

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



Dual INT-A-PAK Low Profile

FEATURES

- Gen 4 IGBT technology
- Standard: optimized for hard switching speed
- 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

PRIMARY CHARACTERISTICS	
V_{CES}	600 V
I_C DC at $T_C = 25\text{ °C}$	530 A
$V_{CE(on)}$ (typical) at 300 A, 25 °C	1.24 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⁾	$T_C = 25\text{ °C}$	530	A
		$T_C = 80\text{ °C}$	376	
Pulsed collector current	I_{CM}		800	
Clamped inductive load current	I_{LM}		800	
Diode continuous forward current	I_F	$T_C = 25\text{ °C}$	219	
		$T_C = 80\text{ °C}$	145	
Gate to emitter voltage	V_{GE}		± 20	V
Maximum power dissipation (IGBT)	P_D	$T_C = 25\text{ °C}$	1136	W
		$T_C = 80\text{ °C}$	636	
RMS isolation voltage	V_{ISOL}	Any terminal to case (V_{RMS} t = 1 s, $T_J = 25\text{ °C}$)	3500	V

Note

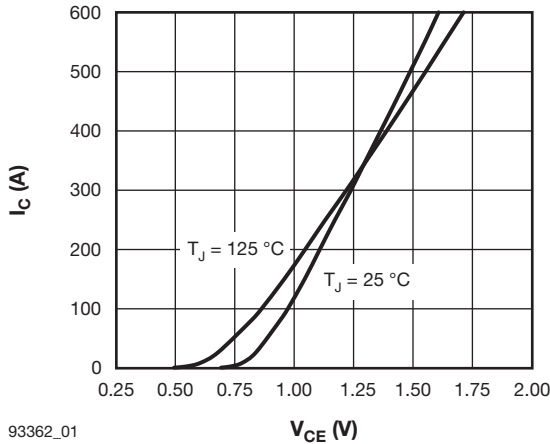
⁽¹⁾ Maximum continuous collector current must be limited to 500 A to do not exceed the maximum temperature of terminals



ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$ 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	$V_{CE(on)}$	$V_{GE} = 15\text{ V}, I_C = 150\text{ A}$	-	1.04	1.15	
		$V_{GE} = 15\text{ V}, I_C = 300\text{ A}$	-	1.24	1.45	
		$V_{GE} = 15\text{ V}, I_C = 150\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	0.96	1.06	
		$V_{GE} = 15\text{ V}, I_C = 300\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	1.22	1.42	
Gate threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 250\text{ }\mu\text{A}$	2.9	4.8	6.3	mA
Collector to emitter leakage current	I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}$ $V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	0.02 1.5	0.75 10	
Diode forward voltage drop	V_{FM}	$I_{FM} = 150\text{ A}$	-	1.23	1.39	V
		$I_{FM} = 300\text{ A}$	-	1.48	1.75	
		$I_{FM} = 150\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	1.17	1.33	
		$I_{FM} = 300\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	1.50	1.77	
Gate to emitter leakage current	I_{GES}	$V_{GE} = \pm 20\text{ V}$	-	-	± 200	nA

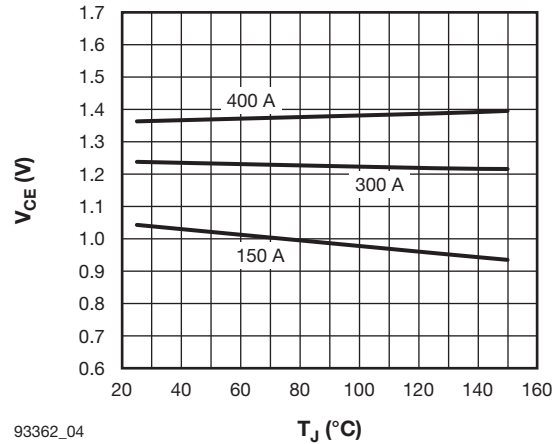
SWITCHING CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Turn-on switching loss	E_{on}	$I_C = 300\text{ A}, V_{CC} = 360\text{ V}, V_{GE} = 15\text{ V},$ $R_g = 1.5\text{ }\Omega, L = 500\text{ }\mu\text{H}, T_J = 25\text{ }^\circ\text{C}$	-	9	-	mJ
Turn-off switching loss	E_{off}		-	90	-	
Total switching loss	E_{tot}		-	99	-	
Turn-on switching loss	E_{on}	$I_C = 300\text{ A}, V_{CC} = 360\text{ V}, V_{GE} = 15\text{ V},$ $R_g = 1.5\text{ }\Omega, L = 500\text{ }\mu\text{H}, T_J = 125\text{ }^\circ\text{C}$	-	23	-	ns
Turn-off switching loss	E_{off}		-	133	-	
Total switching loss	E_{tot}		-	156	-	
Turn-on delay time	$t_{d(on)}$		-	442	-	
Rise time	t_r		-	301	-	
Turn-off delay time	$t_{d(off)}$		-	406	-	
Fall time	t_f	-	1570	-		
Reverse bias safe operating area	RBSOA	$T_J = 150\text{ }^\circ\text{C}, I_C = 800\text{ A}, V_{CC} = 400\text{ V}$ $V_P = 600\text{ V}, R_g = 22\text{ }\Omega, V_{GE} = 15\text{ V to }0\text{ V},$ $L = 500\text{ }\mu\text{H}$	Fullsquare			
Diode reverse recovery time	t_{rr}	$I_F = 300\text{ A}, di_F/dt = 500\text{ A}/\mu\text{s},$ $V_{CC} = 400\text{ V}, T_J = 25\text{ }^\circ\text{C}$	-	150	179	ns
Diode peak reverse current	I_{rr}		-	43	59	A
Diode recovery charge	Q_{rr}		-	3.9	6.3	μC
Diode reverse recovery time	t_{rr}	$I_F = 300\text{ A}, di_F/dt = 500\text{ A}/\mu\text{s},$ $V_{CC} = 400\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	236	265	ns
Diode peak reverse current	I_{rr}		-	64	80	A
Diode recovery charge	Q_{rr}		-	8.6	11.1	μC

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	
Operating junction and storage temperature range	T_J, T_{Stg}	-40	-	150	$^\circ\text{C}$	
Junction to case per leg	IGBT	-	-	0.11	$^\circ\text{C}/\text{W}$	
	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	



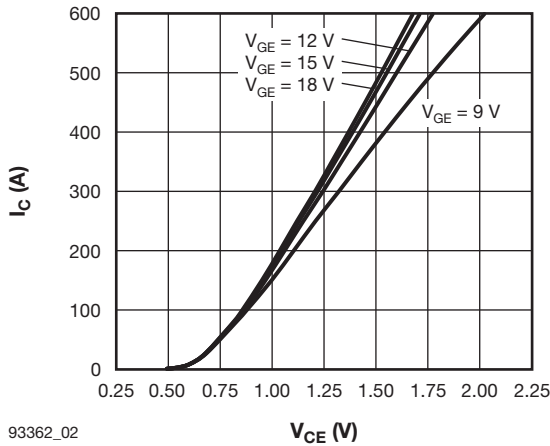
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Fig. 1 - Typical Output Characteristics,
 $T_J = 25\text{ }^\circ\text{C}$, $V_{GE} = 15\text{ V}$



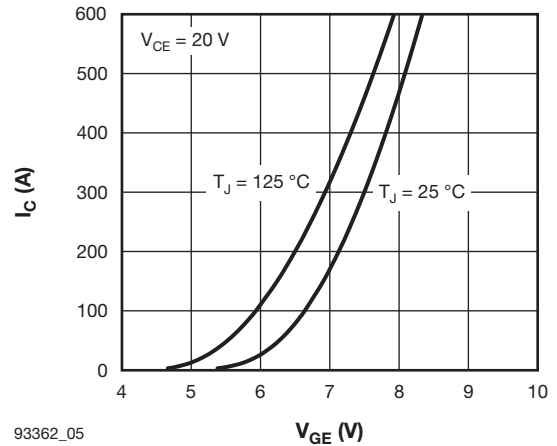
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Fig. 4 - Typical IGBT Collector to Emitter Voltage vs.
Junction Temperature,
 $V_{GE} = 15\text{ V}$



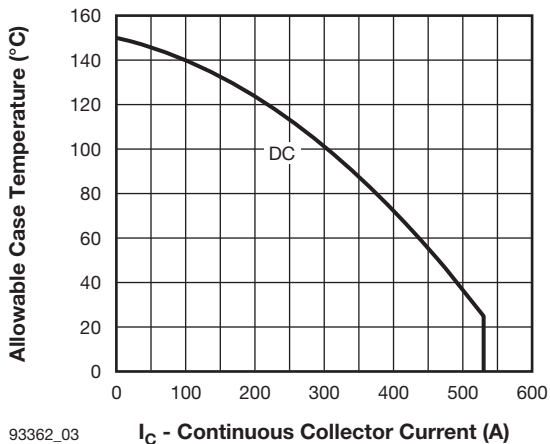
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Fig. 2 - Typical Output Characteristics,
 $T_J = 125\text{ }^\circ\text{C}$



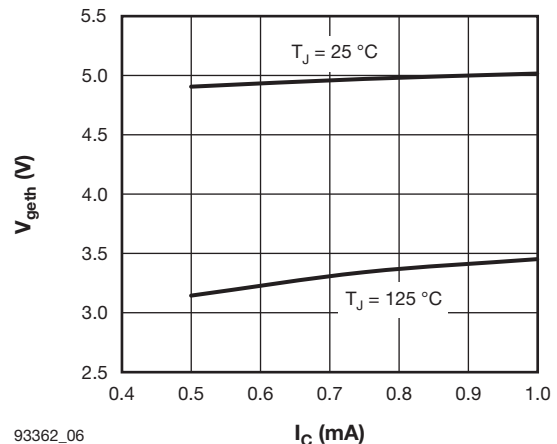
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Fig. 5 - Typical IGBT Transfer Characteristics



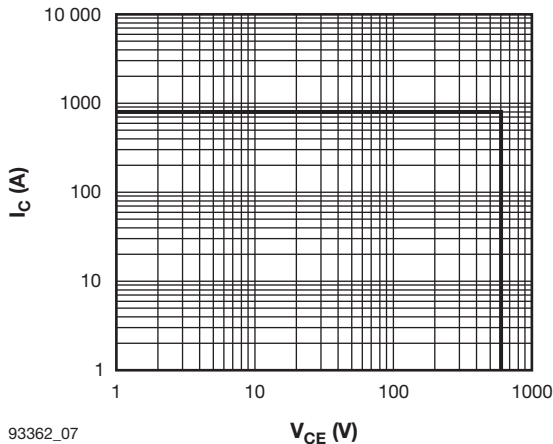
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Fig. 3 - Maximum DC IGBT Collector Current vs.
Case Temperature



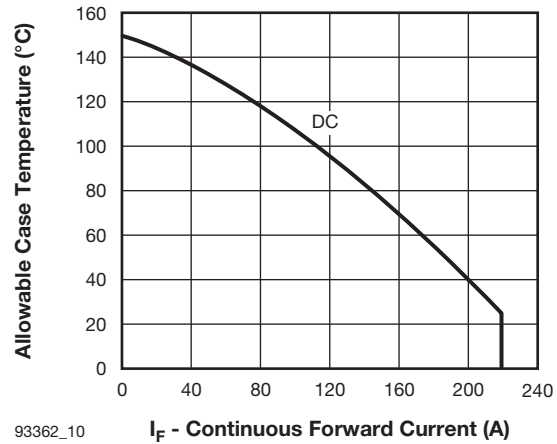
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Fig. 6 - Typical IGBT Gate Threshold Voltage



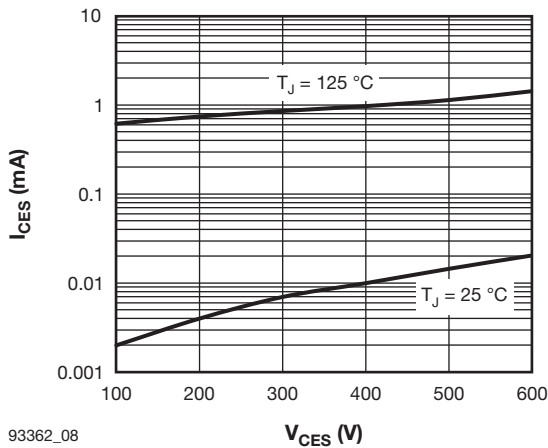
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Fig. 7 - IGBT Reverse Bias SOA,
 $T_J = 150\text{ }^\circ\text{C}$, $V_{GE} = 15\text{ V}$, $R_g = 22\ \Omega$



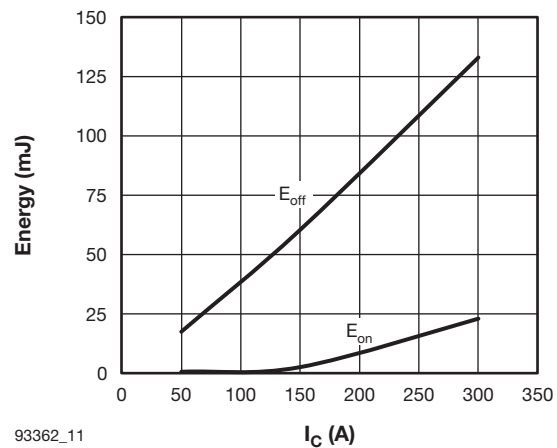
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Fig. 10 - Maximum DC Forward Current vs. Case Temperature



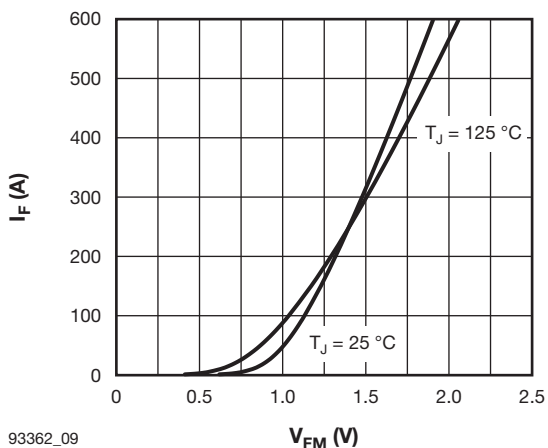
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Fig. 8 - Typical IGBT Zero Gate Voltage Collector Current



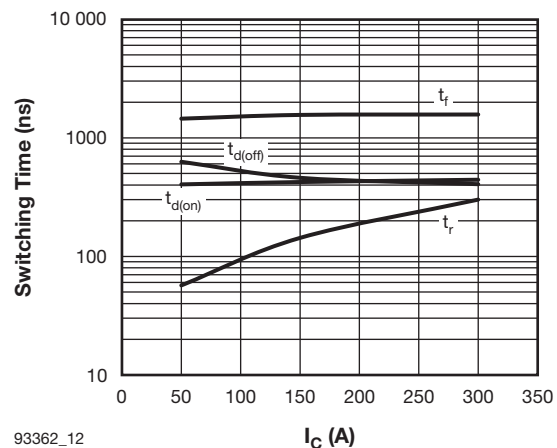
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Fig. 11 - Typical IGBT Energy Loss vs. I_C ,
 $T_J = 125\text{ }^\circ\text{C}$, $V_{CC} = 360\text{ V}$, $R_g = 1.5\ \Omega$,
 $V_{GE} = 15\text{ V}$, $L = 500\ \mu\text{H}$



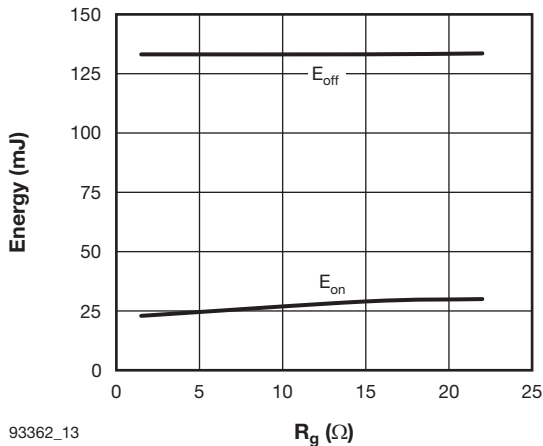
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Fig. 9 - Typical Diode Forward Characteristics



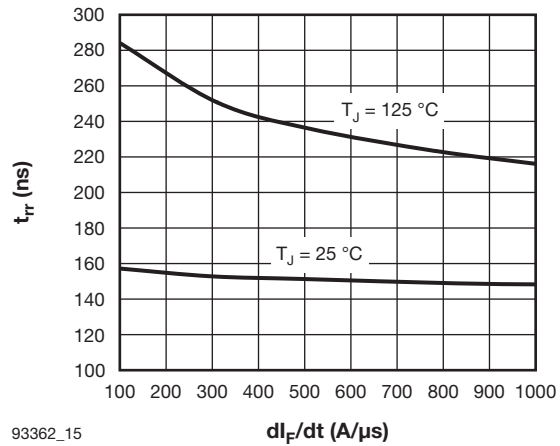
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Fig. 12 - Typical IGBT Switching Time vs. I_C ,
 $T_J = 125\text{ }^\circ\text{C}$, $V_{CC} = 360\text{ V}$, $R_g = 1.5\ \Omega$,
 $V_{GE} = 15\text{ V}$, $L = 500\ \mu\text{H}$



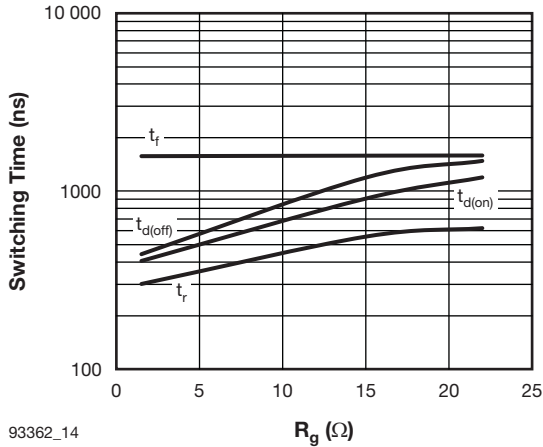
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Fig. 13 - Typical IGBT Energy Loss vs. R_g ,
 $T_J = 125\text{ }^\circ\text{C}$, $I_C = 300\text{ A}$, $V_{CC} = 360\text{ V}$,
 $V_{GE} = 15\text{ V}$, $L = 500\text{ }\mu\text{H}$



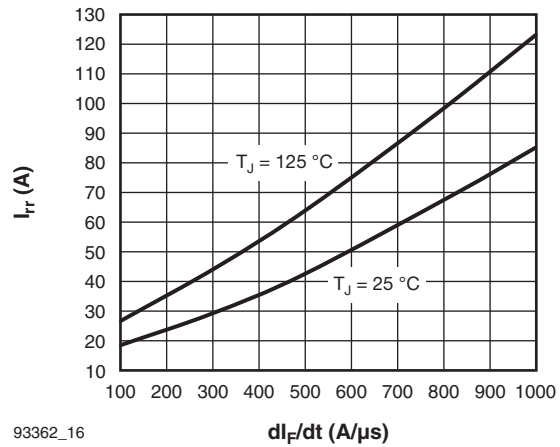
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Fig. 15 - Typical Reverse Recovery Time vs. dI_F/dt ,
 $V_{CC} = 400\text{ V}$, $I_F = 300\text{ A}$



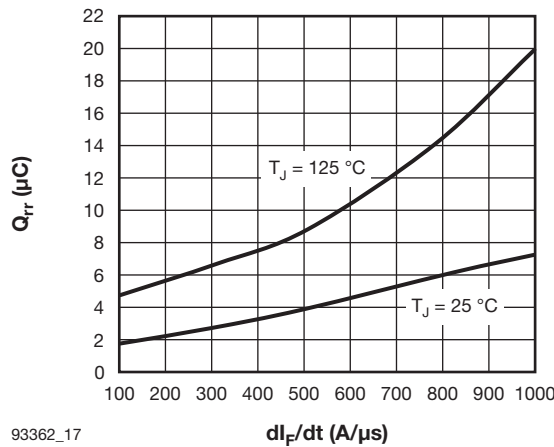
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Fig. 14 - Typical IGBT Switching Time vs. R_g ,
 $T_J = 125\text{ }^\circ\text{C}$, $I_C = 300\text{ A}$, $V_{CC} = 360\text{ V}$,
 $V_{GE} = 15\text{ V}$, $L = 500\text{ }\mu\text{H}$



93362_16

Fig. 16 - Typical Reverse Recovery Current vs. dI_F/dt ,
 $V_{CC} = 400\text{ V}$, $I_F = 300\text{ A}$



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Fig. 17 - Typical Reverse Recovery Charge vs. dI_F/dt ,
 $V_{CC} = 400\text{ V}$, $I_F = 300\text{ A}$

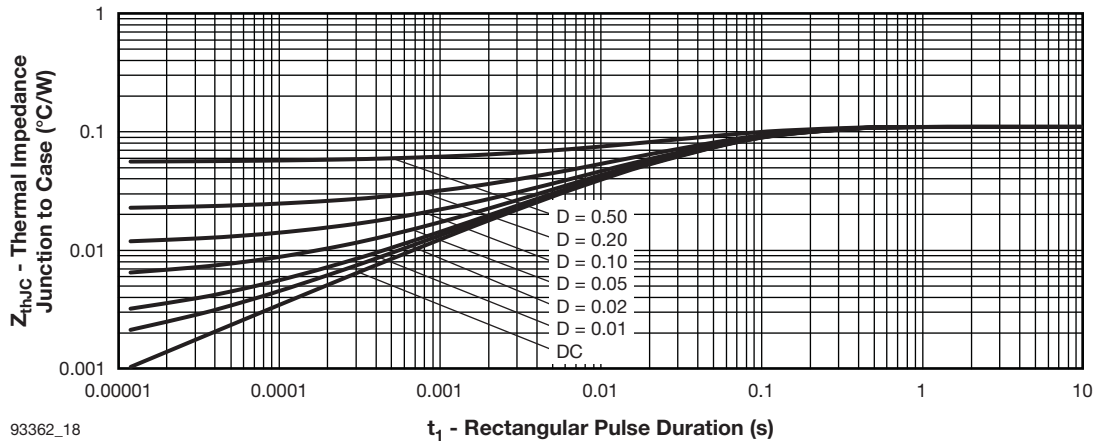


Fig. 18 - Maximum Thermal Impedance Z_{thJC} Characteristics (IGBT)

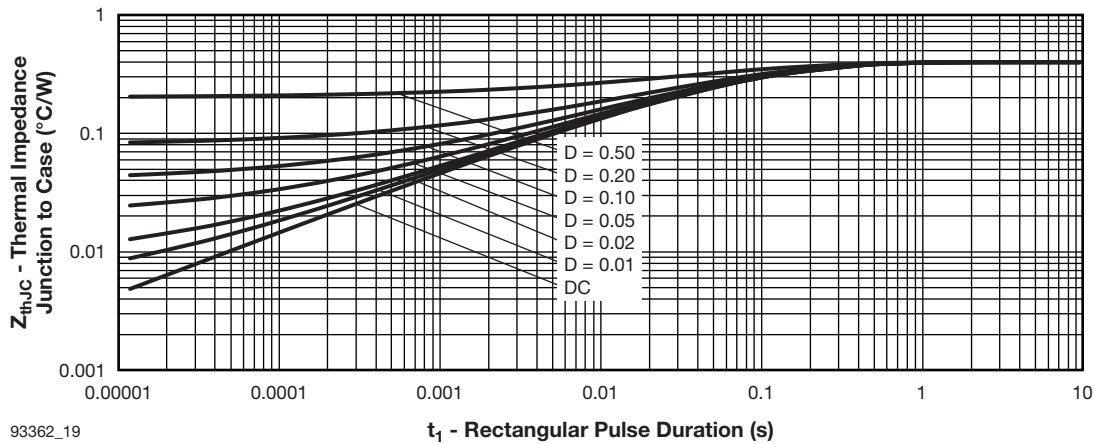


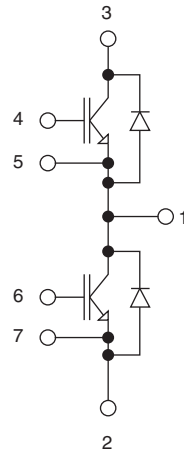
Fig. 19 - Maximum Thermal Impedance Z_{thJC} Characteristics (Diode)

ORDERING INFORMATION TABLE

Device code	G	A	300	T	D	60	S
	①	②	③	④	⑤	⑥	⑦
	1	-	Insulated gate bipolar transistor (IGBT)				
	2	-	A = Gen 4 IGBT				
	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



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