STGB30M65DF2

Trench gate field-stop IGBT, M series 650 V, 30 A low-loss in a D^{2}PAK package

Datasheet - production data

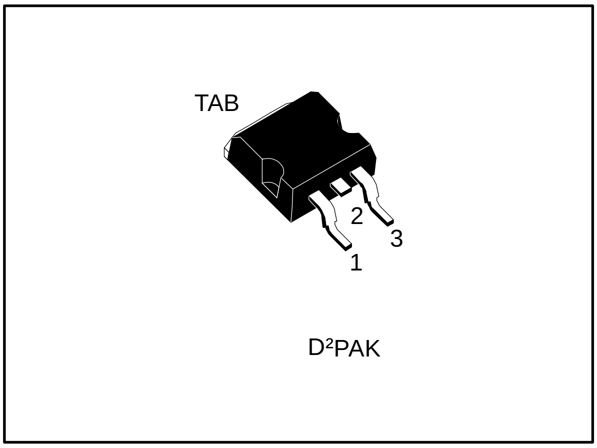
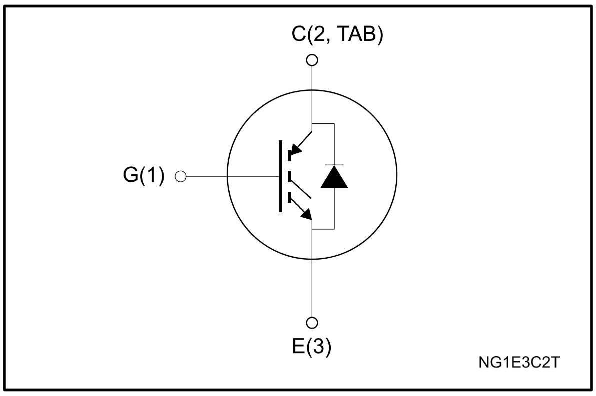


Figure 1: Internal schematic diagram



Features

- 6 µs of short-circuit withstand time
- $V_{CE(sat)}$ = 1.55 V (typ.) @ I_C = 30 A
- Tight parameters distribution
- Safer paralleling
- Low thermal resistance
- Soft and very fast recovery antiparallel diode

Applications

- Motor control
- UPS
- PFC

Description

This device is an IGBT developed using an advanced proprietary trench gate field-stop structure. The device is part of the M series IGBTs, which represent an optimal balance between inverter system performance and efficiency where low-loss and short-circuit functionality are essential. Furthermore, the positive $V_{CE(sat)}$ temperature coefficient and tight parameter distribution result in safer paralleling operation.

Table 1: Device summary

Order code	Marking	Package	Packaging
STGB30M65DF2	G30M65DF2	D²PAK	Tape and reel

This is information on a product in full production.

Contents

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GE} = 0 V)	650	V
I_C	Continuous collector current at T_C = 25 °C	60	A
I_C	Continuous collector current at T_C = 100 °C	30	A
I_{CP}(1)	Pulsed collector current	120	A
V_{GE}	Gate-emitter voltage	±20	V
I_F	Continuous forward current at T_C = 25 °C	60	A
I_F	Continuous forward current at T_C = 100 °C	30	A
I_{FP}(1)	Pulsed forward current	120	A
P_{TOT}	Total dissipation at T_C = 25 °C	258	W
T_{STG}	Storage temperature range	-55 to 150	°C
T_J	Operating junction temperature range	-55 to 175	°C

Notes:

(1)Pulse width limited by maximum junction temperature.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case IGBT	0.58	°C/W
R_{thJC}	Thermal resistance junction-case diode	1.47	°C/W
R_{thJA}	Thermal resistance junction-ambient	62.5	°C/W

2 Electrical characteristics

T_C = 25 °C unless otherwise specified

Table 4: Static characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage	V_{GE} = 0 V, I_C = 250 µA	650			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 30 A		1.55	2.0	V
		V_{GE} = 15 V, I_C = 30 A, T_J = 125 °C		1.95		
		V_{GE} = 15 V, I_C = 30 A, T_J = 175 °C		2.1		
V_F	Forward on-voltage	I_F = 30 A		1.85	2.65	V
		I_F = 30 A, T_J = 125 °C		1.6		
		I_F = 30 A, T_J = 175 °C		1.5		
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 500 µA	5	6	7	V
I_{CES}	Collector cut-off current	V_{GE} = 0 V, V_{CE} = 650 V			25	µA
I_{GES}	Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = ± 20 V			±250	µA

Table 5: Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	V_{CE} = 25 V, f = 1 MHz, V_{GE} = 0 V	-	2490	-	pF
C_{oes}	Output capacitance		-	143	-	
C_{res}	Reverse transfer capacitance		-	46	-	
Q_g	Total gate charge	V_{CC} = 520 V, I_C = 30 A, V_{GE} = 0 to 15 V (see *Figure 30: " Gate charge test circuit"*)	-	80	-	nC
Q_{ge}	Gate-emitter charge		-	18	-	
Q_{gc}	Gate-collector charge		-	32	-	

Table 6: IGBT switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{CE} = 400 V, I_C = 30 A, V_{GE} = 15 V, R_G = 10 Ω (see *Figure 29: " Test circuit for inductive load switching"*)		31.6	-	ns
t_r	Current rise time			13.4	-	ns
$(di/dt)_{on}$	Turn-on current slope			1791	-	A/μs
$t_{d(off)}$	Turn-off-delay time			115	-	ns
t_f	Current fall time			110	-	ns
E_{on}(1)	Turn-on switching energy			0.3	-	mJ
E_{off}(2)	Turn-off switching energy			0.96	-	mJ
E_{ts}	Total switching energy			1.26	-	mJ
$t_{d(on)}$	Turn-on delay time	V_{CE} = 400 V, I_C = 30 A, V_{GE} = 15 V, R_G = 10 Ω T_J = 175 °C (see *Figure 29: " Test circuit for inductive load switching"*)		30	-	ns
t_r	Current rise time			17	-	ns
$(di/dt)_{on}$	Turn-on current slope			1435	-	A/μs
$t_{d(off)}$	Turn-off-delay time			116	-	ns
t_f	Current fall time			194	-	ns
E_{on}(1)	Turn-on switching energy			0.67	-	mJ
E_{off}(2)	Turn-off switching energy			1.36	-	mJ
E_{ts}	Total switching energy			2.03	-	mJ
t_{sc}	Short-circuit withstand time	$V_{CC} \leq$ 400 V, V_{GE} = 13 V, T_{Jstart} = 150 °C	10		-	μs
		$V_{CC} \leq$ 400 V, V_{GE} = 15 V, T_{Jstart} = 150 °C	6		-	

Notes:

(1)Including the reverse recovery of the diode.

(2)Including the tail of the collector current.

Table 7: Diode switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	I_F = 30 A, V_R = 400 V, V_{GE} = 15 V, di/dt = 1000 A/μs (see *Figure 29: " Test circuit for inductive load switching"*)	-	140	-	ns
Q_{rr}	Reverse recovery charge		-	880	-	nC
I_{rrm}	Reverse recovery current		-	17	-	A
dI_{rr}/dt	Peak rate of fall of reverse recovery current during t_b		-	650	-	A/μs
E_{rr}	Reverse recovery energy		-	115	-	μJ
t_{rr}	Reverse recovery time	I_F = 30 A, V_R = 400 V, V_{GE} = 15 V, di/dt = 1000 A/μs, T_J = 175 °C (see *Figure 29: " Test circuit for inductive load switching"*)	-	244	-	ns
Q_{rr}	Reverse recovery charge		-	2743	-	nC
I_{rrm}	Reverse recovery current		-	25	-	A
dI_{rr}/dt	Peak rate of fall of reverse recovery current during t_b		-	220	-	A/μs
E_{rr}	Reverse recovery energy		-	320	-	μJ

2.1 Electrical characteristics (curves)

Figure 2: Power dissipation vs. case temperature

GIPD100420150947FSR

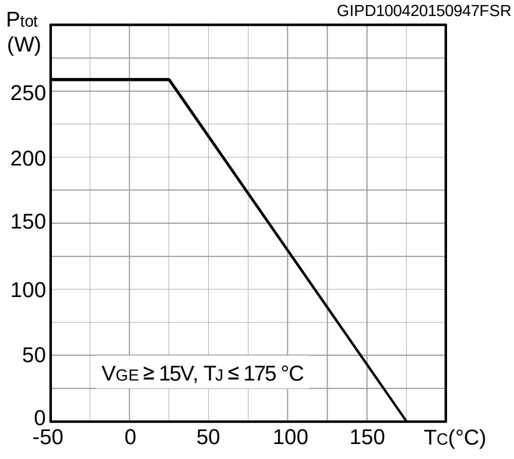


Figure 3: Collector current vs. case temperature

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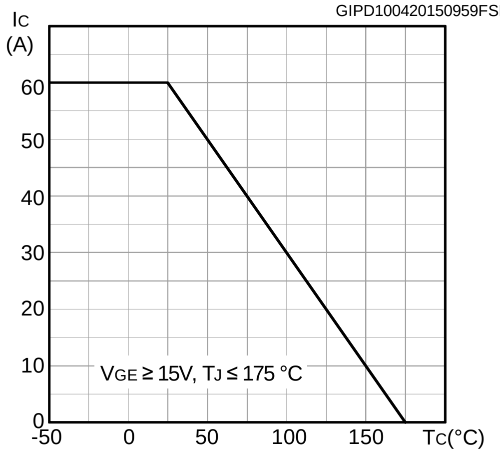

Figure 4: Output characteristics (T_J = 25 °C)

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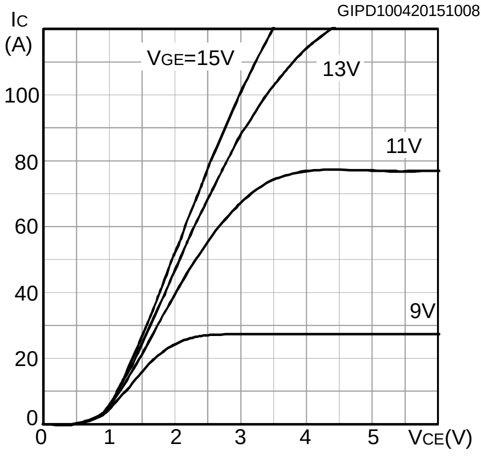

Figure 5: Output characteristics (T_J = 175 °C)

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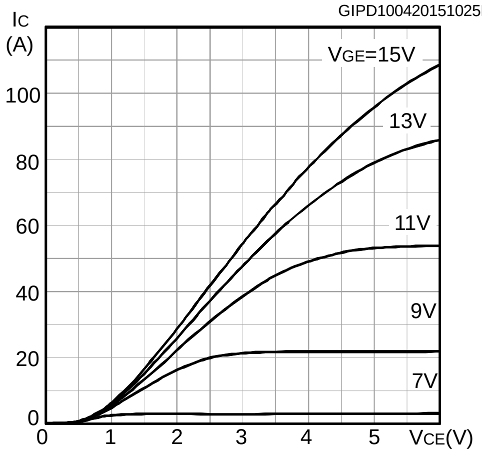

Figure 6: $V_{CE(sat)}$ vs. junction temperature

GIPD281020131418FSR

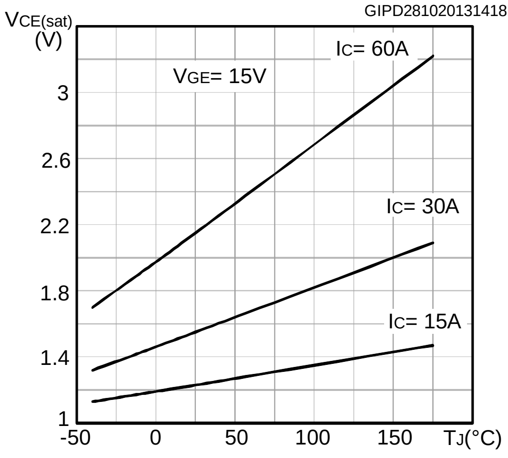

Figure 7: $V_{CE(sat)}$ vs. collector current

GIPD281020131116FSR

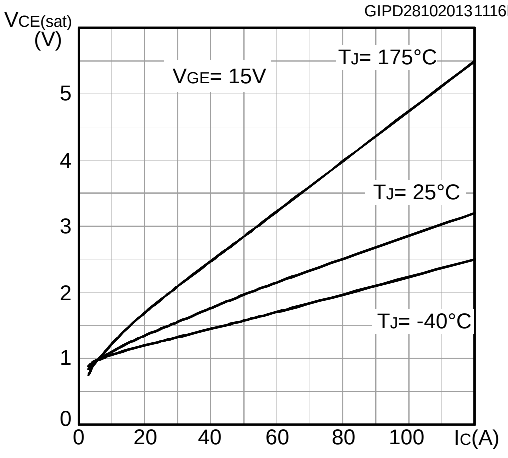

Figure 8: Collector current vs. switching frequency

GIPD100420151129FSR

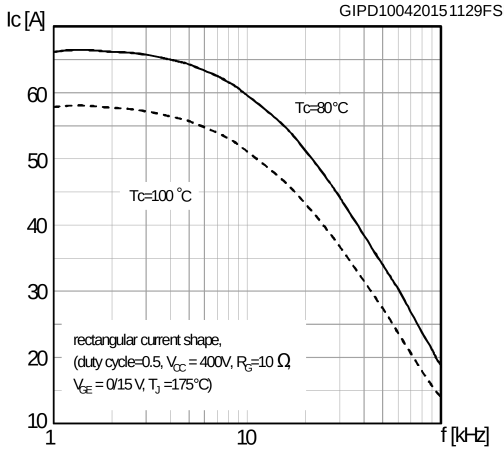

Figure 9: Forward bias safe operating area

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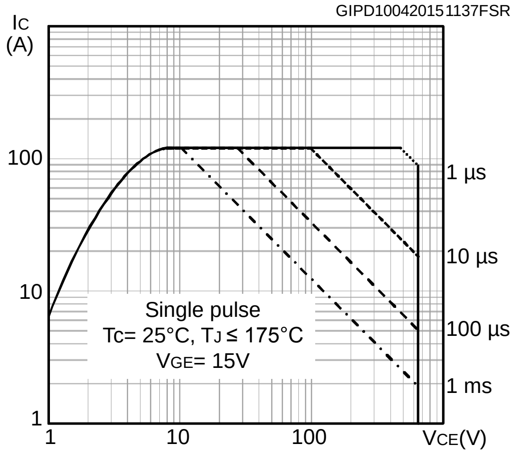

Figure 10: Transfer characteristics

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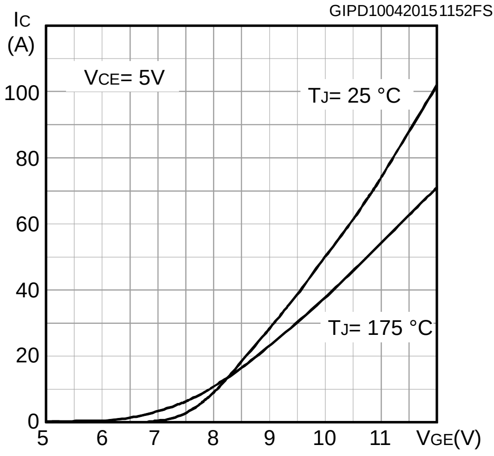

Figure 11: Diode V_F vs. forward current

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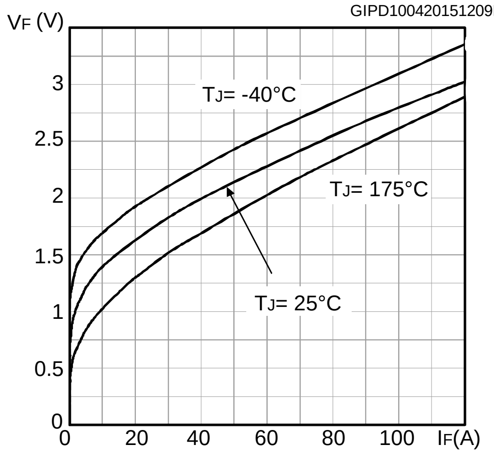

Figure 12: Normalized $V_{GE(th)}$ vs. junction temperature

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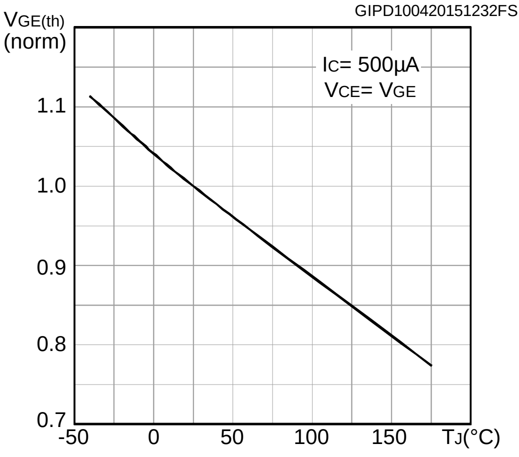

Figure 13: Normalized $V_{(BR)CES}$ vs. junction temperature

GIPD100420151240FSR

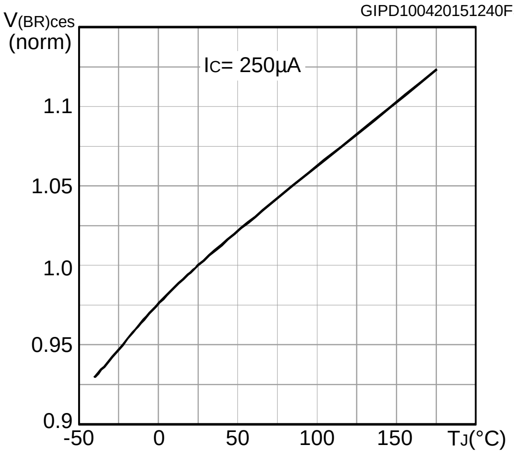

Figure 14: Capacitance variations

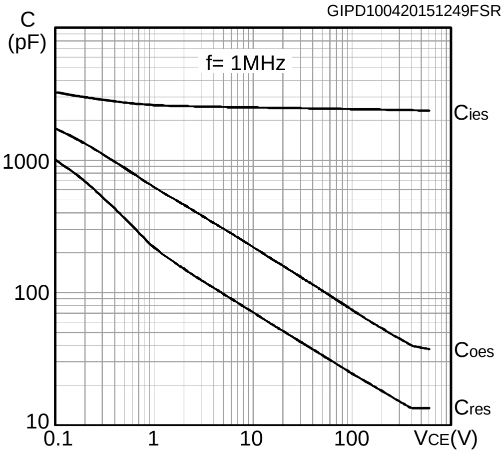

Figure 15: Gate charge vs. gate-emitter voltage

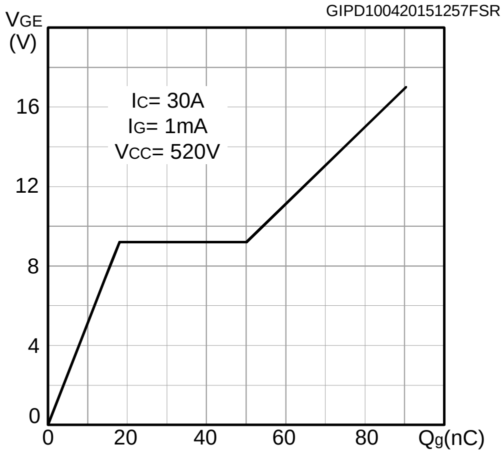

Figure 16: Switching energy vs. collector current

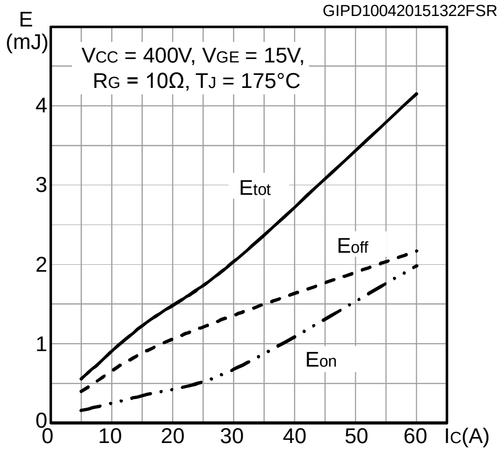

Figure 17: Switching energy vs. gate resistance

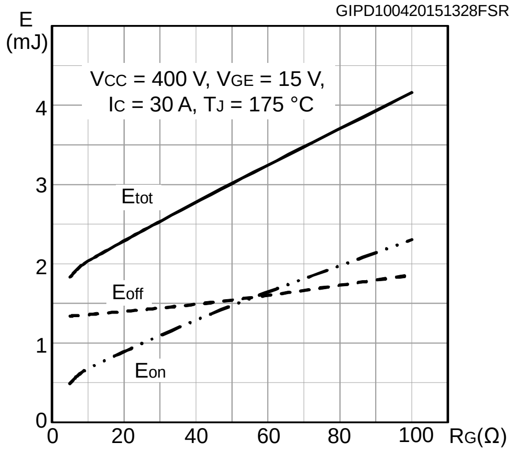

Figure 18: Switching energy vs. temperature

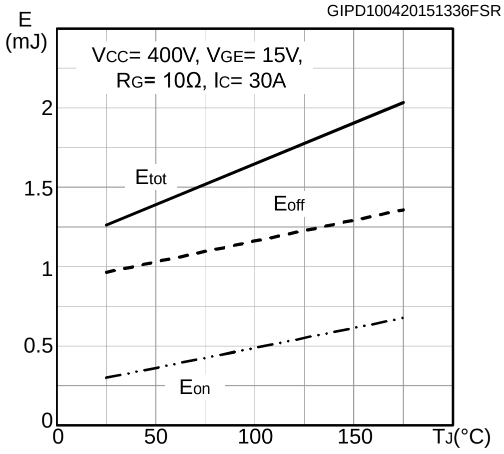

Figure 19: Switching energy vs. collector emitter voltage

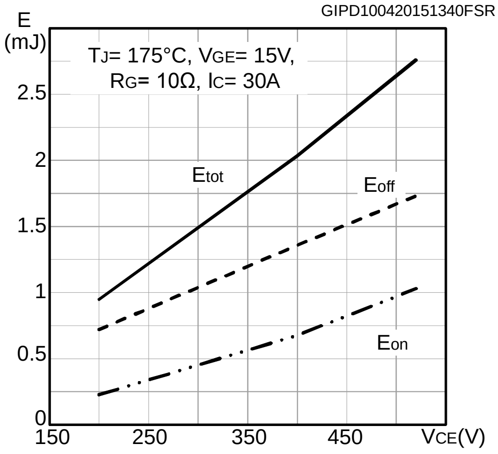

Figure 20: Short-circuit time and current vs. V_{GE}

GIPD100420151351FSR

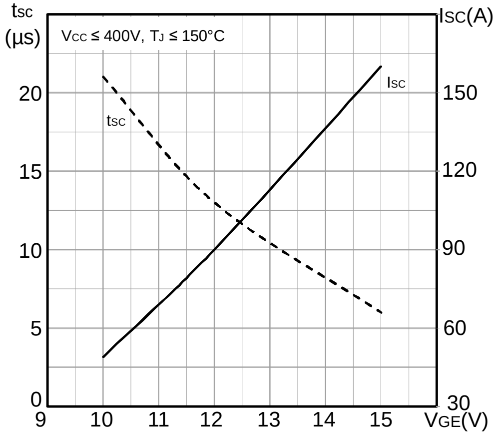

Figure 21: Switching times vs. collector current

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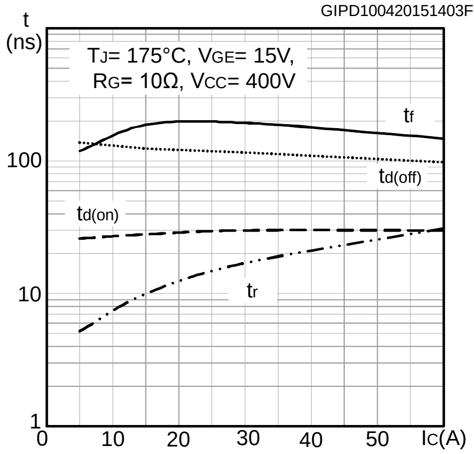

Figure 22: Switching times vs. gate resistance

GIPD100420151412FSR

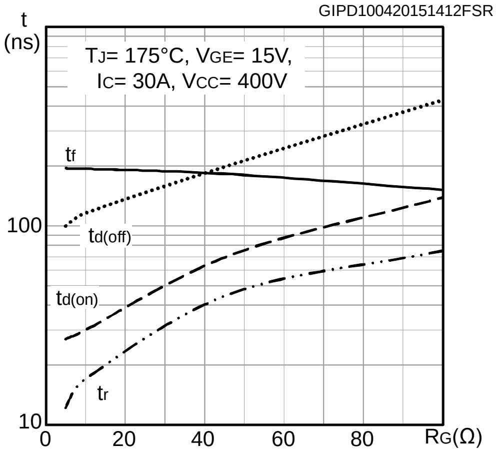

Figure 23: Reverse recovery current vs. diode current slope

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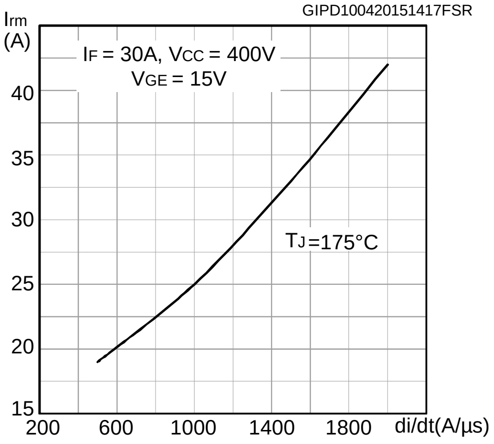


Figure 24: Reverse recovery time vs. diode current slope

GIPD100420151434FSR

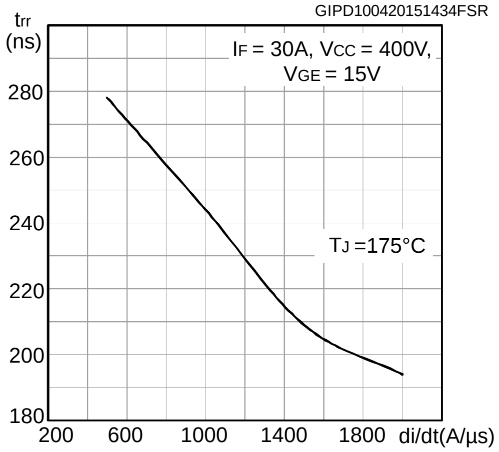


Figure 25: Reverse recovery charge vs. diode current slope

GIPD100420151442FSR

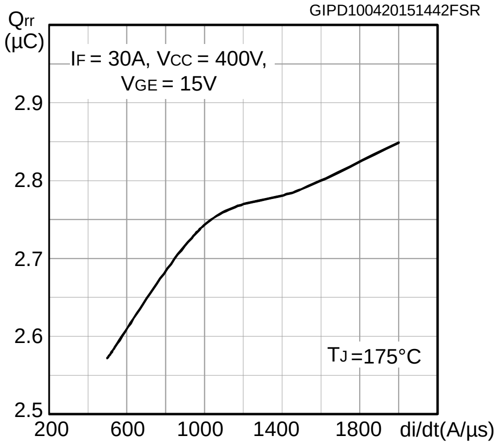


Figure 26: Reverse recovery energy vs. diode current slope

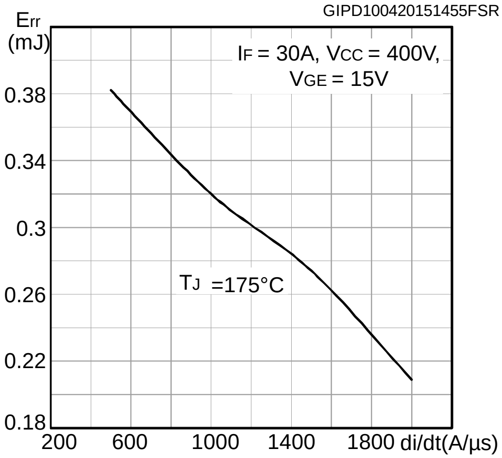


Figure 27: Thermal impedance for IGBT

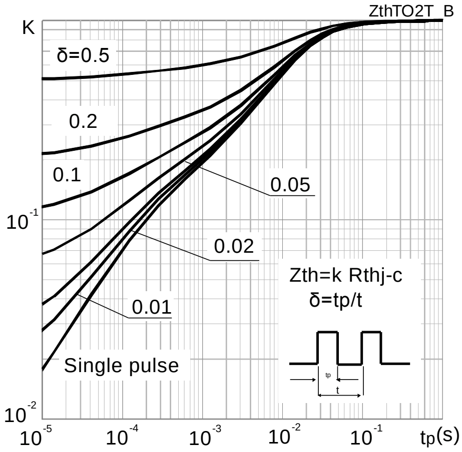
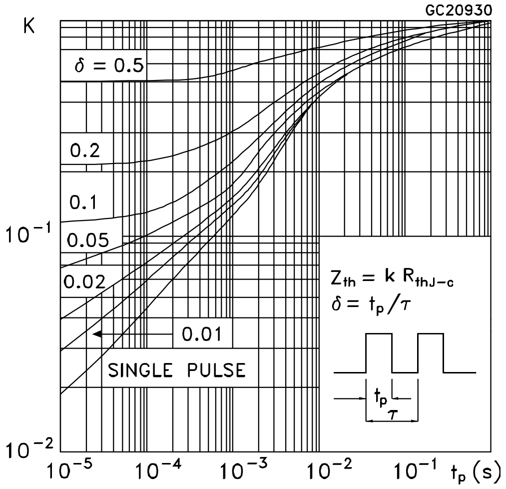


Figure 28: Thermal impedance for diode



3 Test circuits

Figure 29: Test circuit for inductive load switching

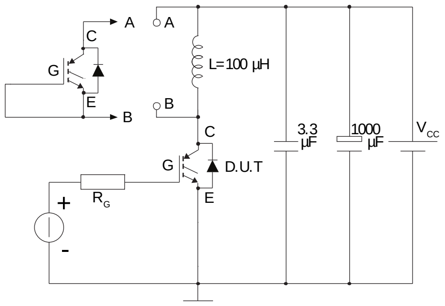


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Figure 30: Gate charge test circuit

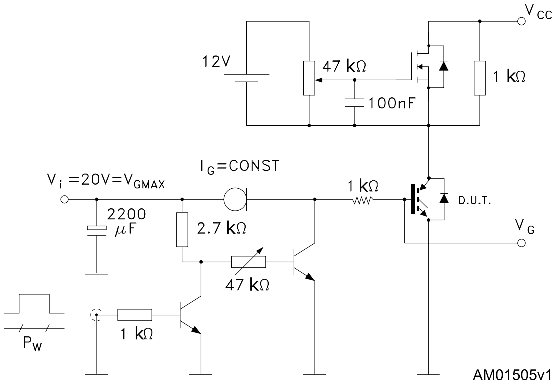

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Figure 31: Switching waveform

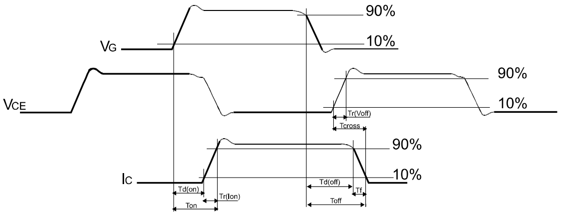

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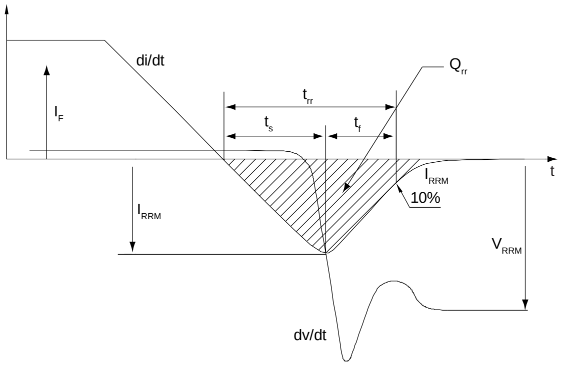
Figure 32: Diode reverse recovery waveform



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4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: ***www.st.com***. ECOPACK® is an ST trademark.

4.1 D²PAK (TO-263) type A package information

Figure 33: D²PAK (TO-263) type A package outline

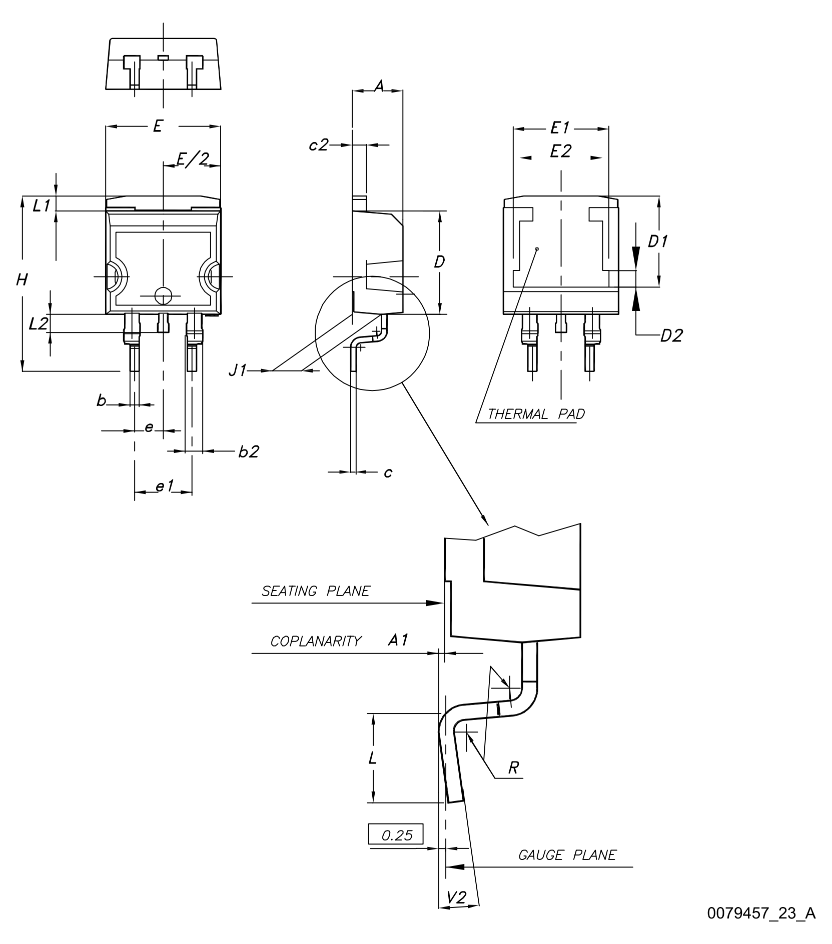
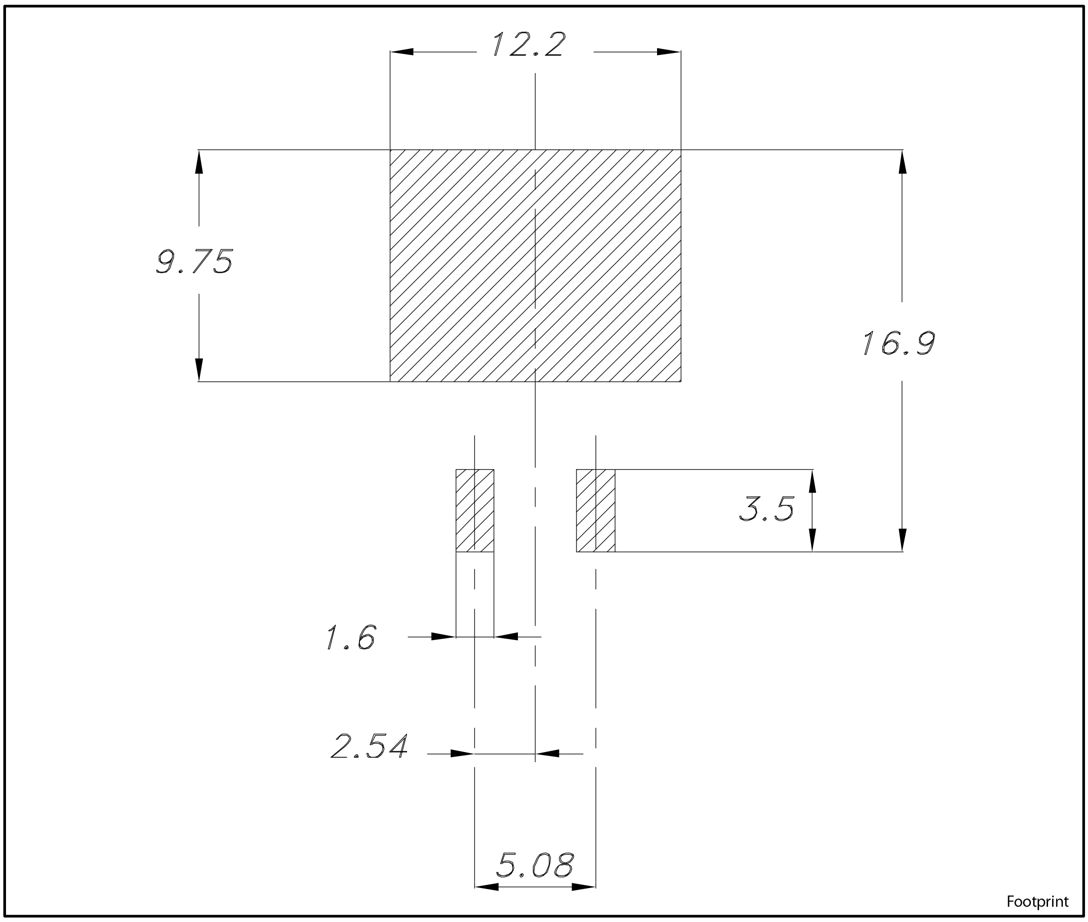


Table 8: D²PAK (TO-263) type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10.00		10.40
E1	8.50	8.70	8.90
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15.00		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.40	
V2	0°		8°

Figure 34: D²PAK (TO-263) type A recommended footprint (dimensions are in mm)



4.2 D²PAK (TO-263) type A packing information

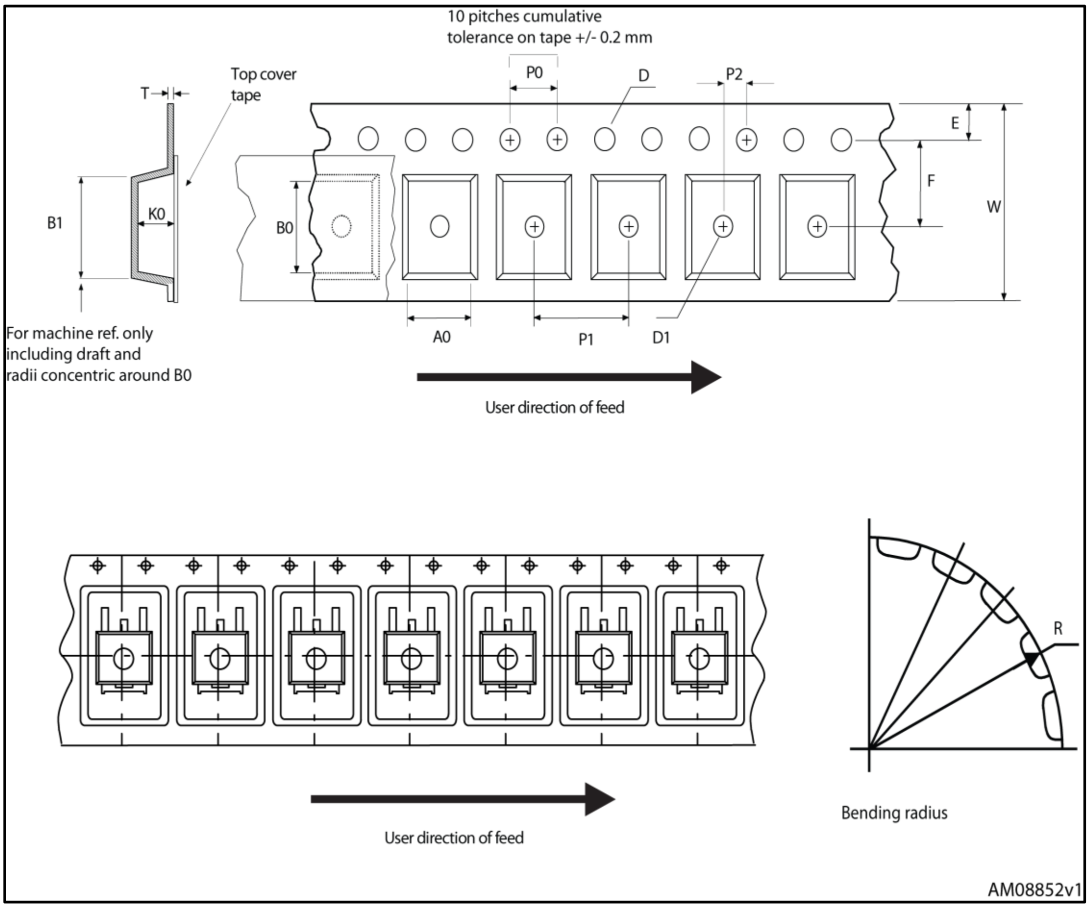


Figure 35: D²PAK type A tape outline

Figure 36: D^{2}PAK type A reel outline

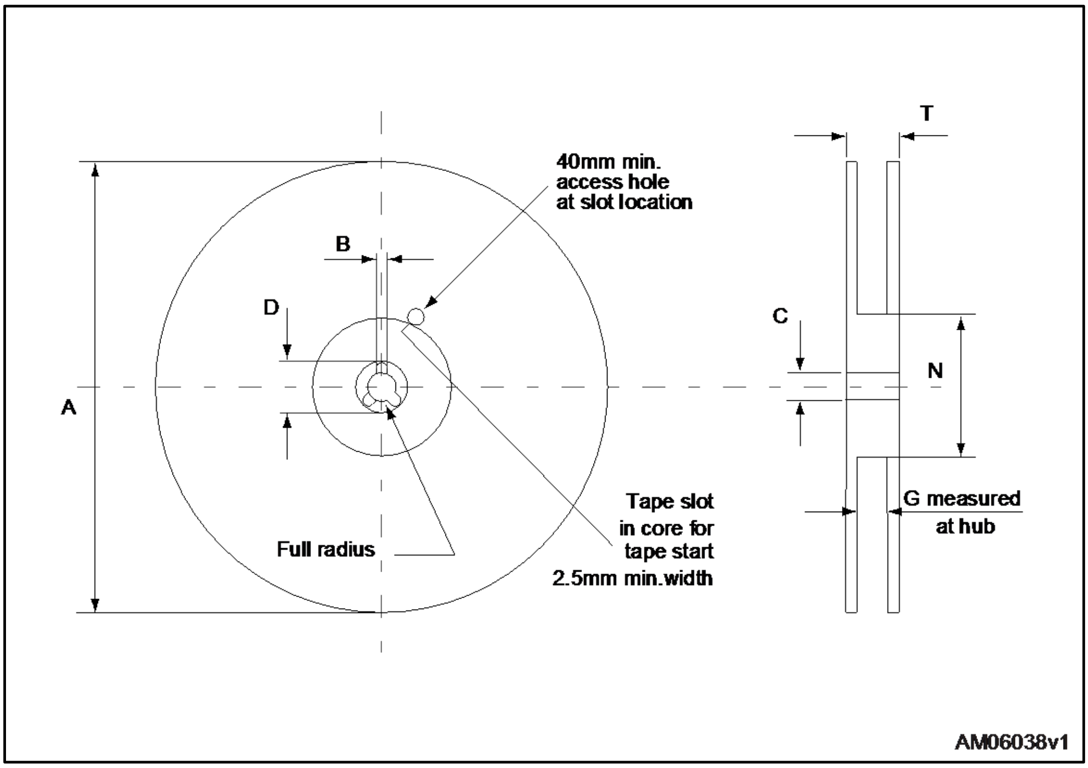


Table 9: D²PAK type A tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base quantity		1000
P2	1.9	2.1	Bulk quantity		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

5 Revision history

Table 10: Document revision history

Date	Revision	Changes
10-Feb-2015	1	First release.
13-Apr-2015	2	Document status promoted from preliminary to production data. Updated *Section 2: "Electrical characteristics"* Added *Section 2.1: "1.1 Electrical characteristics (curve)"*
11-Apr-2017	3	Updated document title. Updated *Table 4: "Static characteristics"*, *Table 6: "IGBT switching characteristics (inductive load)"* and *Table 7: "Diode switching characteristics (inductive load)"*. Updated *Figure 13: "Normalized* $V_{(BR)CES}$ *vs. junction temperature "*. Updated *Section 4.1: "D²PAK (TO-263) type A package information"*. Minor text changes

IMPORTANT NOTICE – PLEASE READ CAREFULLY

Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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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