

International IR Rectifier

I27120 rev. D 02/03

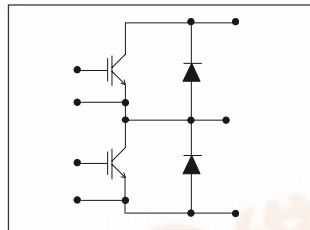
50MT060WH

"HALF-BRIDGE" IGBT MTP

Warp Speed IGBT

Features

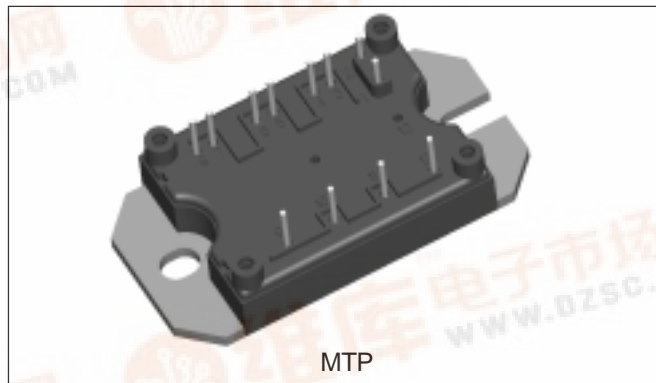
- Gen. 4 Warp Speed IGBT Technology
- HEXFRED™ Antiparallel Diodes with UltraSoft Reverse Recovery
- Very Low Conduction and Switching Losses
- Optional SMT Thermistor (NTC)
- Aluminum Nitride DBC
- Very Low Stray Inductance Design for High Speed Operation
- UL E78996 approved



$V_{CES} = 600V$
 $V_{CE(on) \text{ typ.}} = 2.3V @$
 $V_{GE} = 15V, I_C = 50A$
 $T_C = 25^\circ C$

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



Absolute Maximum Ratings

Parameters		Max	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
I_C	Continuous Collector Current	@ $T_C = 25^\circ C$	114
		@ $T_C = 109^\circ C$	50
I_{CM}	Pulsed Collector Current	350	
I_{LM}	Peak Switching Current	350	
I_F	Diode Continuous Forward Current	@ $T_C = 109^\circ C$	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, $t = 1 \text{ min}$	2500	
P_D	Maximum Power Dissipation	@ $T_C = 25^\circ C$	658
		@ $T_C = 100^\circ C$	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-Emitter 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 V _{CC} = 400V V _{GE} = 15V
Q _{ge} Gate-Emitter Charge (turn-on)		44	52		
Q _{gc} Gate-Collector Charge (turn-on)		133	176		
E _{on} Turn-On Switching Loss		0.26		mJ	Internal gate resistors (see Electrical Diagram) I _C = 50A, V _{CC} = 480V, V _{GE} = 15V, L = 200μH Energy losses include tail and diode reverse recovery
E _{off} Turn-Off Switching Loss		1.2			
E _{ts} Total Switching Loss		1.46			
E _{on} Turn-On Switching Loss		0.73		mJ	Internal gate resistors (see Electrical diagram) I _C = 50A, V _{CC} = 480V, V _{GE} = 15V, L = 200μH Energy losses include tail and diode reverse recovery, T _J = 150°C
E _{off} Turn-Off Switching Loss		1.66			
E _{ts} Total Switching Loss		2.39			
C _{ies} Input Capacitance		7100		pF	V _{GE} = 0V V _{CC} = 30V f = 1.0 MHz
C _{oes} Output Capacitance		510			
C _{res} Reverse Transfer Capacitance		140			
t _{rr} Diode Reverse Recovery Time		82	97	ns	V _{CC} = 200V, I _C = 50A di/dt = 200A/μs
I _{rr} Diode Peak Reverse Current		8.3	10.6	A	
Q _{rr} Diode Recovery Charge		340	514	nC	
t _{rr} Diode Reverse Recovery Time		137	153	ns	V _{CC} = 200V, I _C = 50A di/dt = 200A/μs T _J = 125°C
I _{rr} Diode Peak Reverse Current		12.7	14.8	A	
Q _{rr} Diode Recovery Charge		870	1132	nC	

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⁾ T₀, T₁ are thermistor's temperatures

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

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

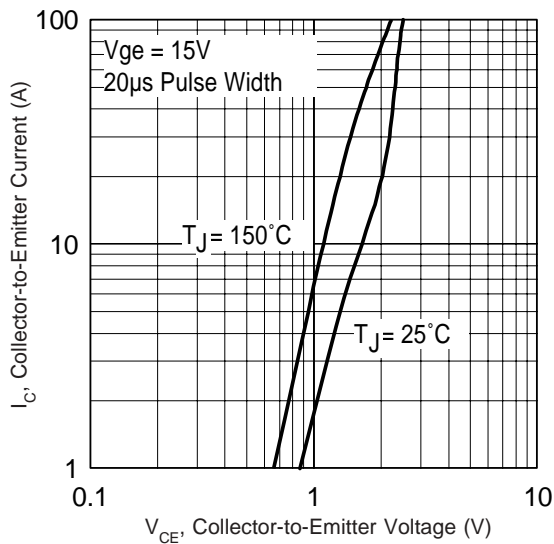


Fig. 1 - Typical Output Characteristics

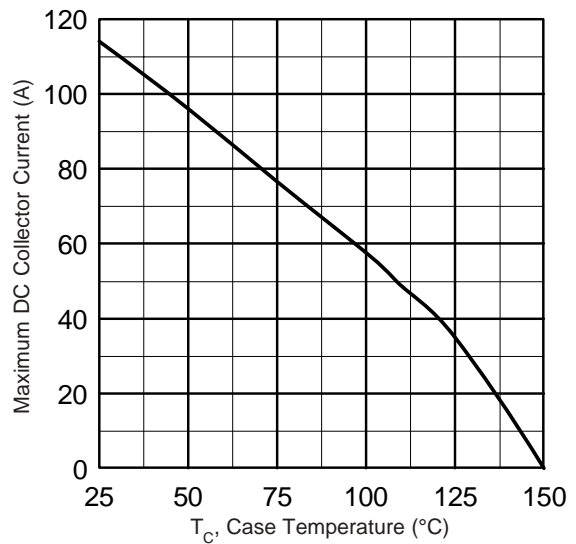


Fig. 2 - Maximum Collector Current vs. Case Temperature

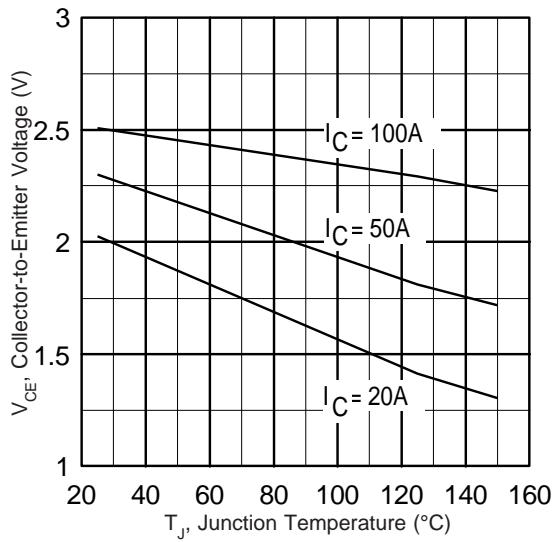


Fig. 3 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

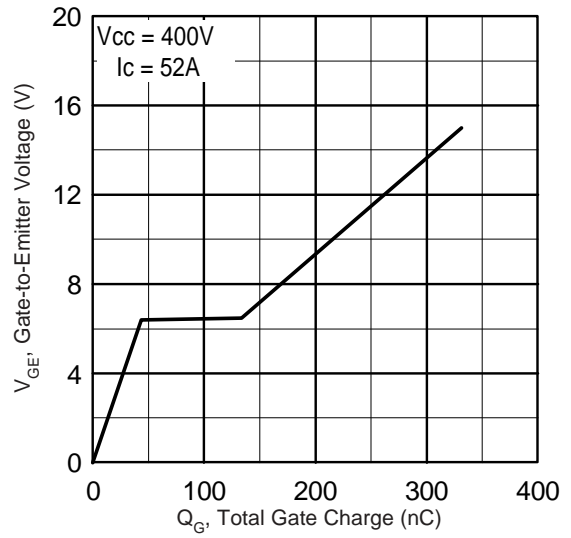


Fig. 4 - Typical Gate Charge vs. Gate-to-Emitter Voltage

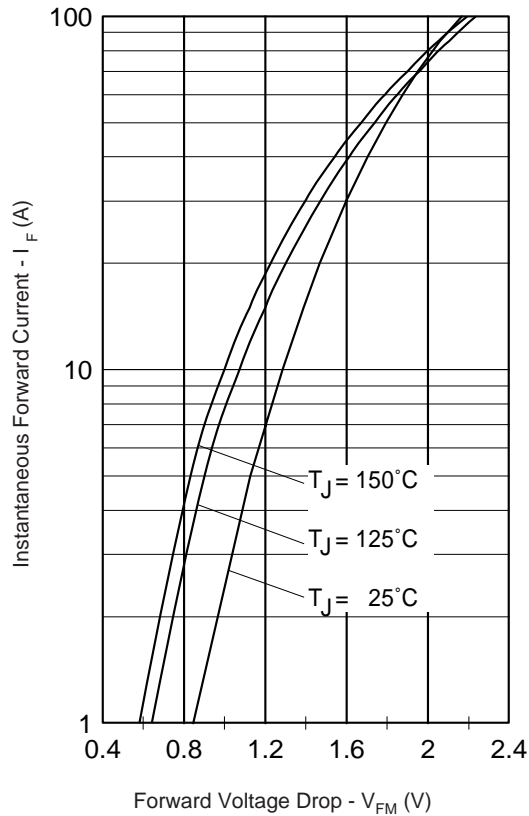


Fig. 5 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

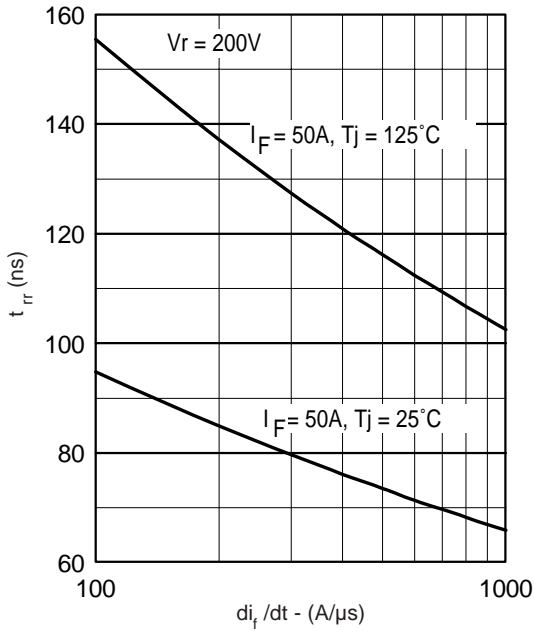


Fig. 6 - Typical Reverse Recovery vs. di_t/dt

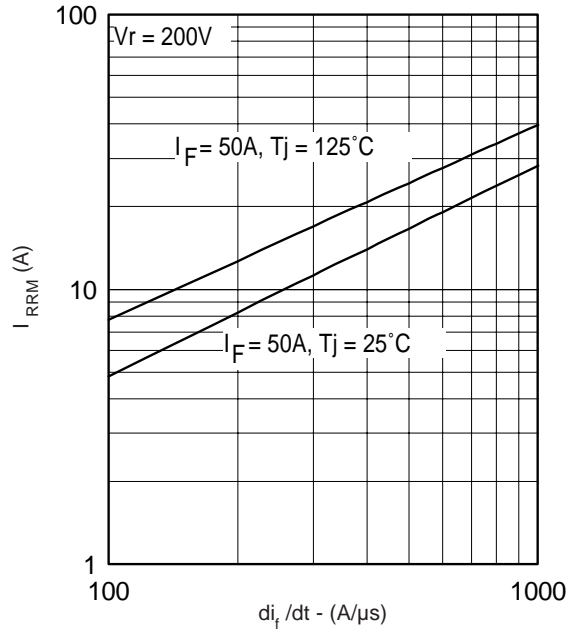


Fig. 7 - Typical Reverse Recovery Current vs. di_t/dt

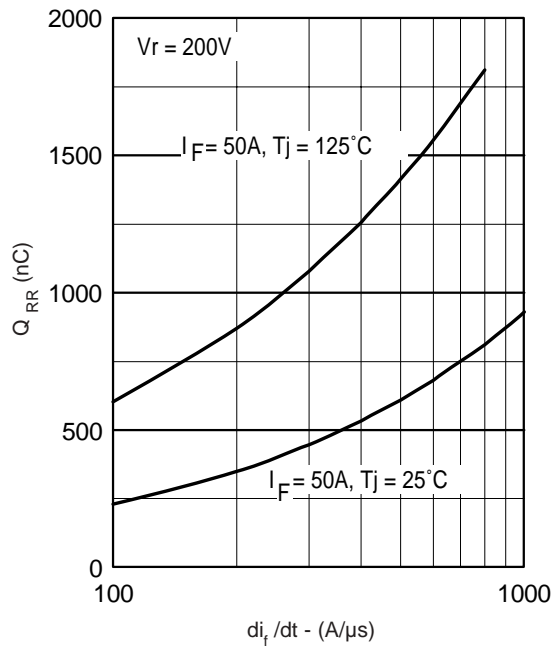
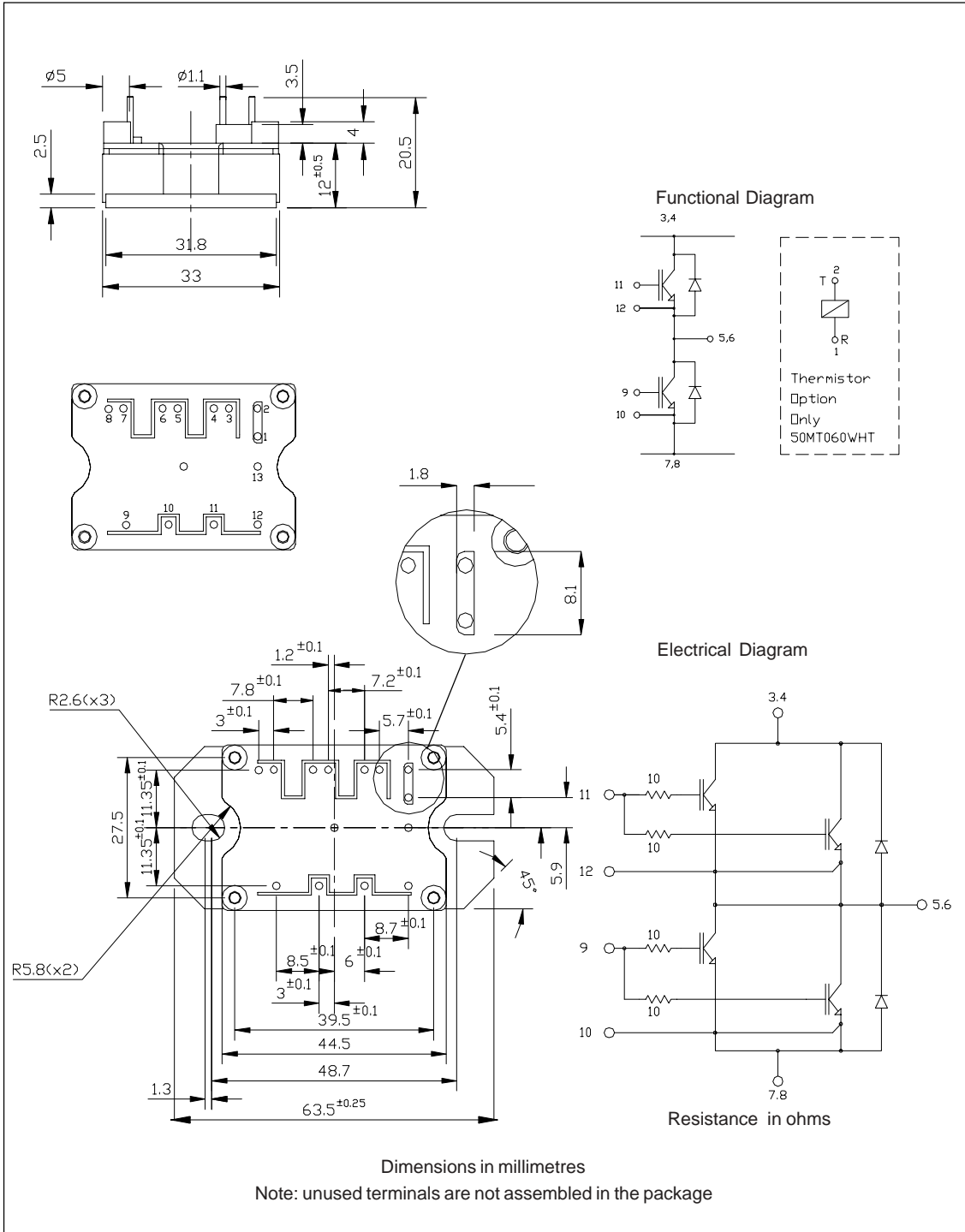


Fig. 8 - Typical Stored Charge vs. di_t/dt

Outline Table



Ordering Information Table

Device Code	
	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px; background-color: #333; color: white;">50</div> <div style="border: 1px solid black; padding: 2px 5px; background-color: #333; color: white;">MT</div> <div style="border: 1px solid black; padding: 2px 5px; background-color: #333; color: white;">060</div> <div style="border: 1px solid black; padding: 2px 5px; background-color: #333; color: white;">W</div> <div style="border: 1px solid black; padding: 2px 5px; background-color: #333; color: white;">H</div> <div style="border: 1px solid black; padding: 2px 5px; background-color: #333; color: white;">-</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> ① ② ③ ④ ⑤ ⑥ </div>
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.