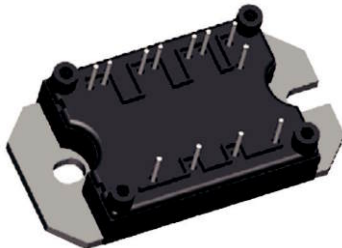



"Half Bridge" IGBT MTP (Warp Speed IGBT), 114 A


MTP

FEATURES

- Generation 4 warp speed IGBT technology
- HEXFRED® antiparallel diodes with ultrasoft reverse recovery
- Very low conduction and switching losses
- Optional SMD thermistor (NTC)
- Very low junction to case thermal resistance
- UL approved file E78996 
- Speed 60 kHz to 100 kHz
- Compliant to RoHS directive 2002/95/EC
- Designed and qualified for industrial level


RoHS
COMPLIANT

PRODUCT SUMMARY	
V_{CES}	600 V
$V_{CE(on)}$ typical at $V_{GE} = 15$ V	2.3 V
I_C at $T_C = 25$ °C	114 A

BENEFITS

- Optimized for welding, UPS and SMPS applications
- Low EMI, requires less snubbing
- Direct mounting to heatsink
- PCB solderable terminals
- Very low stray inductance design for high speed operation

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	114	A
		$T_C = 109$ °C	50	
Pulsed collector current	I_{CM}		350	
Peak switching current	I_{LM}		350	
Diode continuous forward current	I_F	$T_C = 109$ °C	34	
Peak diode forward current	I_{FM}		200	
Gate to emitter voltage	V_{GE}		± 20	
RMS isolation voltage	V_{ISOL}	Any terminal to case, t = 1 minute	2500	
Maximum power dissipation	P_D	$T_C = 25$ °C	658	W
		$T_C = 100$ °C	263	

50MT060WHTAPbF



Vishay High Power Products "Half Bridge" IGBT MTP
(Warp Speed IGBT), 114 A

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	-	2.3	3.15	V
		V _{GE} = 15 V, I _C = 100 A	-	2.5	3.2	
		V _{GE} = 15 V, I _C = 50 A, T _J = 150 °C	-	1.72	2.17	
Gate threshold voltage	V _{GE(th)}	I _C = 0.5 mA	3	-	6	
Collector to emitter leaking current	I _{CES}	V _{GE} = 0 V, I _C = 600 A	-	-	0.4	mA
		V _{GE} = 0 V, I _C = 600 A, T _J = 150 °C	-	-	10	
Diode forward voltage drop	V _{FM}	I _F = 50 A, V _{GE} = 0 V	-	1.58	1.80	V
		I _F = 50 A, V _{GE} = 0 V, T _J = 150 °C	-	1.49	1.68	
		I _F = 100 A, V _{GE} = 0 V, T _J = 25 °C	-	1.9	2.17	
Gate to emitter leakage current	I _{GES}	V _{GE} = ± 20 V	-	-	± 250	nA

SWITCHING CHARACTERISTICS (T _J = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Total gate charge (turn-on)	Q _g	I _C = 52 A V _{CC} = 400 V V _{GE} = 15 V	-	331	385	nC
Gate to emitter charge (turn-on)	Q _{ge}		-	44	52	
Gate to collector charge (turn-on)	Q _{gc}		-	133	176	
Turn-on switching loss	E _{on}	Internal gate resistors (see electrical diagram) I _C = 50 A, V _{CC} = 480 V, V _{GE} = 15 V, L = 200 μH Energy losses include tail and diode reverse recovery, T _J = 25 °C	-	0.26	-	mJ
Turn-off switching loss	E _{off}		-	1.2	-	
Total switching loss	E _{ts}		-	1.46	-	
Turn-on switching loss	E _{on}	Internal gate resistors (see electrical diagram) I _C = 50 A, V _{CC} = 480 V, V _{GE} = 15 V, L = 200 μH Energy losses include tail and diode reverse recovery, T _J = 150 °C	-	0.73	-	mJ
Turn-off switching loss	E _{off}		-	1.66	-	
Total switching loss	E _{ts}		-	2.39	-	
Input capacitance	C _{ies}	V _{GE} = 0 V V _{CC} = 30 V f = 1.0 MHz	-	7100	-	pF
Output capacitance	C _{oes}		-	510	-	
Reverse transfer capacitance	C _{res}		-	140	-	
Diode reverse recovery time	t _{rr}	V _{CC} = 200 V, I _C = 50 A dI/dt = 200 A/μs	-	82	97	ns
Diode peak reverse current	I _{rr}		-	8.3	10.6	A
Diode recovery charge	Q _{rr}		-	340	514	nC
Diode reverse recovery time	t _{rr}	V _{CC} = 200 V, I _C = 50 A dI/dt = 200 A/μs T _J = 125 °C	-	137	153	ns
Diode peak reverse current	I _{rr}		-	12.7	14.8	A
Diode recovery charge	Q _{rr}		-	870	1132	nC

THERMISTOR SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Resistance	R_0 ⁽¹⁾	$T_0 = 25\text{ }^\circ\text{C}$	-	30	-	k Ω
Sensitivity index of the thermistor material	β ⁽¹⁾⁽²⁾	$T_0 = 25\text{ }^\circ\text{C}$ $T_1 = 85\text{ }^\circ\text{C}$	-	4000	-	K

Notes

⁽¹⁾ T_0, T_1 are thermistor's temperatures

⁽²⁾ $\frac{R_0}{R_1} = \exp\left[\beta\left(\frac{1}{T_0} - \frac{1}{T_1}\right)\right]$, temperature in Kelvin

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating junction temperature range	IGBT, Diode		- 40	-	150	°C
	Thermistor					
Storage temperature range	T_{Stg}		- 40	-	125	
Junction to case	IGBT		-	-	0.38	°C/W
	Diode					
Case to sink per module	R_{thCS}	Heatsink compound thermal conductivity = 1 W/mK	-	0.06	-	
Clearance ⁽¹⁾		External shortest distance in air between 2 terminals	5.5	-	-	mm
Creepage ⁽¹⁾		Shortest distance along the external surface of the insulating material between 2 terminals	8	-	-	mm
Mounting torque to heatsink		A mounting compound is recommended and the torque should be checked after 3 hours to allow for the spread of the compound. Lubricated threads.	3 ± 10 %			Nm
Weight			66			g

Note

⁽¹⁾ Standard version only i.e. without optional thermistor

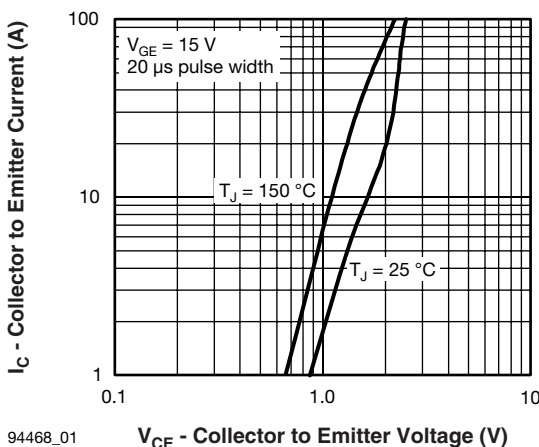


Fig. 1 - Typical Output Characteristics

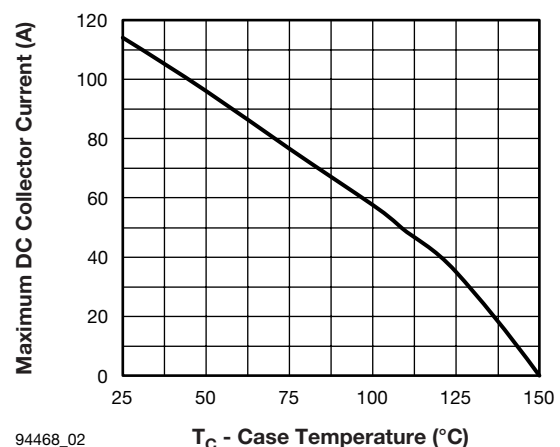


Fig. 2 - Maximum Collector Current vs. Case Temperature

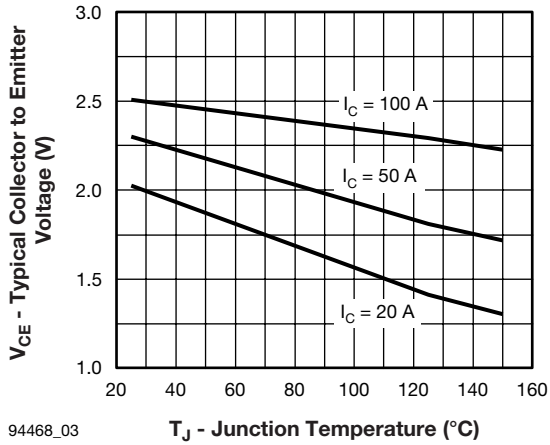


Fig. 3 - Typical Collector to Emitter Voltage vs. Junction Temperature

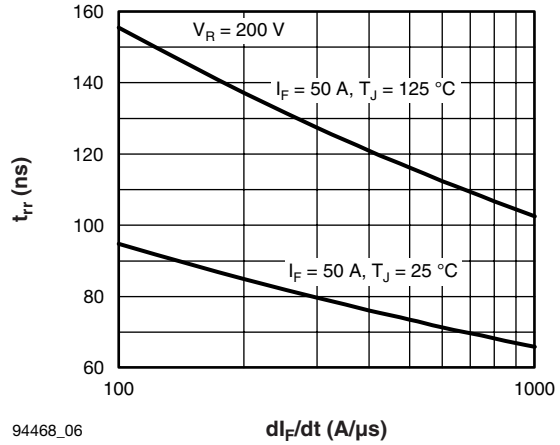


Fig. 6 - Typical Reverse Recovery Time vs. di_F/dt

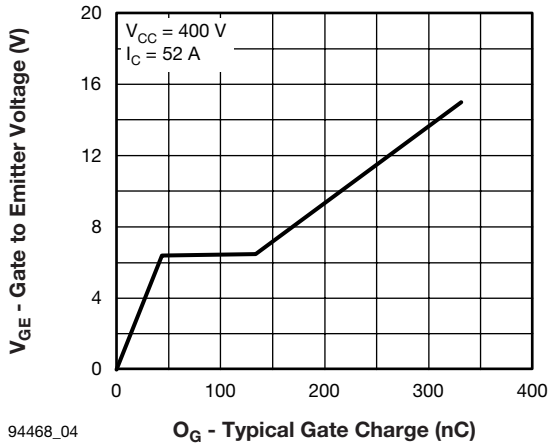


Fig. 4 - Typical Gate Charge vs. Gate to Emitter Voltage

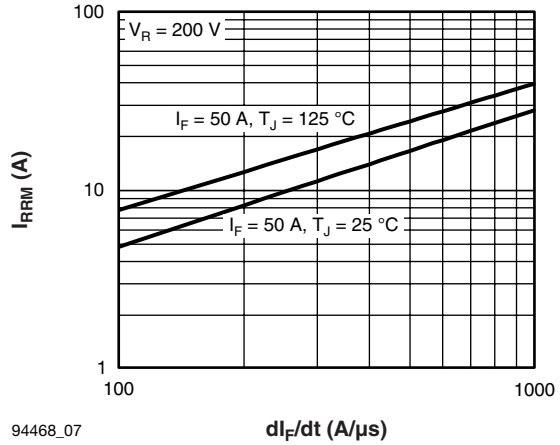


Fig. 7 - Typical Reverse Recovery Current vs. di_F/dt

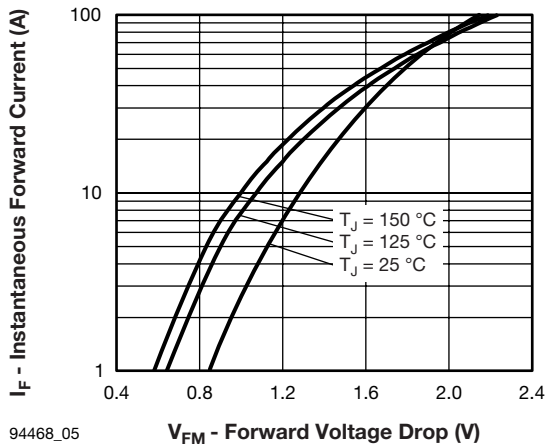


Fig. 5 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

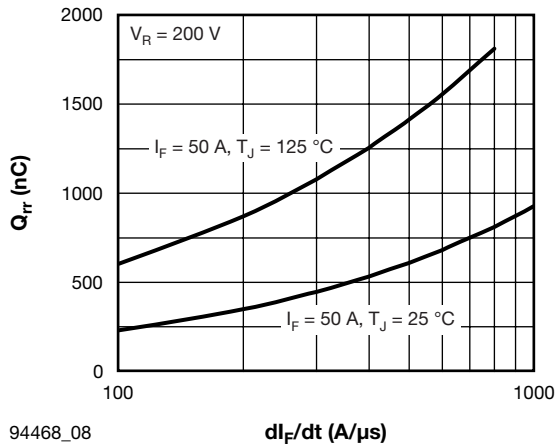


Fig. 8 - Typical Stored Charge vs. di_F/dt

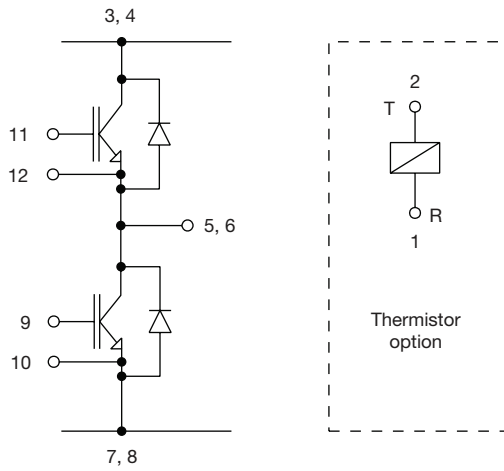


Fig. 9 - Functional Diagram

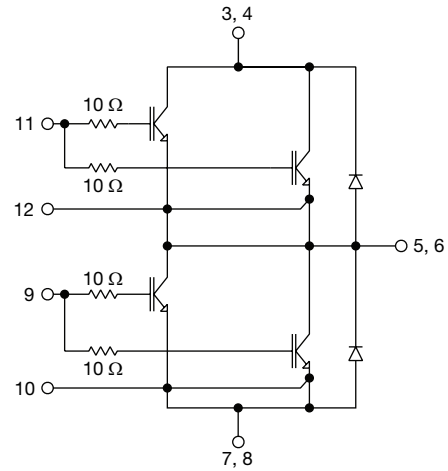
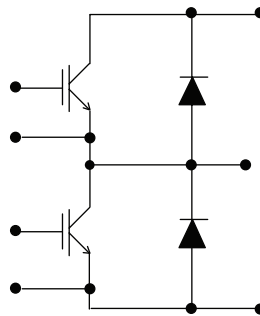


Fig. 10 - Electrical Diagram

ORDERING INFORMATION TABLE

Device code	50	MT	060	W	H	T	A	PbF	
	①	②	③	④	⑤	⑥	⑦	⑧	
	1	-	Current rating (50 = 50 A)	2	-	Essential part number	3	-	Voltage rating (060 = 600 V)
	4	-	Speed/type (W = Warp IGBT)	5	-	Circuit configuration (H = Half bridge)	6	-	T = Thermistor
	7	-	A = Al ₂ O ₃ substrate	8	-	Lead (Pb)-free			

CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95175



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