INT-A-PAK "Half-Bridge" (Ultrafast Speed IGBT), 108 A

INT-A-PAK

PRODUCT SUMMARY	
V_{CES}	600 V
I_C DC	108 A
$V_{CE(on)}$ at 100 A, 25 °C	2.6 V
Package	INT-A-PAK
Circuit	Half bridge

FEATURES

Pb-free
RoHS COMPLIANT

- Generation 5 Non Punch Through (NPT) technology
- Ultrafast: Optimized for hard switching speed 8 kHz to 60 kHz
- Low $V_{CE(on)}$
- 10 μs short circuit capability
- Square RBSOA
- Positive $V_{CE(on)}$ temperature coefficient
- 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

BENEFITS

- Benchmark efficiency for UPS and welding application
- Rugged transient performance
- 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	T_C = 25 °C	108	A
		T_C = 80 °C	74	
Pulsed collector current	I_{CM}		200	
Clamped inductive load current	I_{LM}		200	
Diode continuous forward current	I_F	T_C = 25 °C	106	
		T_C = 80 °C	69	
Gate to emitter voltage	V_{GE}		± 20	V
Maximum power dissipation	P_D	T_C = 25 °C	390	W
		T_C = 80 °C	219	
Isolation voltage	V_{ISOL}	Any terminal to case, t = 1 min	2500	V
Operating junction temperature range	T_J		-40 to +150	°C
Storage temperature range	T_{Stg}		-40 to +150	

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 = 50 A	-	1.95	2.1	
		V_{GE} = 15 V, I_C = 100 A	-	2.6	2.85	
		V_{GE} = 15 V, I_C = 50 A, T_J = 125 °C	-	2.21	2.44	
		V_{GE} = 15 V, I_C = 100 A, T_J = 125 °C	-	3.05	3.38	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 500 μA	3	4.6	6	
Collector to emitter leakage current	I_{CES}	V_{GE} = 0 V, V_{CE} = 600 V	-	0.01	0.1	mA
		V_{GE} = 0 V, V_{CE} = 600 V, T_J = 150 °C	-	3.7	10	
Diode forward voltage drop	V_{FM}	I_C = 50 A	-	1.35	1.66	V
		I_C = 100 A	-	1.57	1.96	
		I_C = 50 A, T_J = 125 °C	-	1.27	1.50	
		I_C = 100 A, T_J = 125 °C	-	1.57	1.89	
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 = 100 A, V_{CC} = 360 V, V_{GE} = 15 V, R_g = 4.7 Ω, L = 200 μH, T_J = 25 °C	-	0.6	-	mJ
Turn-off switching loss	E_{off}		-	1.1	-	
Total switching loss	E_{tot}		-	1.7	-	
Turn-on switching loss	E_{on}	I_C = 100 A, V_{CC} = 360 V, V_{GE} = 15 V, R_g = 4.7 Ω, L = 200 μH, T_J = 125 °C	-	0.8	-	
Turn-off switching loss	E_{off}		-	1.3	-	
Total switching loss	E_{tot}		-	2.1	-	
Turn-on delay time	$t_{d(on)}$		-	197	-	ns
Rise time	t_r		-	50	-	
Turn-off delay time	$t_{d(off)}$		-	225	-	
Fall time	t_f		-	72	-	
Reverse bias safe operating area	RBSOA	T_J = 150 °C, I_C = 200 A, R_g = 27 Ω, V_{GE} = 15 V to 0	Fullsquare			
Short circuit safe operating area	SCSOA	T_J = 150 °C, V_{CC} = 400 V, V_P = 600 V, R_g = 27 Ω, V_{GE} = 15 V to 0	10	-	-	
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 200 A/μs, V_{CC} = 400 V, T_J = 25 °C	-	116	140	ns
Diode peak reverse current	I_{rr}		-	11	15	A
Diode recovery charge	Q_{rr}		-	600	1050	nC
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 200 A/μs, V_{CC} = 400 V, T_J = 125 °C	-	152	190	ns
Diode peak reverse current	I_{rr}		-	16	20	A
Diode recovery charge	Q_{rr}		-	1215	1900	nC

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}	-	0.23	0.32	°C/W
	Diode		-	0.38	0.64	
Case to sink per module		R_{thCS}	-	0.1	-	
Mounting torque	case to heatsink		-	-	4	Nm
	case to terminal 1, 2, 3		-	-	3	
Weight			-	185	-	g

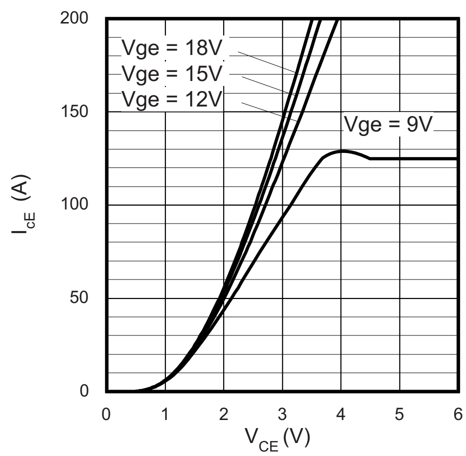


Fig. 1 - Typical IGBT Output Characteristics
T_J = 25 °C, t_p = 500 μs

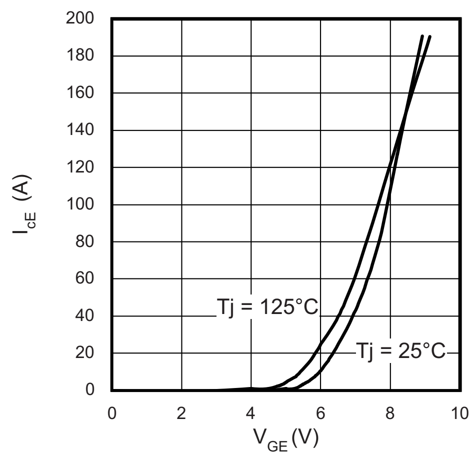


Fig. 3 - Typical Transfer Characteristics
V_{CE} = 20 V, t_p = 500 μs

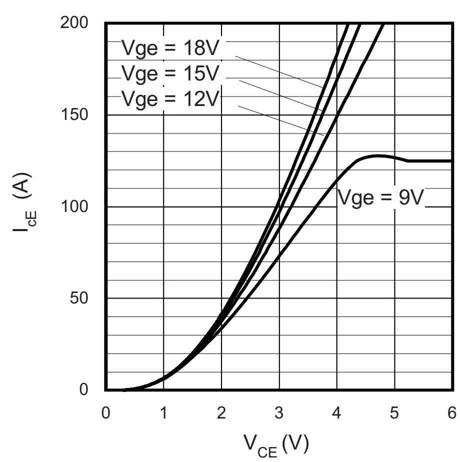


Fig. 2 - Typical IGBT Output Characteristics
T_J = 125 °C, t_p = 500 μs

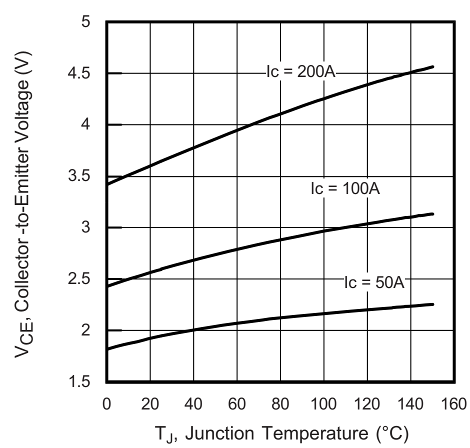


Fig. 4 - Typical Collector to Emitter Voltage vs.
Junction Temperature,
V_{GE} = 15 V, 500 μs pulse width

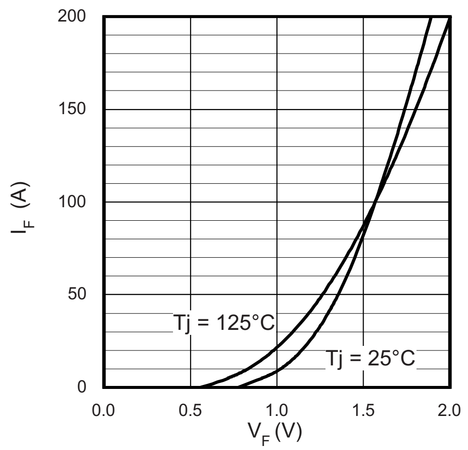


Fig. 5 - Diode Forward Characteristics, t_p = 500 μs

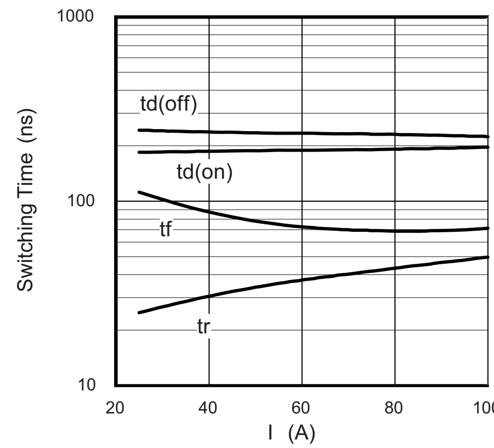


Fig. 8 - Typical Switching Time vs. I_C
T_J = 125 °C, L = 200 μH, V_{CC} = 360 V,
R_g = 4.7 Ω, V_{GE} = 15 V

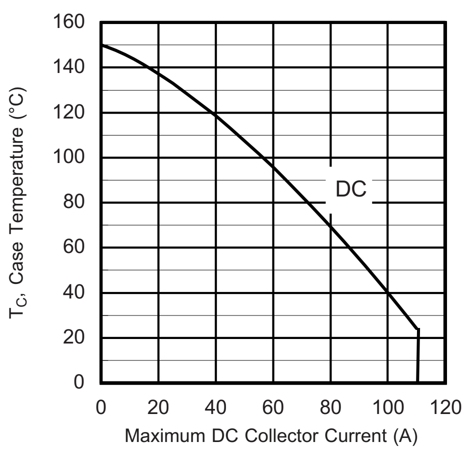


Fig. 6 - Maximum Collector Current vs.
Case Temperature

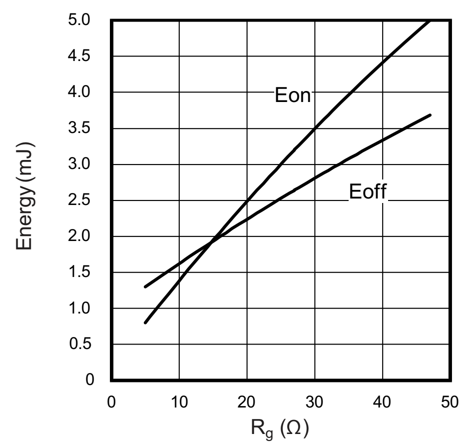


Fig. 9 - Typical Energy Loss vs. R_g
T_J = 125 °C, L = 200 μH, V_{CC} = 360 V,
I_{CE} = 100 A, V_{GE} = 15 V

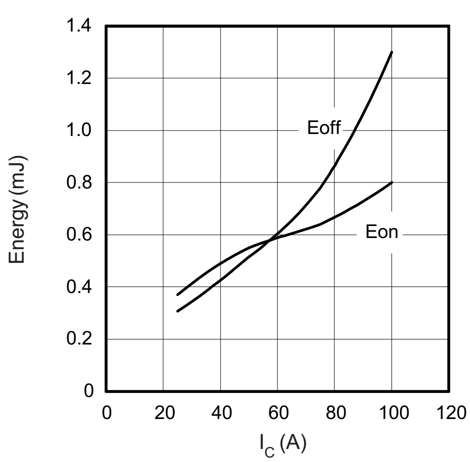


Fig. 7 - Typical Energy Loss vs. I_C, T_J = 125 °C,
L = 200 μH, V_{CC} = 360 V, R_g = 4.7 Ω, V_{GE} = 15 V

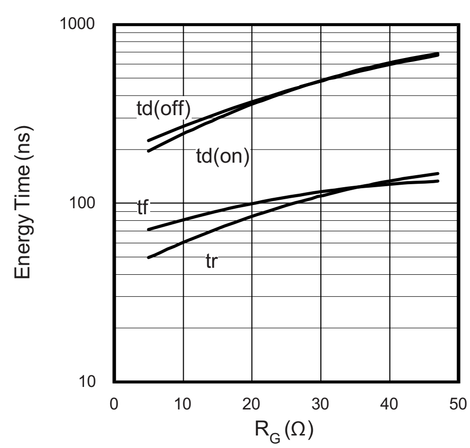


Fig. 10 - Typical Switching Time vs. R_g
T_J = 125 °C, L = 200 μH, V_{CC} = 360 V,
I_{CE} = 100 A, V_{GE} = 15 V

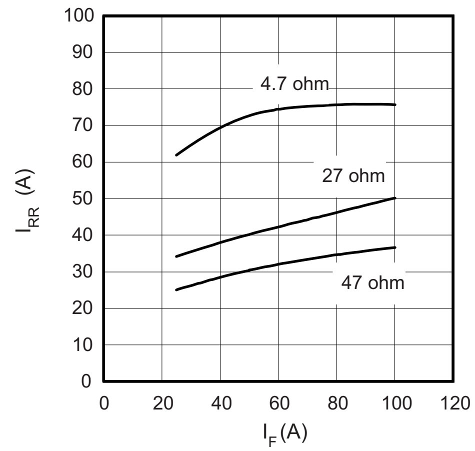


Fig. 11 - Typical Diode I_{rr} vs. I_F,
T_J = 125 °C

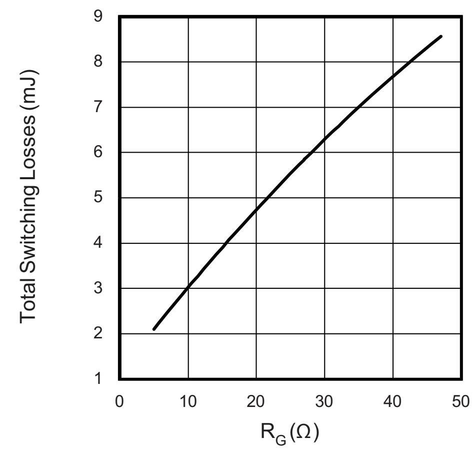


Fig. 14 - Typical Switching Losses vs. Gate Resistance,
T_J = 125 °C, L = 200 µH, R_g = 10 Ω,
V_{CC} = 360 V, V_{GE} = 15 V

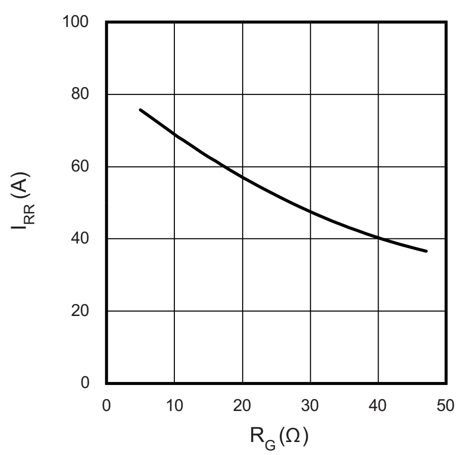


Fig. 12 - Typical Diode I_{rr} vs. R_g,
T_J = 125 °C, I_F = 100 A

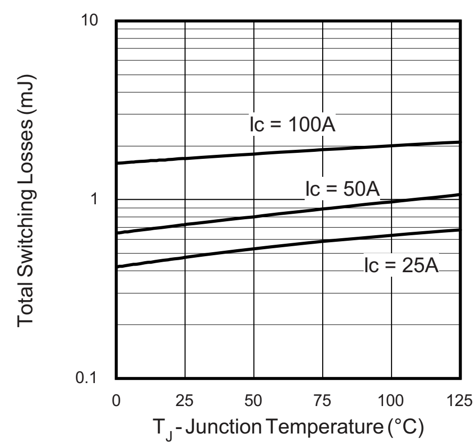


Fig. 15 - Typical Switching Losses vs. Junction Temperature,
L = 200 µH, R_g = 10 Ω, V_{CC} = 360 V, V_{GE} = 15 V

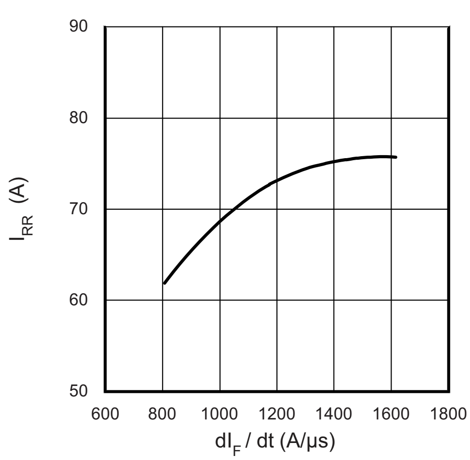


Fig. 13 - Typical Diode I_{rr} vs. dI_F/dt,
T_J = 125 °C, V_{CC} = 360 V, I_F = 150 A, V_{GE} = 15 V

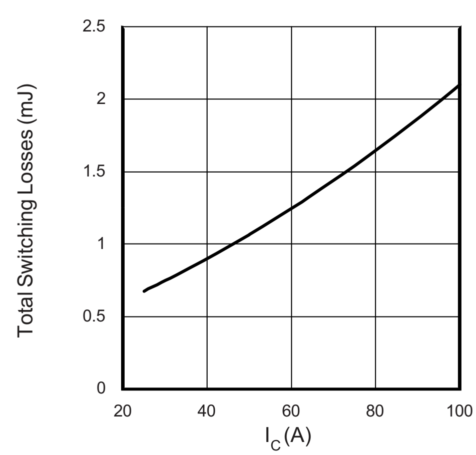


Fig. 16 - Typical Switching Losses vs.
Collector to Emitter Current,
T_J = 125 °C, R_{g1} = 4.7 V, R_{g2} = 0 Ω, V_{CC} = 360 V, V_{GE} = 15 V

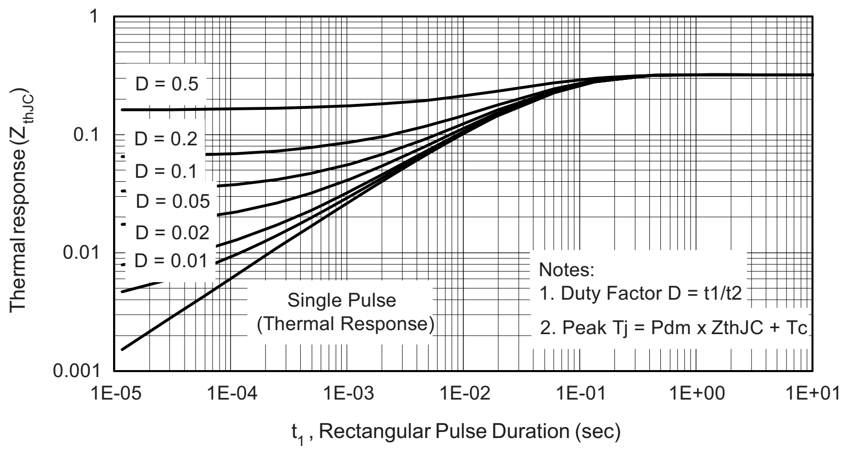


Fig. 17 - Maximum Transient Thermal Impedance, Junction to Case (IGBT)

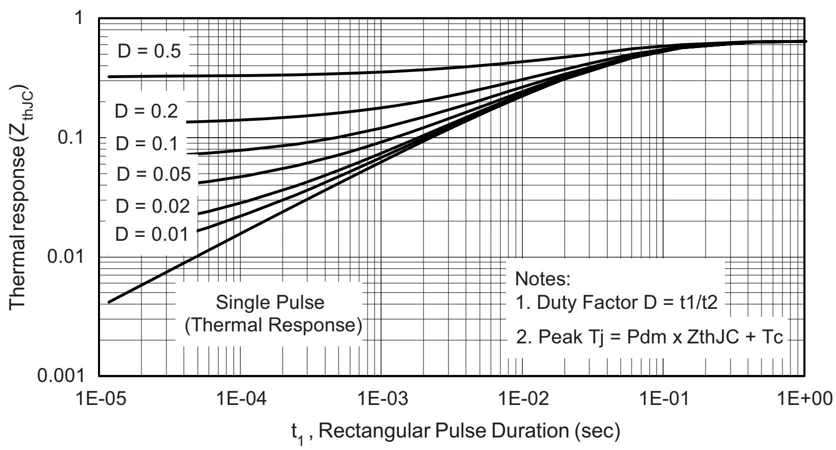


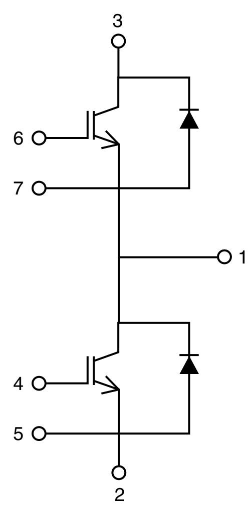
Fig. 18 - Maximum Transient Thermal Impedance, Junction to Case (HEXFRED®)

ORDERING INFORMATION TABLE

Device code	VS-	G	B	100	T	S	60	N	PbF
	1	2	3	4	5	6	7	8	9

- **1** - Vishay Semiconductors product
- **2** - Insulated Gate Bipolar Transistor (IGBT)
- **3** - B = IGBT Generation 5 NPT
- **4** - Current rating (100 = 100 A)
- **5** - Circuit configuration (T = Half-bridge)
- **6** - Package indicator (S = INT-A-PAK)
- **7** - Voltage rating (60 = 600 V)
- **8** - Speed/type (N = Ultrafast IGBT)
- **9** - Lead (Pb)-free

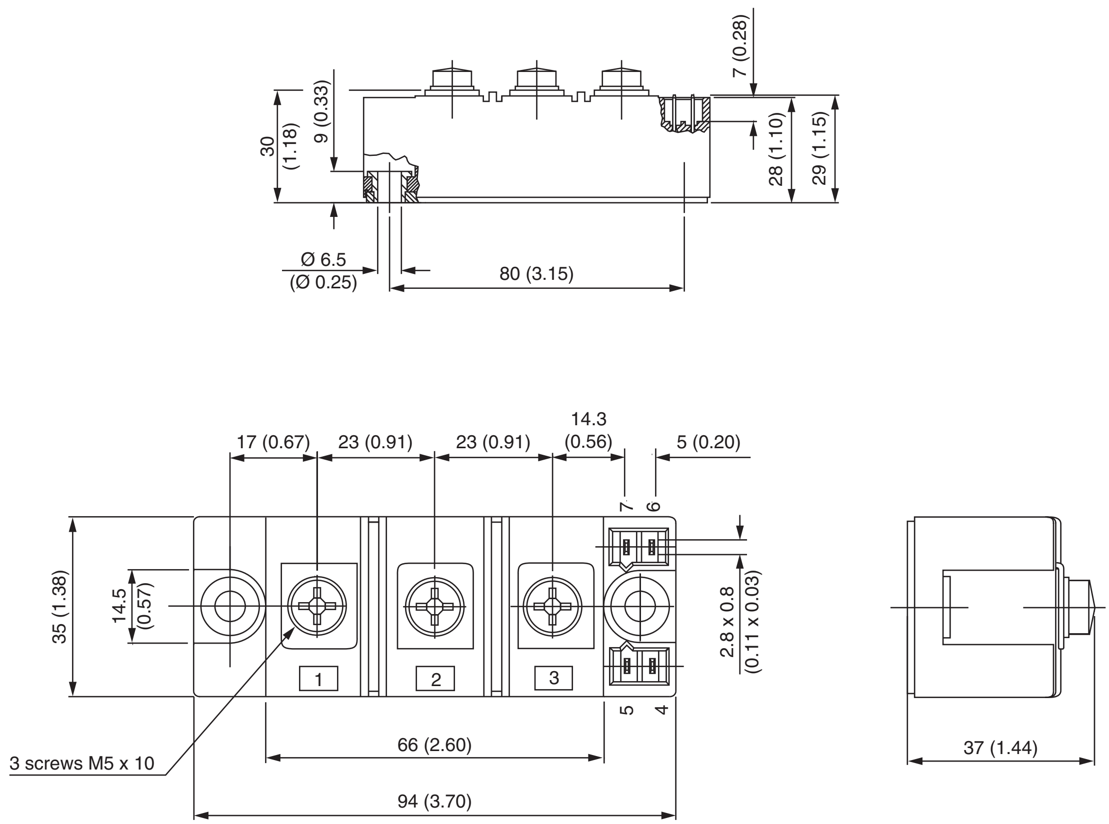
CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95543

INT-A-PAK IGBT

DIMENSIONS in millimeters (inches)



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