

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

Proprietary Vishay IGBT Silicon “L Series”



INT-A-PAK

FEATURES

- Trench PT IGBT technology
- FRED Pt® anti-parallel diodes with fast recovery
- Very low conduction losses
- Al₂O₃ DBC
- UL pending
- Designed for industrial level
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

PRIMARY CHARACTERISTICS	
V _{CES}	600 V
I _C DC, T _C = 130 °C	100 A
V _{CE(on)} at 100 A, 25 °C	1.16 V
Speed	DC to 1 kHz
Package	INT-A-PAK
Circuit configuration	Half bridge

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 °C	337	A
		T _C = 80 °C	235	
Pulsed collector current	I _{CM}		440	
Peak switching current	I _{LM}		440	
Gate to emitter voltage	V _{GE}		± 20	V
RMS isolation voltage	V _{ISOL}	Any terminal to case, t = 1 min	2500	
Maximum power dissipation	P _D	T _C = 25 °C	781	W
		T _C = 100 °C	312	
Operating junction temperature range	T _J		-40 to +150	°C
Storage temperature range	T _{Stg}		-40 to +125	

ELECTRICAL SPECIFICATIONS (T _J = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Collector to emitter breakdown voltage	V _{BR(CES)}	V _{GE} = 0 V, I _C = 500 μA	600	-	-	V
Collector to emitter voltage	V _{CE(on)}	V _{GE} = 15 V, I _C = 100 A	-	1.16	1.34	
		V _{GE} = 15 V, I _C = 200 A	-	1.37	-	
		V _{GE} = 15 V, I _C = 100 A, T _J = 125 °C	-	1.08	-	
Gate threshold voltage	V _{GE(th)}	V _{CE} = V _{GE} , I _C = 3.2 mA	4.9	5.8	8.8	
Temperature coefficient of threshold voltage	ΔV _{GE(th)/ΔT_J}	V _{CE} = V _{GE} , I _C = 3.2 mA, (25 °C to 125 °C)	-	-27	-	mV/°C
Forward transconductance	g _{fe}	V _{CE} = 20 V, I _C = 50 A	-	93	-	S
Transfer characteristics	V _{GE}	V _{CE} = 20 V, I _C = 100 A	-	10.2	-	V
Collector to emitter leakage current	I _{CES}	V _{GE} = 0 V, V _{CE} = 600 V	-	1.0	150	μA
		V _{GE} = 0 V, V _{CE} = 600 V, T _J = 125 °C	-	300	-	
Diode forward voltage drop	V _{FM}	I _C = 100 A, V _{GE} = 0 V	-	1.36	1.96	V
		I _C = 100 A, V _{GE} = 0 V, T _J = 125 °C	-	1.17	-	
Gate to emitter leakage current	I _{GES}	V _{GE} = ± 20 V	-	-	± 500	nA



SWITCHING CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ 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	-	
Turn-on delay time	$t_{d(on)}$		ns	-	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	-	
Turn-on delay time	$t_{d(on)}$		ns	-	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

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL		MIN.	TYP.	MAX.	UNITS
Operating junction temperature range	T_J		-40	-	150	$^\circ\text{C}$
Storage temperature range	T_{Stg}		-40	-	125	
Junction to case	per switch	R_{thJC}	-	-	0.16	$^\circ\text{C}/\text{W}$
	per diode		-	-	0.48	
Case to sink per module	R_{thCS}		-	0.1	-	
Mounting torque $\pm 10\%$	to heatsink	A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow the spread of the compound	4 to 6			Nm
	busbar					
Weight			-	185	-	g

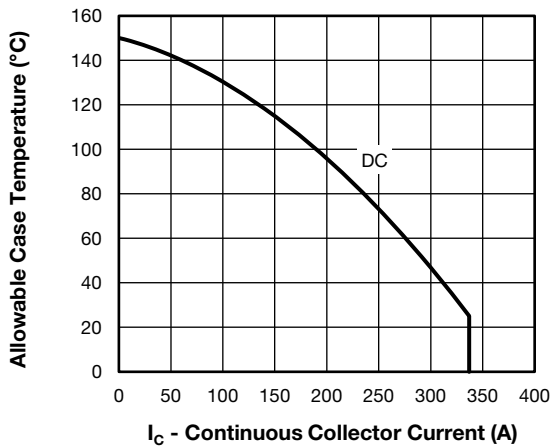


Fig. 1 - Maximum IGBT Continuous Collector Current vs. Case Temperature

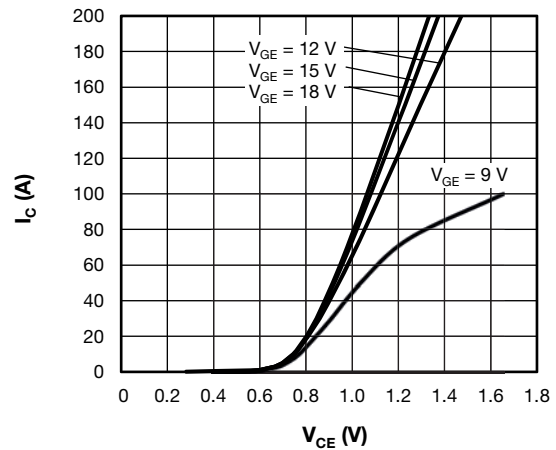


Fig. 4 - Typical IGBT Output Characteristics, $T_J = 125\text{ }^\circ\text{C}$

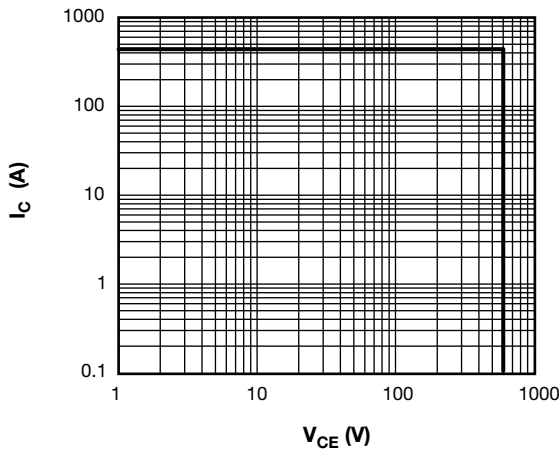


Fig. 2 - IGBT Reverse BIAS SOA $T_J = 150\text{ }^\circ\text{C}$, $V_{GE} = 15\text{ V}$

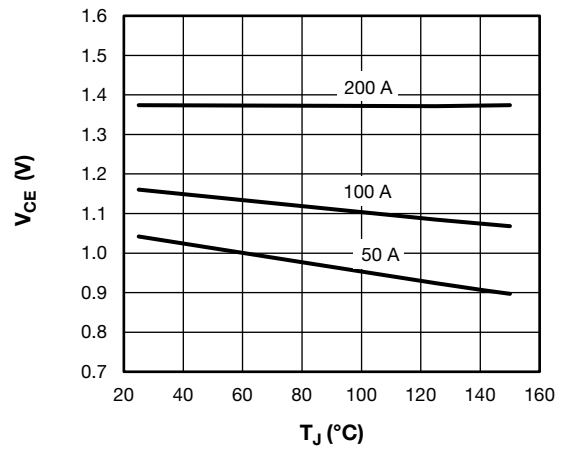


Fig. 5 - Collector to Emitter Voltage vs. Junction Temperature

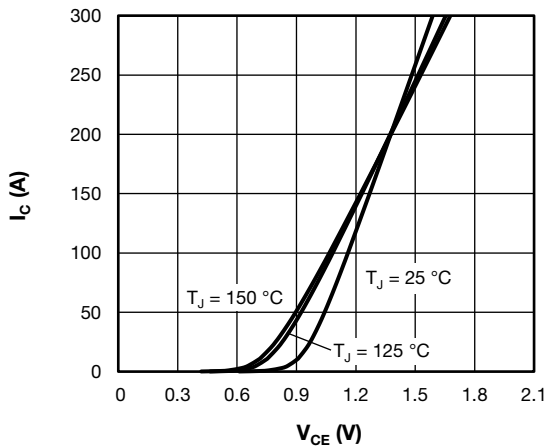


Fig. 3 - Typical IGBT Output Characteristics, $V_{GE} = 15\text{ V}$

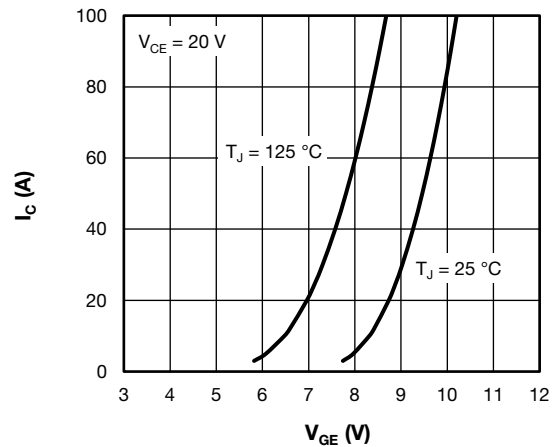


Fig. 6 - Typical IGBT Transfer Characteristics

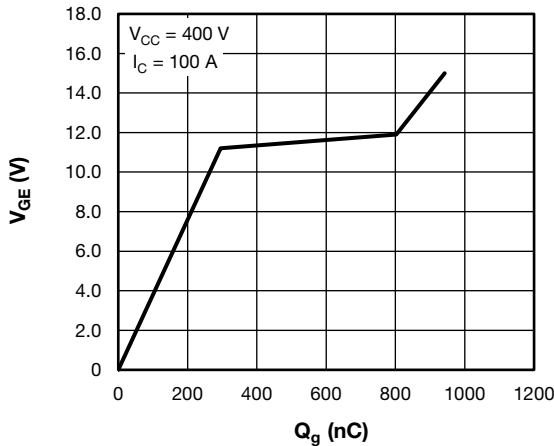


Fig. 7 - Typical Total Gate Charge vs. Gate to Emitter Voltage

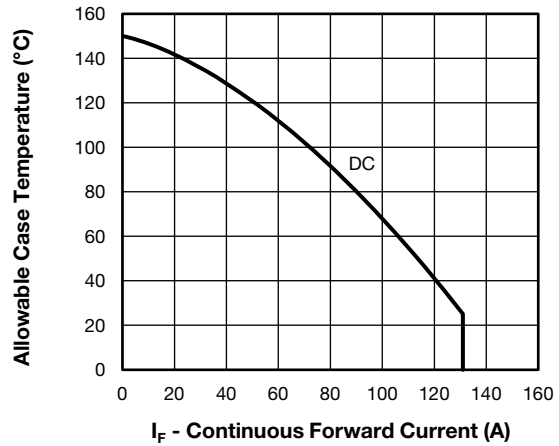


Fig. 10 - Maximum Diode Continuous Forward Current vs. Case Temperature

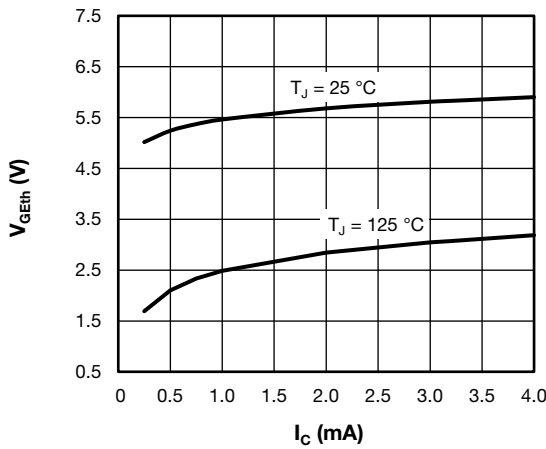


Fig. 8 - Typical IGBT Gate Threshold Voltage

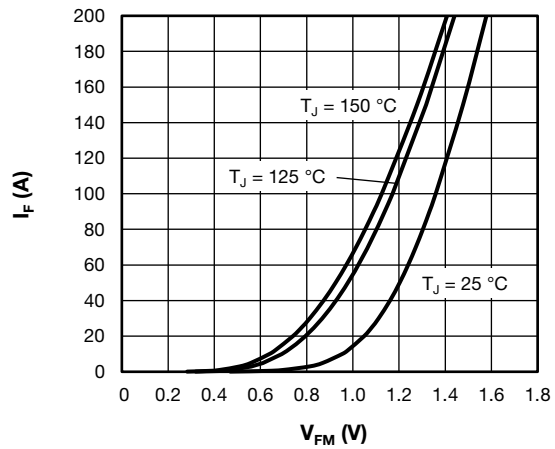


Fig. 11 - Typical Diode Forward Characteristics

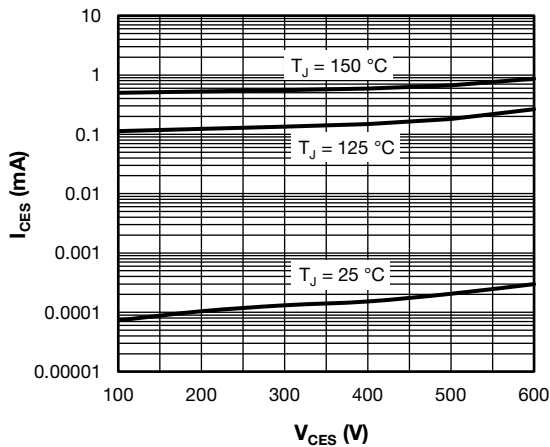


Fig. 9 - Typical IGBT Zero Gate Voltage Collector Current

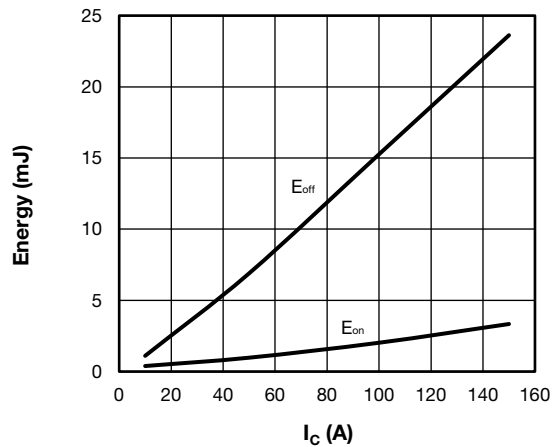


Fig. 12 - Typical IGBT Energy Loss vs. I_C
 $T_J = 125\text{ }^\circ\text{C}$, $V_{CC} = 300\text{ V}$, $R_g = 3.3\ \Omega$, $V_{GE} = 15\text{ V}$, $L = 500\ \mu\text{H}$

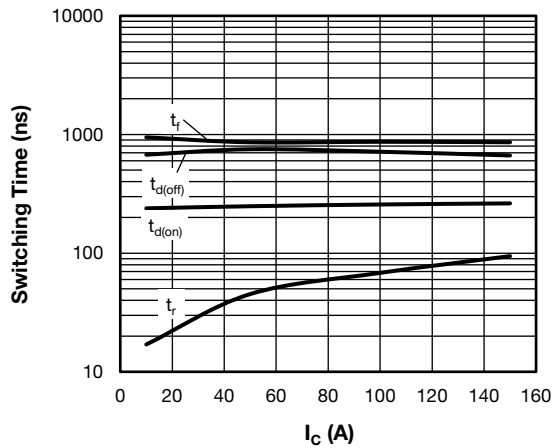


Fig. 13 - Typical IGBT Switching Time vs. I_C
 $T_J = 125^\circ\text{C}$, $V_{CC} = 300\text{ V}$, $R_g = 3.3\ \Omega$, $V_{GE} = 15\text{ V}$, $L = 500\ \mu\text{H}$

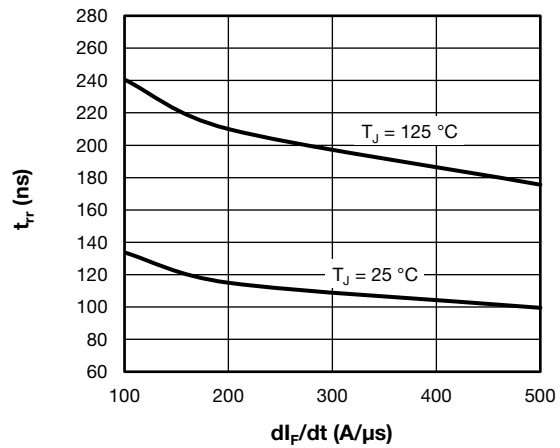


Fig. 16 - Typical Diode Reverse Recovery Time vs. di_F/dt
 $V_{rr} = 200\text{ V}$, $I_F = 50\text{ A}$

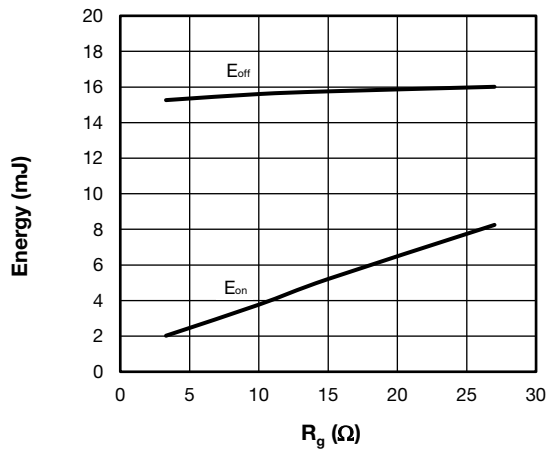


Fig. 14 - Typical IGBT Energy Loss vs. R_g
 $T_J = 125^\circ\text{C}$, $V_{CC} = 300\text{ V}$, $I_C = 100\text{ A}$, $V_{GE} = 15\text{ V}$, $L = 500\ \mu\text{H}$

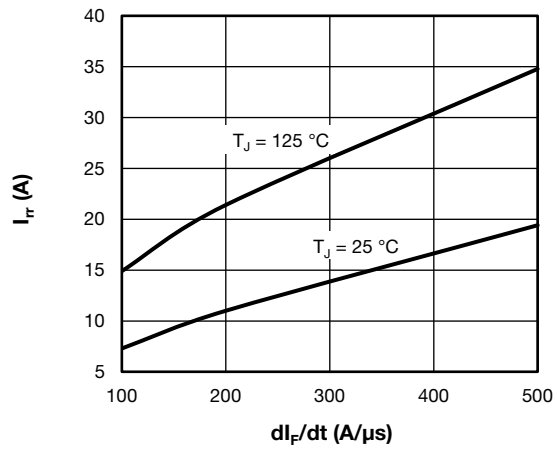


Fig. 17 - Typical Diode Reverse Recovery Current vs. di_F/dt
 $V_{rr} = 200\text{ V}$, $I_F = 50\text{ A}$

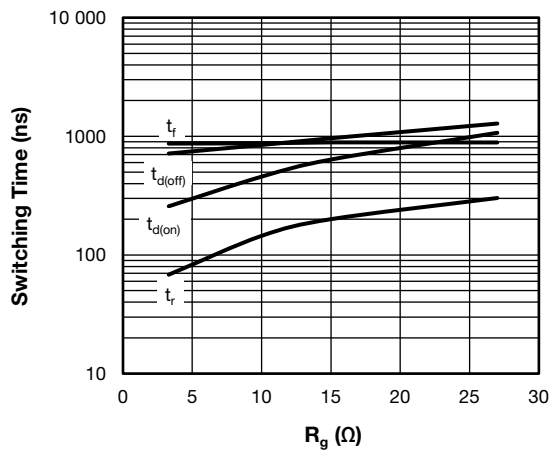


Fig. 15 - Typical IGBT Switching Time vs. R_g
 $T_J = 125^\circ\text{C}$, $V_{CC} = 300\text{ V}$, $I_C = 100\text{ A}$, $V_{GE} = 15\text{ V}$, $L = 500\ \mu\text{H}$

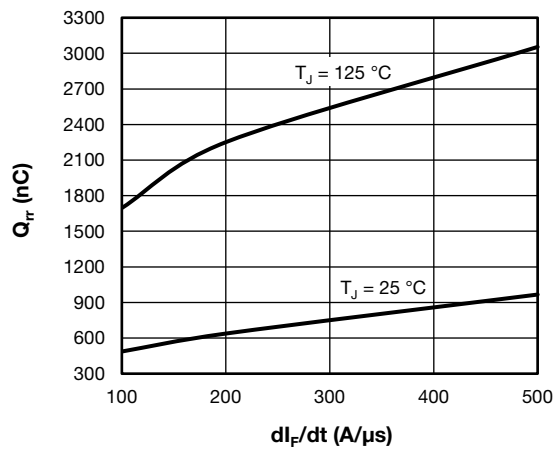


Fig. 18 - Typical Diode Reverse Recovery Charge vs. di_F/dt
 $V_{rr} = 200\text{ V}$, $I_F = 50\text{ A}$

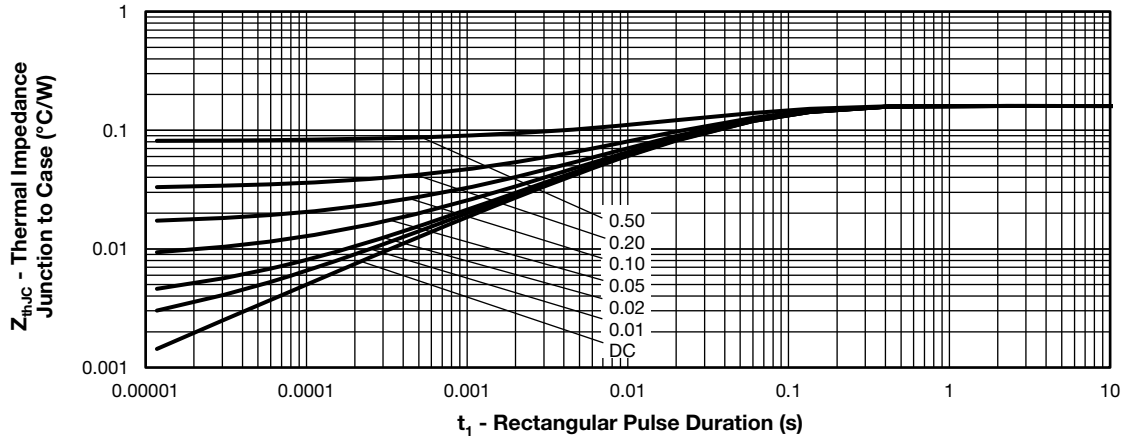


Fig. 19 - Maximum Thermal Impedance Z_{thJC} Characteristics - (IGBT)

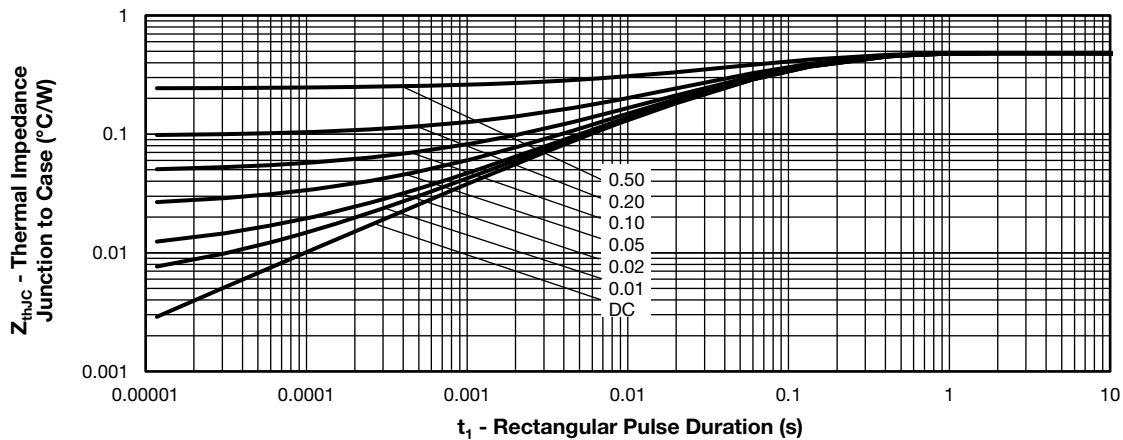


Fig. 20 - Maximum Thermal Impedance Z_{thJC} Characteristics - (Diode)

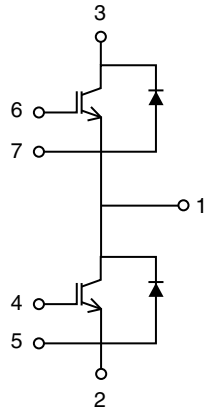
ORDERING INFORMATION TABLE

Device code	VS-	GP	100	T	S	60	S	F	PbF
	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



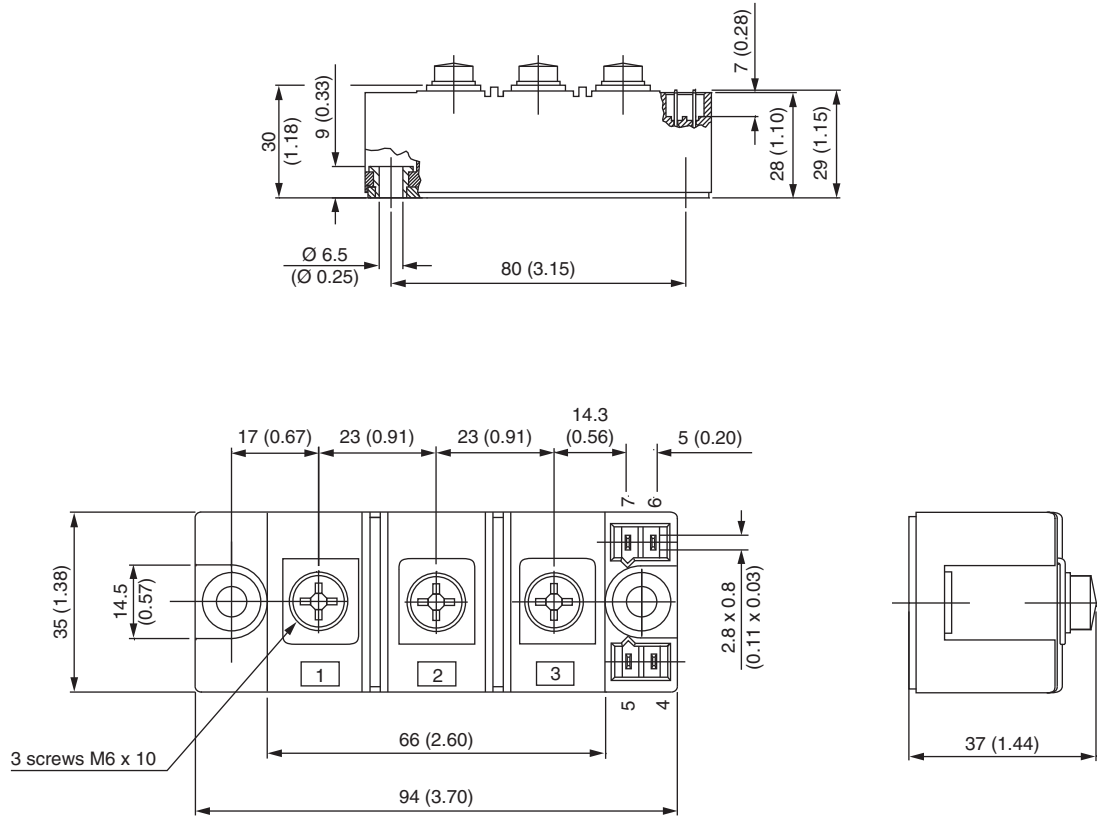
LINKS TO RELATED DOCUMENTS

Dimensions	www.vishay.com/doc?95173
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INT-A-PAK IGBT

DIMENSIONS in millimeters (inches)





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