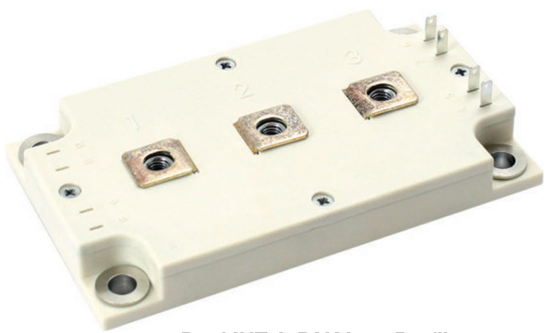
Dual INT-A-PAK Low Profile "Half Bridge" (Standard Speed IGBT), 300 A



Dual INT-A-PAK Low Profile

FEATURES

- TrenchStop IGBT technology
- Standard: optimized for hard switching speed
- Low $V_{CE(on)}$
- Square RBSOA
- Gen 4 FRED Pt® dices technology
- 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

Pb-free

RoHS COMPLIANT

PRIMARY CHARACTERISTICS	
V_{CES}	600 V
I_C DC at T_C = 100 °C	300 A
$V_{CE(on)}$ (typical) at 300 A, 25 °C	1.15 V
Speed	DC to 1 kHz
Package	Dual INT-A-PAK low profile
Circuit configuration	Half bridge

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

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	466	A
		T_C = 80 °C	349	
Pulsed collector current	I_{CM}	T_C = 175 °C, t_p = 6 ms, V_{GE} = 15 V	1500	
Clamped inductive load current	I_{LM}		700	
Diode continuous forward current	I_F	T_C = 25 °C	260	
		T_C = 80 °C	192	
Gate to emitter voltage	V_{GE}		± 20	V
Maximum power dissipation (IGBT)	P_D	T_C = 25 °C	882	W
		T_C = 80 °C	559	
Maximum power dissipation (diode)	P_D	T_C = 25 °C	441	W
		T_C = 80 °C	279	
RMS isolation voltage	V_{ISOL}	Any terminal to case (V_{RMS} t = 1 s, T_J = 25 °C)	3500	V

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 = 800 μA	600	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	V_{GE} = 15 V, I_C = 300 A	-	1.15	1.47	
		V_{GE} = 15 V, I_C = 300 A, T_J = 125 °C	-	1.16	-	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 4 mA	3.8	5.0	6.3	
Collector to emitter leakage current	I_{CES}	V_{GE} = 0 V, V_{CE} = 600 V	-	1.2	200	μA
		V_{GE} = 0 V, V_{CE} = 600 V, T_J = 125 °C	-	380	-	
Diode forward voltage drop	V_{FM}	I_{FM} = 300 A	-	1.56	2.02	V
		I_{FM} = 300 A, T_J = 125 °C	-	1.45	-	
Gate to emitter leakage current	I_{GES}	V_{GE} = ± 20 V	-	-	± 200	nA

SWITCHING CHARACTERISTICS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Total gate charge (turn-on)	Q_g	I_C = 75 A, V_{CC} = 520 V, V_{GE} = 15 V	-	1863	-	nC
Gate-to-emitter charge (turn-on)	Q_{ge}		-	296	-	
Gate-to-collector charge (turn-on)	Q_{gc}		-	540	-	
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 = 25 °C	-	2.1	-	mJ
Turn-off switching loss	E_{off}		-	13.9	-	
Total switching loss	E_{tot}		-	16	-	
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	-	2	-	
Turn-off switching loss	E_{off}		-	20	-	
Total switching loss	E_{tot}		-	22	-	
Turn-on delay time	$t_{d(on)}$		-	19	-	ns
Rise time	t_r		-	75	-	
Turn-off delay time	$t_{d(off)}$		-	419	-	
Fall time	t_f		-	194	-	
Reverse bias safe operating area	RBSOA	T_J = 175 °C, I_C = 700 A, R_g = 1.5 Ω, V_{GE} = +15 V/0 V, V_{CC} = 300 V, V_p = 600 V	Fullsquare			
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 500 A/μs, V_{CC} = 200 V, T_J = 25 °C	-	152	-	ns
Diode peak reverse current	I_{rr}		-	24	-	A
Diode recovery charge	Q_{rr}		-	1.81	-	μC
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 500 A/μs, V_{CC} = 200 V, T_J = 125 °C	-	201	-	ns
Diode peak reverse current	I_{rr}		-	39	-	A
Diode recovery charge	Q_{rr}		-	3.94	-	μC

THERMAL AND MECHANICAL SPECIFICATIONS							
PARAMETER		**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Operating junction and storage temperature range		T_J, T_{Stg}	-40	-	175	°C
Junction to case per leg	IGBT	R_{thJC}	-	-	0.17	°C/W
	Diode		-	-	0.34	
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

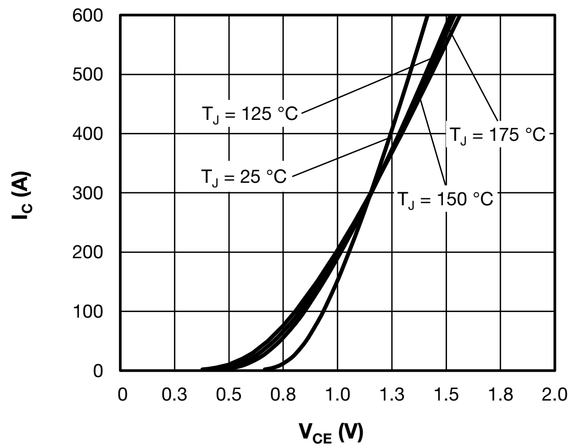


Fig. 1 - Typical Trench IGBT Output Characteristics, V_{GE} = 15 V

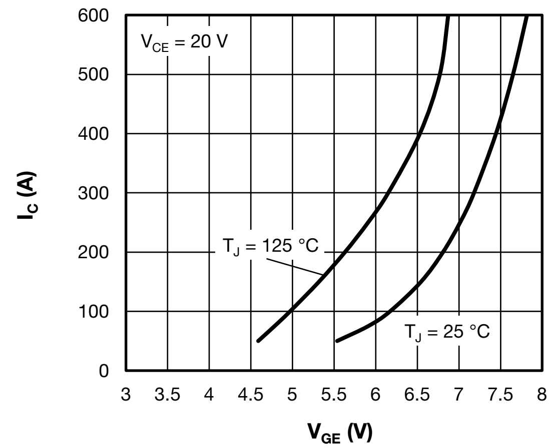


Fig. 4 - Typical Trench IGBT Transfer Characteristics

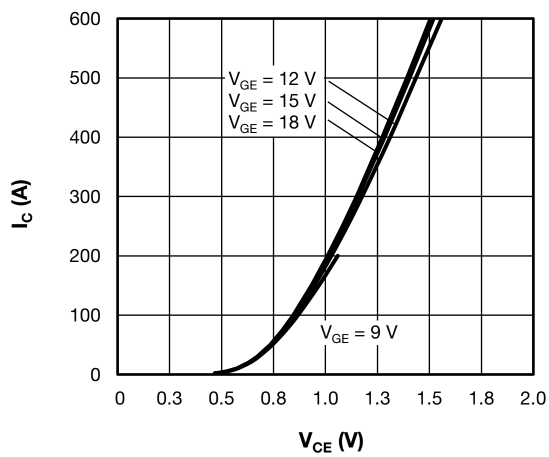


Fig. 2 - Typical Trench IGBT Output Characteristics, T_J = 125 °C

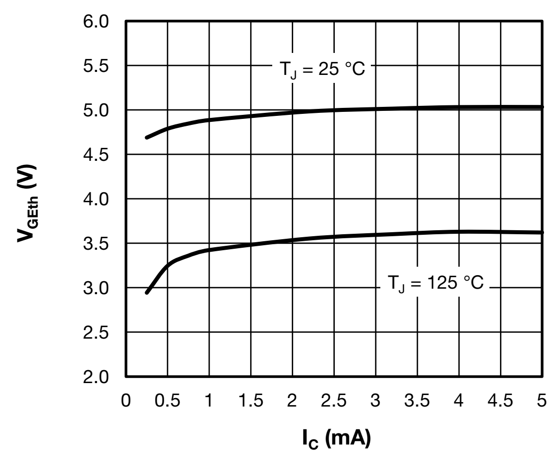


Fig. 5 - Typical Trench IGBT Gate Threshold Voltage

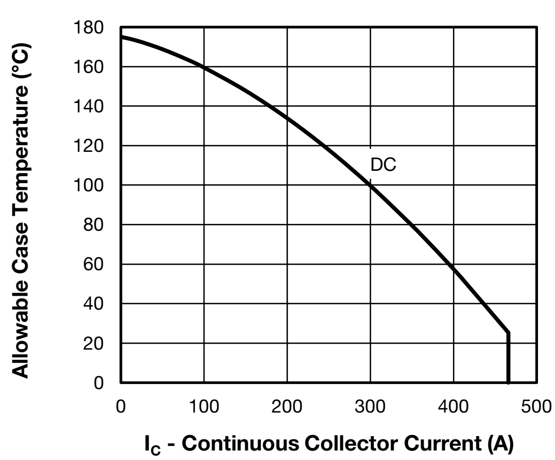


Fig. 3 - Maximum Trench IGBT Continuous Collector Current vs. Case Temperature

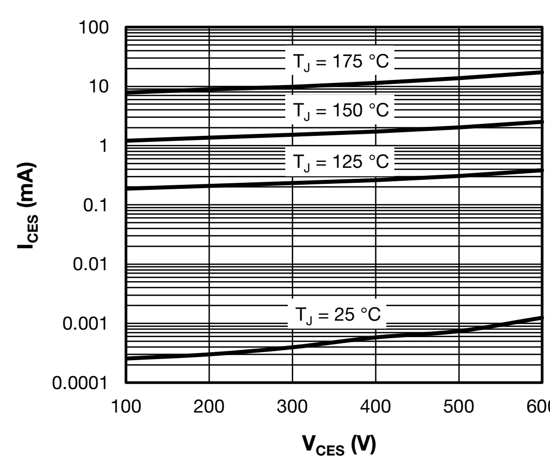


Fig. 6 - Typical trench IGBT Zero Gate Voltage Collector Current

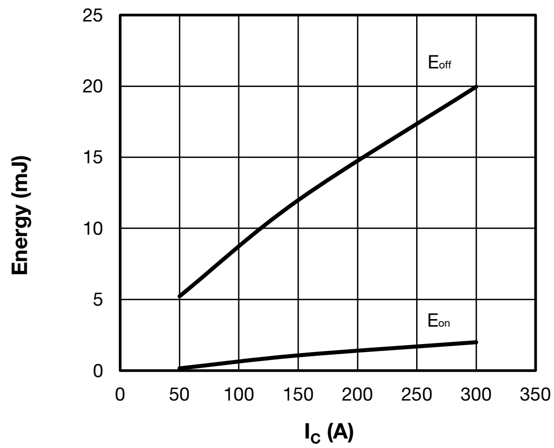


Fig. 7 - Typical Trench IGBT Energy Loss vs. $I_{C)}$,
(with Antiparallel Diode), T_J = 125 °C, V_{CC} = 300 V, R_g = 1.5 Ω,
V_{GE} = +15 V/-15 V, L = 500 µH

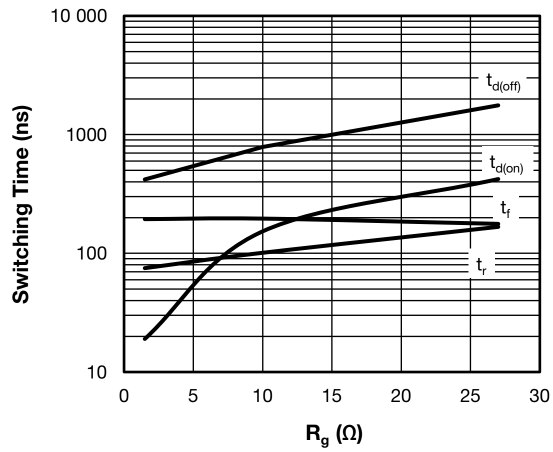


Fig. 10 - Typical Trench IGBT Switching Time vs. R_g
(with Antiparallel Diode), T_J = 125 °C, V_{CC} = 300 V, I_C = 300 A,
V_{GE} = +15 V/-15 V, L = 500 µH

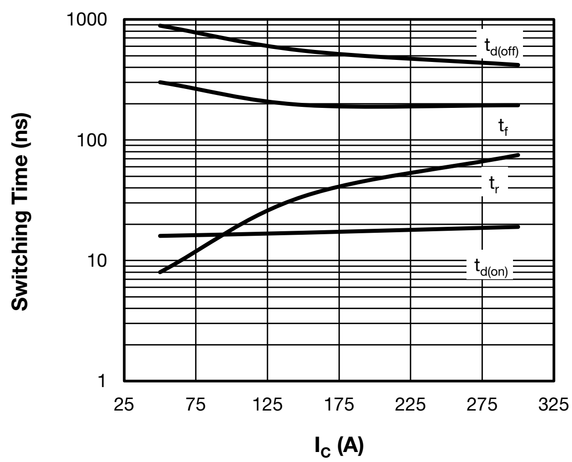


Fig. 8 - Typical Trench IGBT Switching Time vs. $I_{C,}$
(with Antiparallel Diode), T_J = 125 °C, V_{CC} = 300 V, R_g = 1.5 Ω,
V_{GE} = +15 V/-15 V, L = 500 µH

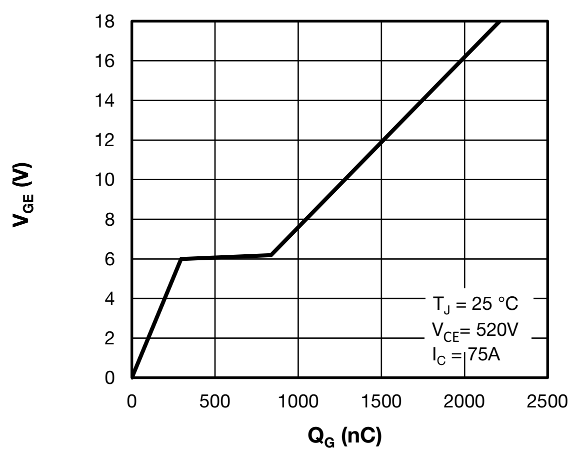


Fig. 11 - Typical Trench IGBT Gate Charge vs.
Gate to Emitter Voltage

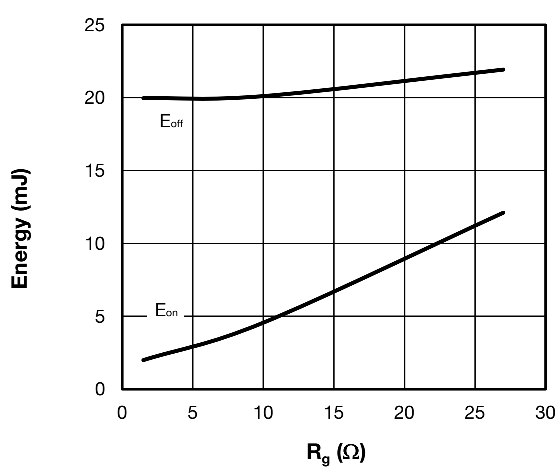


Fig. 9 - Typical Trench IGBT Energy Loss vs. R_g
(with Antiparallel Diode), T_J = 125 °C, V_{CC} = 300 V, I_C = 300 A,
V_{GE} = +15 V/-15 V, L = 500 µH

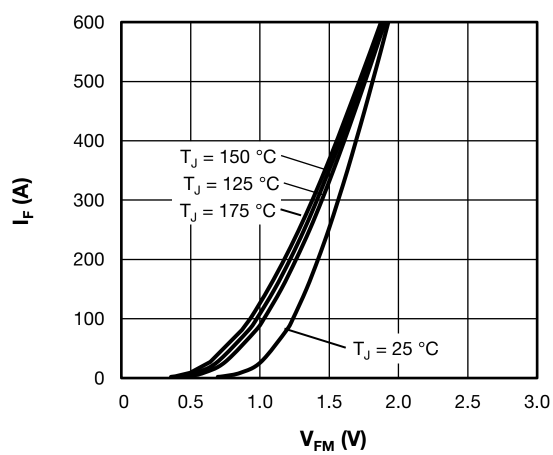


Fig. 12 - Typical Antiparallel Diode Forward Characteristics

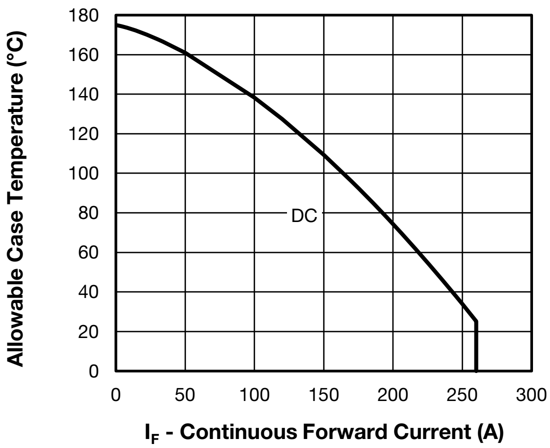


Fig. 13 - Maximum Antiparallel Diode Continuous Forward Current vs. Case Temperature

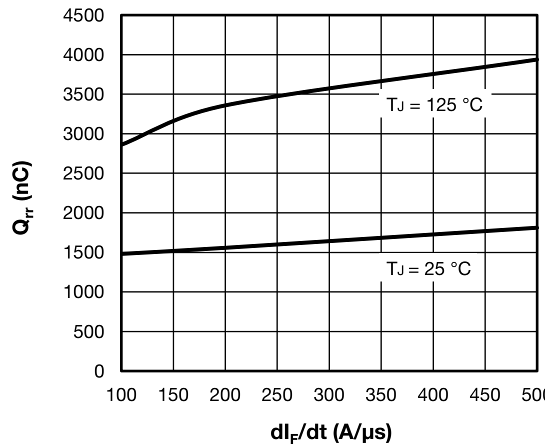


Fig. 16 - Typical Antiparallel Diode Reverse Recovery Charge vs. dI_F/dt, $I_F = 50$ A, $V_{CC} = 200$ V

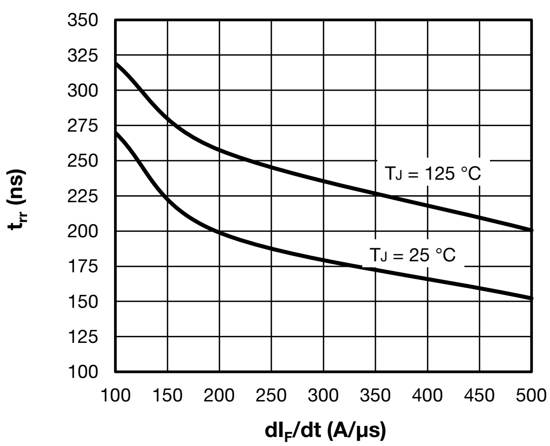


Fig. 14 - Typical Antiparallel Diode Reverse Recovery Time vs. dI_F/dt, $I_F = 50$ A, $V_{CC} = 200$ V

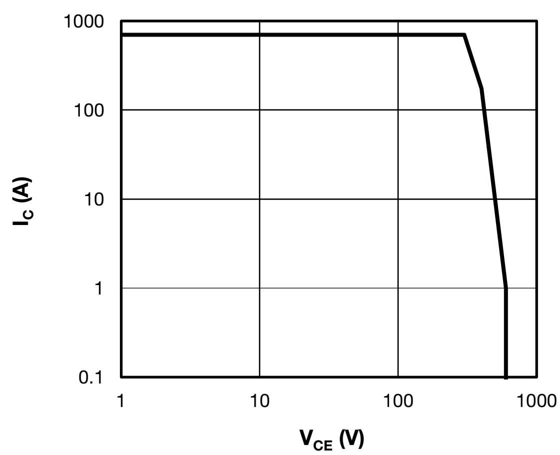


Fig. 17 - Trench IGBT Reverse BIAS SOA
$T_J = 175$ °C, $I_C = 700$ A, $R_g = 1.5\ \Omega$, $V_{GE} = +15$ V/0 V, $V_{CC} = 300$ V, $V_p = 600$ V

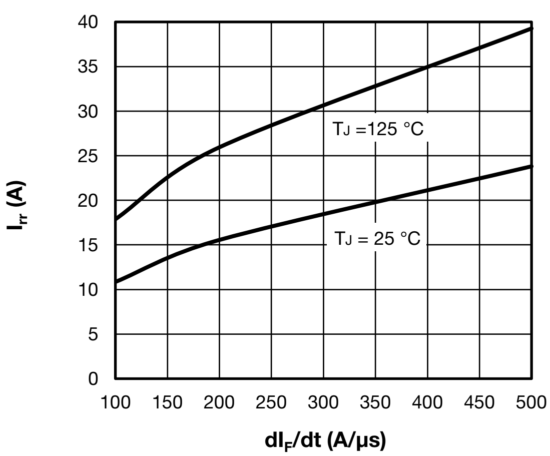


Fig. 15 - Typical Antiparallel Diode Reverse Recovery Current vs. dI_F/dt, $I_F = 50$ A, $V_{CC} = 200$ V

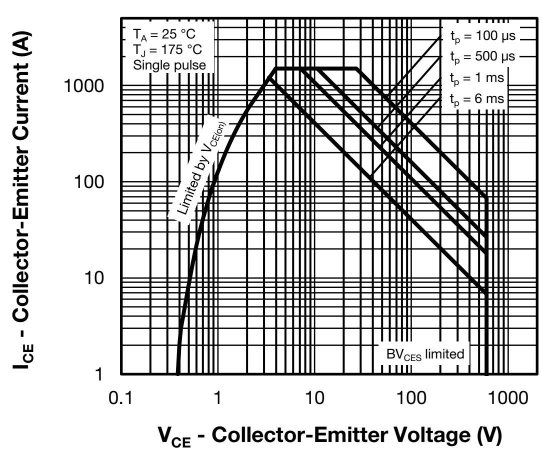


Fig. 18 - Trench IGBT Safe Operating Area

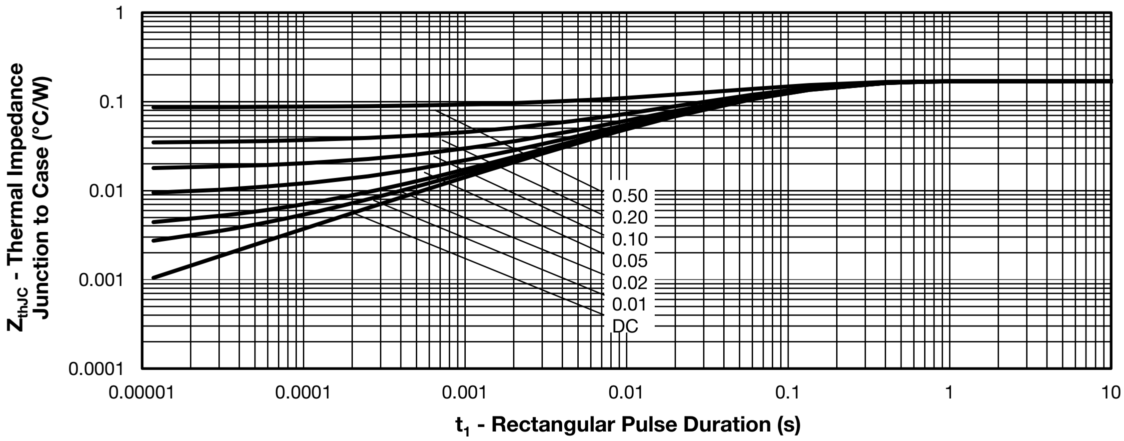


Fig. 19 - Maximum Trench IGBT Thermal Impedance Z_{thJC} Characteristics (IGBT)

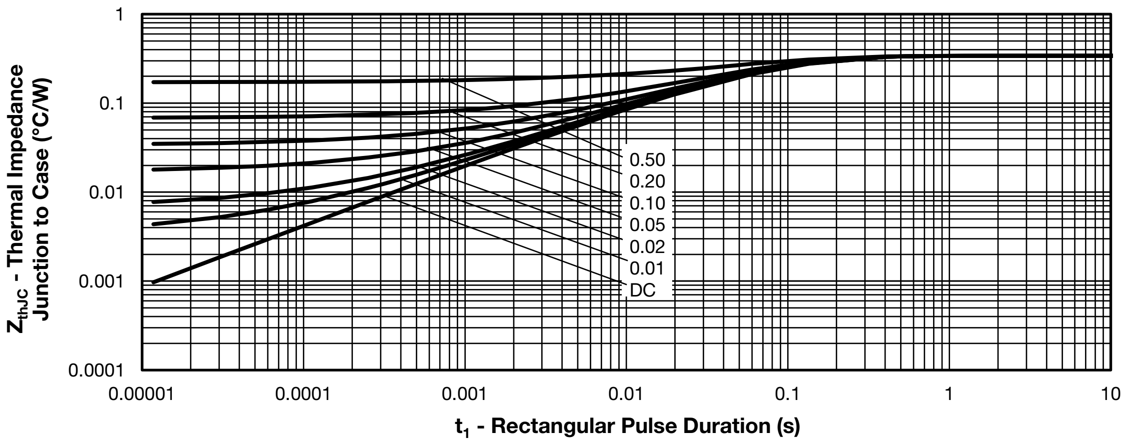


Fig. 20 - Maximum Antiparallel Diode Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

Device code	G	T	300	T	D	60	S
	1	2	3	4	5	6	7

1 - Insulated gate bipolar transistor (IGBT)

2 - T = Trench IGBT technology

3 - Current rating (300 = 300 A)

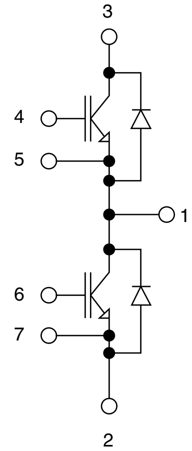
4 - Circuit configuration (T = half bridge)

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

6 - Voltage rating (60 = 600 V)

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

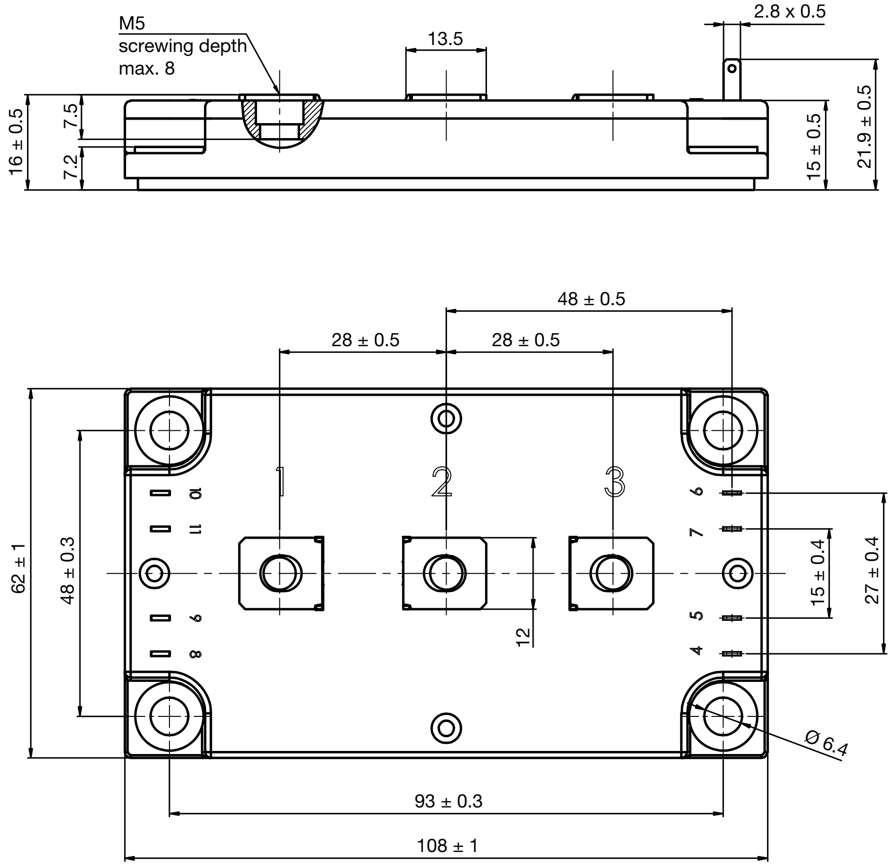
CIRCUIT CONFIGURATION



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

Dual INT-A-PAK Low Profile

DIMENSIONS in millimeters



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