

**“Half Bridge” IGBT INT-A-PAK, (Trench PT IGBT), 100 A**

Proprietary Vishay IGBT Silicon “L Series”



INT-A-PAK

PRODUCT SUMMARY	
$V_{CES}$	600 V
$I_C$ DC, $T_C = 130\text{ }^\circ\text{C}$	100 A
$V_{CE(on)}$ at 100 A, $25\text{ }^\circ\text{C}$	1.16 V
Speed	DC to 1 kHz
Package	INT-A-PAK
Circuit	Half bridge

**FEATURES**

- Trench PT IGBT technology
- FRED Pt<sup>®</sup> anti-parallel diodes with fast recovery
- Very low conduction losses
- Al<sub>2</sub>O<sub>3</sub> DBC
- UL pending
- Designed for industrial level
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

RoHS  
COMPLIANT**BENEFITS**

- Optimized for high current inverter stages (AC TIG welding machines)
- Direct mounting to heatsink
- Very low junction to case thermal resistance
- Low EMI

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	$V_{CES}$		600	V
Continuous collector current	$I_C$	$T_C = 25\text{ }^\circ\text{C}$	337	A
		$T_C = 80\text{ }^\circ\text{C}$	235	
Pulsed collector current	$I_{CM}$		440	
Peak switching current	$I_{LM}$		440	
Gate to emitter voltage	$V_{GE}$		$\pm 20$	V
RMS isolation voltage	$V_{ISOL}$	Any terminal to case, $t = 1\text{ min}$	2500	
Maximum power dissipation	$P_D$	$T_C = 25\text{ }^\circ\text{C}$	781	W
		$T_C = 100\text{ }^\circ\text{C}$	312	
Operating junction temperature range	$T_J$		-40 to +150	$^\circ\text{C}$
Storage temperature range	$T_{Stg}$		-40 to +125	

ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Collector to emitter breakdown voltage	$V_{BR(CES)}$	$V_{GE} = 0\text{ V}$ , $I_C = 500\text{ }\mu\text{A}$	600	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	$V_{GE} = 15\text{ V}$ , $I_C = 100\text{ A}$	-	1.16	1.34	
		$V_{GE} = 15\text{ V}$ , $I_C = 200\text{ A}$	-	1.37	-	
		$V_{GE} = 15\text{ V}$ , $I_C = 100\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$	-	1.08	-	
Gate threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$ , $I_C = 3.2\text{ mA}$	4.9	5.8	8.8	
Temperature coefficient of threshold voltage	$\Delta V_{GE(th)}/\Delta T_J$	$V_{CE} = V_{GE}$ , $I_C = 3.2\text{ mA}$ , ( $25\text{ }^\circ\text{C}$ to $125\text{ }^\circ\text{C}$ )	-	-27	-	mV/ $^\circ\text{C}$
Forward transconductance	$g_{fe}$	$V_{CE} = 20\text{ V}$ , $I_C = 50\text{ A}$	-	93	-	S
Transfer characteristics	$V_{GE}$	$V_{CE} = 20\text{ V}$ , $I_C = 100\text{ A}$	-	10.2	-	V
Collector to emitter leakage current	$I_{CES}$	$V_{GE} = 0\text{ V}$ , $V_{CE} = 600\text{ V}$	-	1.0	150	$\mu\text{A}$
		$V_{GE} = 0\text{ V}$ , $V_{CE} = 600\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$	-	300	-	
Diode forward voltage drop	$V_{FM}$	$I_C = 100\text{ A}$ , $V_{GE} = 0\text{ V}$	-	1.36	1.96	V
		$I_C = 100\text{ A}$ , $V_{GE} = 0\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$	-	1.17	-	
Gate to emitter leakage current	$I_{GES}$	$V_{GE} = \pm 20\text{ V}$	-	-	$\pm 500$	nA



<b>SWITCHING CHARACTERISTICS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Total gate charge	$Q_g$	$I_C = 100\text{ A}$ , $V_{CC} = 400\text{ V}$	-	942	-	nC
Gate to emitter charge	$Q_{ge}$		-	295	-	
Gate to collector charge	$Q_{gc}$		-	802	-	
Turn-on switching energy	$E_{on}$	$I_C = 100\text{ A}$ , $V_{CC} = 300\text{ V}$ , $V_{GE} = 15\text{ V}$ , $L = 500\text{ }\mu\text{H}$ $R_g = 3.3\text{ }\Omega$ , $T_J = 25\text{ }^\circ\text{C}$	-	1.0	-	mJ
Turn-off switching energy	$E_{off}$		-	7.9	-	
Total switching energy	$E_{ts}$		-	8.9	-	ns
Turn-on delay time	$t_{d(on)}$		-	242	-	
Rise time	$t_r$		-	66	-	
Turn-off delay time	$t_{d(off)}$		-	453	-	
Fall time	$t_f$	-	460	-		
Turn-on switching energy	$E_{on}$	$I_C = 100\text{ A}$ , $V_{CC} = 300\text{ V}$ , $V_{GE} = 15\text{ V}$ , $L = 500\text{ }\mu\text{H}$ $R_g = 3.3\text{ }\Omega$ , $T_J = 125\text{ }^\circ\text{C}$	-	2.0	-	mJ
Turn-off switching energy	$E_{off}$		-	15.3	-	
Total switching energy	$E_{ts}$		-	17.3	-	ns
Turn-on delay time	$t_{d(on)}$		-	257	-	
Rise time	$t_r$		-	68	-	
Turn-off delay time	$t_{d(off)}$		-	716	-	
Fall time	$t_f$	-	868	-		
Reverse bias safe operating area	RBSOA	$T_J = 150\text{ }^\circ\text{C}$ , $I_C = 440\text{ A}$ , $V_{CC} = 300\text{ V}$ , $V_p = 600\text{ V}$ , $R_g = 3.3\text{ }\Omega$ , $V_{GE} = 15\text{ V to } 0\text{ V}$ , $L = 500\text{ }\mu\text{H}$	Fullsquare			
Diode reverse recovery time	$t_{rr}$	$I_F = 50\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_{rr} = 200\text{ V}$	-	115	-	ns
Diode peak reverse current	$I_{rr}$		-	11	-	A
Diode recovery charge	$Q_{rr}$		-	638	-	nC
Diode reverse recovery time	$t_{rr}$	$I_F = 50\text{ A}$ , $di_F/dt = 200\text{ A}/\mu\text{s}$ , $V_{rr} = 200\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$	-	210	-	ns
Diode peak reverse current	$I_{rr}$		-	21.4	-	A
Diode recovery charge	$Q_{rr}$		-	2251	-	nC

<b>THERMAL AND MECHANICAL SPECIFICATIONS</b>						
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	
Operating junction temperature range	$T_J$	-40	-	150	°C	
Storage temperature range	$T_{Stg}$	-40	-	125		
Junction to case	per switch	-	-	0.16	°C/W	
	per diode	-	-	0.48		
Case to sink per module	$R_{thCS}$	-	0.1	-		
Mounting torque	case to heatsink	-	-	4	Nm	
	case to terminal 1, 2, 3	-	-	3		
Weight		-	185	-	g	

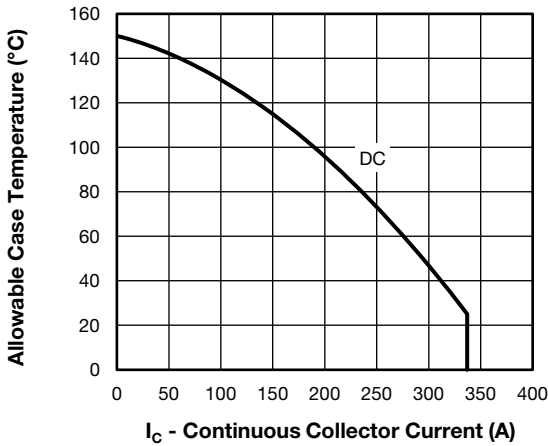


Fig. 1 - Maximum IGBT Continuous Collector Current vs. Case Temperature

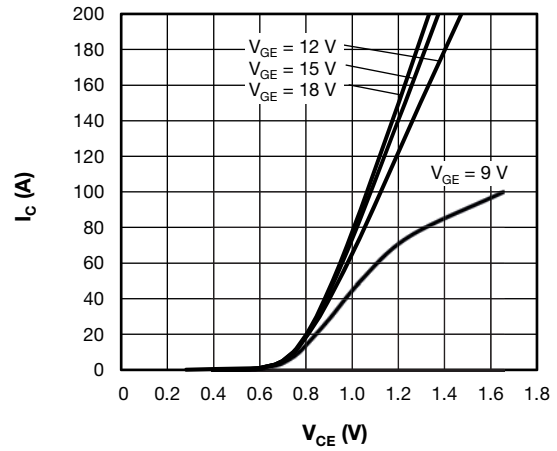


Fig. 4 - Typical IGBT Output Characteristics,  $T_J = 125\text{ }^\circ\text{C}$

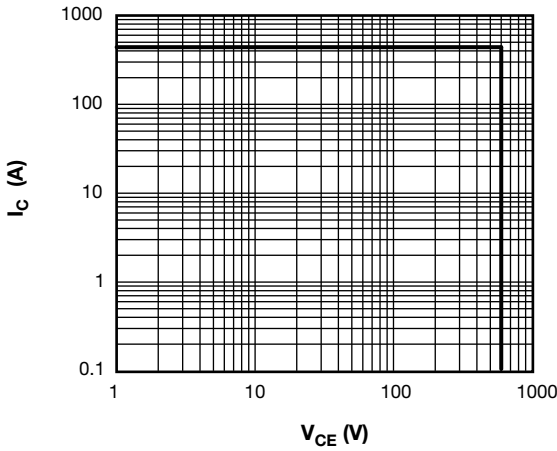


Fig. 2 - IGBT Reverse BIAS SOA  $T_J = 150\text{ }^\circ\text{C}$ ,  $V_{GE} = 15\text{ V}$

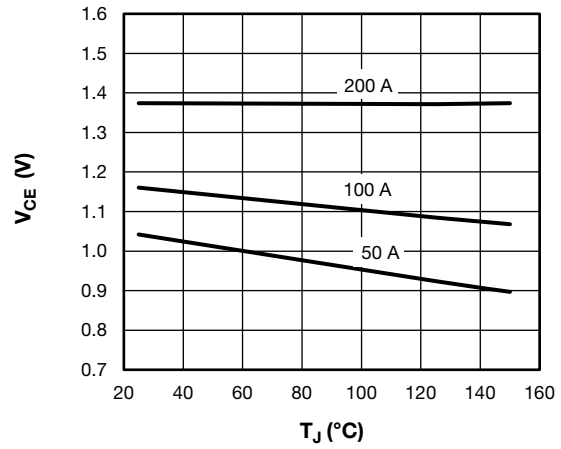


Fig. 5 - Collector to Emitter Voltage vs. Junction Temperature

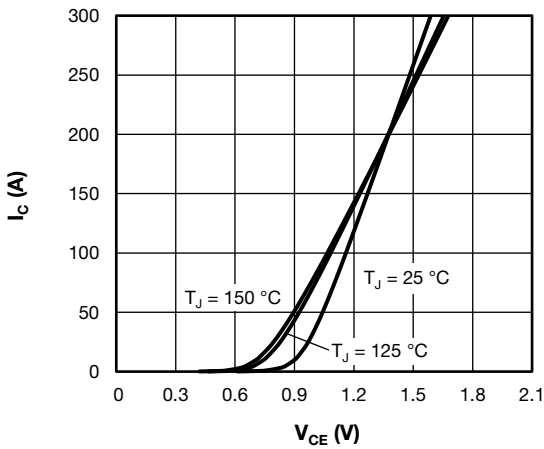


Fig. 3 - Typical IGBT Output Characteristics,  $V_{GE} = 15\text{ V}$

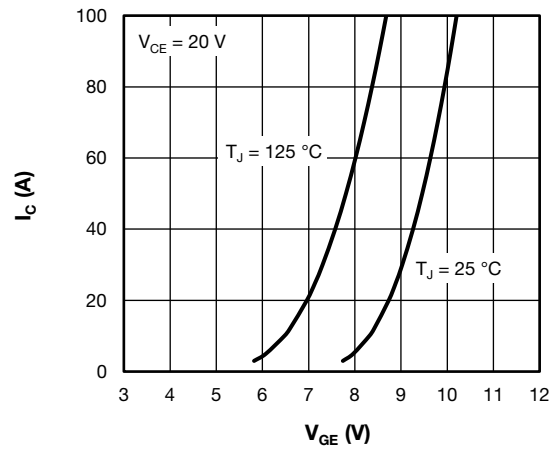


Fig. 6 - Typical IGBT Transfer Characteristics

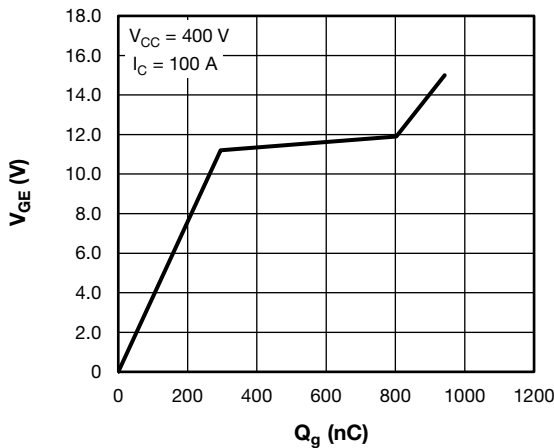


Fig. 7 - Typical Total Gate Charge vs. Gate to Emitter Voltage

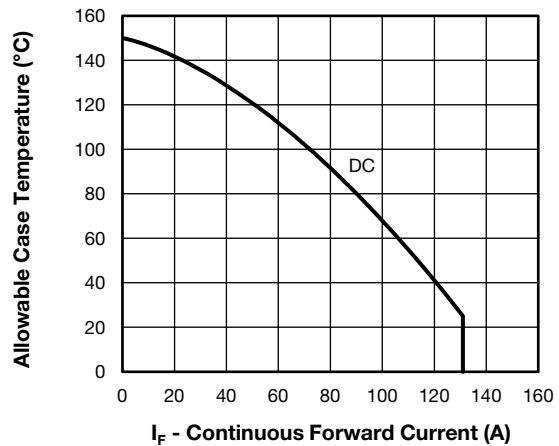


Fig. 10 - Maximum Diode Continuous Forward Current vs. Case Temperature

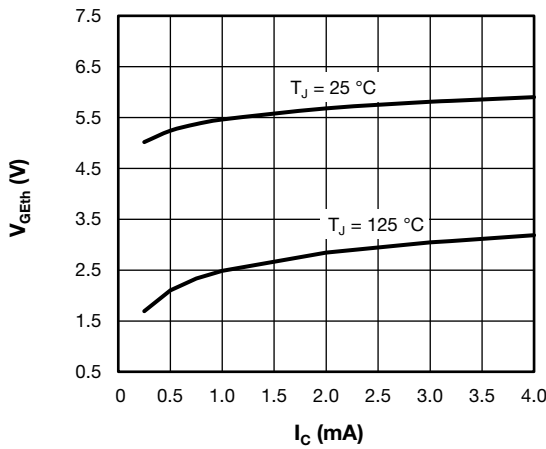


Fig. 8 - Typical IGBT Gate Threshold Voltage

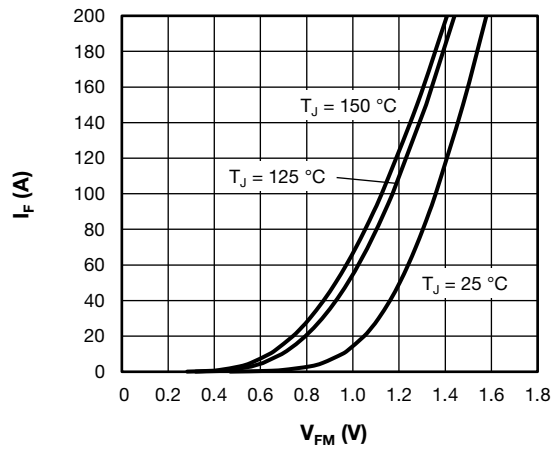


Fig. 11 - Typical Diode Forward Characteristics

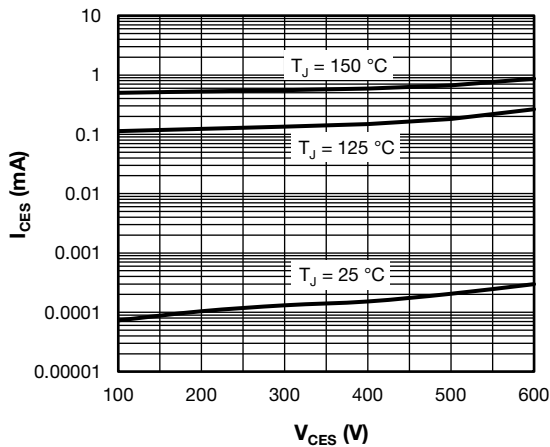


Fig. 9 - Typical IGBT Zero Gate Voltage Collector Current

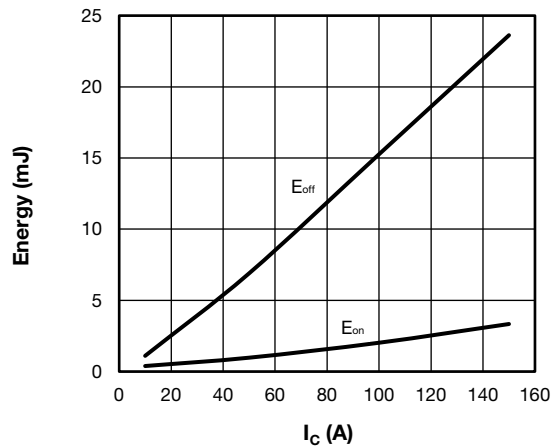


Fig. 12 - Typical IGBT Energy Loss vs.  $I_C$   
 $T_J = 125\text{ }^\circ\text{C}$ ,  $V_{CC} = 300\text{ V}$ ,  $R_g = 3.3\ \Omega$ ,  $V_{GE} = 15\text{ V}$ ,  $L = 500\ \mu\text{H}$

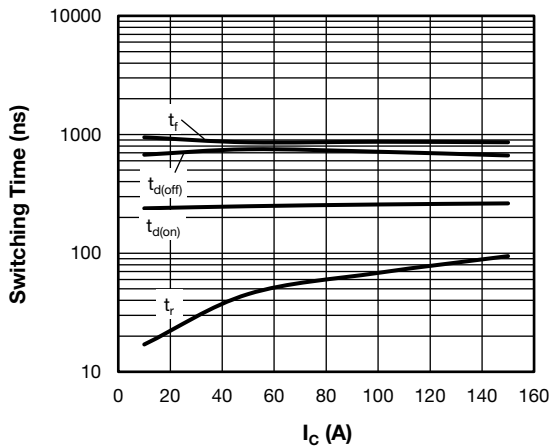


Fig. 13 - Typical IGBT Switching Time vs.  $I_C$   
 $T_J = 125^\circ\text{C}$ ,  $V_{CC} = 300\text{ V}$ ,  $R_g = 3.3\ \Omega$ ,  $V_{GE} = 15\text{ V}$ ,  $L = 500\ \mu\text{H}$

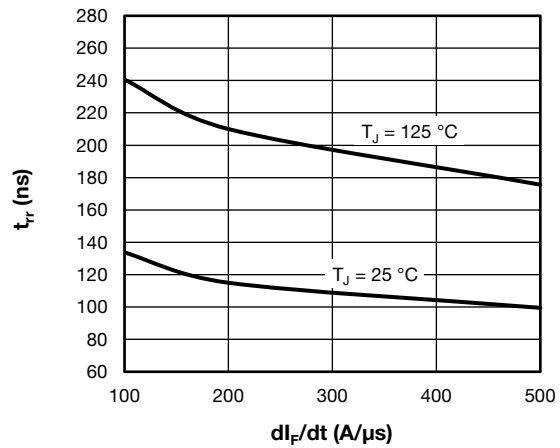


Fig. 16 - Typical Diode Reverse Recovery Time vs.  $di_F/dt$   
 $V_{rr} = 200\text{ V}$ ,  $I_F = 50\text{ A}$

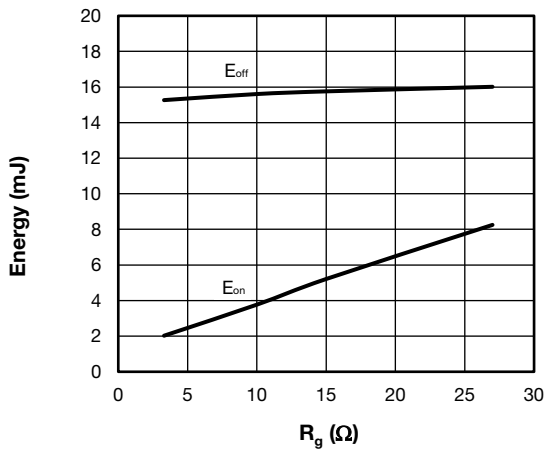


Fig. 14 - Typical IGBT Energy Loss vs.  $R_g$   
 $T_J = 125^\circ\text{C}$ ,  $V_{CC} = 300\text{ V}$ ,  $I_C = 100\text{ A}$ ,  $V_{GE} = 15\text{ V}$ ,  $L = 500\ \mu\text{H}$

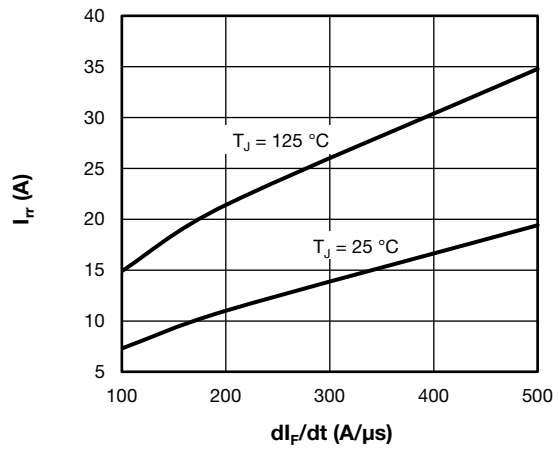


Fig. 17 - Typical Diode Reverse Recovery Current vs.  $di_F/dt$   
 $V_{rr} = 200\text{ V}$ ,  $I_F = 50\text{ A}$

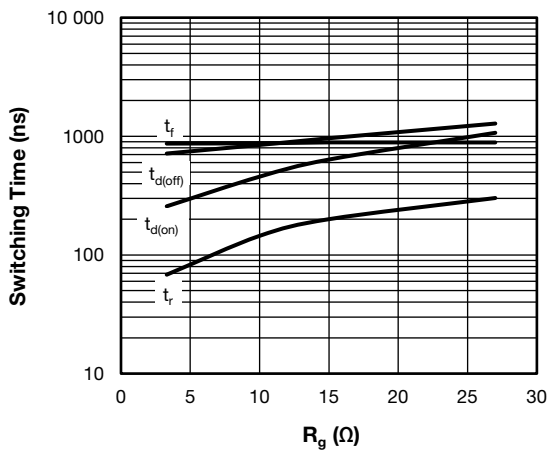


Fig. 15 - Typical IGBT Switching Time vs.  $R_g$   
 $T_J = 125^\circ\text{C}$ ,  $V_{CC} = 300\text{ V}$ ,  $I_C = 100\text{ A}$ ,  $V_{GE} = 15\text{ V}$ ,  $L = 500\ \mu\text{H}$

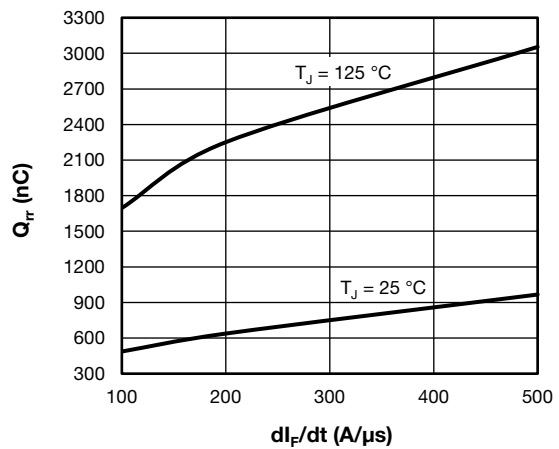


Fig. 18 - Typical Diode Reverse Recovery Charge vs.  $di_F/dt$   
 $V_{rr} = 200\text{ V}$ ,  $I_F = 50\text{ A}$

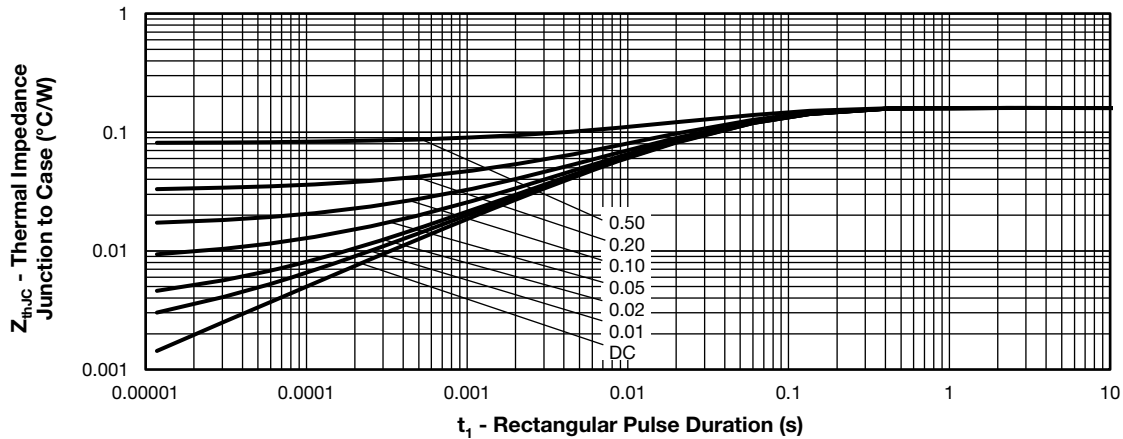


Fig. 19 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics - (IGBT)

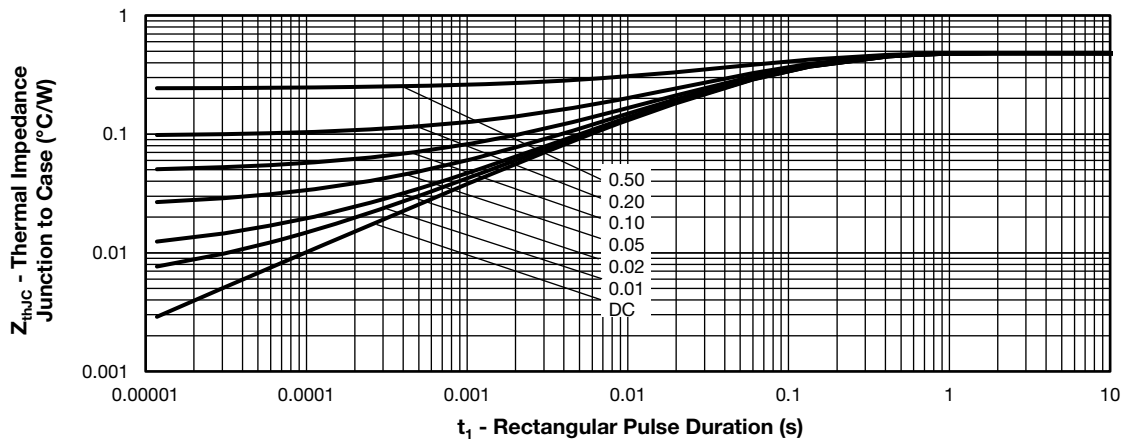


Fig. 20 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics - (Diode)

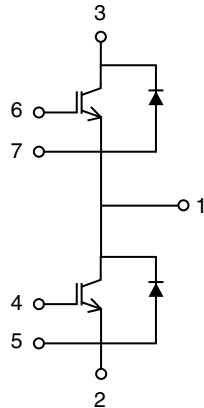
**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>GP</b>	<b>100</b>	<b>T</b>	<b>S</b>	<b>60</b>	<b>S</b>	<b>F</b>	<b>PbF</b>
	①	②	③	④	⑤	⑥	⑦	⑧	⑨

- 1** - Vishay Semiconductors product
- 2** - IGBT die technology (GP = Trench PT)
- 3** - Current rating (100 = 100 A)
- 4** - Circuit configuration (T = Half bridge)
- 5** - Package indicator (S = INT-A-PAK)
- 6** - Voltage code (60 = 600 V)
- 7** - Speed/type (S = standard speed IGBT)
- 8** - Diode type
- 9** - None = Standard production; PbF = Lead (Pb)-free



## CIRCUIT CONFIGURATION



### LINKS TO RELATED DOCUMENTS

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95173">www.vishay.com/doc?95173</a>







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## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

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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.);

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- 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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