Dual INT-A-PAK Low Profile "Half Bridge" (Trench PT IGBT), 300 A

Proprietary Vishay IGBT Silicon "L Series"

Dual INT-A-PAK Low Profile

FEATURES

- Trench PT IGBT technology
- Low $V_{CE(on)}$
- Square RBSOA
- HEXFRED® antiparallel diode with ultrasoft reverse recovery characteristics
- Industry standard package
- Al_2O_3 DBC
- UL approved file E78996
- Designed for industrial level
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

BENEFITS

- Increased operating efficiency
- Performance optimized as output inverter stage for TIG welding machines
- Direct mounting on heatsink
- Very low junction to case thermal resistance

PRIMARY CHARACTERISTICS	
V_{CES}	600 V
I_C DC at T_C = 104 °C	300 A
$V_{CE(on)}$ (typical) at 300 A, 25 °C	1.30 V
Speed	DC to 1 kHz
Package	Dual INT-A-PAK low profile
Circuit configuration	Half bridge

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	V_{CES}		600	V
Continuous collector current	I_C (1)	T_C = 25 °C	580	A
		T_C = 80 °C	400	
Pulsed collector current	I_{CM}		800	
Clamped inductive load current	I_{LM}		800	
Diode continuous forward current	I_F	T_C = 25 °C	219	
		T_C = 80 °C	145	
Gate to emitter voltage	V_{GE}		± 20	V
Maximum power dissipation (IGBT)	P_D	T_C = 25 °C	1136	W
		T_C = 80 °C	636	
RMS isolation voltage	V_{ISOL}	Any terminal to case (V_{RMS} t = 1 s, T_J = 25 °C)	3500	V
Operating junction and storage temperature range	T_J, T_{Stg}		-40 to +150	°C

Note

(1) Maximum continuous collector current must be limited to 500 A to do not exceed the maximum temperature of terminals

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 = 150 A	-	1.12	1.21	
		V_{GE} = 15 V, I_C = 300 A	-	1.30	1.45	
		V_{GE} = 15 V, I_C = 150 A, T_J = 125 °C	-	1.03	-	
		V_{GE} = 15 V, I_C = 300 A, T_J = 125 °C	-	1.26	-	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 6.4 mA	4.9	6.0	8.8	
		V_{CE} = V_{GE}, I_C = 6.4 mA, T_J = 125 °C	-	3.4	-	
Temperature coefficient of threshold voltage	$\Delta V_{GE(th)}/\Delta T$	V_{CE} = V_{GE}, I_C = 6.4 mA, (25 °C to 125 °C)	-	-26	-	mV/°C
Forward transconductance	g_{fe}	V_{CE} = 20 V, I_C = 50 A	-	67	-	S
Transfer characteristics	V_{GE}	V_{CE} = 20 V, I_C = 300 A	-	11.4	-	V
Collector to emitter leakage current	I_{CES}	V_{GE} = 0 V, V_{CE} = 600 V	-	4.0	150	μA
		V_{GE} = 0 V, V_{CE} = 600 V, T_J = 125 °C	-	100	-	
Diode forward voltage drop	V_{FM}	I_{FM} = 150 A	-	1.31	1.41	V
		I_{FM} = 300 A	-	1.56	1.75	
		I_{FM} = 150 A, T_J = 125 °C	-	1.28	-	
		I_{FM} = 300 A, T_J = 125 °C	-	1.63	-	
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**
Turn-on switching energy	E_{on}	I_C = 300 A, V_{CC} = 300 V, V_{GE} = 15 V, R_g = 1.5 Ω, L = 500 μH, T_J = 25 °C	-	6.0	-	mJ
Turn-off switching energy	E_{off}		-	33	-	
Total switching energy	E_{tot}		-	39	-	
Turn-on delay time	$t_{d(on)}$		-	503	-	ns
Rise time	t_r		-	214	-	
Turn-off delay time	$t_{d(off)}$		-	600	-	
Fall time	t_f		-	547	-	
Turn-on switching loss	E_{on}	I_C = 300 A, V_{CC} = 300 V, V_{GE} = 15 V, R_g = 1.5 Ω, L = 500 μH, T_J = 125 °C	-	7.2	-	mJ
Turn-off switching loss	E_{off}		-	55.2	-	
Total switching loss	E_{tot}		-	62.4	-	
Turn-on delay time	$t_{d(on)}$		-	476	-	ns
Rise time	t_r		-	209	-	
Turn-off delay time	$t_{d(off)}$		-	807	-	
Fall time	t_f		-	918	-	
Reverse bias safe operating area	RBSOA	T_J = 150 °C, I_C = 800 A, V_{CC} = 300 V V_P = 600 V, R_g = 1.5 Ω, V_{GE} = 15 V to 0 V, L = 500 μH	Fullsquare			
Diode reverse recovery time	t_{rr}	I_F = 300 A, R_g = 1.5 Ω, V_{CC} = 300 V, T_J = 25 °C	-	119	-	ns
Diode peak reverse current	I_{rr}		-	99	-	A
Diode recovery charge	Q_{rr}		-	7.3	-	μC
Diode reverse recovery time	t_{rr}	I_F = 300 A, R_g = 1.5 Ω, V_{CC} = 300 V, T_J = 125 °C	-	165	-	ns
Diode peak reverse current	I_{rr}		-	127	-	A
Diode recovery charge	Q_{rr}		-	13	-	μC

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER		**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Operating junction and storage temperature range		T_J, T_{Stg}	-40	-	150	°C
Junction to case per leg	IGBT	R_{thJC}	-	-	0.11	°C/W
	diode		-	-	0.4	
Case to sink per module		R_{thCS}	-	0.05	-	
Mounting torque	case to heatsink: M6 screw		4	-	6	Nm
	case to terminal 1, 2, 3: M5 screw		2	-	5	
Weight			-	270	-	g

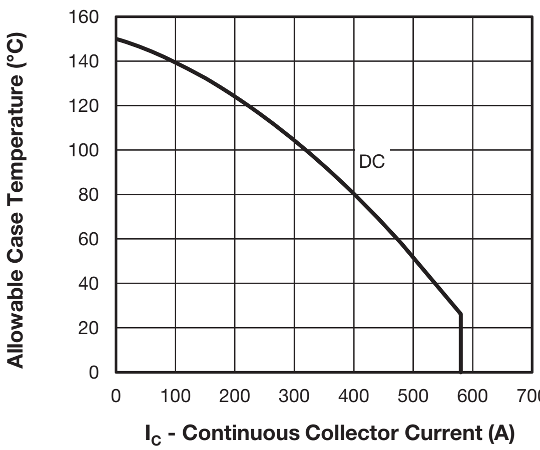


Fig. 1 - Maximum IGBT Continuous Collector Current vs. Case Temperature

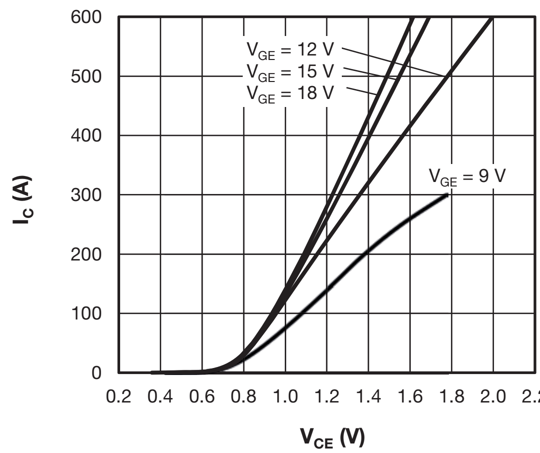


Fig. 3 - Typical IGBT Output Characteristics, T_J = 125 °C

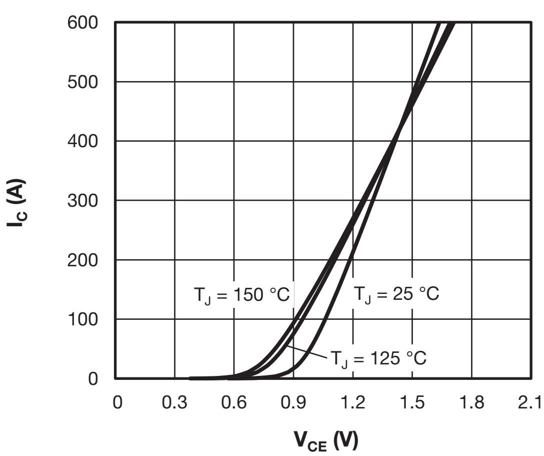


Fig. 2 - Typical IGBT Output Characteristics, V_{GE} = 15 V

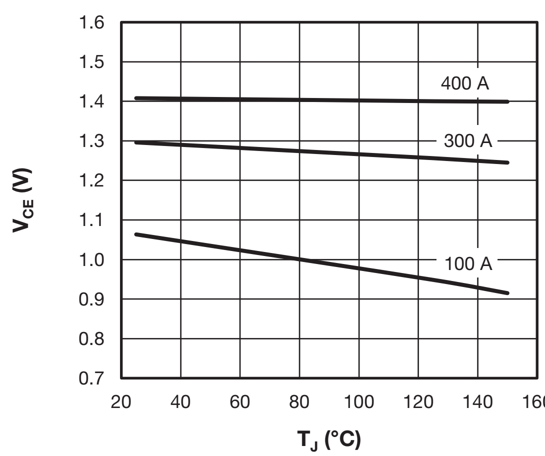


Fig. 4 - Collector to Emitter Voltage vs. Junction Temperature

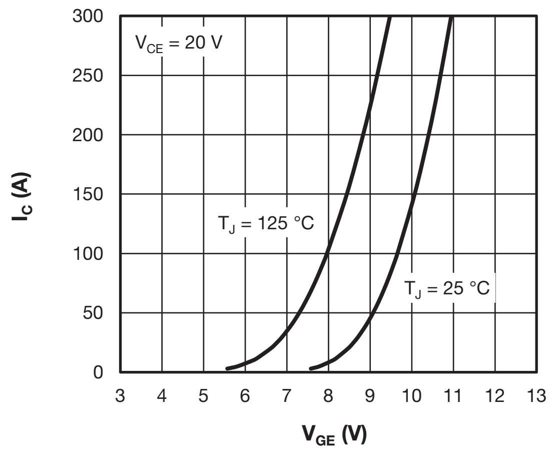


Fig. 5 - Typical IGBT Transfer Characteristics

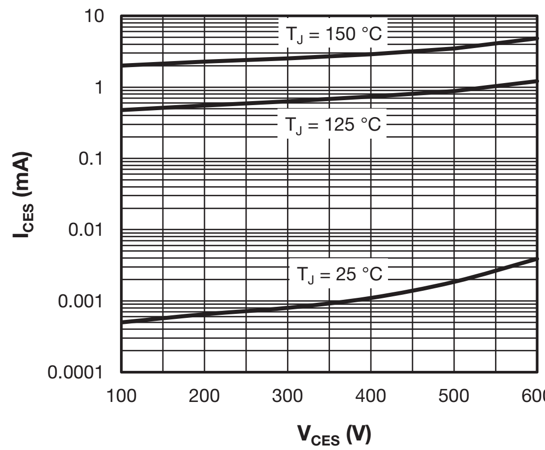


Fig. 8 - Typical IGBT Zero Gate Voltage Collector Current

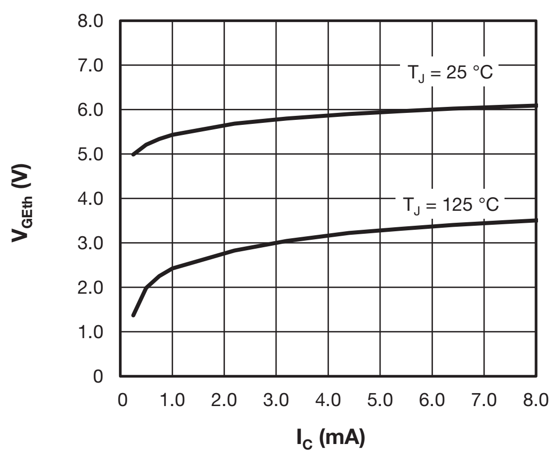


Fig. 6 - Typical IGBT Gate Threshold Voltage

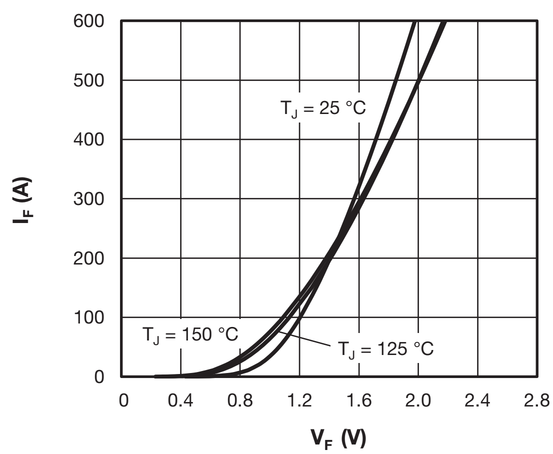


Fig. 9 - Typical Diode Forward Characteristics

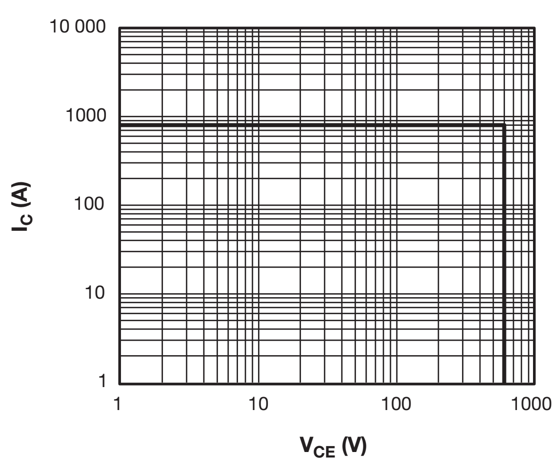


Fig. 7 - IGBT Reverse BIAS SOA T_J = 150 °C, V_{GE} = 15V

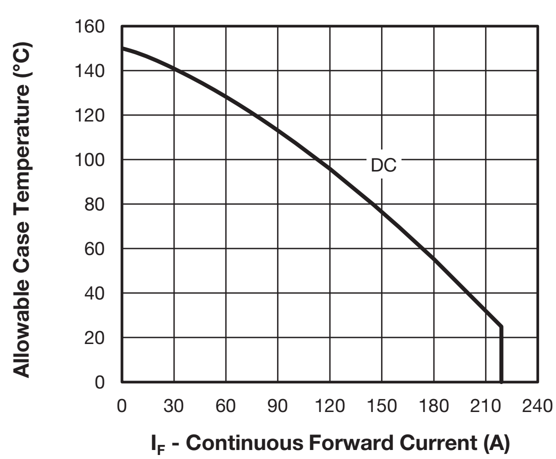


Fig. 10 - Maximum Diode Continuous Forward Current vs. Case Temperature

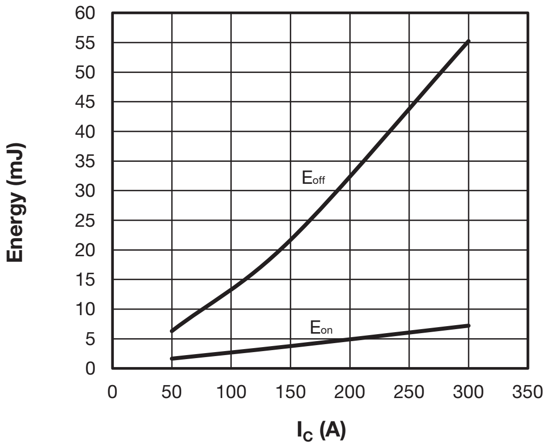


Fig. 11 - Typical IGBT Energy Loss vs. I_C
T_J = 125 °C, V_{CC} = 300 V, R_g = 1.5 Ω, V_{GE} = 15 V, L = 500 μH

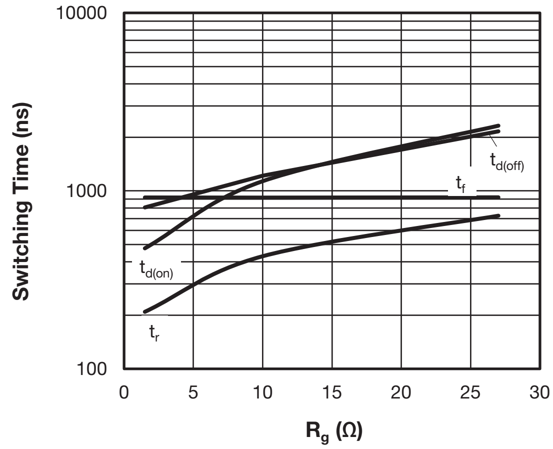


Fig. 14 - Typical IGBT Switching Time vs. R_g
T_J = 125 °C, V_{CC} = 300 V, I_C = 300 A, V_{GE} = 15 V, L = 500 μH

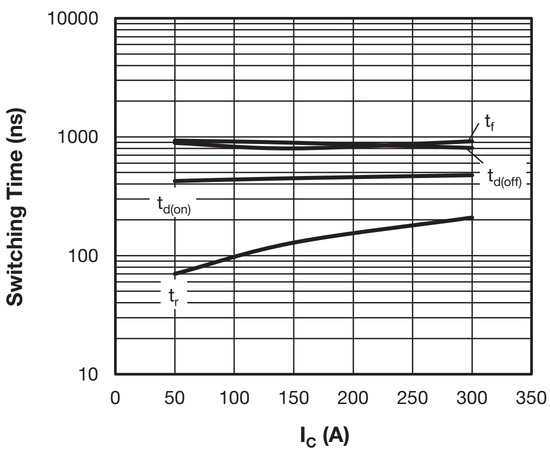


Fig. 12 - Typical IGBT Switching Time vs. I_C
T_J = 125 °C, V_{CC} = 300 V, R_g = 1.5 Ω, V_{GE} = 15 V, L = 500 μH

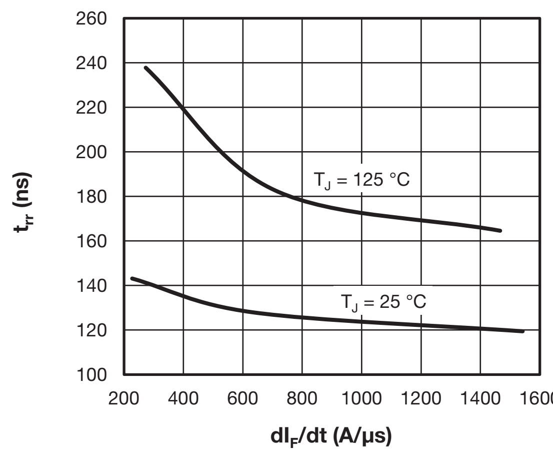


Fig. 15 - Typical Diode Reverse Recovery Time vs. dI_F/dt
V_{CC} = 300 V, I_F = 300 A

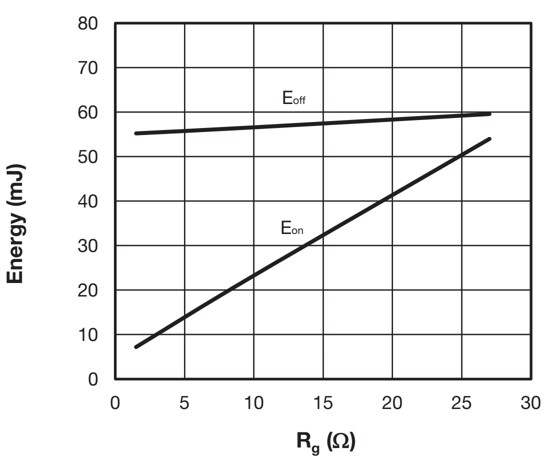


Fig. 13 - Typical IGBT Energy Loss vs. R_g
T_J = 125 °C, V_{CC} = 300 V, I_C = 300 A, V_{GE} = 15 V, L = 500 μH

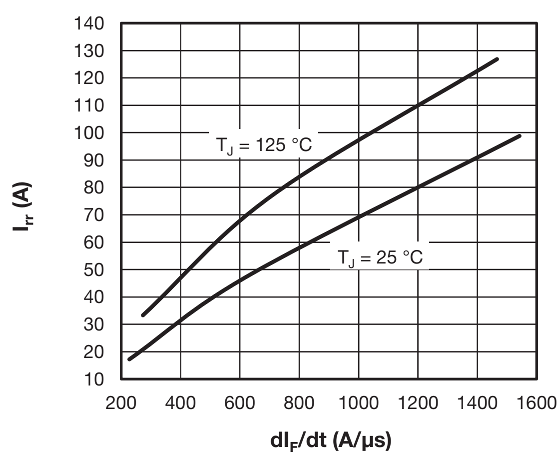


Fig. 16 - Typical Diode Reverse Recovery Current vs. dI_F/dt
V_{CC} = 300 V, I_F = 300 A

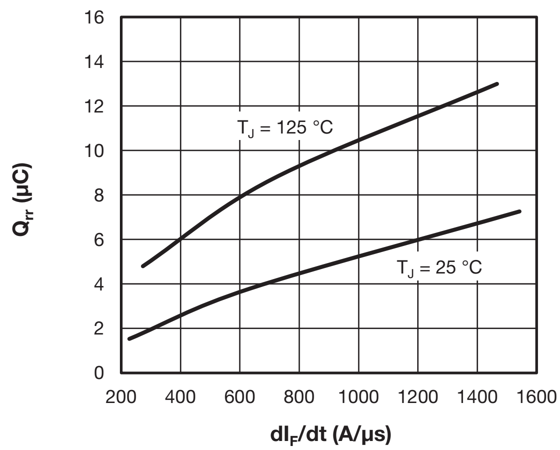


Fig. 17 - Typical Diode Reverse Recovery Charge vs. dI_F/dt
V_{CC} = 300 V, I_F = 300 A

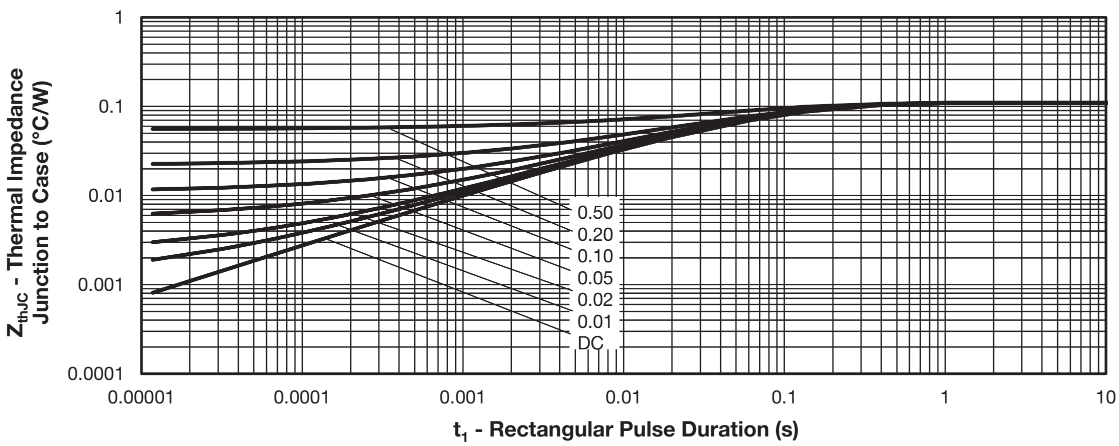


Fig. 18 - Maximum Thermal Impedance Z_{thJC} Characteristics - (IGBT)

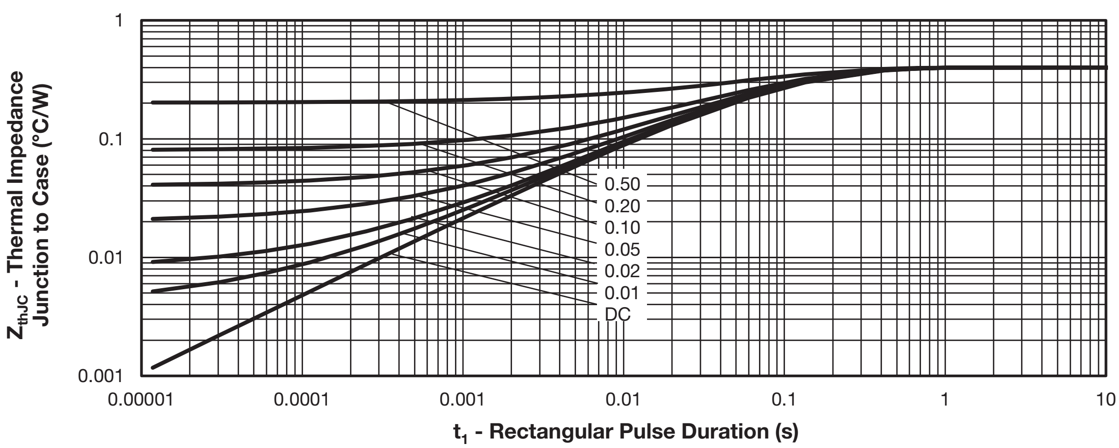


Fig. 19 - Maximum Thermal Impedance Z_{thJC} Characteristics - (Diode)

ORDERING INFORMATION TABLE

Device code	VS-	G	P	300	T	D	60	S
	1	2	3	4	5	6	7	8

1 - Vishay Semiconductors product

2 - Insulated gate bipolar transistor (IGBT)

3 - Trench PT IGBT technology

4 - Current rating (300 = 300 A)

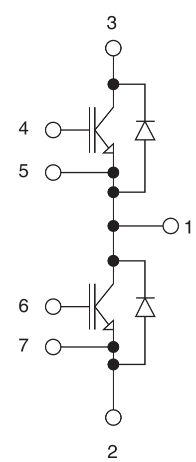
5 - Circuit configuration (T = half bridge)

6 - Package indicator (D = dual INT-A-PAK low profile)

7 - Voltage rating (60 = 600 V)

8 - Speed / type (S = standard speed IGBT)

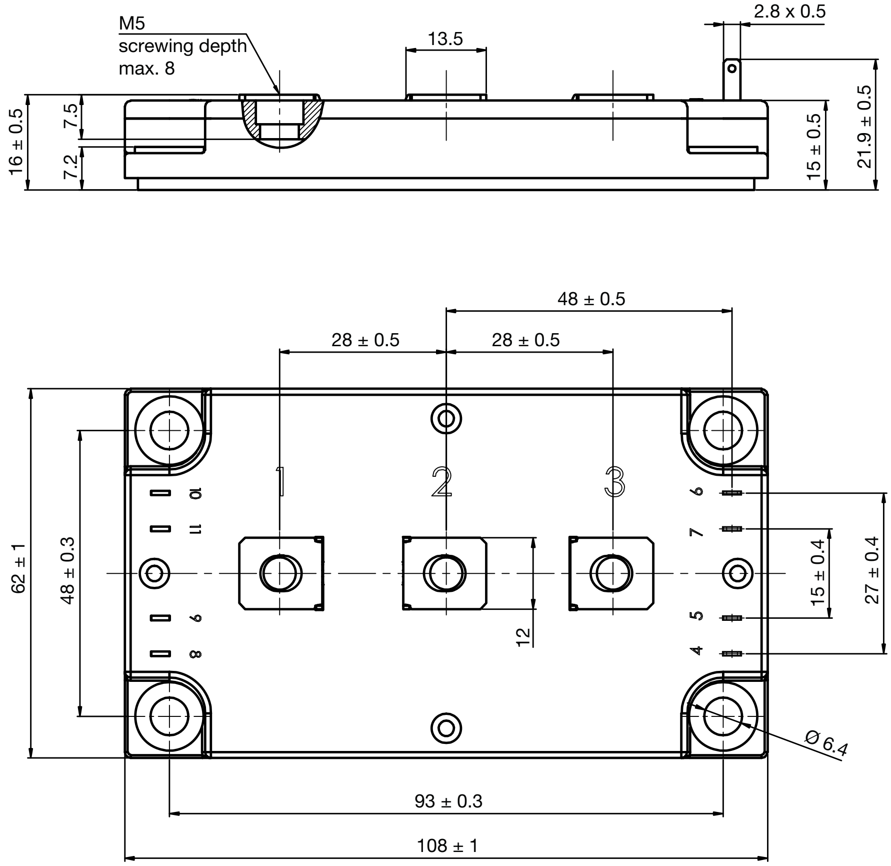
CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95435

Dual INT-A-PAK Low Profile

DIMENSIONS in millimeters



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