

## “Half-Bridge” IGBT INT-A-PAK, (Standard Speed IGBT), 100 A


**INT-A-PAK**

PRODUCT SUMMARY	
$V_{CES}$	600 V
$I_C$ DC	220 A
$V_{CE(on)}$ at 100 A, 25 °C	1.11 V
Speed	DC to 1 kHz
Package	INT-A-PAK
Circuit	Half bridge

### FEATURES

- Standard speed PT IGBT technology
- Optimized for hard switching speed
- FRED Pt® antiparallel diodes with fast recovery
- Very low conduction losses
- $Al_2O_3$  DBC
- UL approved file E78996
- Designed for industrial level
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS  
COMPLIANT**

### BENEFITS

- Optimized for high current inverter stages (AC TIG welding machines)
- Direct mounting to heatsink
- Very low junction to case thermal resistance
- Low EMI

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	$V_{CES}$		600	V
Continuous collector current	$I_C$	$T_C = 25\text{ °C}$	220	A
		$T_C = 130\text{ °C}$	100	
Pulsed collector current	$I_{CM}$		440	
Peak switching current	$I_{LM}$		440	
Gate to emitter voltage	$V_{GE}$		± 20	V
RMS isolation voltage	$V_{ISOL}$	Any terminal to case, $t = 1\text{ min}$	2500	
Maximum power dissipation	$P_D$	$T_C = 25\text{ °C}$	780	W
		$T_C = 100\text{ °C}$	312	
Operating junction temperature range	$T_J$		-40 to +150	°C
Storage temperature range	$T_{Stg}$		-40 to +125	

ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Collector to emitter breakdown voltage	$V_{BR(CES)}$	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	600	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	$V_{GE} = 15\text{ V}, I_C = 100\text{ A}$	-	1.11	1.28	
		$I_C = 200\text{ A}$	-	1.39	-	
		$V_{GE} = 15\text{ V}, I_C = 100\text{ A}, T_J = 125\text{ °C}$	-	1.08	1.22	
Gate threshold voltage	$V_{GE(th)}$	$I_C = 0.25\text{ mA}$	3	-	6	
Collector to emitter leakage current	$I_{CES}$	$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}$	-	-	1	mA
		$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}, T_J = 125\text{ °C}$	-	-	10	
Diode forward voltage drop	$V_{FM}$	$I_C = 100\text{ A}, V_{GE} = 0\text{ V}$	-	1.44	1.96	V
		$I_C = 100\text{ A}, V_{GE} = 0\text{ V}, T_J = 125\text{ °C}$	-	1.25	1.54	
Gate to emitter leakage current	$I_{GES}$	$V_{GE} = \pm 20\text{ V}$	-	-	± 250	nA



SWITCHING CHARACTERISTICS (T <sub>J</sub> = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Total gate charge	Q <sub>g</sub>	I <sub>C</sub> = 100 A V <sub>CC</sub> = 400 V V <sub>GE</sub> = 15 V	-	640	700	nC
Gate to emitter charge	Q <sub>ge</sub>		-	108	120	
Gate to collector charge	Q <sub>gc</sub>		-	230	300	
Rise time	t <sub>r</sub>	I <sub>C</sub> = 100 A V <sub>CC</sub> = 480 V V <sub>GE</sub> = 15 V R <sub>g</sub> = 15 Ω T <sub>J</sub> = 25 °C	-	0.45	-	μs
Fall time	t <sub>f</sub>		-	1.0	-	
Turn-on switching energy	E <sub>on</sub>		-	4	6	
Turn-off switching energy	E <sub>off</sub>	I <sub>C</sub> = 100 A, V <sub>CC</sub> = 480 V V <sub>GE</sub> = 15 V, R <sub>g</sub> = 15 Ω T <sub>J</sub> = 125 °C	-	23	29	mJ
Total switching energy	E <sub>ts</sub>		-	27	35	
Turn-on switching energy	E <sub>on</sub>		-	6	12	
Turn-off switching energy	E <sub>off</sub>	I <sub>C</sub> = 100 A, V <sub>CC</sub> = 480 V V <sub>GE</sub> = 15 V, R <sub>g</sub> = 15 Ω T <sub>J</sub> = 125 °C	-	35	40	mJ
Total switching energy	E <sub>ts</sub>		-	41	52	
Turn-on switching energy	E <sub>on</sub>		-	6	12	
Input capacitance	C <sub>ies</sub>	V <sub>GE</sub> = 0 V V <sub>CC</sub> = 30 V f = 1.0 MHz	-	16 250	-	pF
Output capacitance	C <sub>oes</sub>		-	1040	-	
Reverse transfer capacitance	C <sub>res</sub>		-	190	-	
Diode reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 50 A dI <sub>F</sub> /dt = 200 A/μs V <sub>rr</sub> = 200 V	-	91	155	ns
Diode peak reverse current	I <sub>rr</sub>		-	10.6	15	A
Diode recovery charge	Q <sub>rr</sub>		-	500	900	nC
Diode reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 50 A dI <sub>F</sub> /dt = 200 A/μs V <sub>rr</sub> = 200 V, T <sub>J</sub> = 125 °C	-	180	344	ns
Diode peak reverse current	I <sub>rr</sub>		-	17	20.5	A
Diode recovery charge	Q <sub>rr</sub>		-	1633	2315	nC

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	
Operating junction temperature range	T <sub>J</sub>	-40	-	150	°C	
Storage temperature range	T <sub>Stg</sub>	-40	-	125		
Junction to case	per switch	R <sub>thJC</sub>	-	-	0.16	°C/W
	per diode		-	-	0.48	
Case to sink per module	R <sub>thCS</sub>	-	0.1	-		
Mounting torque	case to heatsink	-	-	4	Nm	
	case to terminal 1, 2, 3	-	-	3		
Weight		-	185	-	g	

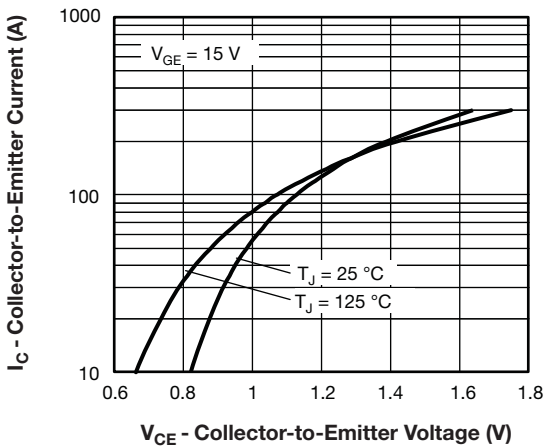


Fig. 1 - Typical Output Characteristics

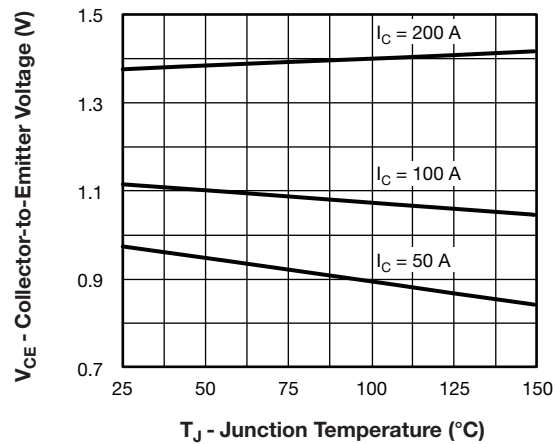


Fig. 4 - Typical Collector to Emitter Voltage vs. Junction Temperature

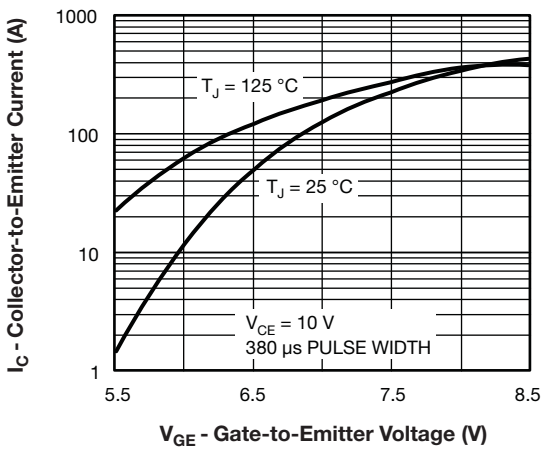


Fig. 2 - Typical Transfer Characteristics

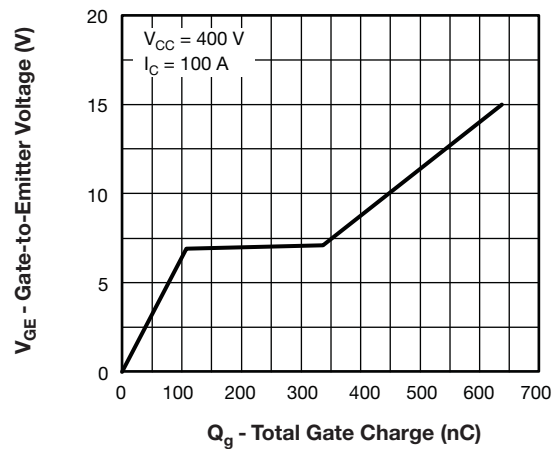


Fig. 5 - Typical Gate Charge vs. Gate to Emitter Voltage

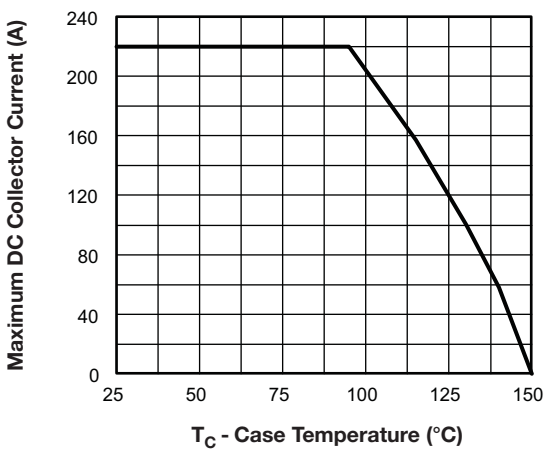


Fig. 3 - Maximum Collector Current vs. Case Temperature

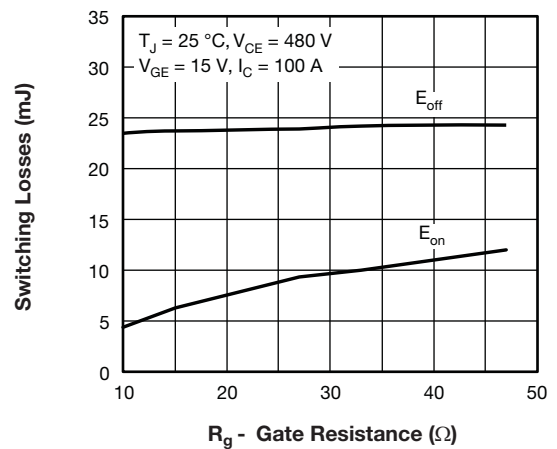


Fig. 6 - Typical Switching Losses vs. Gate Resistance

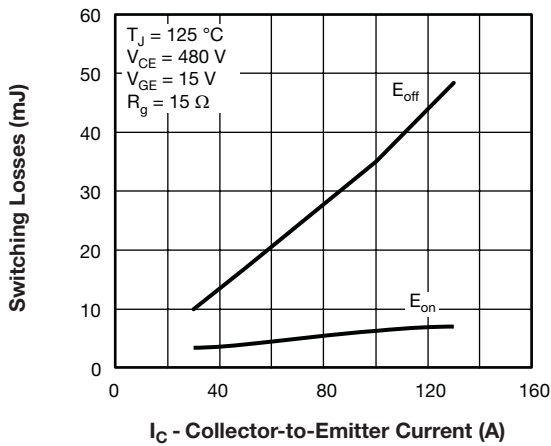


Fig. 7 - Typical Switching Losses vs. Collector to Emitter Current

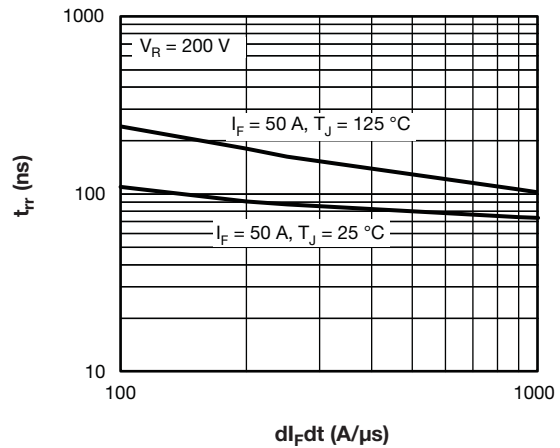


Fig. 9 - Typical Reverse Recovery Time vs.  $dI_F/dt$

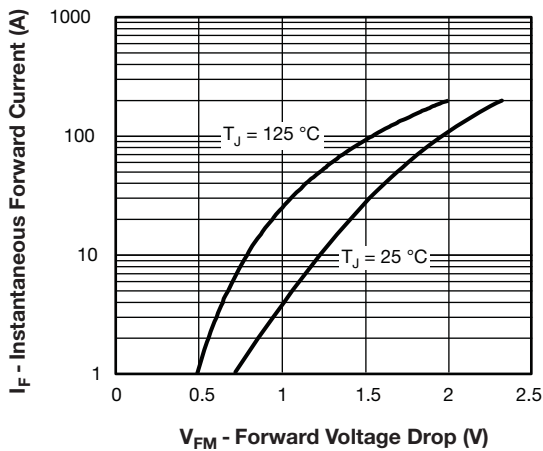


Fig. 8 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

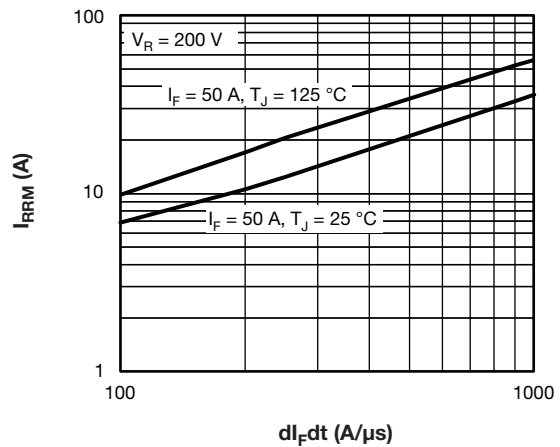


Fig. 10 - Typical Reverse Recovery Current vs.  $dI_F/dt$

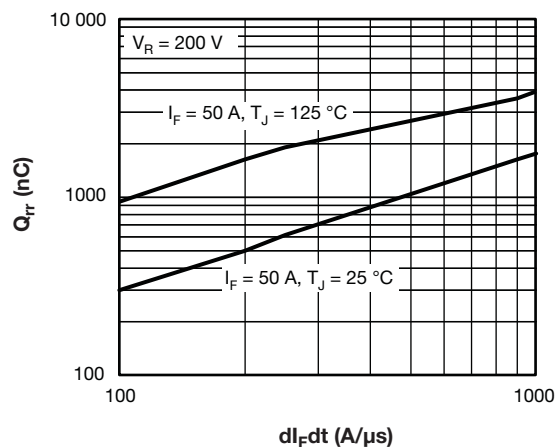
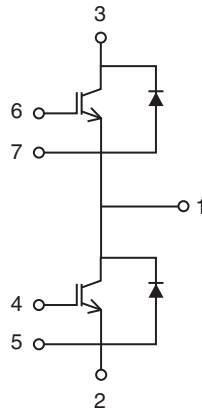


Fig. 11 - Typical Stored Charge vs.  $dI_F/dt$

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>GA</b>	<b>100</b>	<b>T</b>	<b>S</b>	<b>60</b>	<b>S</b>	<b>F</b>	<b>PbF</b>
	①	②	③	④	⑤	⑥	⑦	⑧	⑨

- 1** - Vishay Semiconductors product
- 2** - Essential part number IGBT modules
- 3** - Current rating (100 = 100 A)
- 4** - Circuit configuration (T = Half bridge)
- 5** - INT-A-PAK
- 6** - Voltage code (60 = 600 V)
- 7** - Speed/type (S = Standard speed IGBT)
- 8** - Diode type
- 9** - None = Standard production; PbF = Lead (Pb)-free

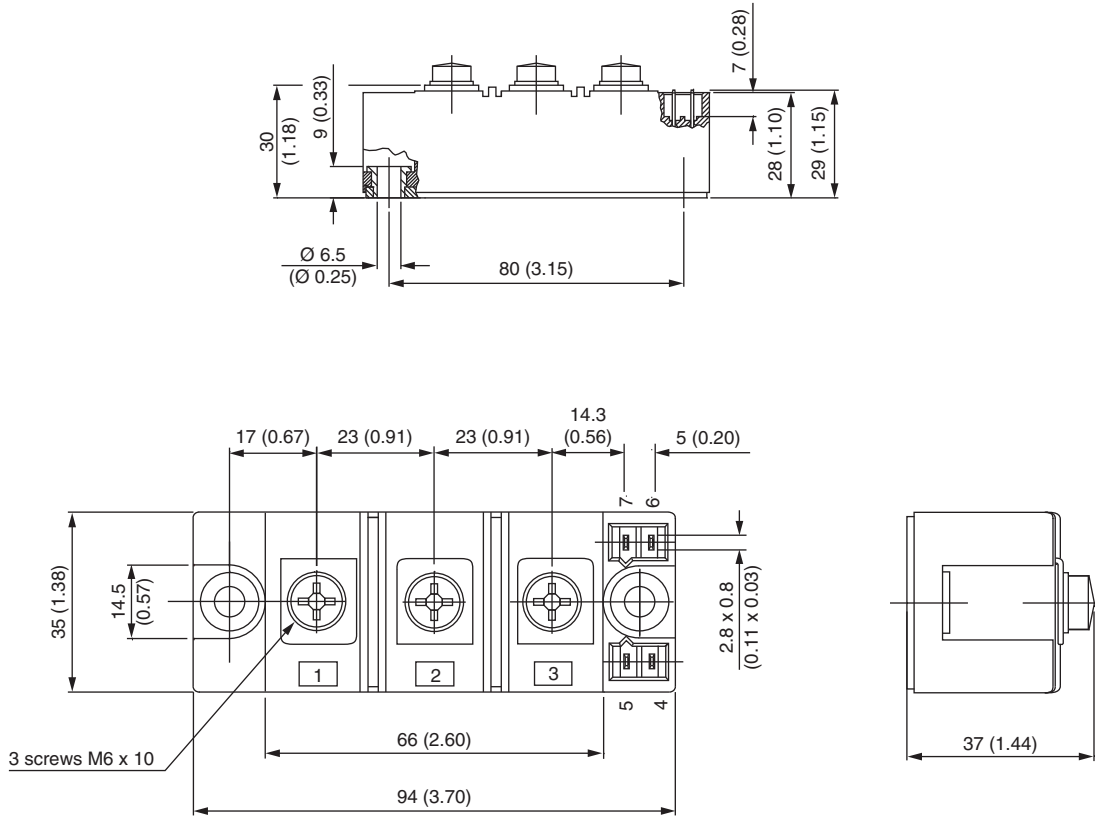
**CIRCUIT CONFIGURATION**

**LINKS TO RELATED DOCUMENTS**

Dimensions	<a href="http://www.vishay.com/doc?95173">www.vishay.com/doc?95173</a>
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## INT-A-PAK IGBT

**DIMENSIONS** in millimeters (inches)





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