International
IOR Rectifier

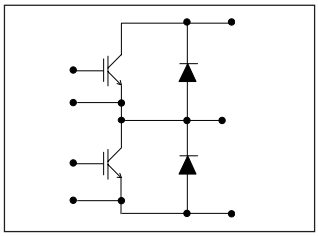
50MT060WH

"HALF-BRIDGE" IGBT MTP

Warp Speed IGBT

Features

- Gen. 4 Warp Speed IGBT Technology
- HEXFRED ™ Antiparallel Diodes with UltraSoft Reverse Recovery
- Very Low Conduction and Switching Losses
- Optional SMT Thermistor (NTC)
- Aluminum Nitride DBC
- Very Low Stray Inductance Design for High Speed Operation
- UL E78996 approved



V_{CES} = 600V

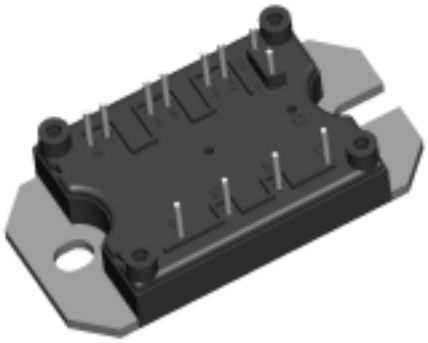
$V_{CE(on)\ typ.}$ = 2.3V @

V_{GE} = 15V, I_C = 50A

T_C = 25°C

Benefits

- Optimized for Welding, UPS and SMPS Applications
- Operating Frequencies > 20 kHz Hard Switching, >200 kHz Resonant Mode
- Low EMI, requires Less Snubbing
- Direct Mounting to Heatsink
- PCB Solderable Terminals
- Very Low Junction-to-Case Thermal Resistance



MTP

Absolute Maximum Ratings

	Parameters		Max	Units
V_{CES}	Collector-to-Emitter Voltage		600	V
I_C	Continuos Collector Current	@ T_C = 25°C	114	A
		@ T_C = 109°C	50	
I_{CM}	Pulsed Collector Current		350	
I_{LM}	Peak Switching Current		350	
I_F	Diode Continuous Forward Current	@ T_C = 109°C	34	
I_{FM}	Peak Diode Forward Current		200	
V_{GE}	Gate-to-Emitter Voltage		± 20	V
V_{ISOL}	RMS Isolation Voltage, Any Terminal to Case, t = 1 min		2500	
P_D	Maximum Power Dissipation	@ T_C = 25°C	658	W
		@ T_C = 100°C	263	

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameters	Min	Typ	Max	Units	Test Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	600			V	V_{GE} = 0V, I_C = 500µA
$V_{CE(on)}$	Collector-to-Emitter Voltage		2.3	3.15		V_{GE} = 15V, I_C = 50A
			2.5	3.2		V_{GE} = 15V, I_C = 100A
			1.72	2.17		V_{GE} = 15V, I_C = 50A, T_J = 150°C
$V_{GE(th)}$	Gate Threshold Voltage	3		6		I_C = 0.5mA
I_{CES}	Collector-to-Emiter Leaking Current			0.4	mA	V_{GE} = 0V, V_{CE} = 600V
				10		V_{GE} = 0V, V_{CE} = 600V, T_J = 150°C
V_{FM}	Diode Forward Voltage Drop		1.58	1.80	V	I_F = 50A, V_{GE} = 0V
			1.49	1.68		I_F = 50A, V_{GE} = 0V, T_J = 150°C
			1.9	2.17		I_F = 100A, V_{GE} = 0V, T_J = 25°C
I_{GES}	Gate-to-Emitter Leakage Current			± 250	nA	V_{GE} = ± 20V

Switching Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameters	Min	Typ	Max	Units	Test Conditions
Q_g	Total Gate Charge (turn-on)		331	385	nC	I_C = 52A
Q_{ge}	Gate-Emitter Charge (turn-on)		44	52		V_{CC} = 400V
Q_{gc}	Gate-Collector Charge (turn-on)		133	176		V_{GE} = 15V
E_{on}	Turn-On Switching Loss		0.26		mJ	Internal gate resistors (see Electrical Diagram)
E_{off}	Turn-Off Switching Loss		1.2			I_C = 50A, V_{CC} = 480V, V_{GE} = 15V, L = 200µH
E_{ts}	Total Switching Loss		1.46			Energy losses include tail and diode reverse recovery
E_{on}	Turn-On Switching Loss		0.73		mJ	Internal gate resistors (see Electrical diagram)
E_{off}	Turn-Off Switching Loss		1.66			I_C = 50A, V_{CC} = 480V, V_{GE} = 15V, L = 200µH
E_{ts}	Total Switching Loss		2.39			Energy losses include tail and diode reverse recovery, T_J = 150°C
C_{ies}	Input Capacitance		7100		pF	V_{GE} = 0V
C_{oes}	Output Capacitance		510			V_{CC} = 30V
C_{res}	Reverse Transfer Capacitance		140			f = 1.0 MHz
trr	Diode Reverse Recovery Time		82	97	ns	V_{CC} = 200V, I_C = 50A
Irr	Diode Peak Reverse Current		8.3	10.6	A	di/dt = 200A/µs
Qrr	Diode Recovery Charge		340	514	nC	
trr	Diode Reverse Recovery Time		137	153	ns	V_{CC} = 200V, I_C = 50A
Irr	Diode Peak Reverse Current		12.7	14.8	A	di/dt = 200A/µs
Qrr	Diode Recovery Charge		870	1132	nC	T_J = 125°C

Thermistor Specifications

	Parameters	Min	Typ	Max	Units	Test Conditions
R_0 (1)	Resistance		30		kΩ	T_0 = 25°C
β (1) (2)	Sensitivity index of the thermistor material		4000		K	T_0 = 25°C T_1 = 85°C

(1) T_0,T_1 are thermistor's temperatures

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

Thermal- Mechanical Specifications

	Parameters		Min	Typ	Max	Units
T_J	Operating Junction	IGBT, Diode	- 40		150	°C
	Temperature Range	Thermistor	- 40		125	
T_{STG}	Storage Temperature Range		- 40		125	
R_{thJC}	Junction-to-Case	IGBT			0.38	°C/ W
		Diode			0.8	
R_{thCS}	Case-to-Sink	Module		0.06		
	(Heatsink Compound Thermal Conductivity = 1 W/mK)					
	Clearance (3) (external shortest distance in air between two terminals)		5.5			mm
	Creepage (3) (shortest distance along the external surface of the insulating material between 2 terminals)		8			
T	Mounting torque to heatsink (4)		3 ± 10%			Nm
Wt	Weight		66			g

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

(4) A mounting compound is recommended and the torque should be checked after 3 hours to allow for the spread of the compound. Lubricated threads

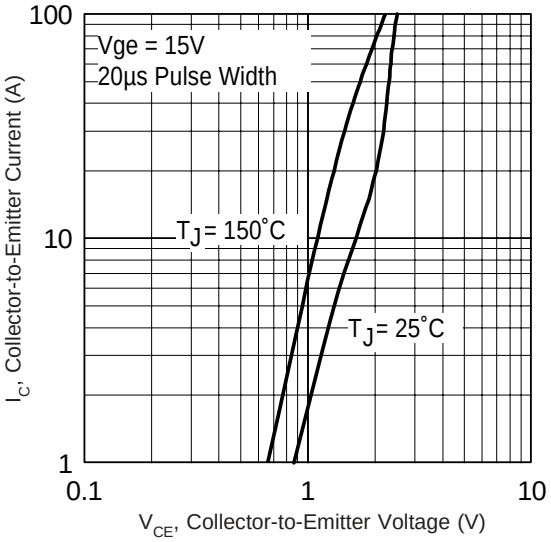


Fig. 1 - Typical Output Characteristics

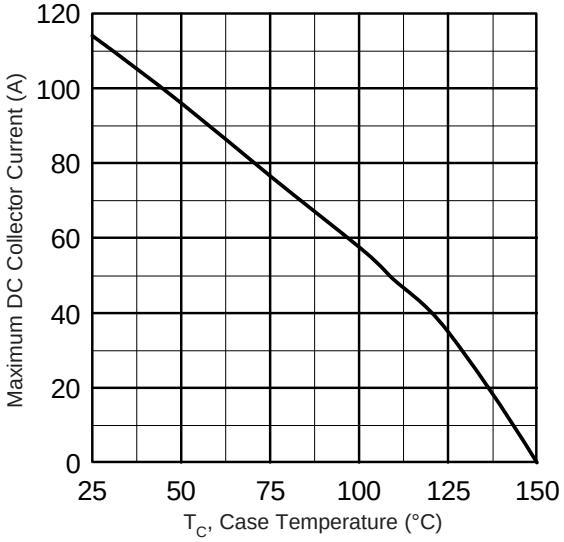


Fig. 2 - Maximum Collector Current vs. Case Temperature

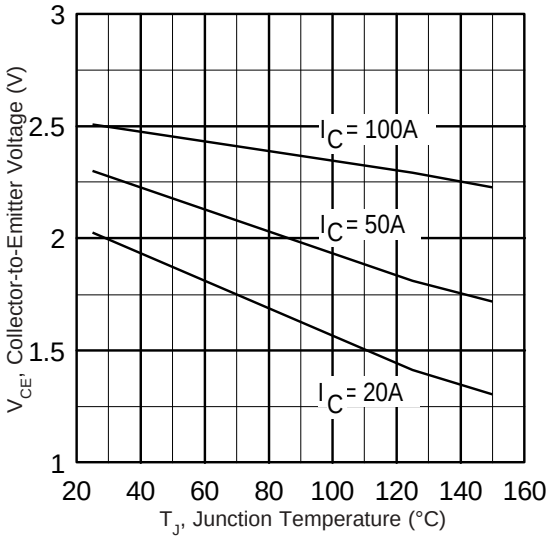


Fig. 3 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

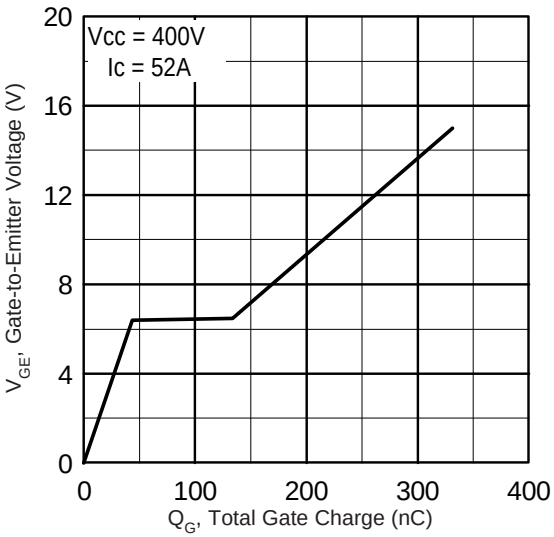


Fig. 4 - Typical Gate Charge vs. Gate-to-Emitter Voltage

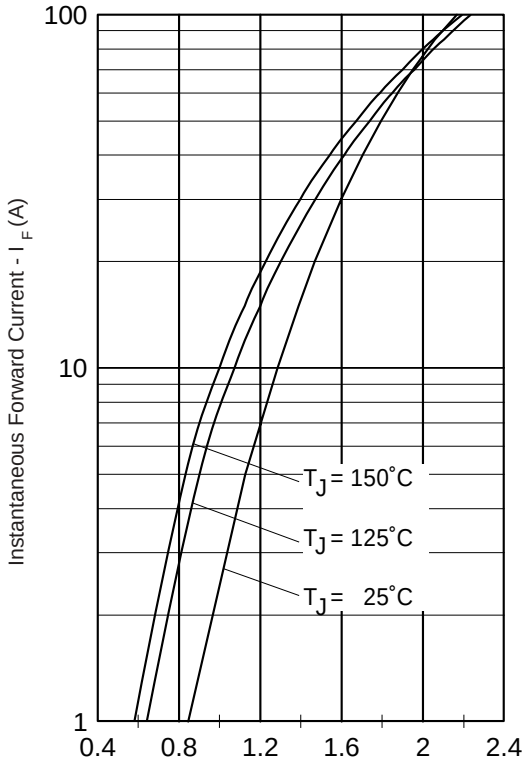


Fig. 5 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

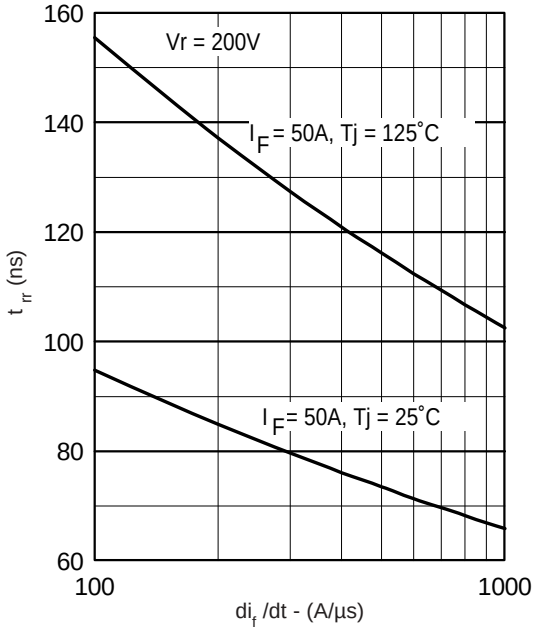


Fig. 6 - Typical Reverse Recovery vs. di_f/dt

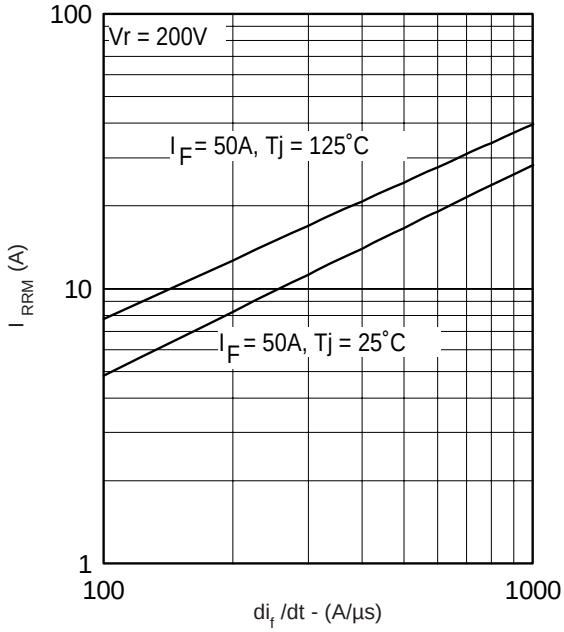


Fig. 7 - Typical Reverse Recovery Current vs. di_f/dt

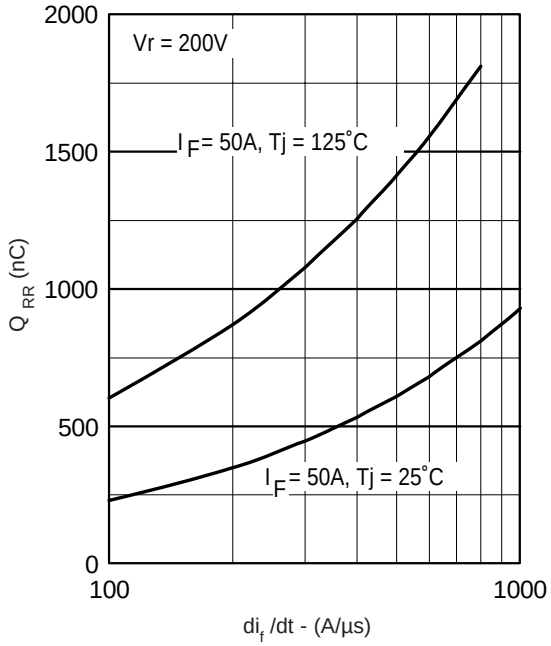
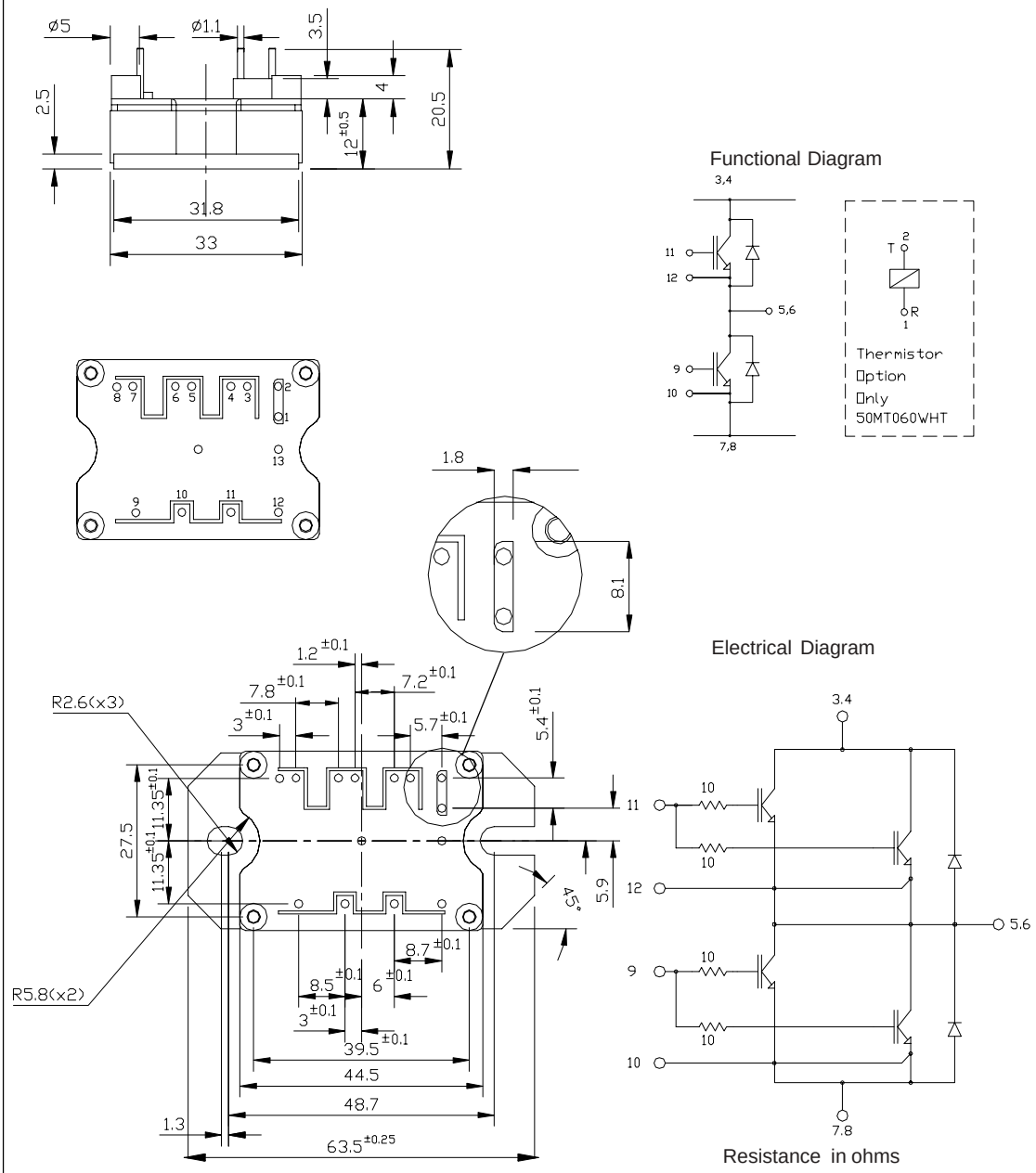


Fig. 8 - Typical Stored Charge vs. di_f/dt

Outline Table

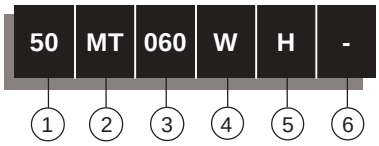


Dimensions in millimetres

Note: unused terminals are not assembled in the package

Ordering Information Table

Device Code



1	-	Current rating	(50 = 50A)
2	-	Essential Part Number	
3	-	Voltage code	(060 = 600V)
4	-	Speed/ Type	(W = Warp IGBT)
5	-	Circuit Configuration	(H = Half Bridge)
6	-	Special Option	Empty = no special option T = Thermistor

Data and specifications subject to change without notice.
This product has been designed and qualified for Industrial Level.
Qualification Standards can be found on IR's Web site.

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IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7309
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