

**FAIRCHILD**  
SEMICONDUCTOR®

**IGBT**

## FMG2G150US60

### Molding Type Module

#### General Description

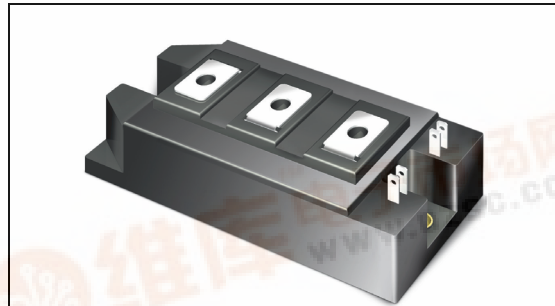
Fairchild IGBT Power Module provides low conduction and switching losses as well as short circuit ruggedness. It's designed for the applications such as motor control, uninterrupter power supplies (UPS) and general inverters where short-circuit ruggedness is required.

#### Features

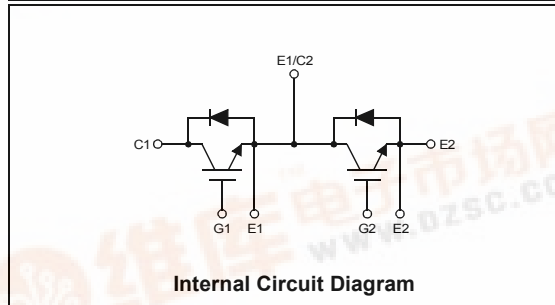
- Short Circuit Rated Time; 10us @  $T_C = 100^\circ\text{C}$ ,  $V_{GE} = 15\text{V}$
- High Speed Switching
- Low Saturation Voltage :  $V_{CE(sat)} = 2.1\text{V}$  @  $I_C = 150\text{A}$
- High Input Impedance
- Fast & Soft Anti-Parallel FWD
- UL Certified No.E209204

#### Application

- AC & DC Motor Controls
- General Purpose Inverters
- Robotics
- Servo Controls
- UPS



Package Code : 7PM-HA



Internal Circuit Diagram

#### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Description	FMG2G150US60	Units
$V_{CES}$	Collector-Emitter Voltage	600	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current @ $T_C = 80^\circ\text{C}$	150	A
$I_{CM(1)}$	Pulsed Collector Current	300	A
$I_F$	Diode Continuous Forward Current @ $T_C = 80^\circ\text{C}$	150	A
$I_{FM}$	Diode Maximum Forward Current	300	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	595	W
$T_{SC}$	Short Circuit Withstand Time @ $T_C = 100^\circ\text{C}$	10	us
$T_J$	Operating Junction Temperature	-40 to +150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-40 to +125	$^\circ\text{C}$
$V_{ISO}$	Isolation Voltage @ AC 1minute	2500	V
Mounting Torque	Power Terminal Screw : M5	4.0	N.m
	Mounting Screw : M6	4.0	N.m

**Notes :**

(1) Repetitive rating : Pulse width limited by max. junction temperature



### Electrical Characteristics of IGBT T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
$V_{CES}$	Collector-Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 250\mu A$	600	--	--	V
$\Delta B_{V_{CES}} / \Delta T_J$	Temperature Coeff. of Breakdown Voltage	$V_{GE} = 0V, I_C = 1mA$	--	0.6	--	V/°C
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0V$	--	--	250	$\mu A$
$I_{GES}$	Gate - Emitter Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0V$	--	--	$\pm 100$	nA

### On Characteristics

$V_{GE(th)}$	Gate - Emitter Threshold Voltage	$I_C = 150mA, V_{CE} = V_{GE}$	5.0	6.5	8.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 150A, V_{GE} = 15V$	--	2.1	2.7	V

### Switching Characteristics

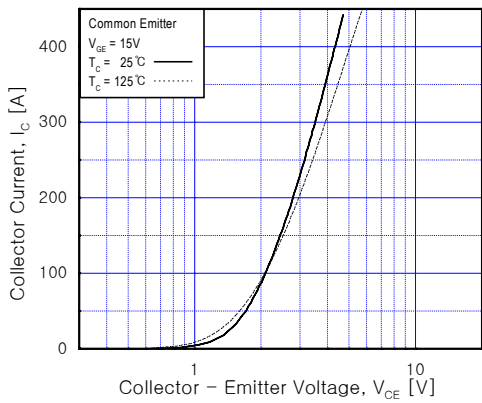
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300V, I_C = 150A,$ $R_G = 2\Omega, V_{GE} = 15V,$ Inductive Load, $T_C = 25^\circ C$	--	140	--	ns
$t_r$	Rise Time		--	80	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	120	--	ns
$t_f$	Fall Time		--	130	250	ns
$E_{on}$	Turn-On Switching Loss		--	2.3	--	mJ
$E_{off}$	Turn-Off Switching Loss		--	4.7	--	mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300V, I_C = 150A,$ $R_G = 2\Omega, V_{GE} = 15V,$ Inductive Load, $T_C = 125^\circ C$	--	180	--	ns
$t_r$	Rise Time		--	90	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	150	--	ns
$t_f$	Fall Time		--	270	--	ns
$E_{on}$	Turn-On Switching Loss		--	3.1	--	mJ
$E_{off}$	Turn-Off Switching Loss		--	7.7	--	mJ
$T_{sc}$	Short Circuit Withstand Time	$V_{CC} = 300V, V_{GE} = 15V$ @ $T_C = 100^\circ C$	10	--	--	$\mu s$
$Q_g$	Total Gate Charge	$V_{CE} = 300V, I_C = 150A,$ $V_{GE} = 15V$	--	460	--	nC
$Q_{ge}$	Gate-Emitter Charge		--	130	--	nC
$Q_{gc}$	Gate-Collector Charge		--	190	--	nC

### Electrical Characteristics of DIODE T<sub>C</sub> = 25°C unless otherwise noted

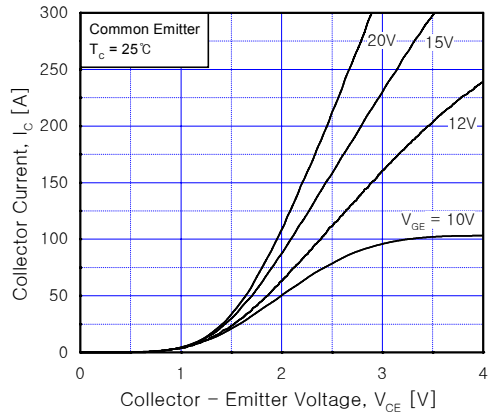
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units	
$V_{FM}$	Diode Forward Voltage	$I_F = 150A$	$T_C = 25^\circ C$	--	1.9	2.8	V
			$T_C = 100^\circ C$	--	1.8	--	
$t_{rr}$	Diode Reverse Recovery Time	$I_F = 150A$ $di / dt = 300 A/\mu s$	$T_C = 25^\circ C$	--	90	130	ns
			$T_C = 100^\circ C$	--	130	--	
$I_{rr}$	Diode Peak Reverse Recovery Current		$T_C = 25^\circ C$	--	15	20	A
			$T_C = 100^\circ C$	--	22	--	
$Q_{rr}$	Diode Reverse Recovery Charge		$T_C = 25^\circ C$	--	675	1270	nC
			$T_C = 100^\circ C$	--	1430	--	

### Thermal Characteristics

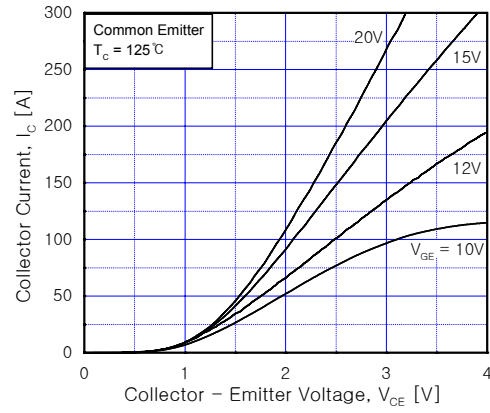
Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)	--	0.21	°C/W
$R_{\theta JC}$	Junction-to-Case (DIODE Part, per 1/2 Module)	--	0.48	°C/W
$R_{\theta JC}$	Case-to-Sink (Conductive grease applied)	0.045	--	°C/W
Weight	Weight of Module	240	--	g



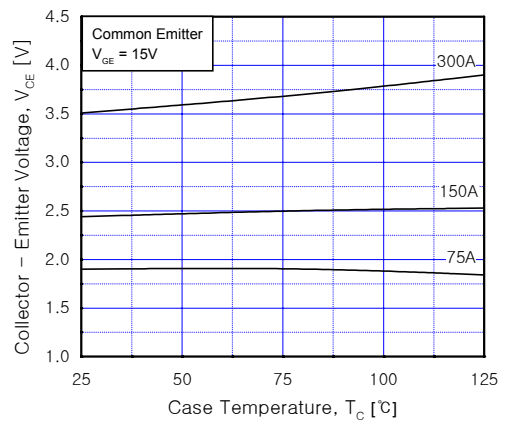
**Fig 1. Typical Output Characteristics**



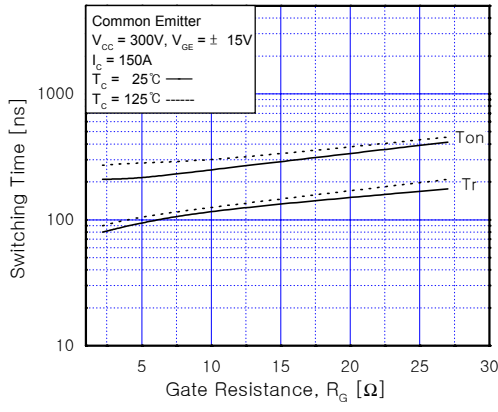
**Fig 2. Typical Saturation Voltage Characteristics**



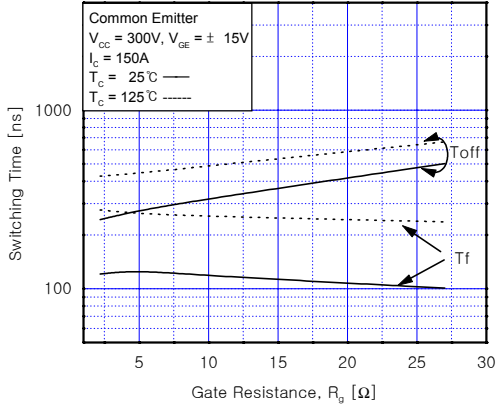
**Fig 3. Typical Saturation Voltage Characteristics**



**Fig 4. Saturation Voltage vs. Case Temperature at Variant Current Level**



**Fig 5. Turn-On Characteristics vs. Gate Resistance**



**Fig 6. Turn-Off Characteristics vs. Gate Resistance**

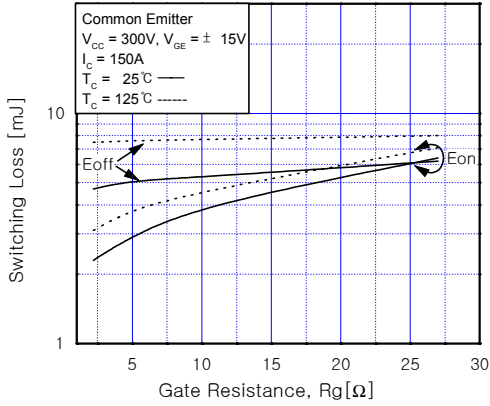


Fig 7. Switching Loss vs. Gate Resistance

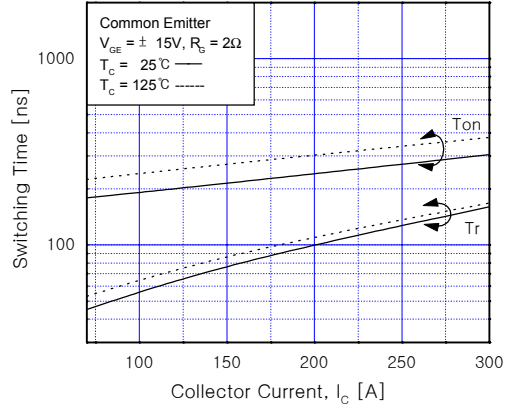


Fig 8. Turn-On Characteristics vs. Collector Current

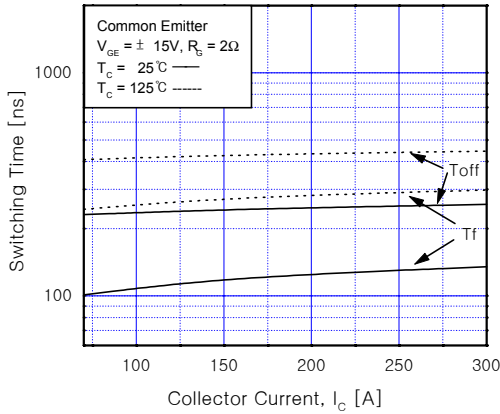


Fig 9. Turn-Off Characteristics vs. Collector Current

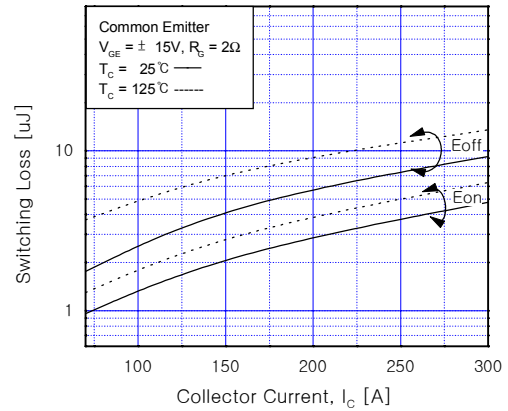


Fig 10. Switching Loss vs. Collector Current

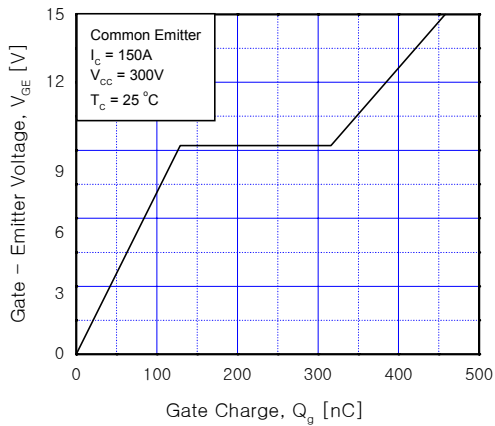


Fig 11. Gate Charge Characteristics

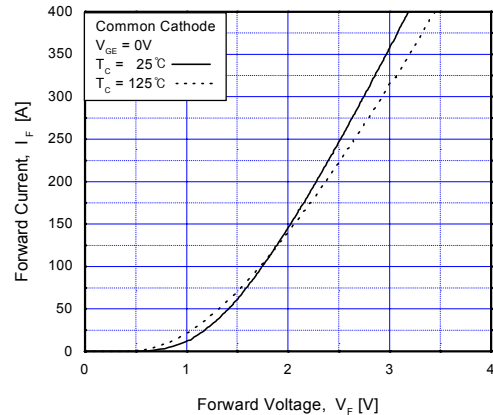


Fig 12. Forward Characteristics(diode)

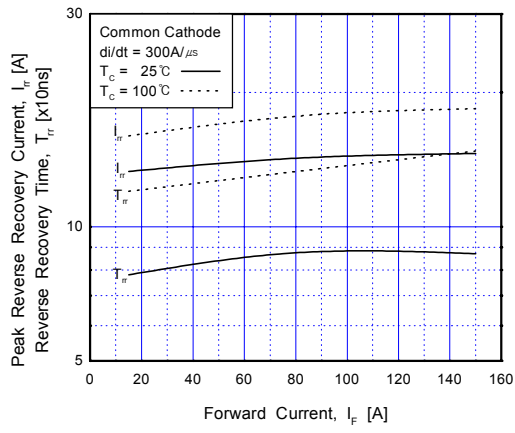
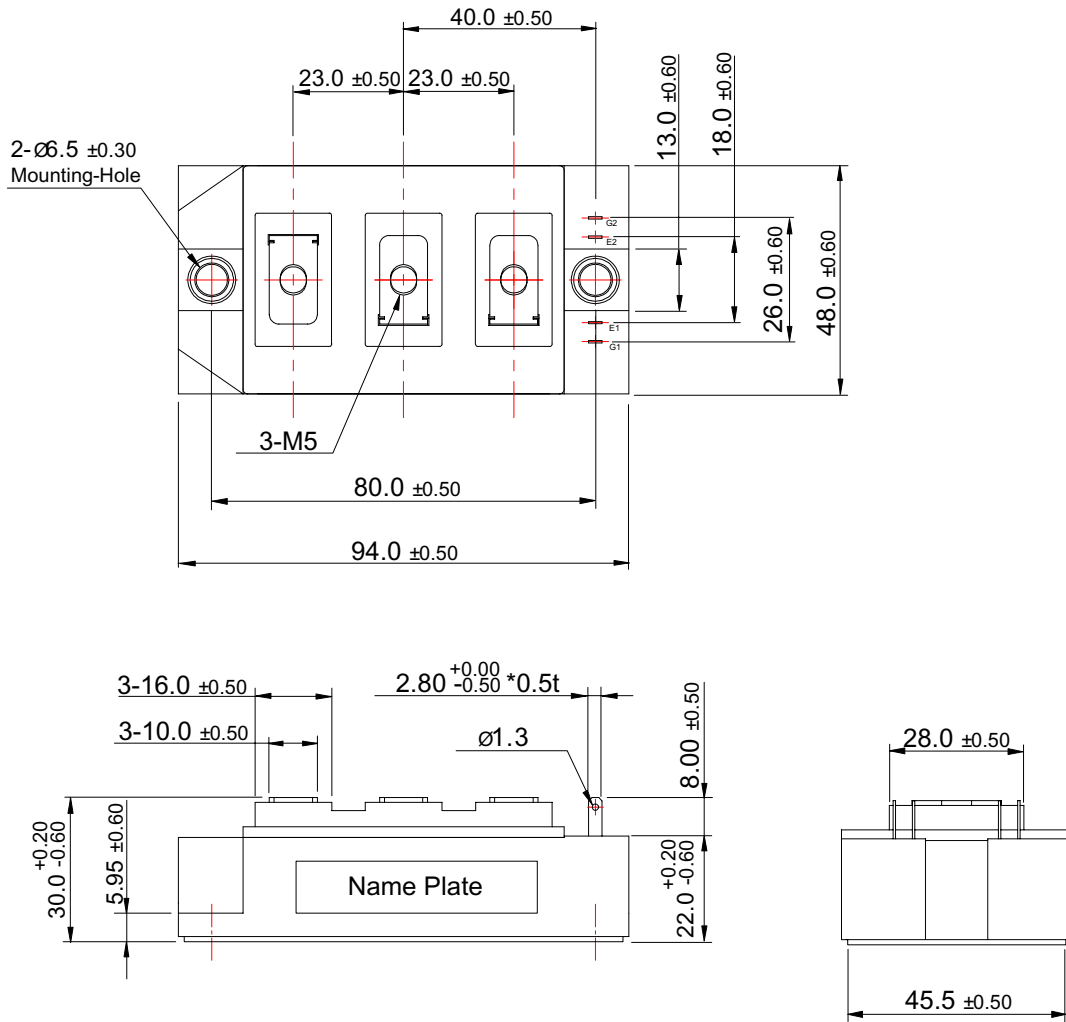


Fig 13. Reverse Recovery Characteristics(diode)

Package Dimension

7PM-HA



Dimensions in Millimeters

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