

# FMG2G400LS60

## Molding Type Module

### General Description

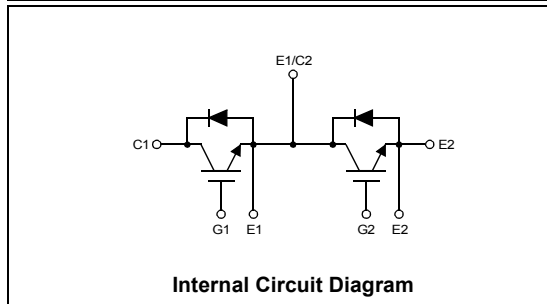
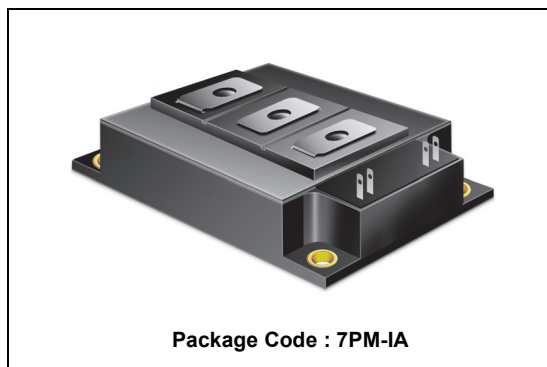
Fairchild IGBT Power Module provides low conduction as well as short circuit ruggedness. It's designed for the applications such as welder.

#### 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 <sub>CES</sub>	Collector-Emitter Breakdown Voltage	V <sub>GE</sub> = 0V, I <sub>C</sub> = 250uA	600	--	--	V
ΔBV <sub>CES</sub> /ΔT <sub>J</sub>	Temperature Coeff. of Breakdown Voltage	V <sub>GE</sub> = 0V, I <sub>C</sub> = 1mA	--	0.6	--	V/°C
I <sub>CES</sub>	Collector Cut-Off Current	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V	--	--	250	uA
I <sub>GES</sub>	Gate - Emitter Leakage Current	V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V	--	--	± 100	nA

### On Characteristics

V <sub>GE(th)</sub>	Gate - Emitter Threshold Voltage	I <sub>C</sub> = 400mA, V <sub>CE</sub> = V <sub>GE</sub>	5.0	6.5	8.5	V
V <sub>CE(sat)</sub>	Collector to Emitter Saturation Voltage	I <sub>C</sub> = 400A, V <sub>GE</sub> = 15V	--	1.4	1.8	V

### Switching Characteristics

t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 300 V, I <sub>C</sub> = 400A, R <sub>G</sub> = 10Ω, V <sub>GE</sub> = 15V, Inductive Load, T <sub>C</sub> = 25°C	--	0.33	--	us
t <sub>r</sub>	Rise Time		--	0.3	--	us
t <sub>d(off)</sub>	Turn-Off Delay Time		--	0.52	--	us
t <sub>f</sub>	Fall Time		--	2.3	--	us
E <sub>on</sub>	Turn-On Switching Loss		--	19.5	--	mJ
E <sub>off</sub>	Turn-Off Switching Loss	--	230	--	mJ	
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 300 V, I <sub>C</sub> = 400A, R <sub>G</sub> = 10Ω, V <sub>GE</sub> = 15V, Inductive Load, T <sub>C</sub> = 125°C	--	0.41	--	us
t <sub>r</sub>	Rise Time		--	0.33	--	us
t <sub>d(off)</sub>	Turn-Off Delay Time		--	0.62	--	us
t <sub>f</sub>	Fall Time		--	23	--	us
E <sub>on</sub>	Turn-On Switching Loss		--	320	--	mJ
E <sub>off</sub>	Turn-Off Switching Loss	--	--	--	mJ	
T <sub>sc</sub>	Short Circuit Withstand Time	V <sub>CC</sub> = 300 V, V <sub>GE</sub> = 15V @ T <sub>C</sub> = 100°C	10	--	--	us
Q <sub>g</sub>	Total Gate Charge	V <sub>CE</sub> = 300 V, I <sub>C</sub> = 400A, V <sub>GE</sub> = 15V	--	1200	--	nC
Q <sub>ge</sub>	Gate-Emitter Charge		--	310	--	nC
Q <sub>gc</sub>	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 <sub>FM</sub>	Diode Forward Voltage	I <sub>F</sub> = 400A	T <sub>C</sub> = 25°C	--	1.9	2.8	V
			T <sub>C</sub> = 100°C	--	1.8	--	
t <sub>rr</sub>	Diode Reverse Recovery Time	I <sub>F</sub> = 400A di / dt = 800 A/us	T <sub>C</sub> = 25°C	--	90	130	ns
			T <sub>C</sub> = 100°C	--	130	--	
I <sub>rr</sub>	Diode Peak Reverse Recovery Current	I <sub>F</sub> = 400A di / dt = 800 A/us	T <sub>C</sub> = 25°C	--	35	46	A
			T <sub>C</sub> = 100°C	--	76	--	
Q <sub>rr</sub>	Diode Reverse Recovery Charge	I <sub>F</sub> = 400A di / dt = 800 A/us	T <sub>C</sub> = 25°C	--	1580	3000	nC
			T <sub>C</sub> = 100°C	--	4940	--	

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-Case (IGBT Part, per 1/2 Module)	--	0.11	°C/W
R <sub>θJC</sub>	Junction-to-Case (DIODE Part, per 1/2 Module)	--	0.18	°C/W
R <sub>θJC</sub>	Case-to-Sink (Conductive grease applied)	0.03	--	°C/W
Weight	Weight of Module	360	--	g

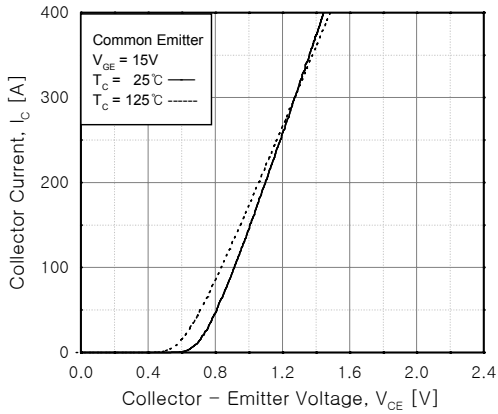


Fig 1. Typical Output Characteristics

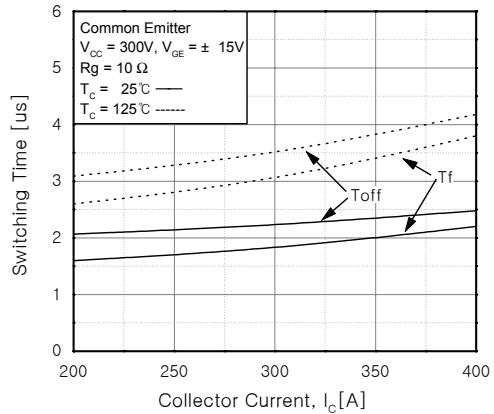


Fig 2. Turn-Off Characteristics vs. Collector Current

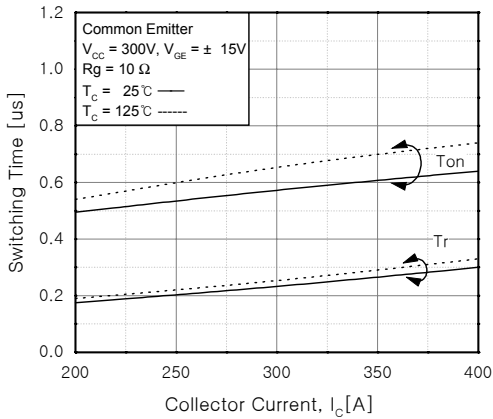


Fig 3. Turn-On Characteristics vs. Collector Current

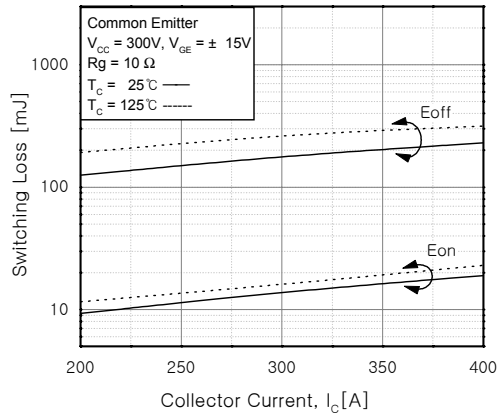


Fig 4. Switching Loss vs. Collector Current

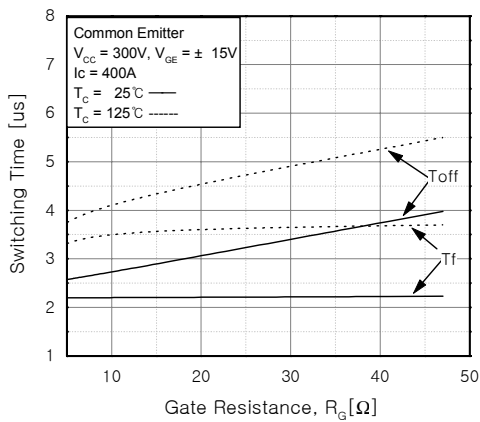


Fig 5. Turn-Off Characteristics vs. Gate Resistance

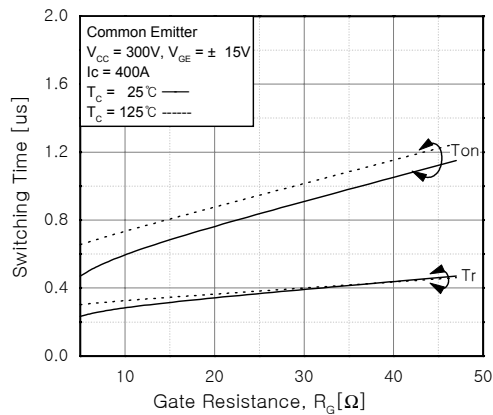


Fig 6. Turn-On Characteristics vs. Gate Resistance

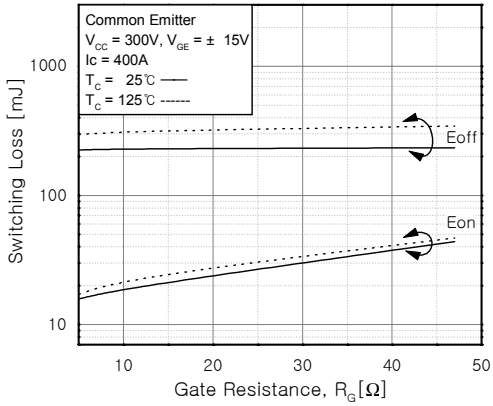


Fig 7. Switching Loss vs. Gate Resistance

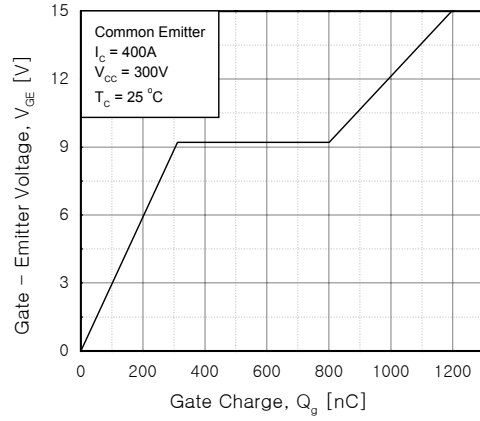


Fig 8. Gate Charge Characteristics

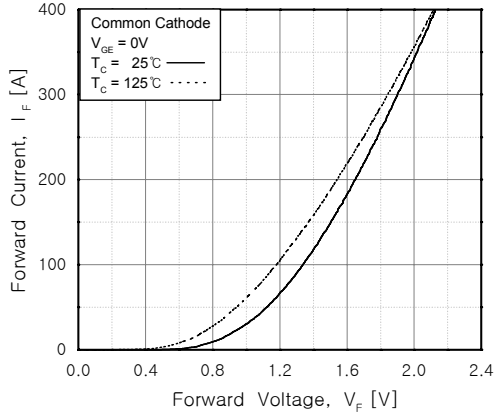


Fig 9. Forward Characteristics (diode)

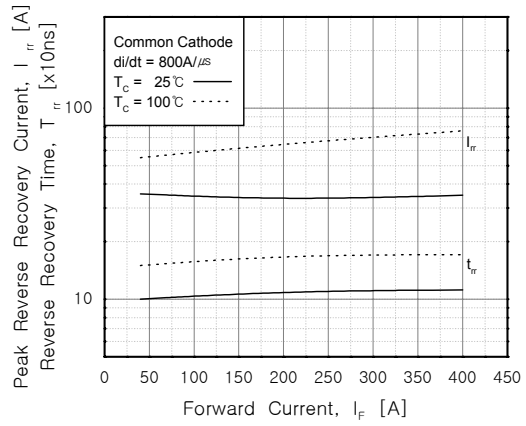
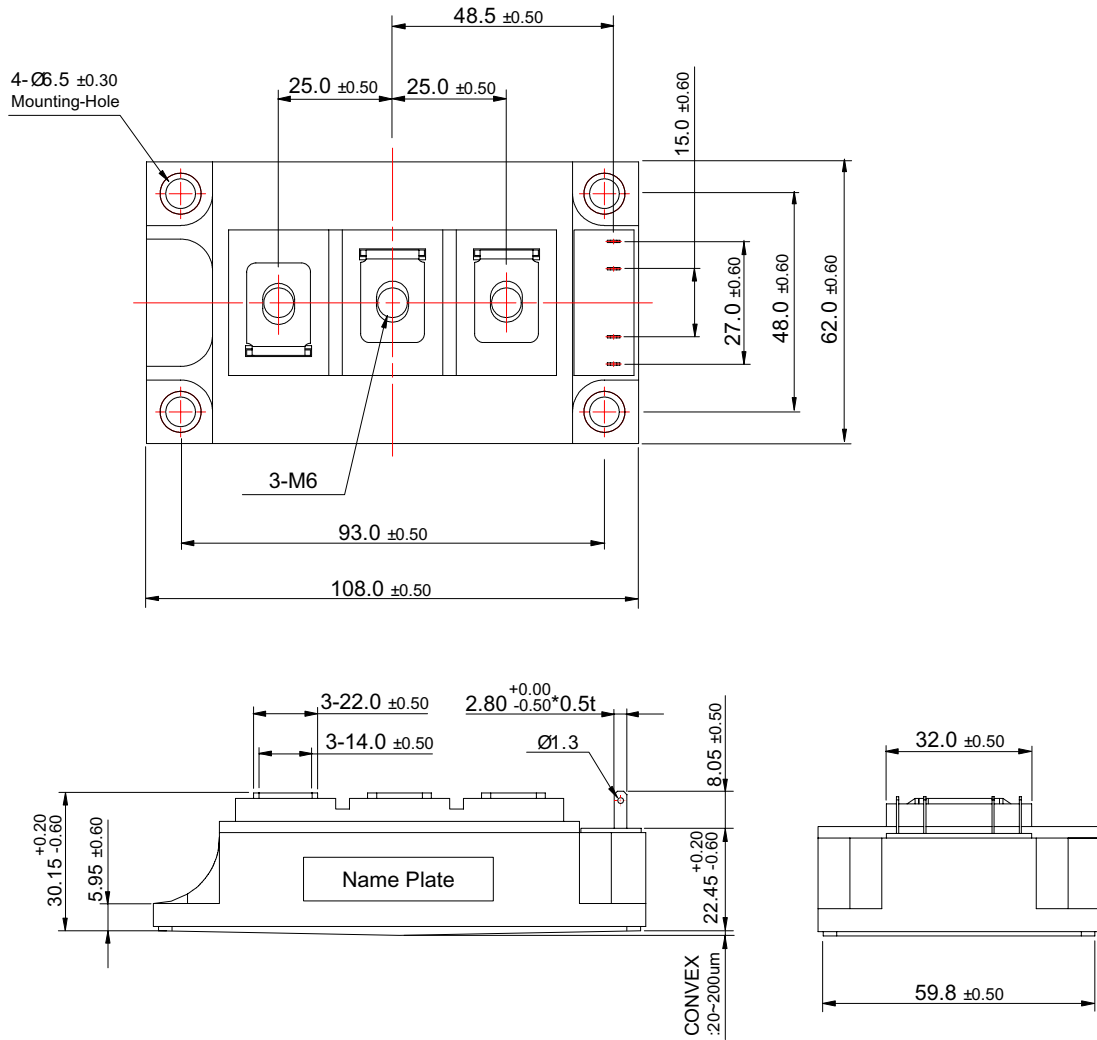


Fig 10. Reverse Recovery Characteristics (diode)

Package Dimension

7PM-IA



Dimensions in Millimeters

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