

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

Note

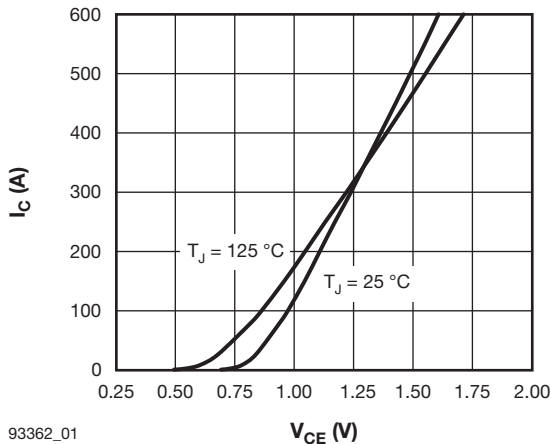
⁽¹⁾ Maximum continuous collector current must be limited to 500 A to do not exceed the maximum temperature of terminals



ELECTRICAL SPECIFICATIONS (T _J = 25 °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	-	1.04	1.15	
		V _{GE} = 15 V, I _C = 300 A	-	1.24	1.45	
		V _{GE} = 15 V, I _C = 150 A, T _J = 125 °C	-	0.96	1.06	
		V _{GE} = 15 V, I _C = 300 A, T _J = 125 °C	-	1.22	1.42	
Gate threshold voltage	V _{GE(th)}	V _{CE} = V _{GE} , I _C = 250 μA	2.9	4.8	6.3	
Collector to emitter leakage current	I _{CES}	V _{GE} = 0 V, V _{CE} = 600 V	-	0.02	0.75	mA
		V _{GE} = 0 V, V _{CE} = 600 V, T _J = 125 °C	-	1.5	10	
Diode forward voltage drop	V _{FM}	I _{FM} = 150 A	-	1.23	1.39	V
		I _{FM} = 300 A	-	1.48	1.75	
		I _{FM} = 150 A, T _J = 125 °C	-	1.17	1.33	
		I _{FM} = 300 A, T _J = 125 °C	-	1.50	1.77	
Gate to emitter leakage current	I _{GES}	V _{GE} = ± 20 V	-	-	± 200	nA

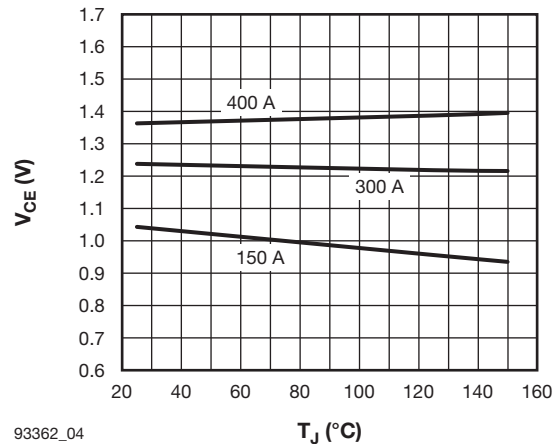
SWITCHING CHARACTERISTICS (T _J = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Turn-on switching loss	E _{on}	I _C = 300 A, V _{CC} = 360 V, V _{GE} = 15 V, R _g = 1.5 Ω, L = 500 μH, T _J = 25 °C	-	9	-	mJ
Turn-off switching loss	E _{off}		-	90	-	
Total switching loss	E _{tot}		-	99	-	
Turn-on switching loss	E _{on}	I _C = 300 A, V _{CC} = 360 V, V _{GE} = 15 V, R _g = 1.5 Ω, L = 500 μH, T _J = 125 °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 °C, I _C = 800 A, V _{CC} = 400 V, V _P = 600 V, R _g = 22 Ω, V _{GE} = 15 V to 0 V, L = 500 μH	Fullsquare			
Diode reverse recovery time	t _{rr}	I _F = 300 A, dI _F /dt = 500 A/μs, V _{CC} = 400 V, T _J = 25 °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 A, dI _F /dt = 500 A/μs, V _{CC} = 400 V, T _J = 125 °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	°C	
Junction to case per leg	IGBT	-	-	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	



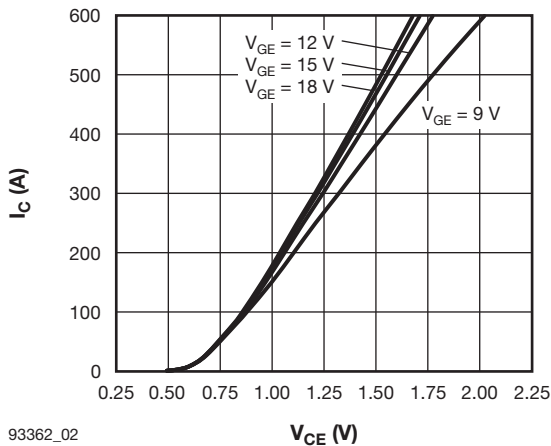
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Fig. 1 - Typical Output Characteristics,
 $T_J = 25\text{ }^\circ\text{C}$, $V_{GE} = 15\text{ V}$



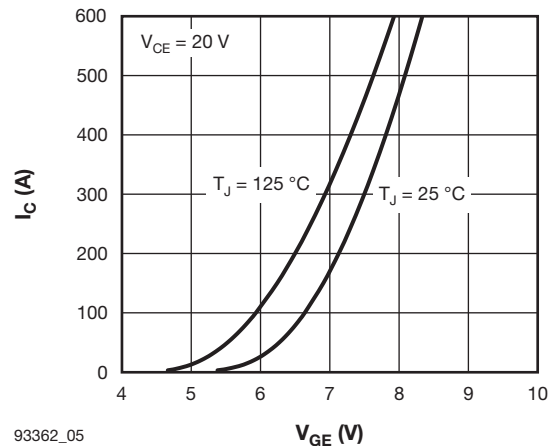
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Fig. 4 - Typical IGBT Collector to Emitter Voltage vs.
Junction Temperature,
 $V_{GE} = 15\text{ V}$



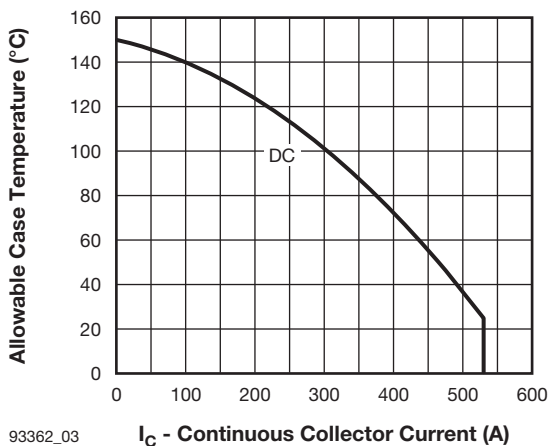
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Fig. 2 - Typical Output Characteristics,
 $T_J = 125\text{ }^\circ\text{C}$



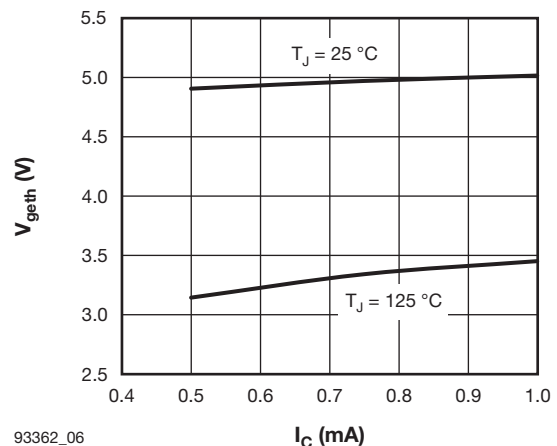
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Fig. 5 - Typical IGBT Transfer Characteristics



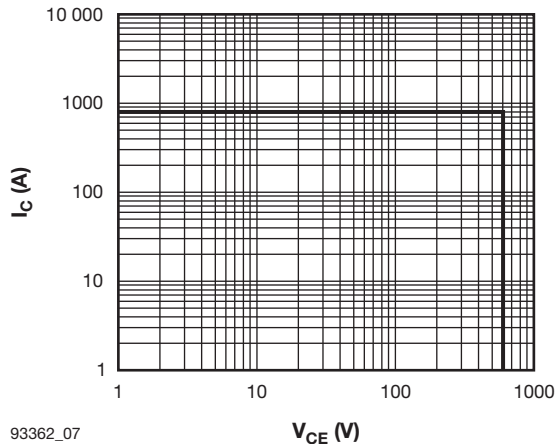
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Fig. 3 - Maximum DC IGBT Collector Current vs.
Case Temperature



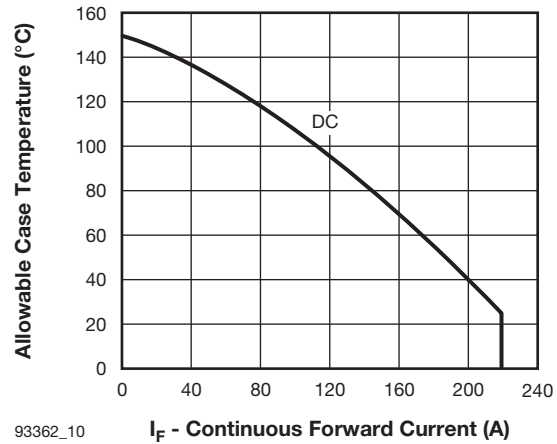
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Fig. 6 - Typical IGBT Gate Threshold Voltage



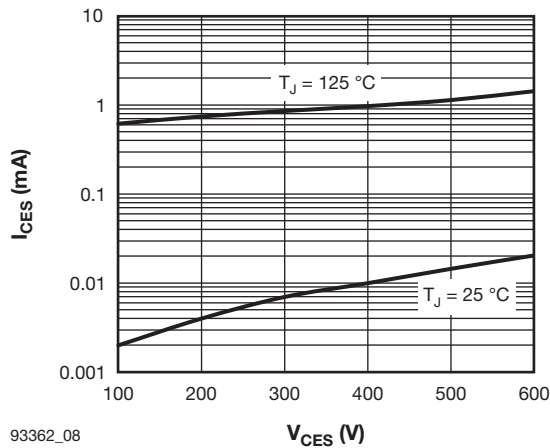
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Fig. 7 - IGBT Reverse Bias SOA,
 $T_J = 150\text{ }^\circ\text{C}$, $V_{GE} = 15\text{ V}$, $R_g = 22\text{ }\Omega$



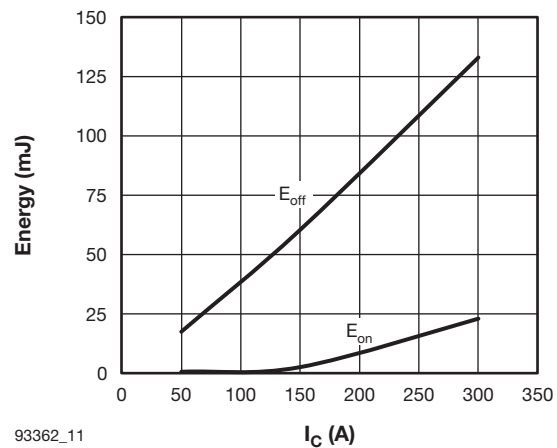
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Fig. 10 - Maximum DC Forward Current vs. Case Temperature



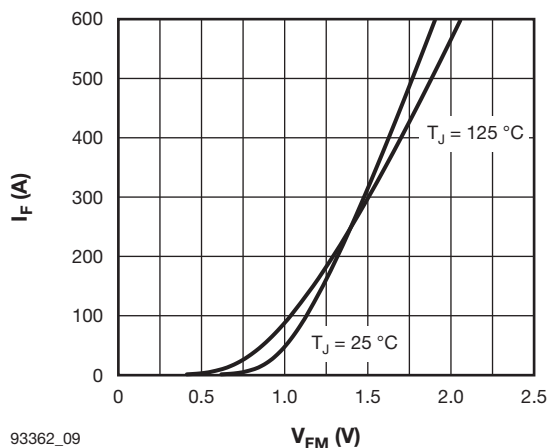
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Fig. 8 - Typical IGBT Zero Gate Voltage Collector Current



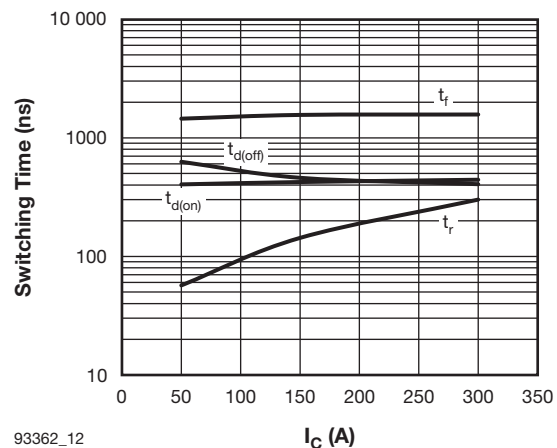
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Fig. 11 - Typical IGBT Energy Loss vs. I_C ,
 $T_J = 125\text{ }^\circ\text{C}$, $V_{CC} = 360\text{ V}$, $R_g = 1.5\text{ }\Omega$,
 $V_{GE} = 15\text{ V}$, $L = 500\text{ }\mu\text{H}$



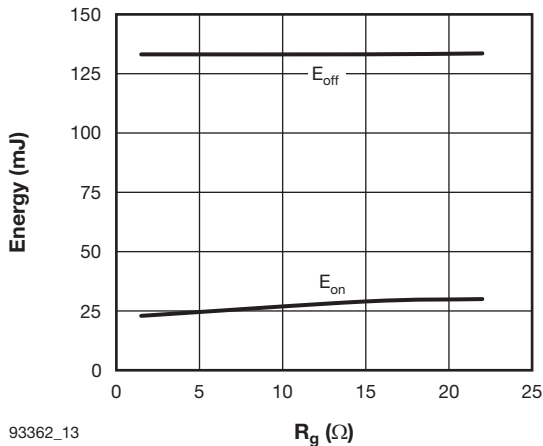
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Fig. 9 - Typical Diode Forward Characteristics



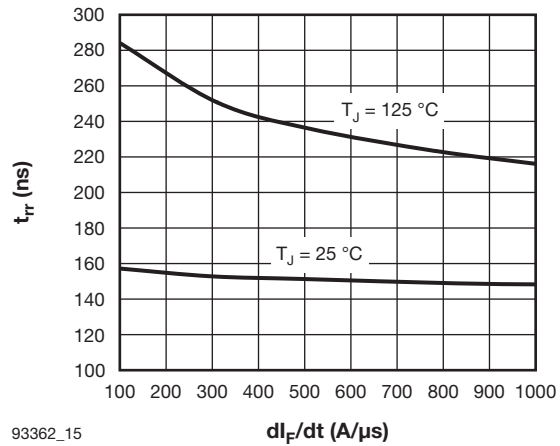
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Fig. 12 - Typical IGBT Switching Time vs. I_C ,
 $T_J = 125\text{ }^\circ\text{C}$, $V_{CC} = 360\text{ V}$, $R_g = 1.5\text{ }\Omega$,
 $V_{GE} = 15\text{ V}$, $L = 500\text{ }\mu\text{H}$



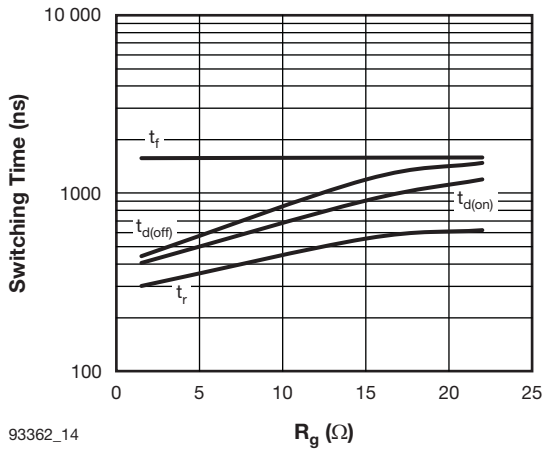
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Fig. 13 - Typical IGBT Energy Loss vs. R_g ,
 $T_J = 125\text{ }^\circ\text{C}$, $I_C = 300\text{ A}$, $V_{CC} = 360\text{ V}$,
 $V_{GE} = 15\text{ V}$, $L = 500\text{ }\mu\text{H}$



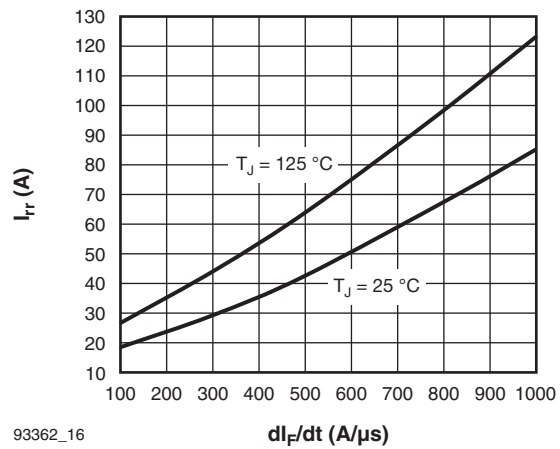
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Fig. 15 - Typical Reverse Recovery Time vs. dI_F/dt ,
 $V_{CC} = 400\text{ V}$, $I_F = 300\text{ A}$



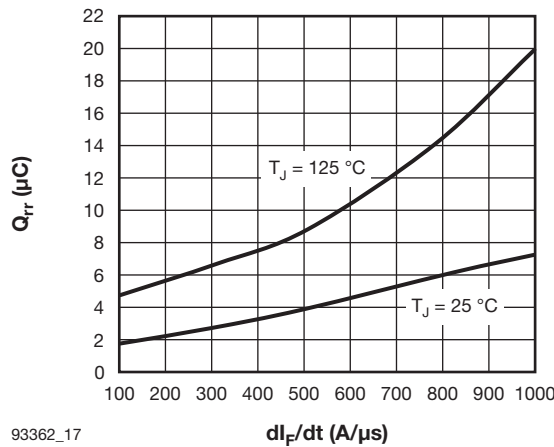
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Fig. 14 - Typical IGBT Switching Time vs. R_g ,
 $T_J = 125\text{ }^\circ\text{C}$, $I_C = 300\text{ A}$, $V_{CC} = 360\text{ V}$,
 $V_{GE} = 15\text{ V}$, $L = 500\text{ }\mu\text{H}$



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 ,
 $V_{CC} = 400\text{ V}$, $I_F = 300\text{ A}$

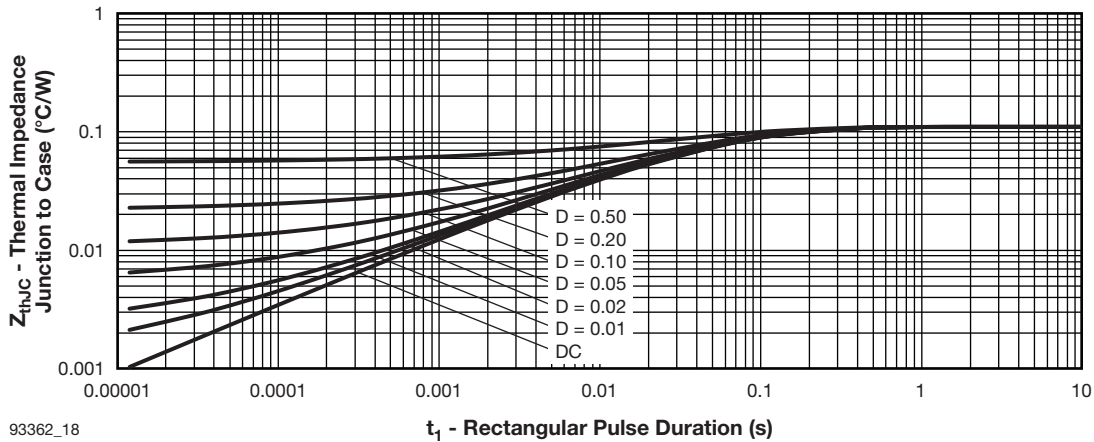


Fig. 18 - Maximum Thermal Impedance Z_{thJC} Characteristics (IGBT)

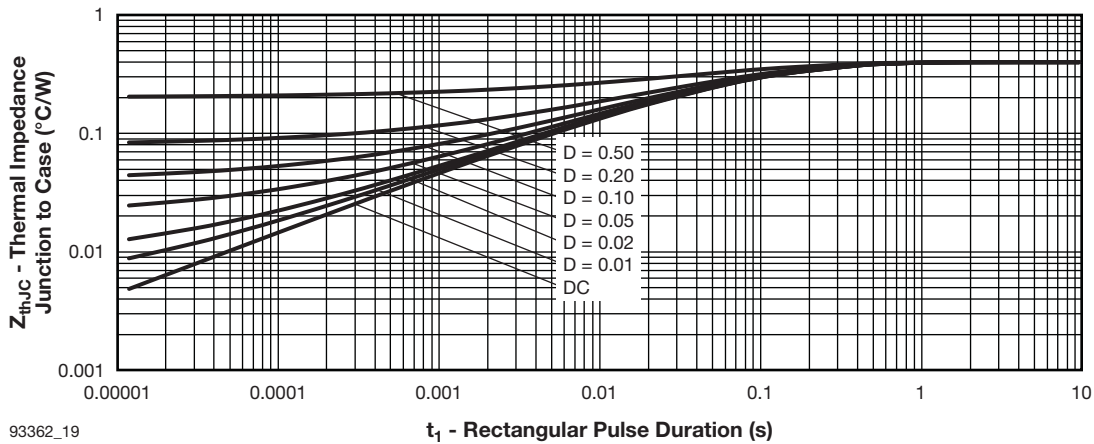


Fig. 19 - Maximum Thermal Impedance Z_{thJC} Characteristics (Diode)

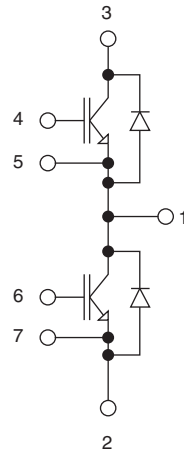
ORDERING INFORMATION TABLE

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