

# FMG2G400LS60

## Molding Type Module

### General Description

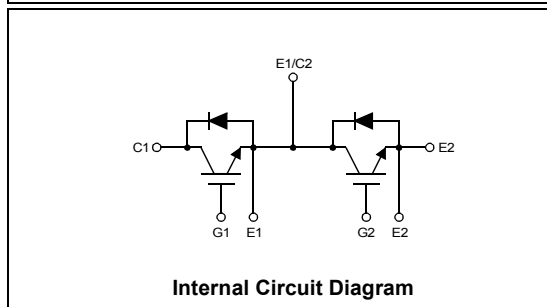
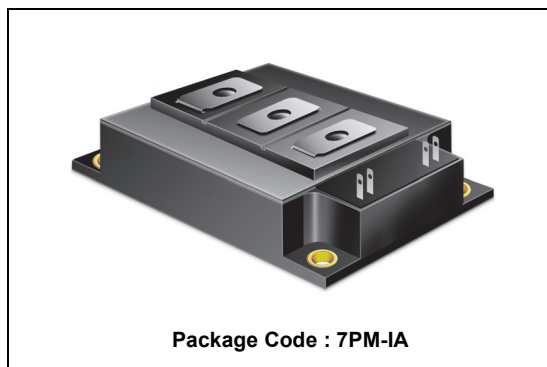
Fairchild IGBT Power Module provides low conduction as well as short circuit ruggedness. It's designed for the applications such as welder.

#### Features

- Short Circuit Rated Time; 10us @  $T_C = 100^\circ\text{C}$ ,  $V_{GE} = 15\text{V}$
- Low Saturation Voltage :  $V_{CE(sat)} = 1.4\text{V}$  @  $I_C = 400\text{A}$
- High Input Impedance
- Fast & Soft Anti-Parallel FWD
- UL Certified No.E209204

### Application

- AC/ DC Welder



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

Symbol	Description	FMG2G400LS60	Units
$V_{CES}$	Collector-Emitter Voltage	600	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current	400	A
$I_{CM(1)}$	Pulsed Collector Current	800	A
$I_F$	Diode Continuous Forward Current	400	A
$I_{FM}$	Diode Maximum Forward Current	800	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	1136	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 : M6	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>						
$BV_{CES}$	Collector-Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 250\mu A$	600	--	--	V
$\Delta BV_{CES} / \Delta T_J$	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	$I_C = 400mA, V_{CE} = V_{GE}$	5.0	6.5	8.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 400A, V_{GE} = 15V$	--	1.4	1.8	V

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300V, I_C = 400A,$ $R_G = 10\Omega, V_{GE} = 15V,$ Inductive Load, $T_C = 25^\circ C$	--	0.33	--	$\mu s$
$t_r$	Rise Time		--	0.3	--	$\mu s$
$t_{d(off)}$	Turn-Off Delay Time		--	0.52	--	$\mu s$
$t_f$	Fall Time		--	2.3	--	$\mu s$
$E_{on}$	Turn-On Switching Loss		--	19.5	--	mJ
$E_{off}$	Turn-Off Switching Loss		--	230	--	mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300V, I_C = 400A,$ $R_G = 10\Omega, V_{GE} = 15V,$ Inductive Load, $T_C = 125^\circ C$	--	0.41	--	$\mu s$
$t_r$	Rise Time		--	0.33	--	$\mu s$
$t_{d(off)}$	Turn-Off Delay Time		--	0.62	--	$\mu s$
$t_f$	Fall Time		--	23	--	$\mu s$
$E_{on}$	Turn-On Switching Loss		--	320	--	mJ
$E_{off}$	Turn-Off Switching Loss		--	--	--	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	$V_{CE} = 300V, I_C = 400A,$ $V_{GE} = 15V$	--	1200	--	nC
$Q_{ge}$	Gate-Emitter Charge		--	310	--	nC
$Q_{gc}$	Gate-Collector Charge		--	490	--	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	$I_F = 400A$	$T_C = 25^\circ C$	--	1.9	2.8	V
			$T_C = 100^\circ C$	--	1.8	--	
$t_{rr}$	Diode Reverse Recovery Time	$I_F = 400A$ $di / dt = 800 A/\mu s$	$T_C = 25^\circ C$	--	90	130	ns
			$T_C = 100^\circ C$	--	130	--	
$I_{rr}$	Diode Peak Reverse Recovery Current	$I_F = 400A$ $di / dt = 800 A/\mu s$	$T_C = 25^\circ C$	--	35	46	A
			$T_C = 100^\circ C$	--	76	--	
$Q_{rr}$	Diode Reverse Recovery Charge	$I_F = 400A$ $di / dt = 800 A/\mu s$	$T_C = 25^\circ C$	--	1580	3000	nC
			$T_C = 100^\circ C$	--	4940	--	

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)	--	0.11	°C/W
$R_{\theta JC}$	Junction-to-Case (DIODE Part, per 1/2 Module)	--	0.18	°C/W
$R_{\theta JC}$	Case-to-Sink (Conductive grease applied)	0.03	--	°C/W
Weight	Weight of Module	360	--	g

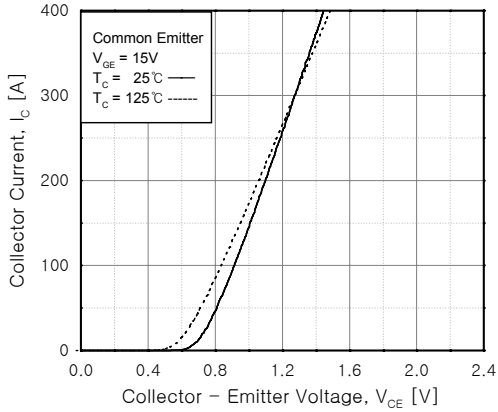


Fig 1. Typical Output Characteristics

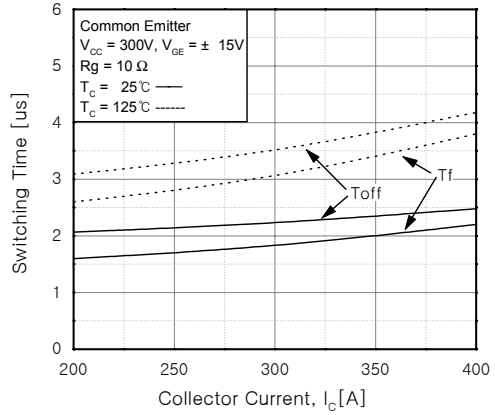


Fig 2. Turn-Off Characteristics vs. Collector Current

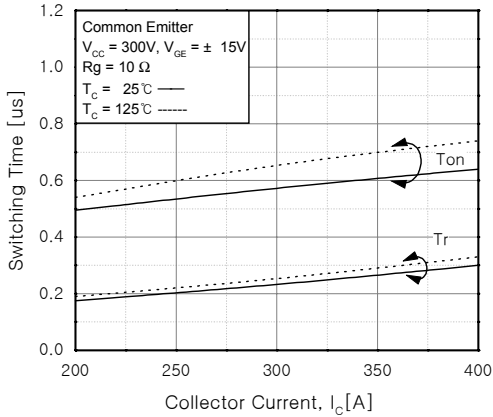


Fig 3. Turn-On Characteristics vs. Collector Current

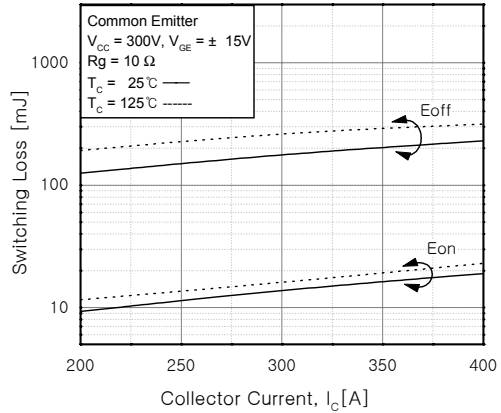


Fig 4. Switching Loss vs. Collector Current

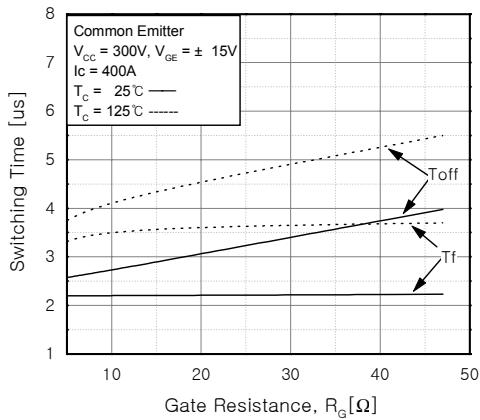


Fig 5. Turn-Off Characteristics vs. Gate Resistance

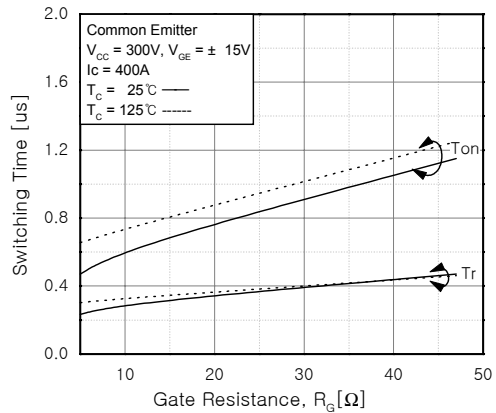


Fig 6. Turn-On Characteristics vs. Gate Resistance

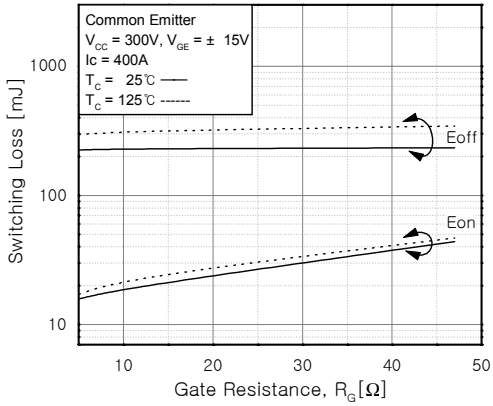


Fig 7. Switching Loss vs. Gate Resistance

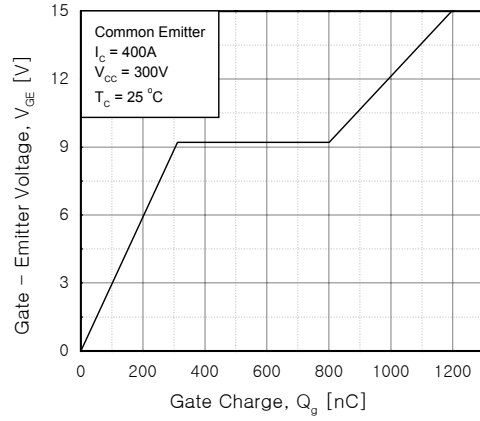


Fig 8. Gate Charge Characteristics

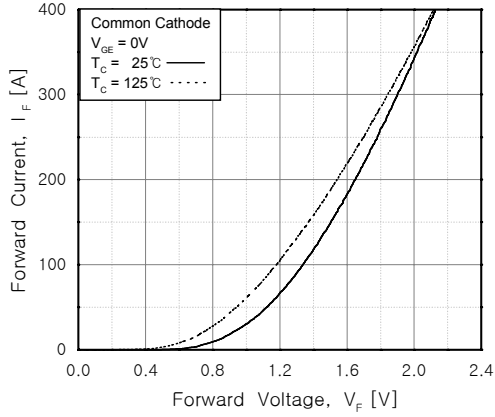


Fig 9. Forward Characteristics (diode)

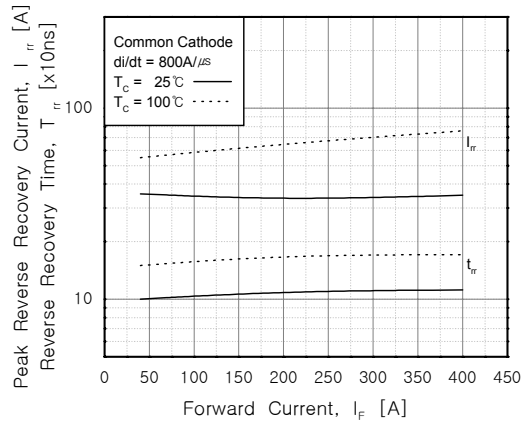
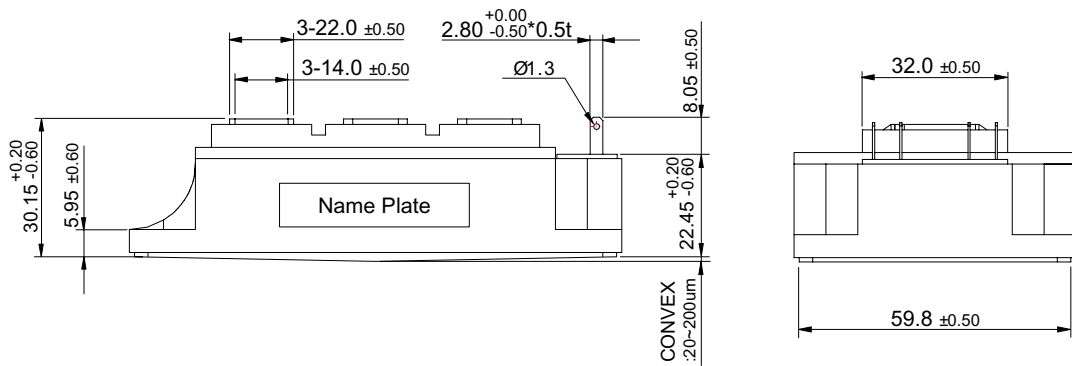
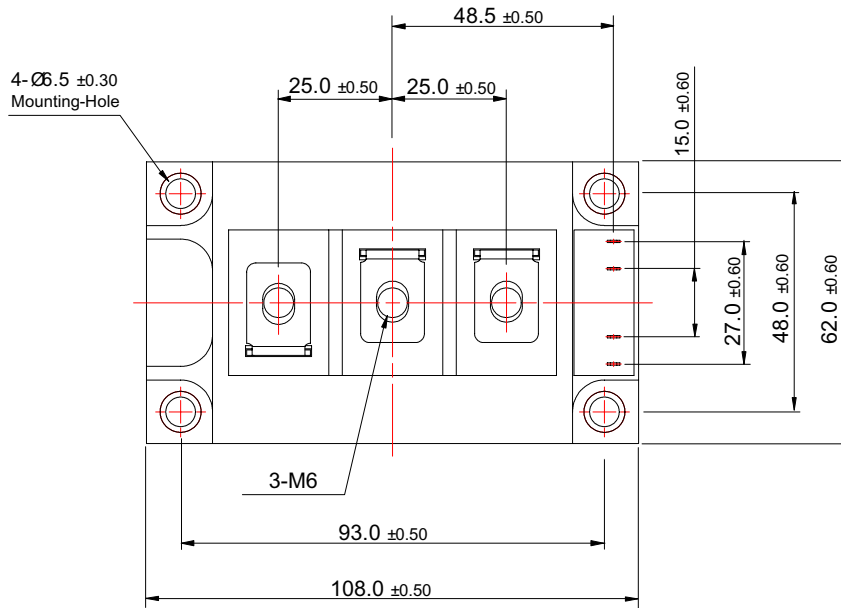


Fig 10. Reverse Recovery Characteristics (diode)

Package Dimension

7PM-IA



Dimensions in Millimeters

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