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

Proprietary Vishay IGBT Silicon "L Series"

INT-A-PAK

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

FEATURES

- Trench PT IGBT technology
- FRED Pt® anti-parallel diodes with fast recovery
- Very low conduction losses
- Al_2O_3 DBC
- UL pending
- Designed for industrial level
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
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 °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	$\Delta V_{GE(th)}/\Delta T_J$	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 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Total gate charge	Q_g	I_C = 100 A, V_{CC} = 400 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 A, V_{CC} = 300 V, V_{GE} = 15 V, L = 500 μH R_g = 3.3 Ω, T_J = 25 °C	-	1.0	-	mJ
Turn-off switching energy	E_{off}		-	7.9	-	
Total switching energy	E_{ts}		-	8.9	-	
Turn-on delay time	$t_{d(on)}$		-	242	-	ns
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 A, V_{CC} = 300 V, V_{GE} = 15 V, L = 500 μH R_g = 3.3 Ω, T_J = 125 °C	-	2.0	-	mJ
Turn-off switching energy	E_{off}		-	15.3	-	
Total switching energy	E_{ts}		-	17.3	-	
Turn-on delay time	$t_{d(on)}$		-	257	-	ns
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°C, I_C = 440 A, V_{CC} = 300 V, V_p = 600 V, R_g = 3.3 Ω, V_{GE} = 15 V to 0 V, L = 500 μH	Fullsquare			
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 200 A/μs, V_{rr} = 200 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 A, dI_F/dt = 200 A/μs, V_{rr} = 200 V, T_J = 125 °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	°C
Storage temperature range		T_{Stg}		-40	-	125	
Junction to case	per switch	R_{thJC}		-	-	0.16	°C/W
	per diode			-	-	0.48	
Case to sink per module		R_{thCS}		-	0.1	-	
Mounting torque ±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

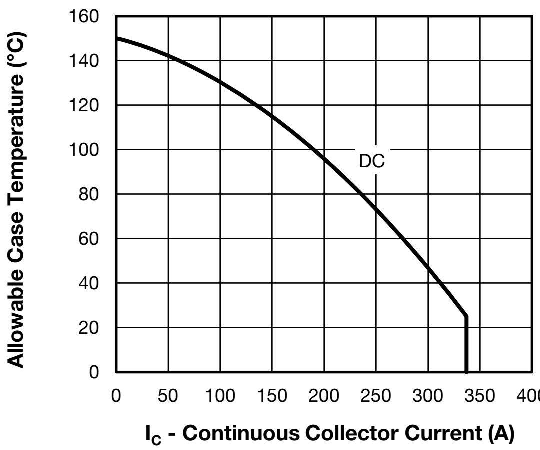


Fig. 1 - Maximum IGBT Continuous Collector Current vs. Case Temperature

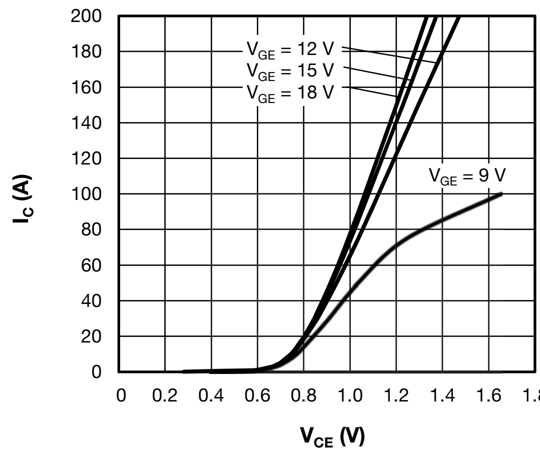


Fig. 4 - Typical IGBT Output Characteristics, T_J = 125 °C

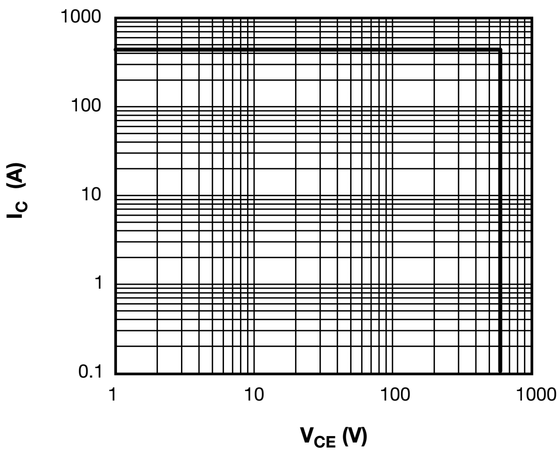


Fig. 2 - IGBT Reverse BIAS SOA T_J = 150 °C, V_{GE} = 15 V

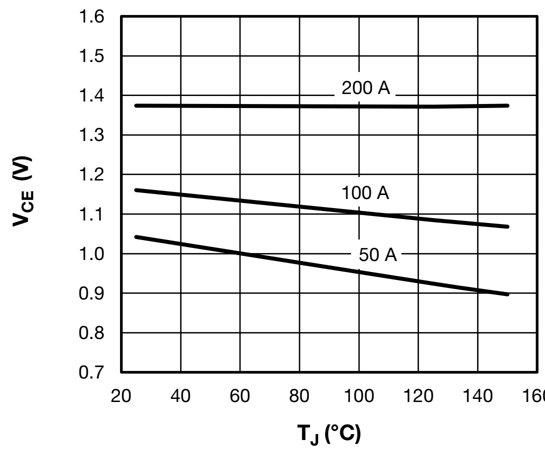


Fig. 5 - Collector to Emitter Voltage vs. Junction Temperature

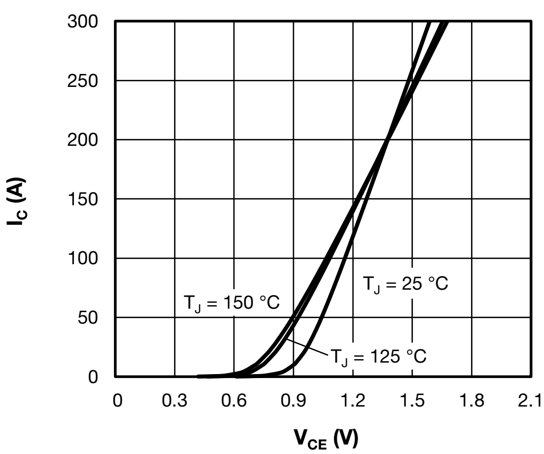


Fig. 3 - Typical IGBT Output Characteristics, V_{GE} = 15 V

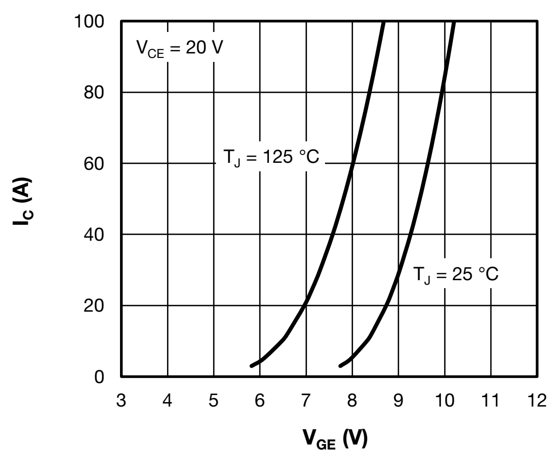


Fig. 6 - Typical IGBT Transfer Characteristics

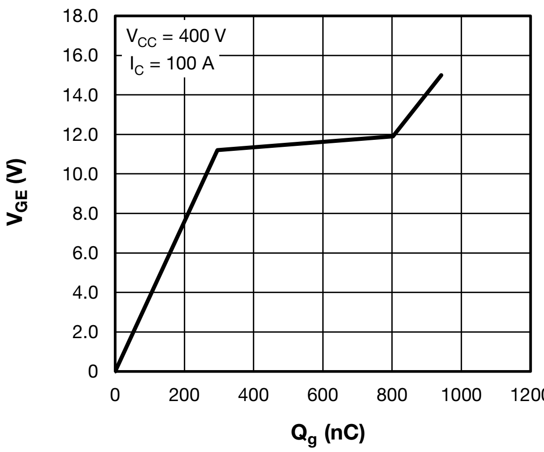


Fig. 7 - Typical Total Gate Charge vs. Gate to Emitter Voltage

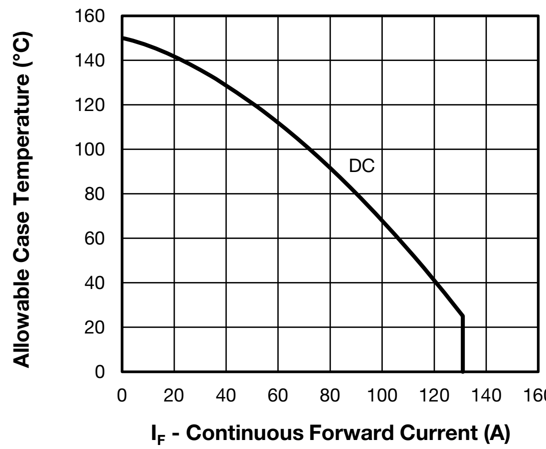


Fig. 10 - Maximum Diode Continuous Forward Current vs. Case Temperature

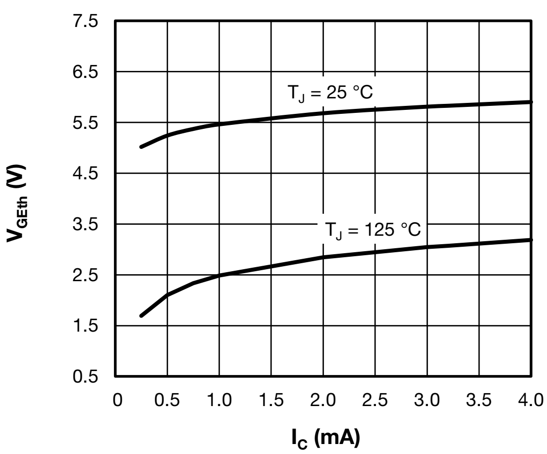


Fig. 8 - Typical IGBT Gate Threshold Voltage

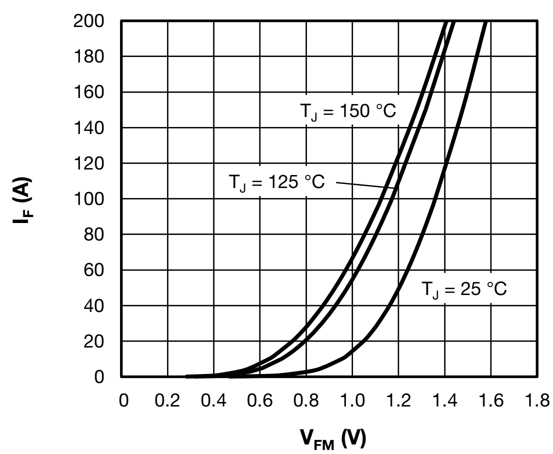


Fig. 11 - Typical Diode Forward Characteristics

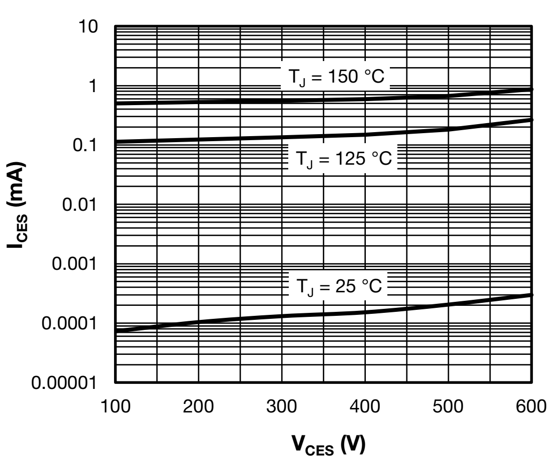


Fig. 9 - Typical IGBT Zero Gate Voltage Collector Current

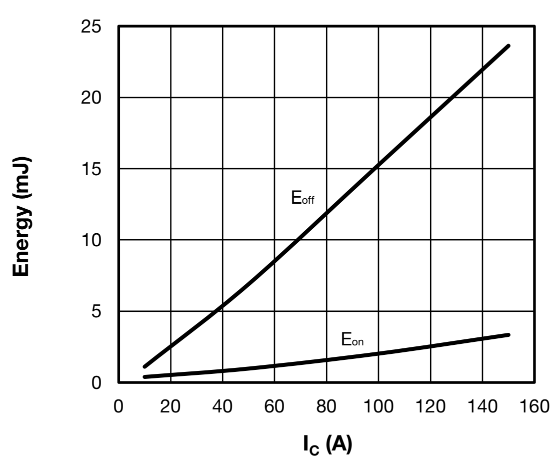


Fig. 12 - Typical IGBT Energy Loss vs. I_C
T_J = 125 °C, V_{CC} = 300 V, R_g = 3.3 Ω, V_{GE} = 15 V, L = 500 μH

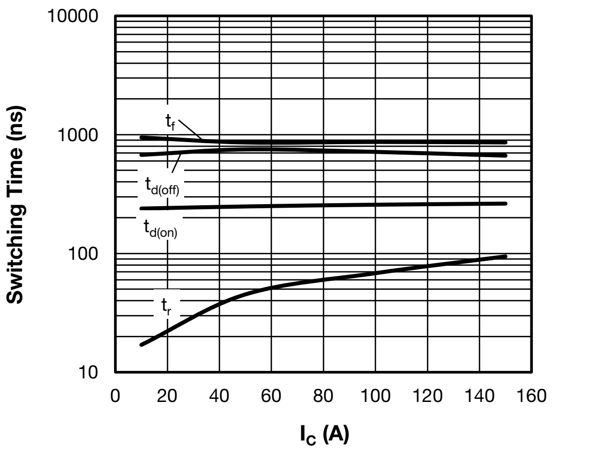


Fig. 13 - Typical IGBT Switching Time vs. I_C
T_J = 125 °C, V_{CC} = 300 V, R_g = 3.3 Ω, V_{GE} = 15 V, L = 500 μH

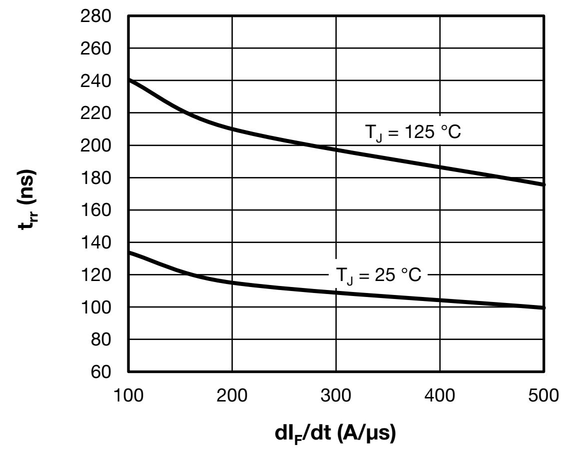


Fig. 16 - Typical Diode Reverse Recovery Time vs. dI_F/dt
V_{rr} = 200 V, I_F = 50 A

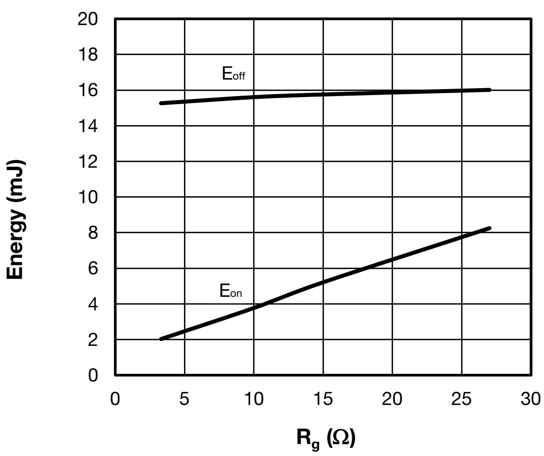


Fig. 14 - Typical IGBT Energy Loss vs. R_g
T_J = 125 °C, V_{CC} = 300 V, I_C = 100 A, V_{GE} = 15 V, L = 500 μH

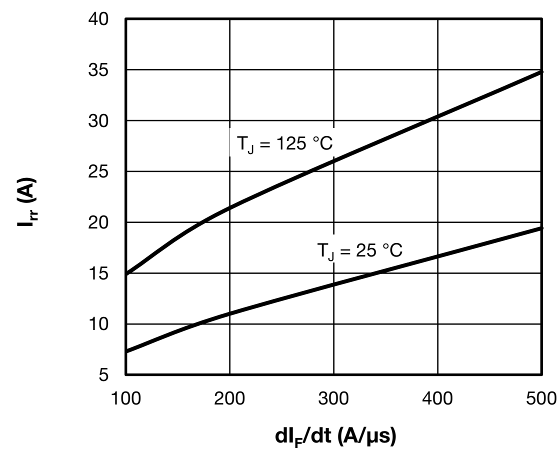


Fig. 17 - Typical Diode Reverse Recovery Current vs. dI_F/dt
V_{rr} = 200 V, I_F = 50 A

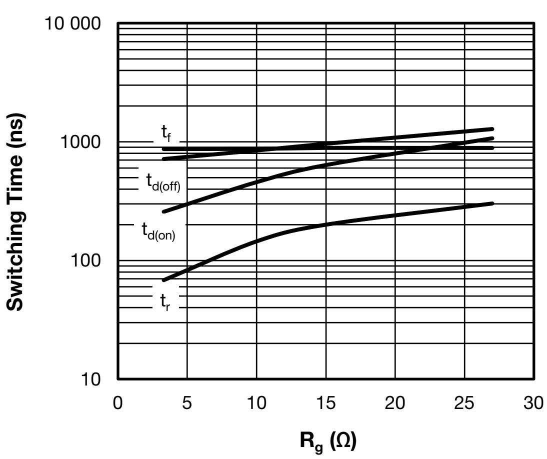


Fig. 15 - Typical IGBT Switching Time vs. R_g
T_J = 125 °C, V_{CC} = 300 V, I_C = 100 A, V_{GE} = 15 V, L = 500 μH

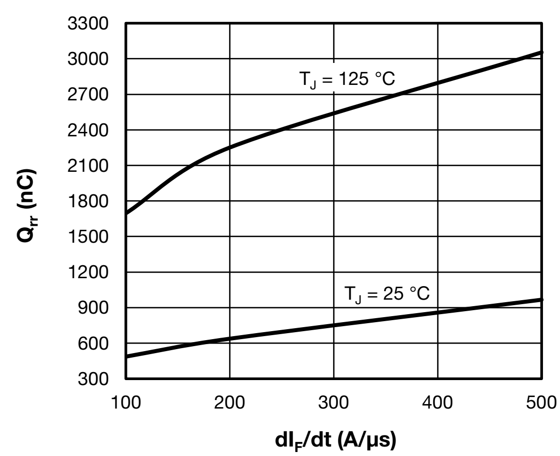


Fig. 18 - Typical Diode Reverse Recovery Charge vs. dI_F/dt)
V_{rr} = 200 V, I_F = 50 A

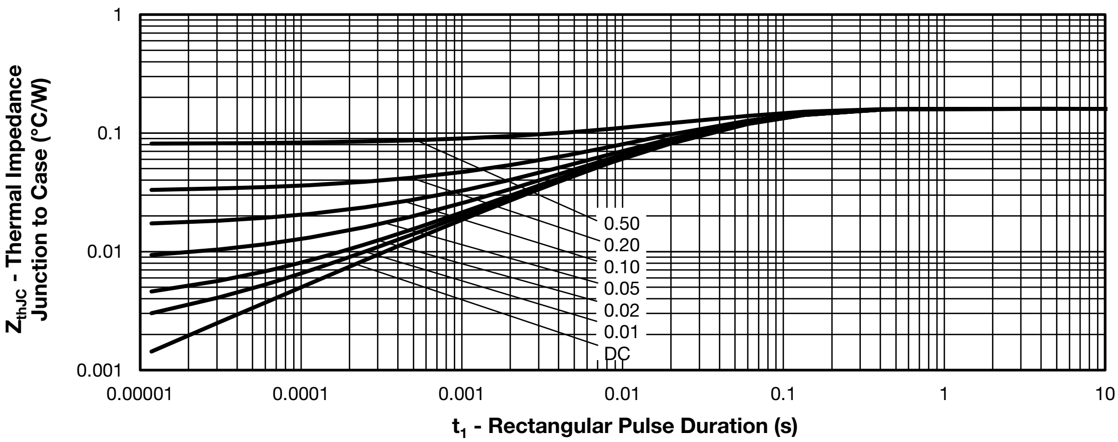


Fig. 19 - Maximum Thermal Impedance Z_{thJC} Characteristics - (IGBT)

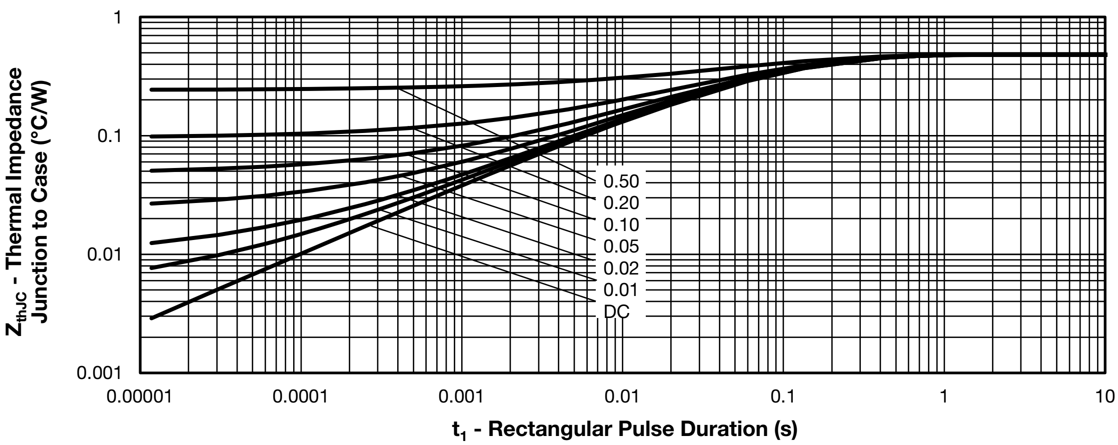


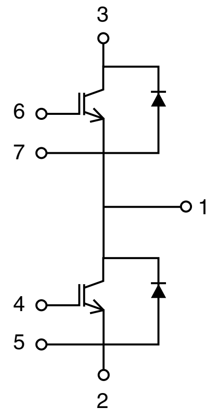
Fig. 20 - Maximum Thermal Impedance Z_{thJC} Characteristics - (Diode))

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

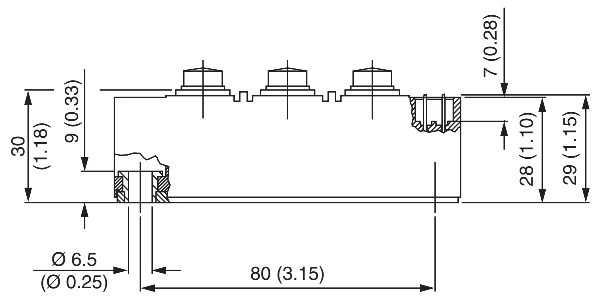
CIRCUIT CONFIGURATION

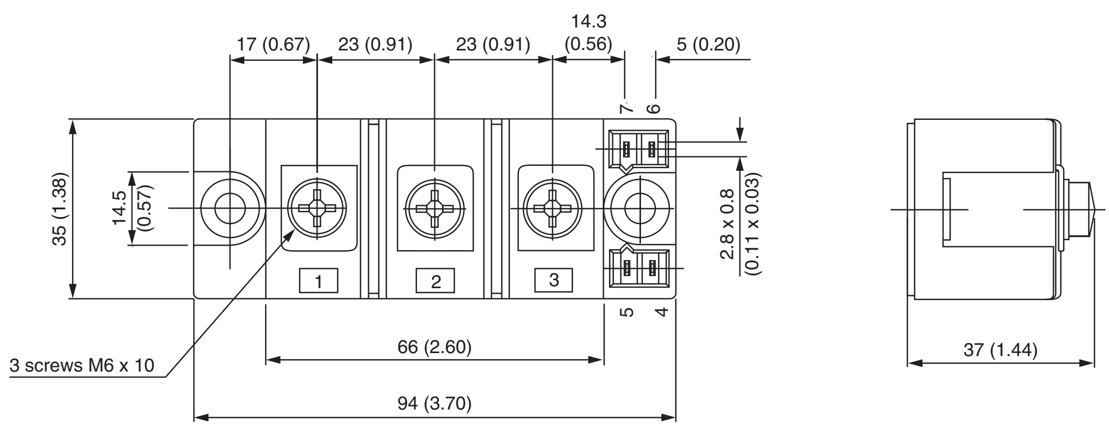


LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95173

INT-A-PAK IGBT

DIMENSIONS in millimeters (inches)





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