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**VS-GT50TP60N**

Vishay Semiconductors

## Half Bridge IGBT Power Module, 600 V, 50 A



INT-A-PAK

### FEATURES

- Low  $V_{CE(on)}$  trench IGBT technology
- 5  $\mu$ s short circuit capability
- $V_{CE(on)}$  with positive temperature coefficient
- Maximum junction temperature 175 °C
- Low inductance case
- Fast and soft reverse recovery antiparallel FWD
- Isolated copper baseplate using DCB (Direct Copper Bonding) technology
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS  
COMPLIANT

PRODUCT SUMMARY	
$V_{CES}$	600 V
$I_C$ at $T_C = 80^\circ\text{C}$	50 A
$V_{CE(on)}$ (typical) at $I_C = 50 \text{ A}, 25^\circ\text{C}$	1.65 V
Speed	8 kHz to 30 kHz
Package	INT-A-PAK
Circuit	Half bridge

### TYPICAL APPLICATIONS

- UPS (Uninterruptable Power Supply)
- Electronic welders
- Switching mode power supplies

### DESCRIPTION

Vishay's IGBT power module provides ultra low conduction loss as well as short circuit ruggedness. It is designed for applications such as UPS and SMPS.

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	$V_{CES}$		600	V
Gate to emitter voltage	$V_{GES}$		$\pm 20$	
Collector current	$I_C$	$T_C = 25^\circ\text{C}$	85	A
		$T_C = 80^\circ\text{C}$	50	
Pulsed collector current	$I_{CM}^{(1)}$	$t_p = 1 \text{ ms}$	100	
Diode continuous forward current	$I_F$	$T_C = 80^\circ\text{C}$	50	
Diode maximum forward current	$I_{FM}^{(1)}$	$t_p = 1 \text{ ms}$	100	
Maximum power dissipation	$P_D$	$T_J = 175^\circ\text{C}$	208	
Short circuit withstand time	$t_{SC}$	$T_C = 125^\circ\text{C}$	5	$\mu\text{s}$
RMS isolation voltage	$V_{ISOL}$	$f = 50 \text{ Hz}, t = 1 \text{ min}$	4000	V

#### Note

(1) Repetitive rating: pulse width limited by maximum junction temperature.

IGBT ELECTRICAL SPECIFICATIONS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Collector to emitter breakdown voltage	$V_{(BR)CES}$	$T_J = 25^\circ\text{C}$	600	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	$V_{GE} = 15 \text{ V}, I_C = 50 \text{ A}, T_J = 25^\circ\text{C}$	-	1.65	2.10	
		$V_{GE} = 15 \text{ V}, I_C = 50 \text{ A}, T_J = 175^\circ\text{C}$	-	2.05	-	
Gate to emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 1.4 \text{ mA}, T_J = 25^\circ\text{C}$	4.0	4.9	6.5	
Collector cut-off current	$I_{CES}$	$V_{CE} = V_{CES}, V_{GE} = 0 \text{ V}, T_J = 25^\circ\text{C}$	-	-	1.0	mA
Gate to emitter leakage current	$I_{GES}$	$V_{GE} = V_{GES}, V_{CE} = 0 \text{ V}, T_J = 25^\circ\text{C}$	-	-	400	nA



<b>SWITCHING CHARACTERISTICS</b>								
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS	
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 300 \text{ V}, I_C = 50 \text{ A}, R_g = 3.3 \Omega, V_{GE} = \pm 15 \text{ V}, T_J = 25 \text{ }^\circ\text{C}$		-	58	-	ns	
Rise time	$t_r$			-	31	-		
Turn-off delay time	$t_{d(off)}$			-	80	-		
Fall time	$t_f$			-	100	-		
Turn-on switching loss	$E_{on}$			-	0.41	-	mJ	
Turn-off switching loss	$E_{off}$			-	0.42	-		
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 300 \text{ V}, I_C = 50 \text{ A}, R_g = 3.3 \Omega, V_{GE} = \pm 15 \text{ V}, T_J = 125 \text{ }^\circ\text{C}$		-	64	-	ns	
Rise time	$t_r$			-	37	-		
Turn-off delay time	$t_{d(off)}$			-	90	-		
Fall time	$t_f$			-	117	-		
Turn-on switching loss	$E_{on}$			-	0.69	-	mJ	
Turn-off switching loss	$E_{off}$			-	0.69	-		
Input capacitance	$C_{ies}$	$V_{GE} = 0 \text{ V}, V_{CE} = 30 \text{ V}, f = 1.0 \text{ MHz}$		-	3.03	-	nF	
Output capacitance	$C_{oes}$			-	0.25	-		
Reverse transfer capacitance	$C_{res}$			-	0.09	-		
SC data	$I_{SC}$	$t_p \leq 5 \mu\text{s}, V_{GE} = 15 \text{ V}, T_J = 125 \text{ }^\circ\text{C}, V_{CC} = 360 \text{ V}, V_{CEM} \leq 600 \text{ V}$		-	450	-	A	
Stray inductance	$L_{CE}$			-	-	30	nH	
Module lead resistance, terminal to chip	$R_{CC'EE'}$			-	0.75	-	mΩ	

<b>DIODE ELECTRICAL SPECIFICATIONS</b> ( $T_C = 25 \text{ }^\circ\text{C}$ unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Forward voltage	$V_F$	$I_F = 50 \text{ A}$	$T_J = 25 \text{ }^\circ\text{C}$	-	1.35	1.75	V
			$T_J = 125 \text{ }^\circ\text{C}$	-	1.37	-	
Reverse recovery charge	$Q_{rr}$	$I_F = 50 \text{ A}, V_R = 300 \text{ V}, R_G = 3.3 \Omega, V_{GE} = -15 \text{ V}$	$T_J = 25 \text{ }^\circ\text{C}$	-	2.3	-	$\mu\text{C}$
			$T_J = 125 \text{ }^\circ\text{C}$	-	4.3	-	
Peak reverse recovery current	$I_{rr}$		$T_J = 25 \text{ }^\circ\text{C}$	-	33	-	A
			$T_J = 125 \text{ }^\circ\text{C}$	-	58	-	
Reverse recovery energy	$E_{rec}$		$T_J = 25 \text{ }^\circ\text{C}$	-	0.56	-	mJ
			$T_J = 125 \text{ }^\circ\text{C}$	-	1.11	-	

<b>THERMAL AND MECHANICAL SPECIFICATIONS</b>							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Maximum junction temperature range	$T_J$			-	-	175	$^\circ\text{C}$
Storage temperature range	$T_{Stg}$			-40	-	125	$^\circ\text{C}$
Junction to case per ½ module	IGBT	$R_{thJC}$			-	0.72	K/W
Diode					-	1.02	
Case to sink (Conductive grease applied)	$R_{thCS}$			-	0.05	-	
Mounting torque			Power terminal screw: M5		2.5 to 5.0		Nm
			Mounting screw: M6		3.0 to 5.0		
Weight		Weight of module		-	150	-	g



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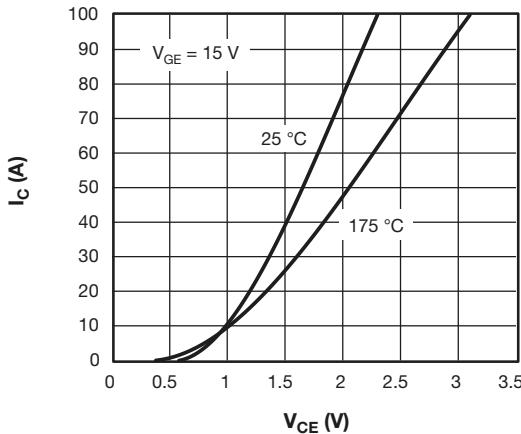


Fig. 1 - IGBT Typical Output Characteristics

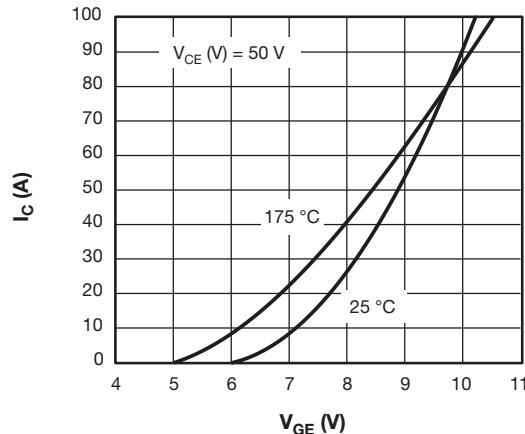


Fig. 3 - IGBT Switching Loss vs.  $I_C$

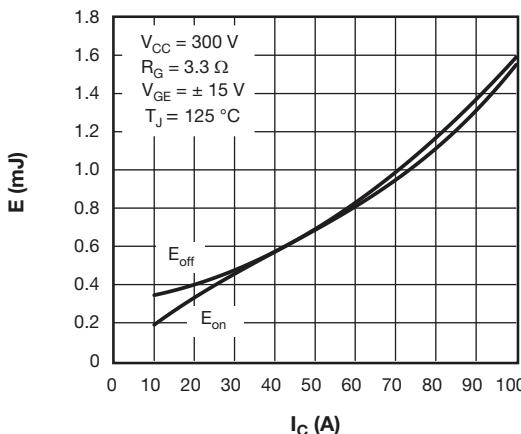


Fig. 2 - IGBT Transfer Characteristics

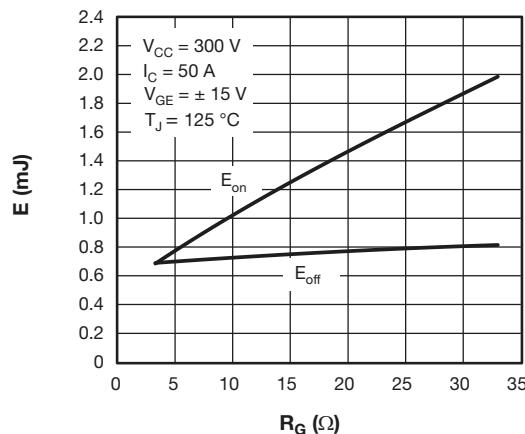


Fig. 4 - IGBT Switching Loss vs.  $R_G$

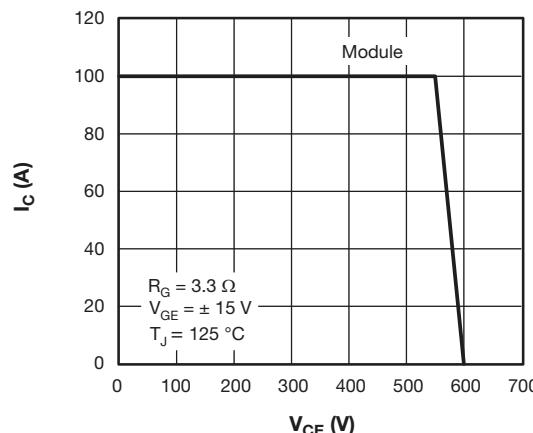


Fig. 5 - RBSOA

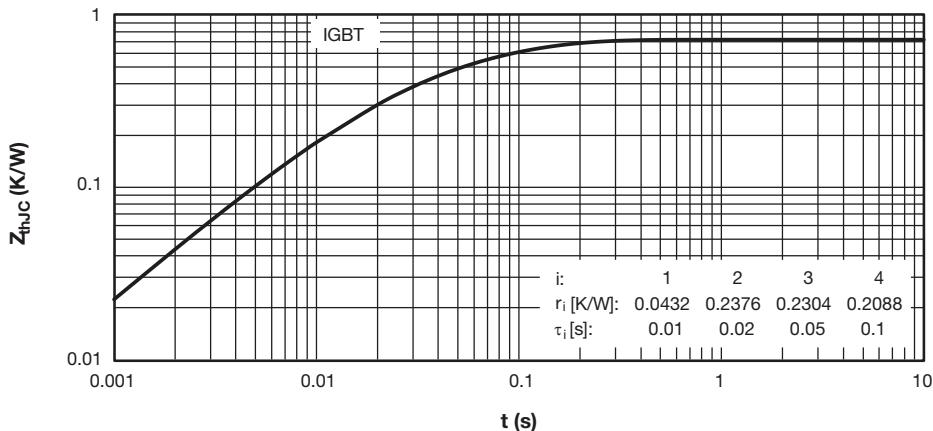


Fig. 6 - IGBT Transient Thermal Impedance

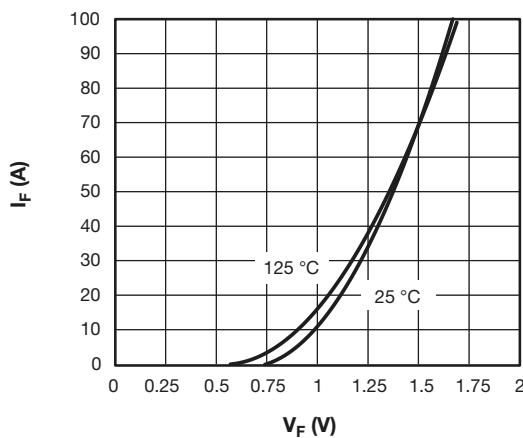


Fig. 7 - Diode Forward Characteristics

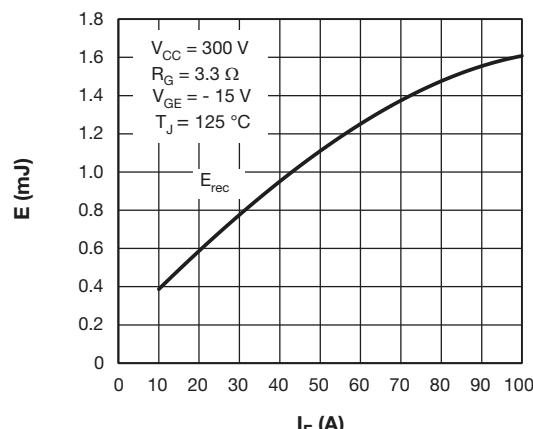


Fig. 8 - Diode Switching Loss vs. IF

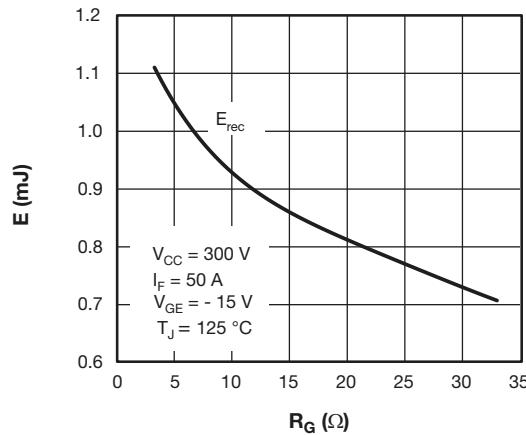


Fig. 9 - Diode Switching Loss vs. RG

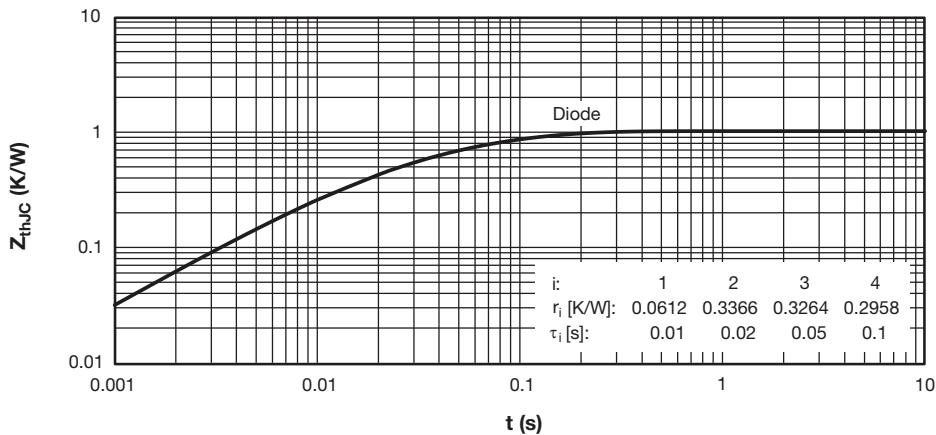
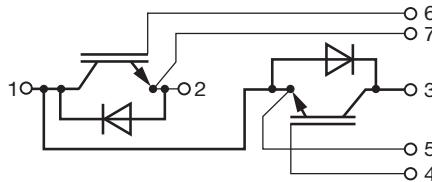


Fig. 10 - Diode Transient Thermal Impedance

## CIRCUIT CONFIGURATION



### LINKS TO RELATED DOCUMENTS

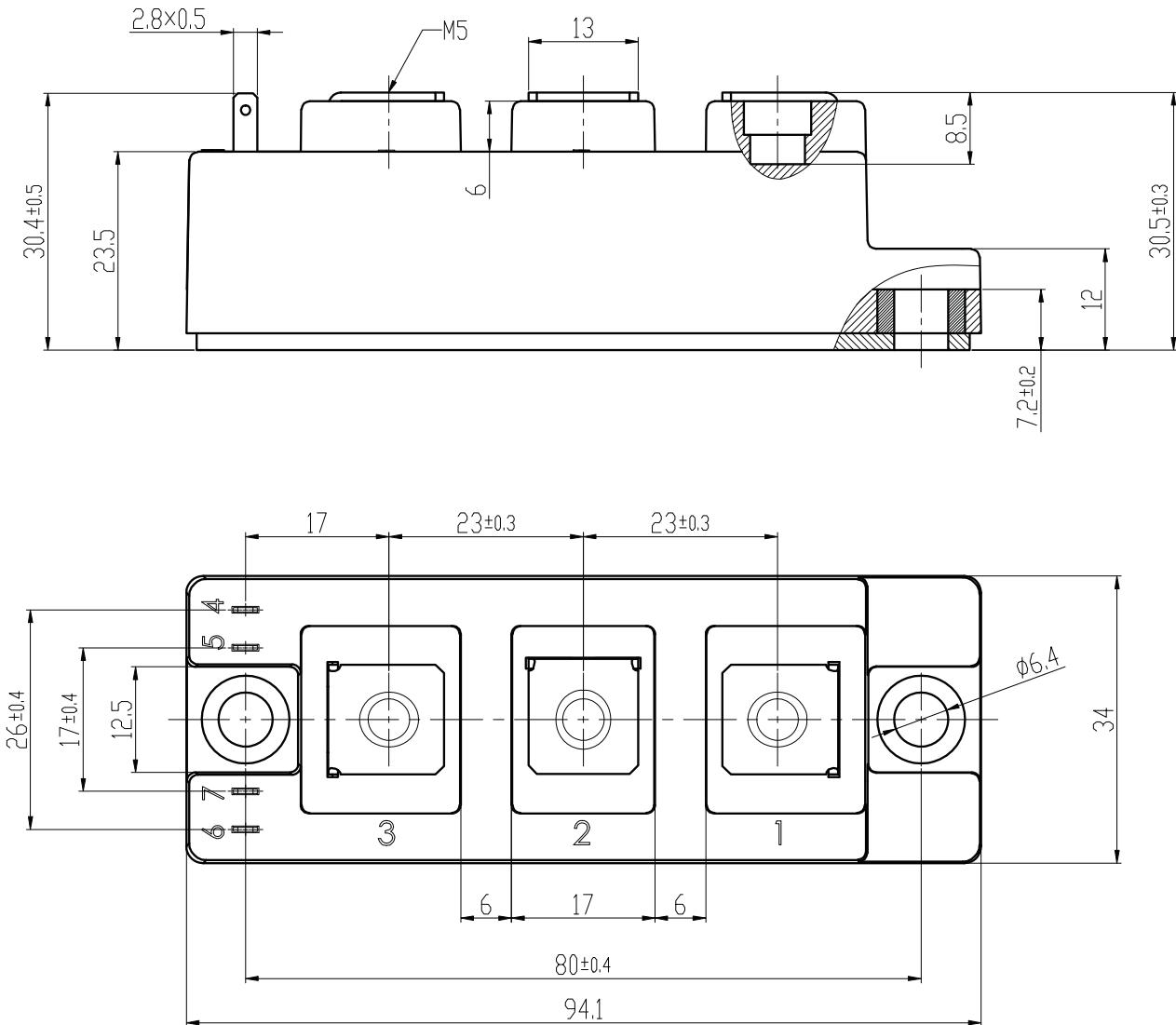
Dimensions	<a href="http://www.vishay.com/doc?95524">www.vishay.com/doc?95524</a>
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## Outline Dimensions

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### INT-A-PAK

**DIMENSIONS** in millimeters (inches)





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