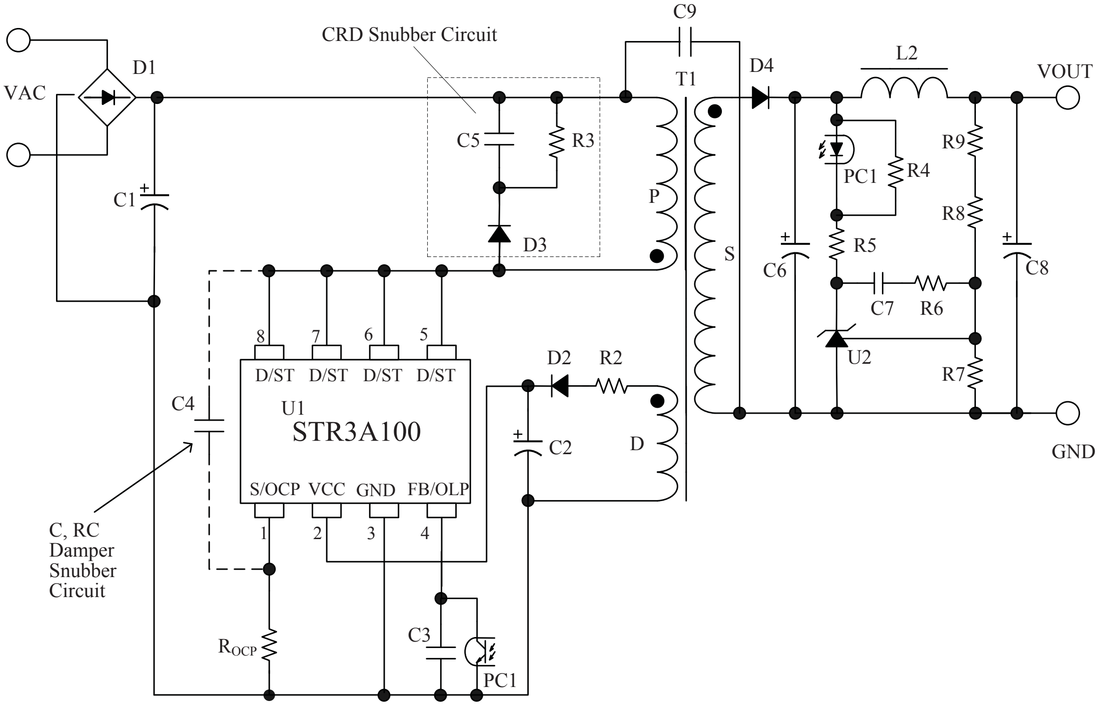
The products are provided in an industry standard DIP8 package.

Applications

Switching power supplies for electronic devices such as:

- Stand-by power supply for LCD/PDP television, desktop PC, multi-function printer, audio equipment, and so forth
- Small switched-mode power supply (SMPS) for printer, BD/DVD player, set-top box, and so forth
- Auxiliary power supply for air conditioner, refrigerator, washer, dishwasher, and so forth

Typical Application



Features and Benefits (continued)

- Soft Start function: reduces stress on internal power MOSFET and secondary output rectifier diode at startup
- Protection Functions:
  - ▫ Overcurrent Protection function (OCP); pulse-by-pulse, built-in compensation circuit to minimize OCP point variation on AC input voltage
  - ▫ Overload Protection function (OLP); auto restart, built-in timer, reduces heat during overload condition, and no external components required
  - ▫ Overvoltage Protection function (OVP); auto restart
  - ▫ Thermal Shutdown function (TSD); auto restart

Selection Guide

Part Number	f_{OSC} (kHz)	MOSFET		P_{OUT}* (W)		OVP/TSD
		V_{DSS}(min) (V)	$R_{DS(on)}$(max) (Ω)	230 VAC	85 to 265 VAC	
STR3A151D	67	650	4.0	24	16	Auto restart
STR3A152D			3.0	30	23	
STR3A153D			1.9	36	30	
STR3A154D			1.4	40	32	
STR3A155D			1.1	43	35	

*The listed output power is based on the thermal ratings, and the peak output power can be 120% to 140% of the value stated here. At low output voltage and short duty cycle, the output power may be less than the value stated here.

The polarity value for current specifies a sink as "+," and a source as "−," referencing the IC.

Absolute Maximum Ratings Unless specifically noted, T_A is 25°C

Characteristic	Symbol	Notes		Pins	Rating	Unit
Drain Peak Current[1]	I_{DPEAK}	STR3A151D	Single pulse	8−1	3.6	A
		STR3A152D			4	A
		STR3A153D			5.2	A
		STR3A154D			6.4	A
		STR3A155D			7.2	A
Avalanche Energy[2]	E_{AS}	STR3A151D	Single pulse, I_{LPEAK} = 2.13 A	8−1	53	mJ
		STR3A152D	Single pulse, I_{LPEAK} = 2.19 A		56	mJ
		STR3A153D	Single pulse, I_{LPEAK} = 2.46 A		72	mJ
		STR3A154D	Single pulse, I_{LPEAK} = 2.66 A		83	mJ
		STR3A155D	Single pulse, I_{LPEAK} = 3.05 A		110	mJ
S/OCP Pin Voltage	V_{OCP}			1−3	−2 to 6	V
Control Part Input Voltage	V_{CC}			2−3	32	V
FB/OLP Pin Voltage	V_{FB}			4−3	−0.3 to 14	V
FB/OLP Pin Sink Current	I_{FB}			4−3	1.0	mA
MOSFET Power Dissipation[3]	P_{D1}	STR3A151D STR3A152D	Mounted on 15 mm × 15 mm printed circuit board	8−1	1.68	W
		STR3A153D STR3A154D			1.76	W
		STR3A155D			1.81	W
Control Part Power Dissipation	P_{D2}	$V_{CC} \times I_{CC}$		2−3	1.3	W
Operating Ambient Temperature	T_{OP}			–	−40 to 125	°C
Storage Temperature	T_{stg}			–	−40 to 125	°C
Channel Temperature	T_{ch}			–	150	°C

[1] Refer to MOSFET Safe Operating Area Curve.
[2] Refer to MOSFET Avalanche Energy Derating Coefficient Curve.
[3] Refer to MOSFET Temperature versus Power Dissipation Curve.

Electrical Characteristics of Control Part Unless specifically noted, T_A is 25°C, V_{CC} = 18 V

Characteristic	Symbol	Test Conditions		Pins	Min.	Typ.	Max.	Unit
Operation Start Voltage	$V_{CC(ON)}$			2 – 3	13.8	15.3	16.8	V
Operation Stop Voltage*	$V_{CC(OFF)}$			2 – 3	7.3	8.1	8.9	V
Circuit Current in Operation	$I_{CC(ON)}$	V_{CC} = 12 V		2 – 3	−	−	2.5	mA
Minimum Start Voltage	$V_{ST(ON)}$			8 – 3	−	40	−	V
Startup Current	$I_{STARTUP}$	V_{CC} = 13.5 V		2 – 3	−3.9	−2.5	−1.1	mA
Startup Current Threshold Biasing Voltage*	$V_{CC(BIAS)}$			2 – 3	8.5	9.5	10.5	V
Average Operation Frequency	$f_{OSC(AVG)}$			8 – 3	60	67	74	kHz
Frequency Modulation Deviation	Δf			8 – 3	−	5	−	kHz
Maximum Duty Cycle	D_{MAX}			8 – 3	65	74	83	%
Leading Edge Blanking Time	t_{BW}			–	−	350	−	ns
OCP Compensation Coefficient	DPC			–	−	17	−	mV/μs
OCP Compensation Duty Cycle Limit	D_{DPC}			−	−	36	−	%
OCP Threshold Voltage at Zero Duty Cycle	$V_{OCP(L)}$			1 – 3	0.69	0.78	0.87	V
OCP Threshold Voltage at 36% Duty Cycle	$V_{OCP(H)}$			1 – 3	0.79	0.88	0.97	V
Maximum Feedback Current	$I_{FB(MAX)}$			4 – 3	−110	−70	−35	μA
Minimum Feedback Current	$I_{FB(MIN)}$			4 – 3	−30	−15	−7	μA
FB/OLP Oscillation Stop Threshold Voltage	$V_{FB(OFF)}$	STR3A151D STR3A152D STR3A153D	V_{CC} = 32 V	4 – 3	1.09	1.21	1.33	V
		STR3A154D STR3A155D	V_{CC} = 32 V	4 – 3	0.85	0.98	1.09	V
OLP Threshold Voltage	$V_{FB(OLP)}$	V_{CC} = 32 V		4 – 3	7.3	8.1	8.9	V
OLP Operation Current	$I_{CC(OLP)}$	V_{CC} = 12 V		2 – 3	−	230	−	μA
OLP Delay Time	t_{OLP}			–	54	70	86	ms
FB/OLP Clamp Voltage	$V_{FB(CLAMP)}$			4 – 3	11.0	12.8	14.0	V
OVP Threshold Voltage	$V_{CC(OVP)}$			2 – 3	27.5	29.5	31.5	V
Thermal Shutdown Activating Temperature	$T_{J(TSD)}$			−	135	−	−	°C

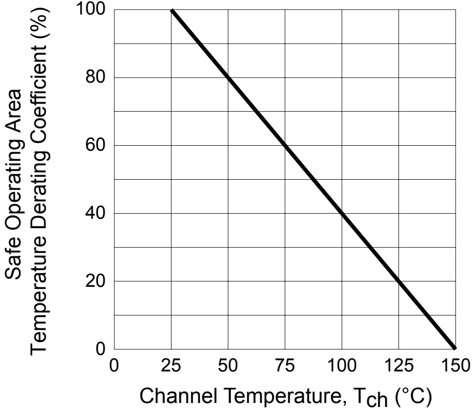
*$V_{CC(BIAS)} > V_{CC(OFF)}$ always.

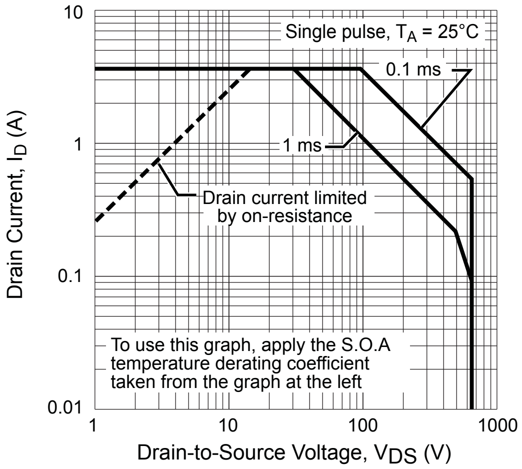
Electrical Characteristics of MOSFET Unless specifically noted, T_A is 25°C

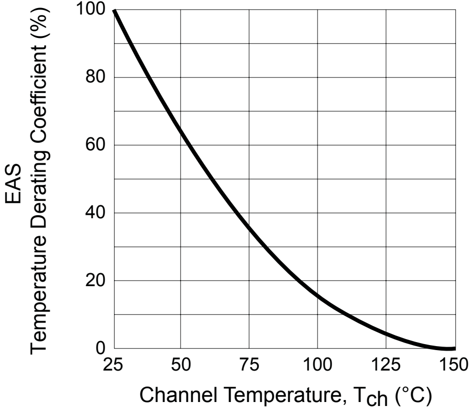
Characteristic	Symbol	Test Conditions		Pins	Min.	Typ.	Max.	Unit
Drain-to-Source Breakdown Voltage	V_{DSS}			8 – 1	650	–	–	V
Drain Leakage Current	I_{DSS}			8 – 1	–	–	300	μA
On-Resistance	$R_{DS(ON)}$	STR3A151D		8 – 1	–	–	4.0	Ω
		STR3A152D			–	–	3.0	Ω
		STR3A153D			–	–	1.9	Ω
		STR3A154D			–	–	1.4	Ω
		STR3A155D			–	–	1.1	Ω
Switching Time	t_f			8 – 1	–	–	250	ns
Thermal Resistance	$R_{\theta ch\text{-}C}$	STR3A151D STR3A152D STR3A153D	The thermal resistance between channel and case. Case temperature (T_C) is measured at the center of the branded side.	–	–	–	18	°C/W
		STR3A154D STR3A155D		–	–	–	17	°C/W

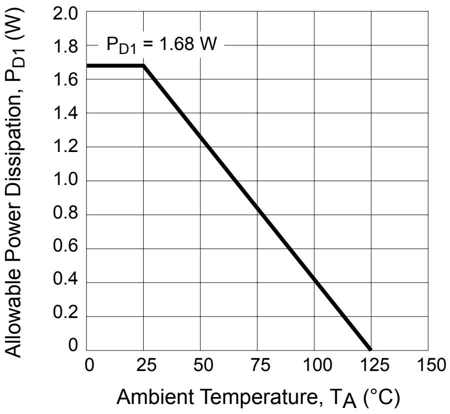
Characteristic Performance

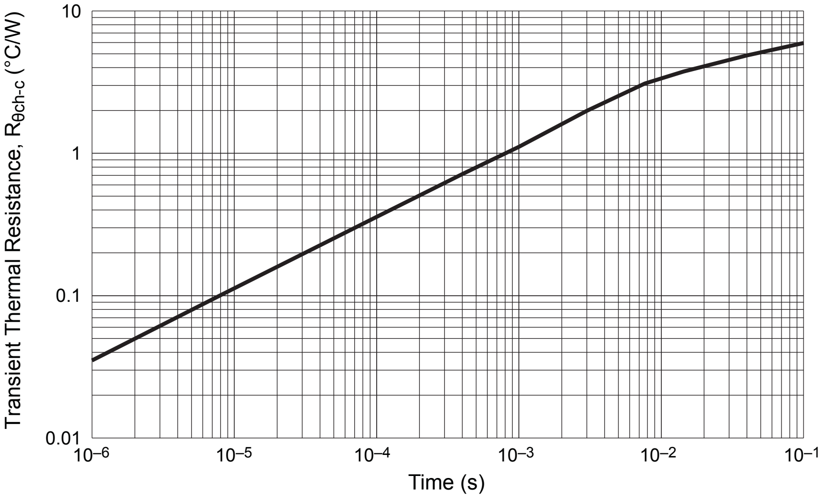
STR3A151D


S. O. A. Temperature Derating Coefficient Curve


MOSFET Safe Operating Area Curve


MOSFET Avalanche Energy Derating Coefficient Curve

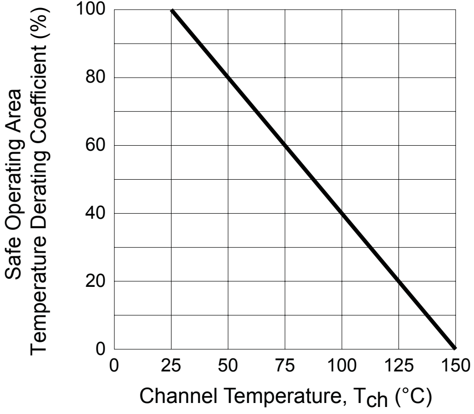

MOSFET Temperature versus Power Dissipation Curve


Transient Thermal Resistance Curve

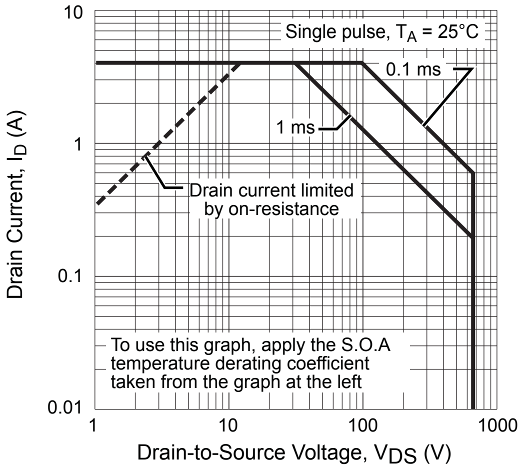
Characteristic Performance

STR3A152D

S. O. A. Temperature Derating Coefficient Curve

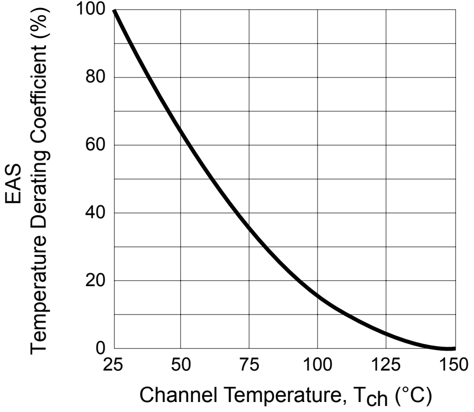


MOSFET Safe Operating Area Curve

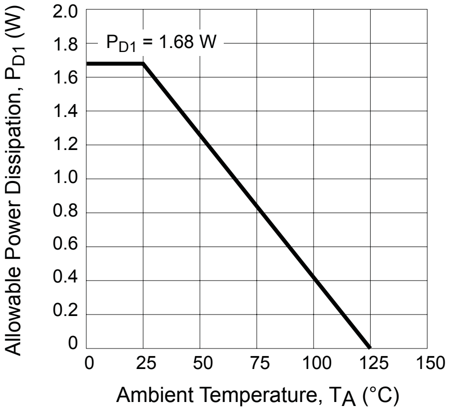


To use this graph, apply the S.O.A temperature derating coefficient taken from the graph at the left

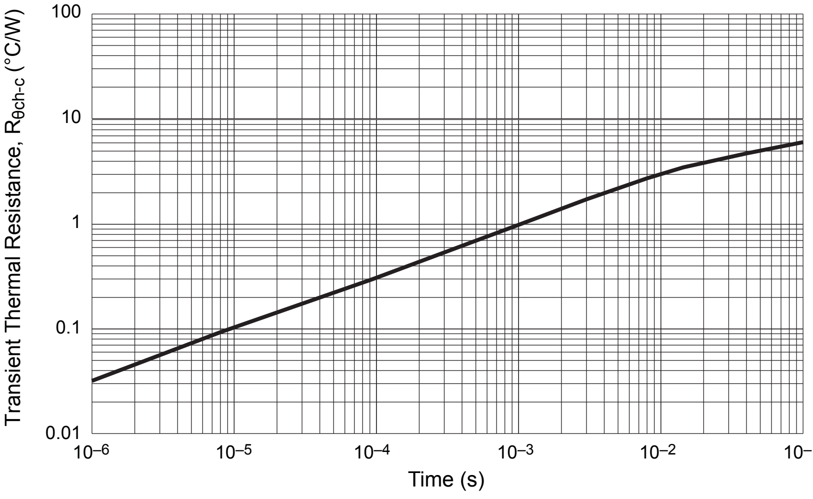
MOSFET Avalanche Energy Derating Coefficient Curve



MOSFET Temperature versus Power Dissipation Curve

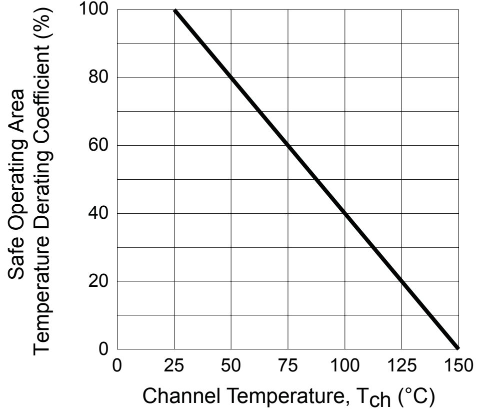


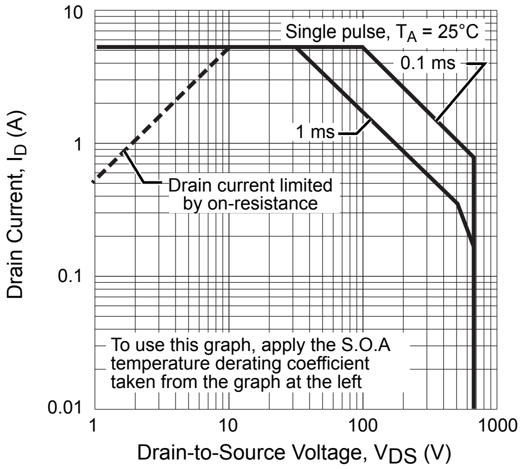
Transient Thermal Resistance Curve

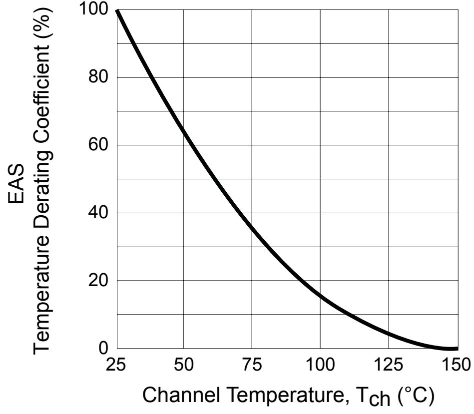


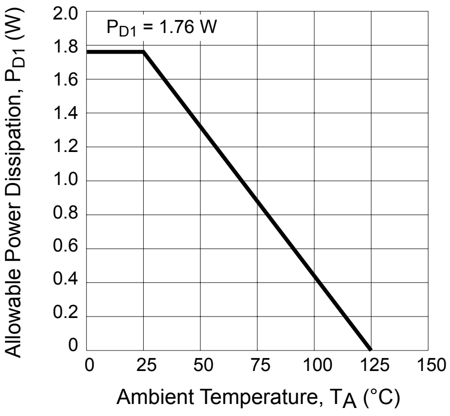
Characteristic Performance

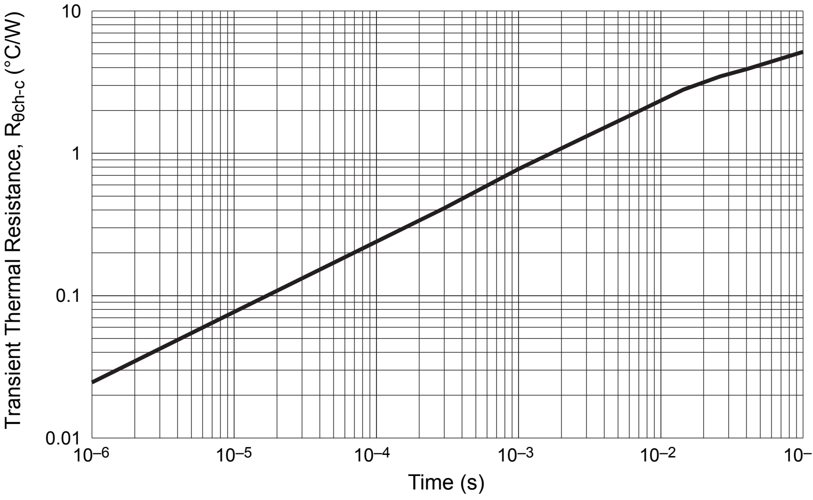
STR3A153D


S. O. A. Temperature Derating Coefficient Curve


MOSFET Safe Operating Area Curve


MOSFET Avalanche Energy Derating Coefficient Curve

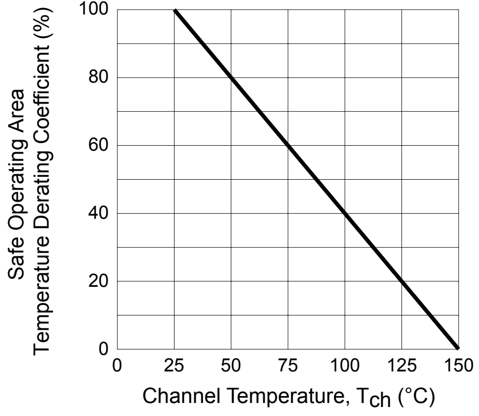

MOSFET Temperature versus Power Dissipation Curve


Transient Thermal Resistance Curve

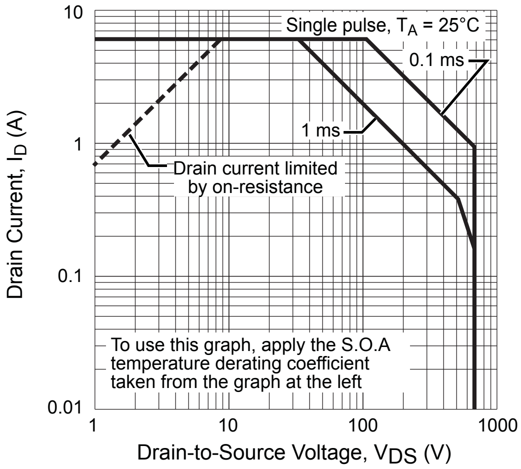
Characteristic Performance

STR3A154D

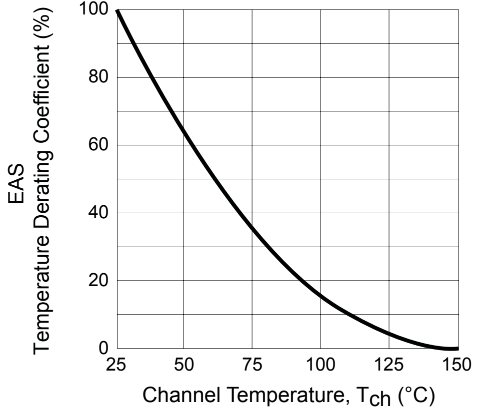
S. O. A. Temperature Derating Coefficient Curve



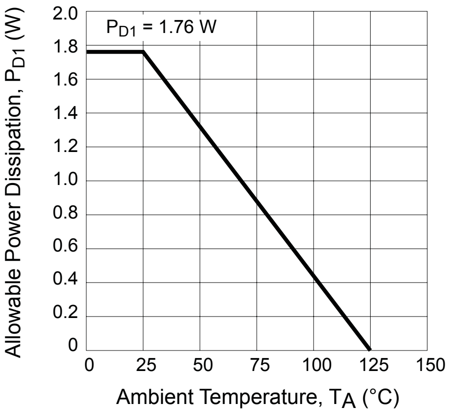
MOSFET Safe Operating Area Curve



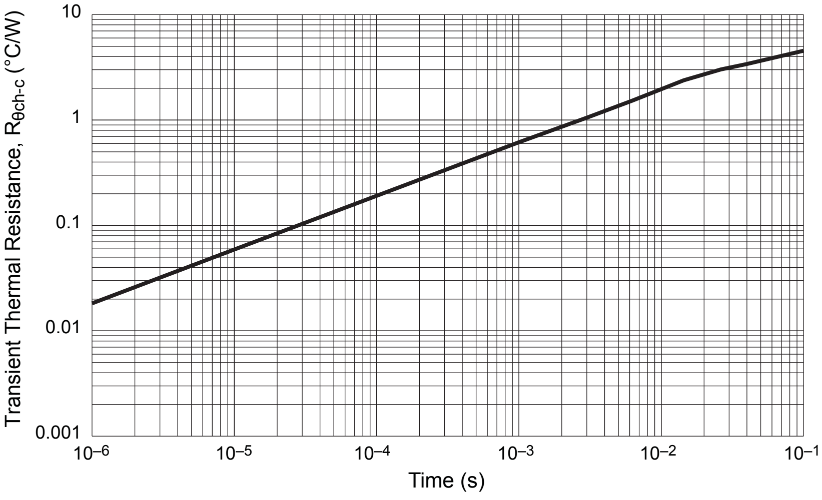
MOSFET Avalanche Energy Derating Coefficient Curve



MOSFET Temperature versus Power Dissipation Curve



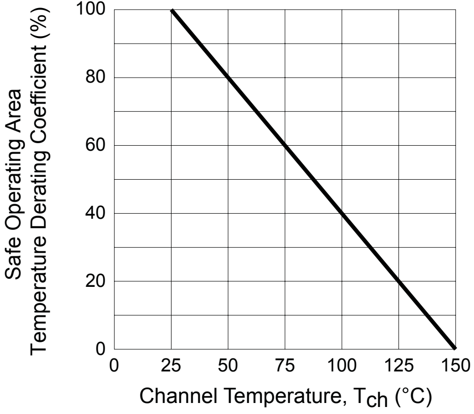
Transient Thermal Resistance Curve



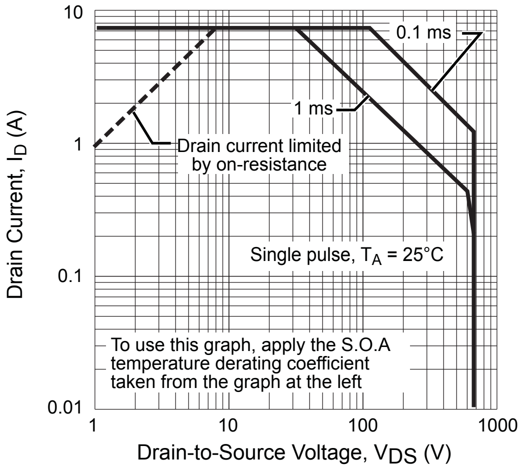
Characteristic Performance

STR3A155D

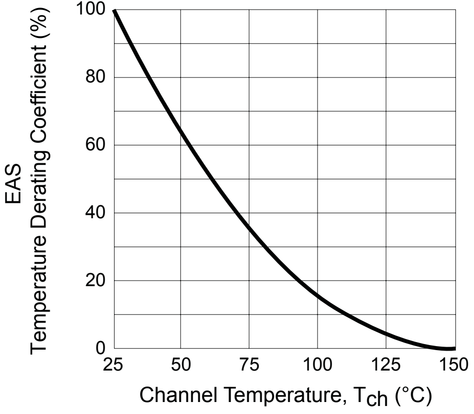
S. O. A. Temperature Derating Coefficient Curve



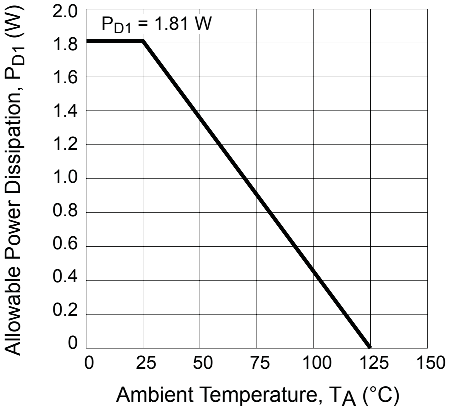
MOSFET Safe Operating Area Curve



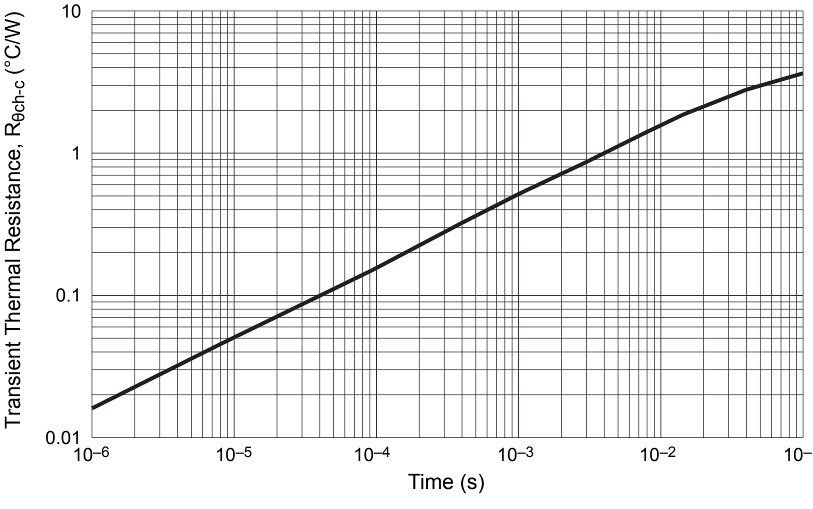
MOSFET Avalanche Energy Derating Coefficient Curve



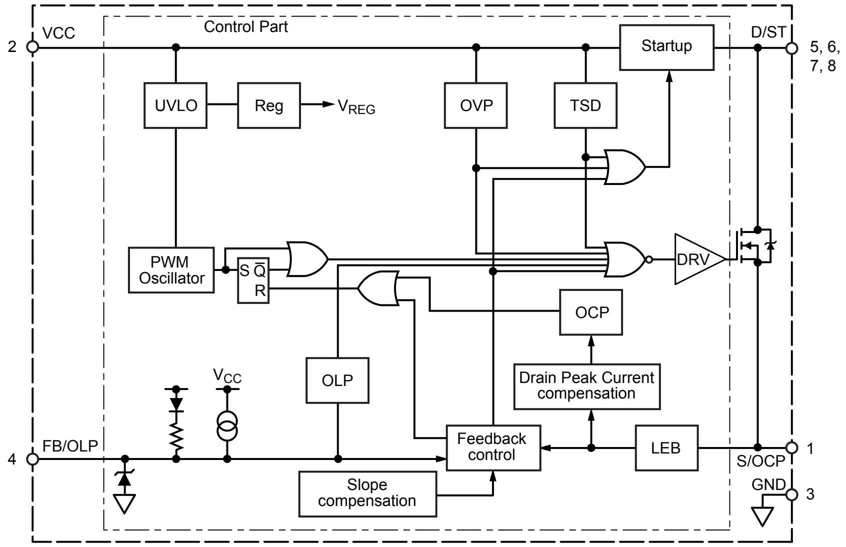
MOSFET Temperature versus Power Dissipation Curve



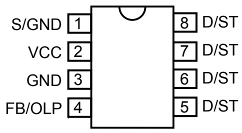
Transient Thermal Resistance Curve



Functional Block Diagram



Pin-out Diagram

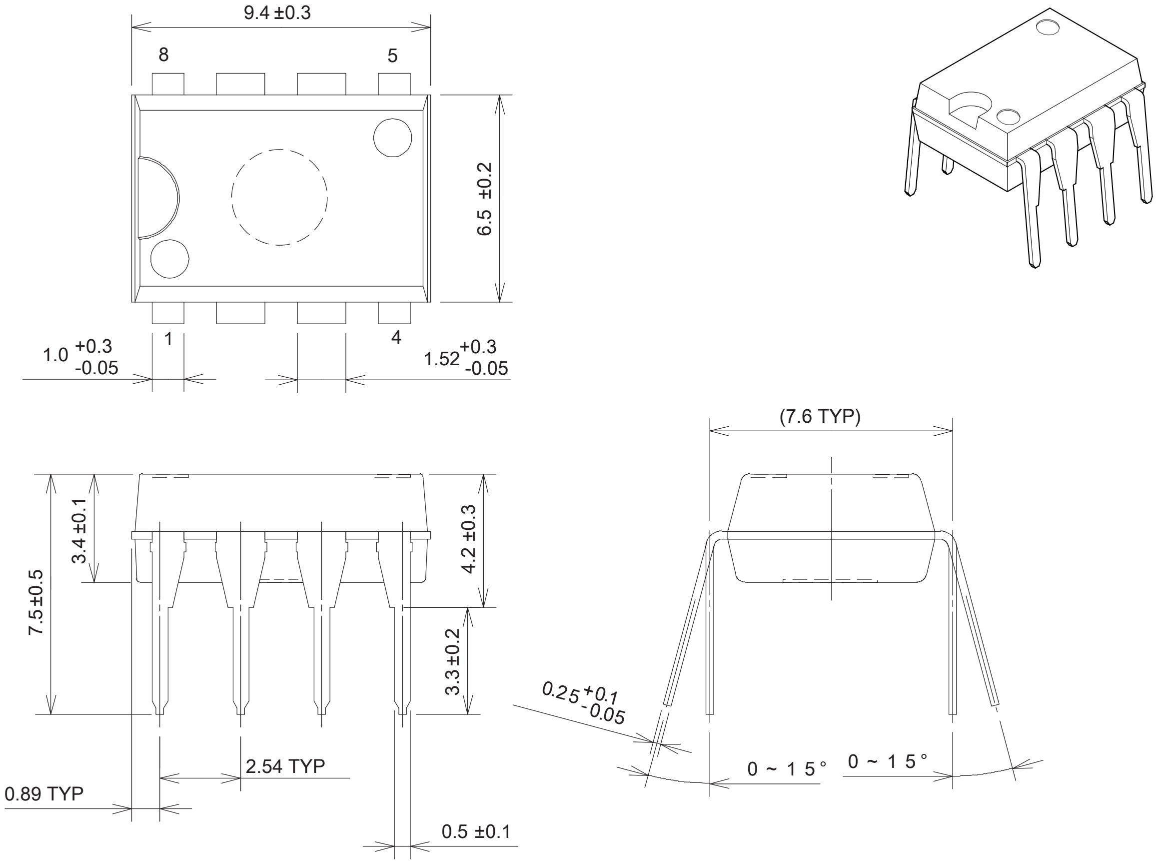


Pin List Table

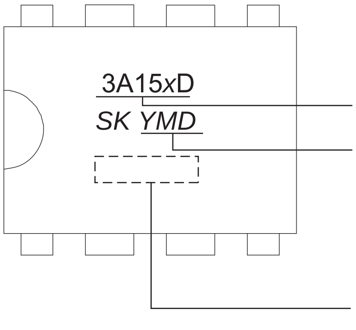
Number	Name	Function
1	S/OCP	MOSFET source and input of Overcurrent Protection (OCP) signal
2	VCC	Power supply voltage input for Control Part and input of Overvoltage Protection (OVP) signal
3	GND	Ground
4	FB/OLP	Feedback signal input for constant voltage control signal and input of Overload Protection (OLP) signal
5, 6,7, 8	D/ST	MOSFET drain pin and input of the startup current

Package Diagram

DIP8 package



Unit: mm



Part Number

Lot Number
  Y is the last digit of the year (0 to 9)
  M is the month (1 to 9, O, N, or D)
  D is a period of days:
    1 – 1st to 10th
    2 – 11th to 20th
    3 – 21st to 31st
Sanken Control Number

Pb-free.
Device composition compliant
with the RoHS directive.

Because reliability can be affected adversely by improper storage environments and handling methods, please observe the following cautions.

Cautions for Storage

- Ensure that storage conditions comply with the standard temperature (5°C to 35°C) and the standard relative humidity (around 40% to 75%); avoid storage locations that experience extreme changes in temperature or humidity.
- Avoid locations where dust or harmful gases are present and avoid direct sunlight.
- Reinspect for rust on leads and solderability of the products that have been stored for a long time.

Cautions for Testing and Handling

When tests are carried out during inspection testing and other standard test periods, protect the products from power surges from the testing device, shorts between the product pins, and wrong connections. Ensure all test parameters are within the ratings specified by Sanken for the products.

Remarks About Using Silicone Grease with a Heatsink

- When silicone grease is used in mounting the products on a heatsink, it shall be applied evenly and thinly. If more silicone grease than required is applied, it may produce excess stress.
- Volatile-type silicone greases may crack after long periods of time, resulting in reduced heat radiation effect. Silicone greases with low consistency (hard grease) may cause cracks in the mold resin when screwing the products to a heatsink.

  Our recommended silicone greases for heat radiation purposes, which will not cause any adverse effect on the product life, are indicated below:

Type	Suppliers
G746	Shin-Etsu Chemical Co., Ltd.
YG6260	Momentive Performance Materials Inc.
SC102	Dow Corning Toray Co., Ltd.

Soldering

- When soldering the products, please be sure to minimize the working time, within the following limits:
  260±5°C 10±1 s (Flow, 2 times)
  380±10°C 3.5±0.5 s (Soldering iron, 1 time)
- Soldering should be at a distance of at least 1.5 mm from the body of the products.

Electrostatic Discharge

- When handling the products, the operator must be grounded. Grounded wrist straps worn should have at least 1 MΩ of resistance from the operator to ground to prevent shock hazard, and it should be placed near the operator.
- Workbenches where the products are handled should be grounded and be provided with conductive table and floor mats.
- When using measuring equipment such as a curve tracer, the equipment should be grounded.
- When soldering the products, the head of soldering irons or the solder bath must be grounded in order to prevent leak voltages generated by them from being applied to the products.
- The products should always be stored and transported in Sanken shipping containers or conductive containers, or be wrapped in aluminum foil.

- The contents in this document are subject to changes, for improvement and other purposes, without notice. Make sure that this is the latest revision of the document before use.
- Application and operation examples described in this document are quoted for the sole purpose of reference for the use of the products herein and Sanken can assume no responsibility for any infringement of industrial property rights, intellectual property rights or any other rights of Sanken or any third party which may result from its use.
- Although Sanken undertakes to enhance the quality and reliability of its products, the occurrence of failure and defect of semiconductor products at a certain rate is inevitable. Users of Sanken products are requested to take, at their own risk, preventative measures including safety design of the equipment or systems against any possible injury, death, fires or damages to the society due to device failure or malfunction.
- Sanken products listed in this document are designed and intended for the use as components in general purpose electronic equipment or apparatus (home appliances, office equipment, telecommunication equipment, measuring equipment, etc.).

  When considering the use of Sanken products in the applications where higher reliability is required (transportation equipment and its control systems, traffic signal control systems or equipment, fire/crime alarm systems, various safety devices, etc.), and whenever long life expectancy is required even in general purpose electronic equipment or apparatus, please contact your nearest Sanken sales representative to discuss, prior to the use of the products herein.

  The use of Sanken products without the written consent of Sanken in the applications where extremely high reliability is required (aerospace equipment, nuclear power control systems, life support systems, etc.) is strictly prohibited.
- In the case that you use Sanken products or design your products by using Sanken products, the reliability largely depends on the degree of derating to be made to the rated values. Derating may be interpreted as a case that an operation range is set by derating the load from each rated value or surge voltage or noise is considered for derating in order to assure or improve the reliability. In general, derating factors include electric stresses such as electric voltage, electric current, electric power etc., environmental stresses such as ambient temperature, humidity etc. and thermal stress caused due to self-heating of semiconductor products. For these stresses, instantaneous values, maximum values and minimum values must be taken into consideration.

  In addition, it should be noted that since power devices or IC's including power devices have large self-heating value, the degree of derating of junction temperature affects the reliability significantly.
- When using the products specified herein by either (i) combining other products or materials therewith or (ii) physically, chemically or otherwise processing or treating the products, please duly consider all possible risks that may result from all such uses in advance and proceed therewith at your own responsibility.
- Anti radioactive ray design is not considered for the products listed herein.
- Sanken assumes no responsibility for any troubles, such as dropping products caused during transportation out of Sanken's distribution network.
- The contents in this document must not be transcribed or copied without Sanken's written consent.

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Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

Как с нами связаться

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