


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



INT-A-PAK

### FEATURES

- Standard speed PT IGBT technology
- Standard speed: DC to 1 kHz, optimized for hard switching speed
- FRED Pt® antiparallel diodes with fast recovery
- Very low conduction losses
- Al<sub>2</sub>O<sub>3</sub> DBC
- UL approved file E78996 
- Compliant to RoHS directive 2002/95/EC
- Designed for industrial level


**RoHS**  
COMPLIANT

### PRODUCT SUMMARY

$V_{CES}$	600 V
$I_C$ DC	220 A
$V_{CE(on)}$ at 100 A, 25 °C	1.11 V

### 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 min	2500	
Maximum power dissipation	$P_D$	$T_C = 25\text{ °C}$	780	W
		$T_C = 100\text{ °C}$	312	

### 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

# GA100TS60SFPbF



Vishay High Power Products "Half-Bridge" IGBT INT-A-PAK  
(Standard Speed IGBT), 100 A

SWITCHING CHARACTERISTICS ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Total gate charge	$Q_g$	$I_C = 100\text{ A}$ $V_{CC} = 400\text{ V}$ $V_{GE} = 15\text{ V}$	-	640	700	nC
Gate to emitter charge	$Q_{ge}$		-	108	120	
Gate to collector charge	$Q_{gc}$		-	230	300	
Rise time	$t_r$	$I_C = 100\text{ A}$ $V_{CC} = 480\text{ V}$	-	0.45	-	$\mu\text{s}$
Fall time	$t_f$		-	1.0	-	
Turn-on switching energy	$E_{on}$	$V_{GE} = 15\text{ V}$ $R_g = 15\text{ }\Omega$ $T_J = 25\text{ }^\circ\text{C}$	-	4	6	mJ
Turn-off switching energy	$E_{off}$		-	23	29	
Total switching energy	$E_{ts}$		-	27	35	
Turn-on switching energy	$E_{on}$		$I_C = 100\text{ A}, V_{CC} = 480\text{ V}$	-	6	
Turn-off switching energy	$E_{off}$	$V_{GE} = 15\text{ V}, R_g = 15\text{ }\Omega$ $T_J = 125\text{ }^\circ\text{C}$	-	35	40	mJ
Total switching energy	$E_{ts}$		-	41	52	
Input capacitance	$C_{ies}$	$V_{GE} = 0\text{ V}$ $V_{CC} = 30\text{ V}$ $f = 1.0\text{ MHz}$	-	16 250	-	pF
Output capacitance	$C_{oes}$		-	1040	-	
Reverse transfer capacitance	$C_{res}$		-	190	-	
Diode reverse recovery time	$t_{rr}$	$I_F = 50\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_{RR} = 200\text{ V}$	-	91	155	ns
Diode peak reverse current	$I_{rr}$		-	10.6	15	A
Diode recovery charge	$Q_{rr}$		-	500	900	nC
Diode reverse recovery time	$t_{rr}$	$I_F = 50\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_{RR} = 200\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	180	344	ns
Diode peak reverse current	$I_{rr}$		-	17	20.5	A
Diode recovery charge	$Q_{rr}$		-	1633	2315	nC

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	
Operating junction temperature range	$T_J$	- 40	-	150	$^\circ\text{C}$	
Storage temperature range	$T_{Stg}$	- 40	-	125		
Junction to case	$R_{thJC}$	per switch	-	-	0.16	$^\circ\text{C}/\text{W}$
		per diode	-	-	0.48	
Case to sink per module	$R_{thCS}$	-	0.1	-	Nm	
Mounting torque	case to heatsink	-	-	4		
	case to terminal 1, 2, 3	-	-	3		
Weight		-	185	-	g	

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Vishay High Power Products

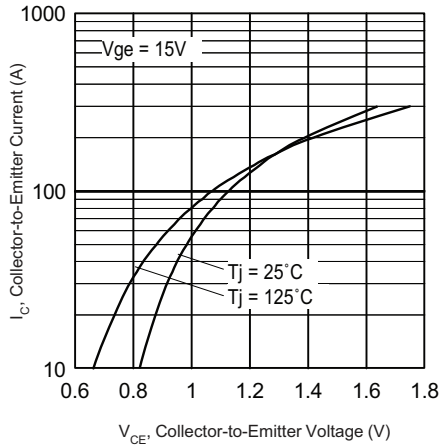


Fig. 1 - Typical Output Characteristics

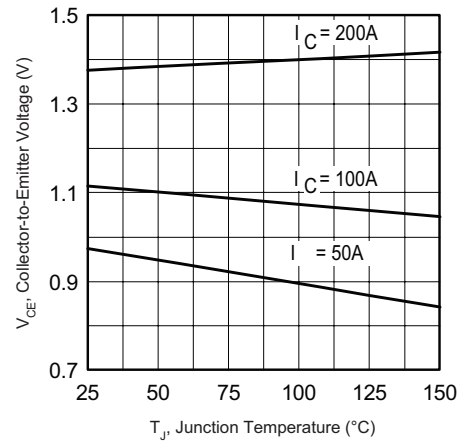


Fig. 4 - Typical Collector to Emitter Voltage vs. Junction Temperature

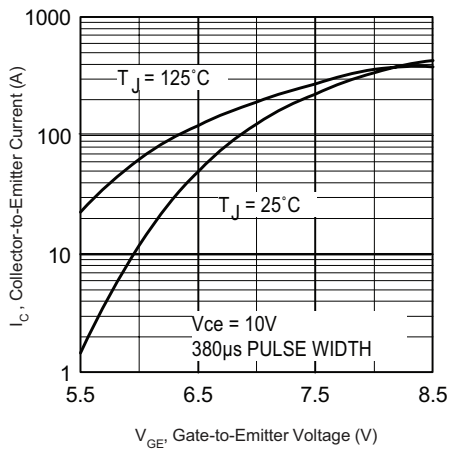


Fig. 2 - Typical Transfer Characteristics

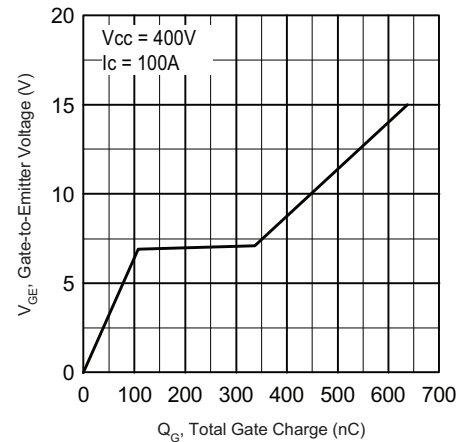


Fig. 5 - Typical Gate Charge vs. Gate to Emitter Voltage

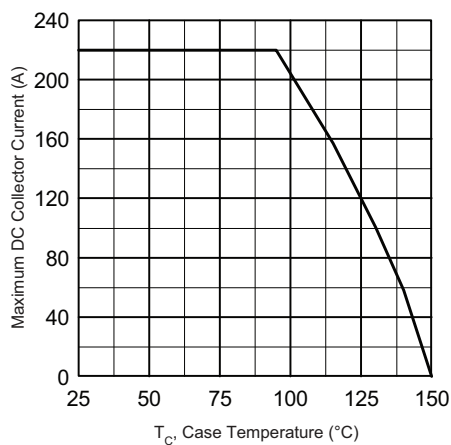


Fig. 3 - Maximum Collector Current vs. Case Temperature

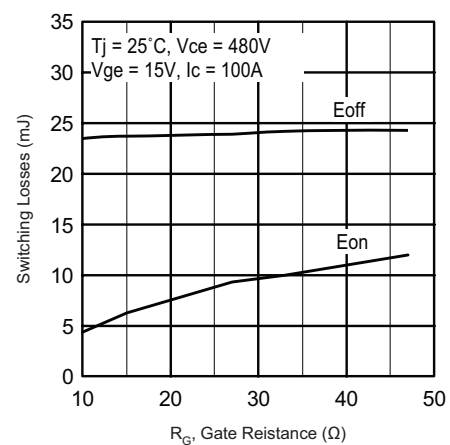


Fig. 6 - Typical Switching Losses vs. Gate Resistance

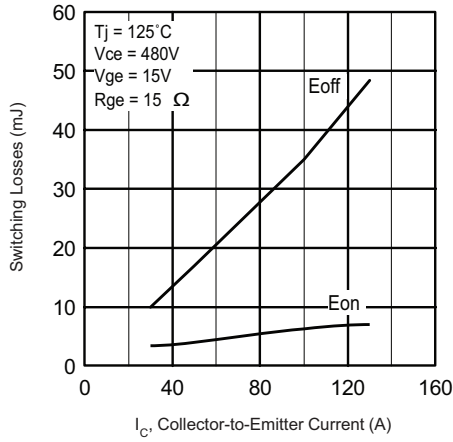


Fig. 7 - Typical Switching Losses vs. Collector to Emitter Current

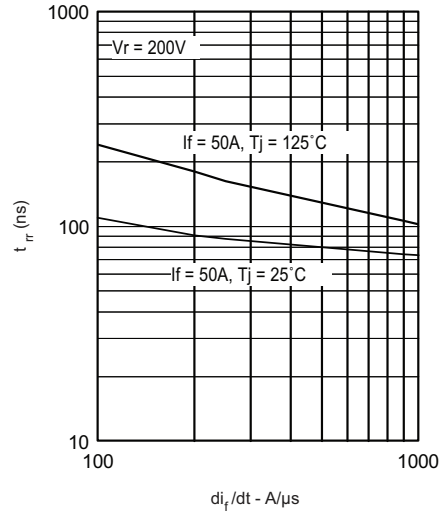


Fig. 9 - Typical Reverse Recovery Time vs.  $di_f/dt$

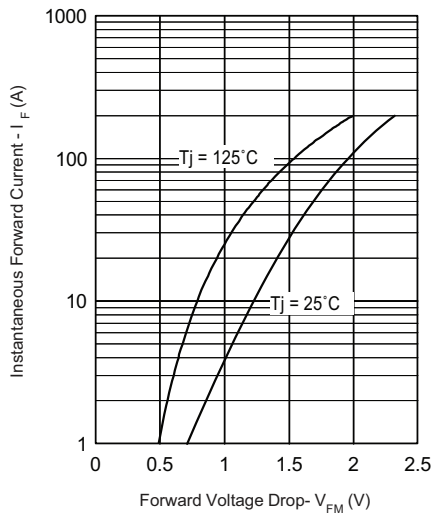


Fig. 8 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

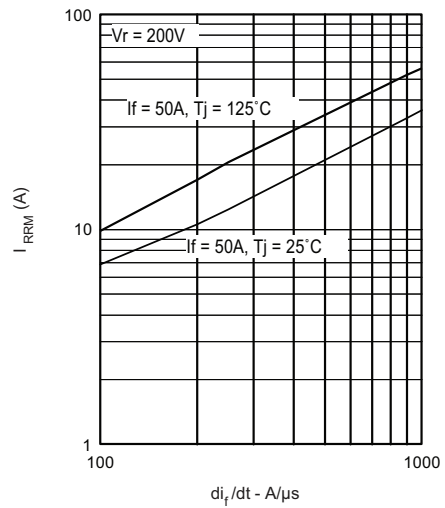
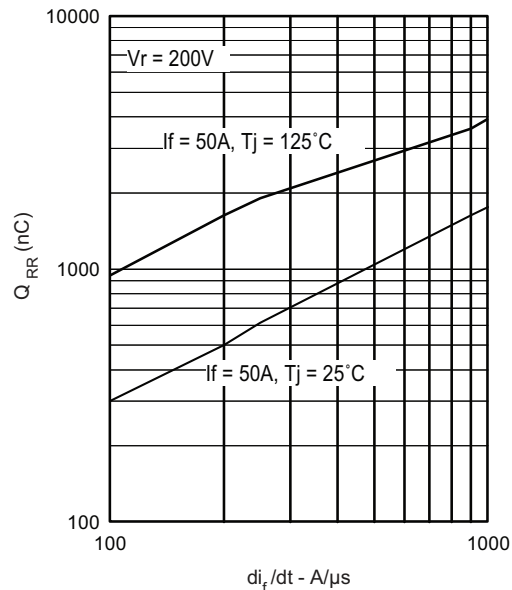
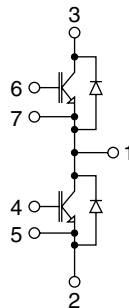


Fig. 10 - Typical Reverse Recovery Current vs.  $di_f/dt$


 Fig. 11 - Typical Stored Charge vs.  $di_T/dt$ 
**ORDERING INFORMATION TABLE**

Device code	<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

- 1** - Essential part number IGBT modules
- 2** - Current rating (100 = 100 A)
- 3** - Circuit configuration (T = Half bridge)
- 4** - INT-A-PAK
- 5** - Voltage code (60 = 600 V)
- 6** - Speed/type (S = Standard speed IGBT)
- 7** - Diode type
- 8** - 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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