FAIRCHILD
SEMICONDUCTOR®

IGBT

FMG1G400US60L

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, uninterrupted power supplies (UPS) and general inverters where short-circuit ruggedness is required.

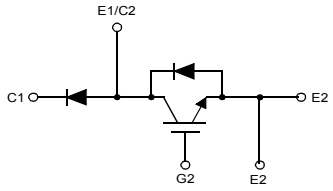
Features

- Short Circuit Rated Time; 10us @ T_C =100°C, V_{GE} = 15V
- High Speed Switching
- Low Saturation Voltage : V_{CE}(sat) = 2.1 V @ I_C = 400A
- 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-IA



Internal Circuit Diagram

Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Description		FMG1G400US60L	Units
V_{CES}	Collector-Emitter Voltage		600	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Collector Current	@ T_C = 80°C	400	A
$I_{CM\ (1)}$	Pulsed Collector Current		800	A
I_F	Diode Continuous Forward Current	@ T_C = 80°C	400	A
I_{FM}	Diode Maximum Forward Current		800	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	1136	W
T_{SC}	Short Circuit Withstand Time	@ T_C = 100°C	10	us
T_J	Operating Junction Temperature		-40 to +150	°C
T_{STG}	Storage Temperature Range		-40 to +125	°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_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 250uA	600	--	--	V
$\Delta B_{VCES}/\Delta T_J$	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	uA
I_{GES}	Gate - Emitter Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0V	--	--	± 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	--	2.1	2.7	V
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 400A, R_G = 2Ω, V_{GE} = 15V, Inductive Load, T_C = 25°C	--	160	--	ns
t_r	Rise Time		--	220	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	230	--	ns
t_f	Fall Time		--	150	250	ns
E_{on}	Turn-On Switching Loss		--	9.5	--	mJ
E_{off}	Turn-Off Switching Loss		--	21	--	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 400A, R_G = 2Ω, V_{GE} = 15V, Inductive Load, T_C = 125°C	--	320	--	ns
t_r	Rise Time		--	240	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	290	--	ns
t_f	Fall Time		--	230	--	ns
E_{on}	Turn-On Switching Loss		--	11	--	mJ
E_{off}	Turn-Off Switching Loss		--	26	--	mJ
T_{sc}	Short Circuit Withstand Time	V_{CC} = 300 V, V_{GE} = 15V @ T_C = 100°C	10	--	--	us
Q_g	Total Gate Charge	V_{CE} = 300 V, 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_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_{FM}	Diode Forward Voltage	I_F = 400A	T_C = 25°C	--	1.9	2.8	V
			T_C = 100°C	--	1.8	--	
t_{rr}	Diode Reverse Recovery Time	I_F = 400A di / dt = 800 A/us	T_C = 25°C	--	90	130	ns
			T_C = 100°C	--	130	--	
I_{rr}	Diode Peak Reverse Recovery Current		T_C = 25°C	--	35	46	A
			T_C = 100°C	--	76	--	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	--	1580	3000	nC
			T_C = 100°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

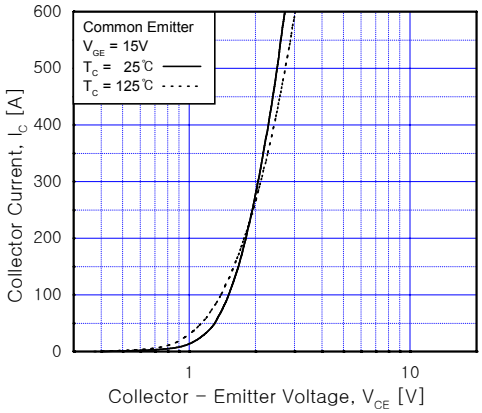


Fig 1. Typical Output Characteristics

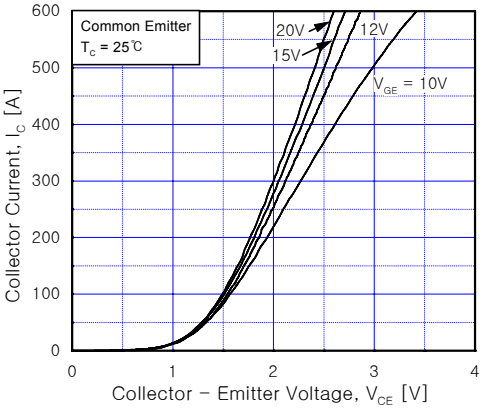


Fig 2. Typical Saturation Voltage Characteristics

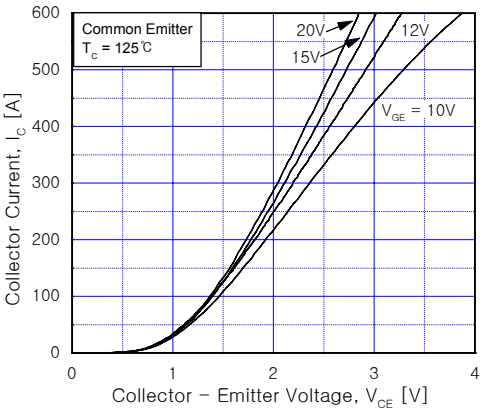


Fig 3. Typical Saturation Voltage Characteristics

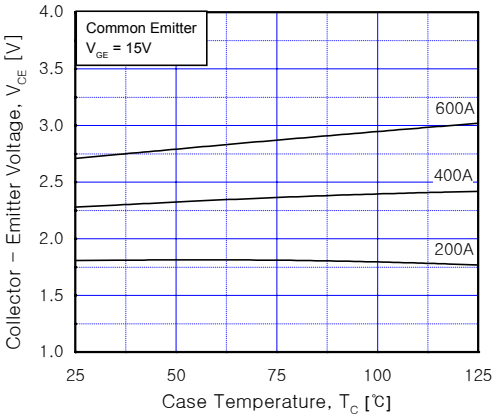


Fig 4. Saturation Voltage vs. Case Temperature at Variant Current Level

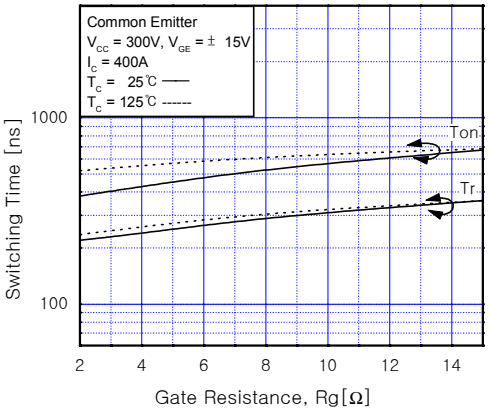


Fig 5. Turn-On Characteristics vs. Gate Resistance

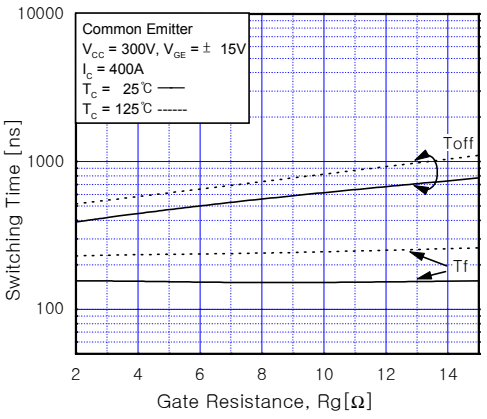


Fig 6. Turn-Off Characteristics vs. Gate Resistance

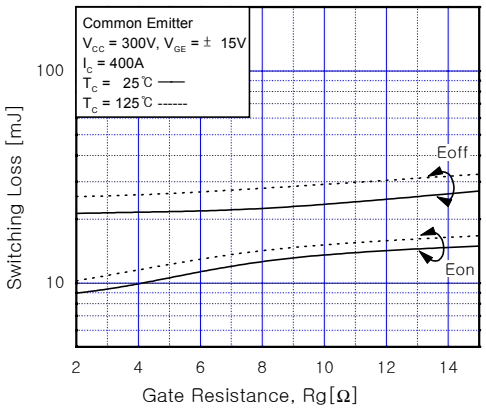


Fig 7. Switching Loss vs. Gate Resistance

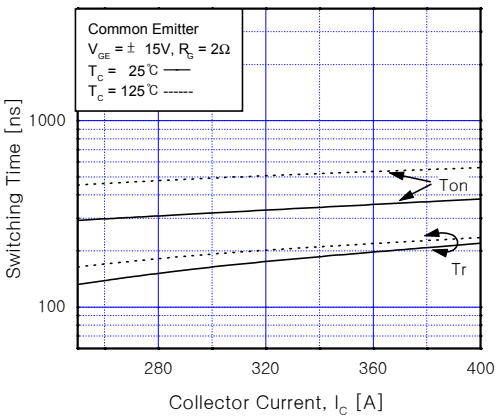


Fig 8. Turn-On Characteristics vs. Collector Current

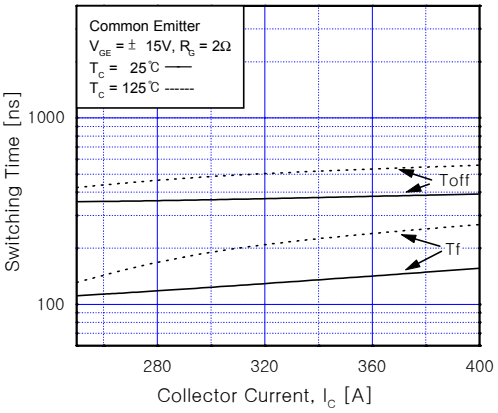


Fig 9. Turn-Off Characteristics vs. Collector Current

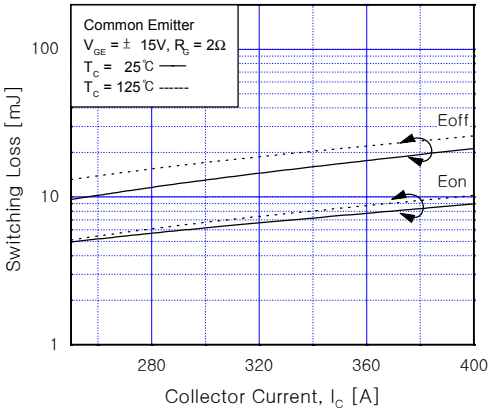


Fig 10. Switching Loss vs. Collector Current

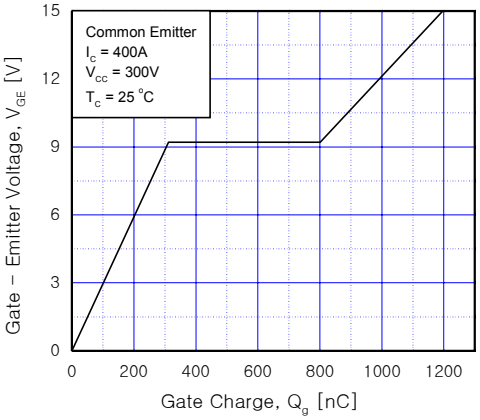


Fig 11. Gate Charge Characteristics

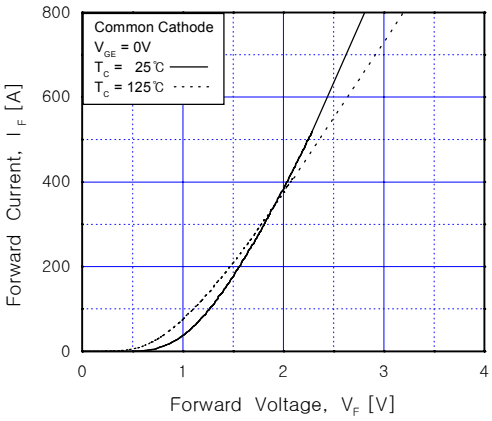


Fig 12. Forward Characteristics (diode)

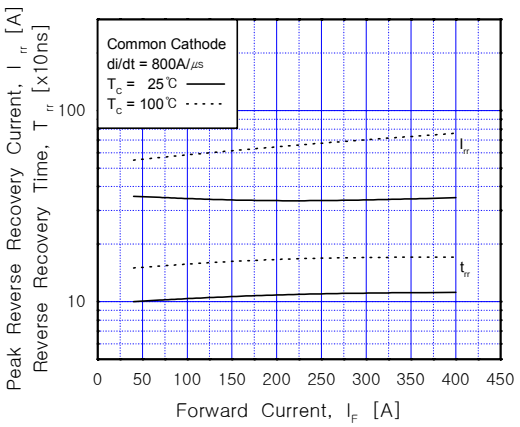
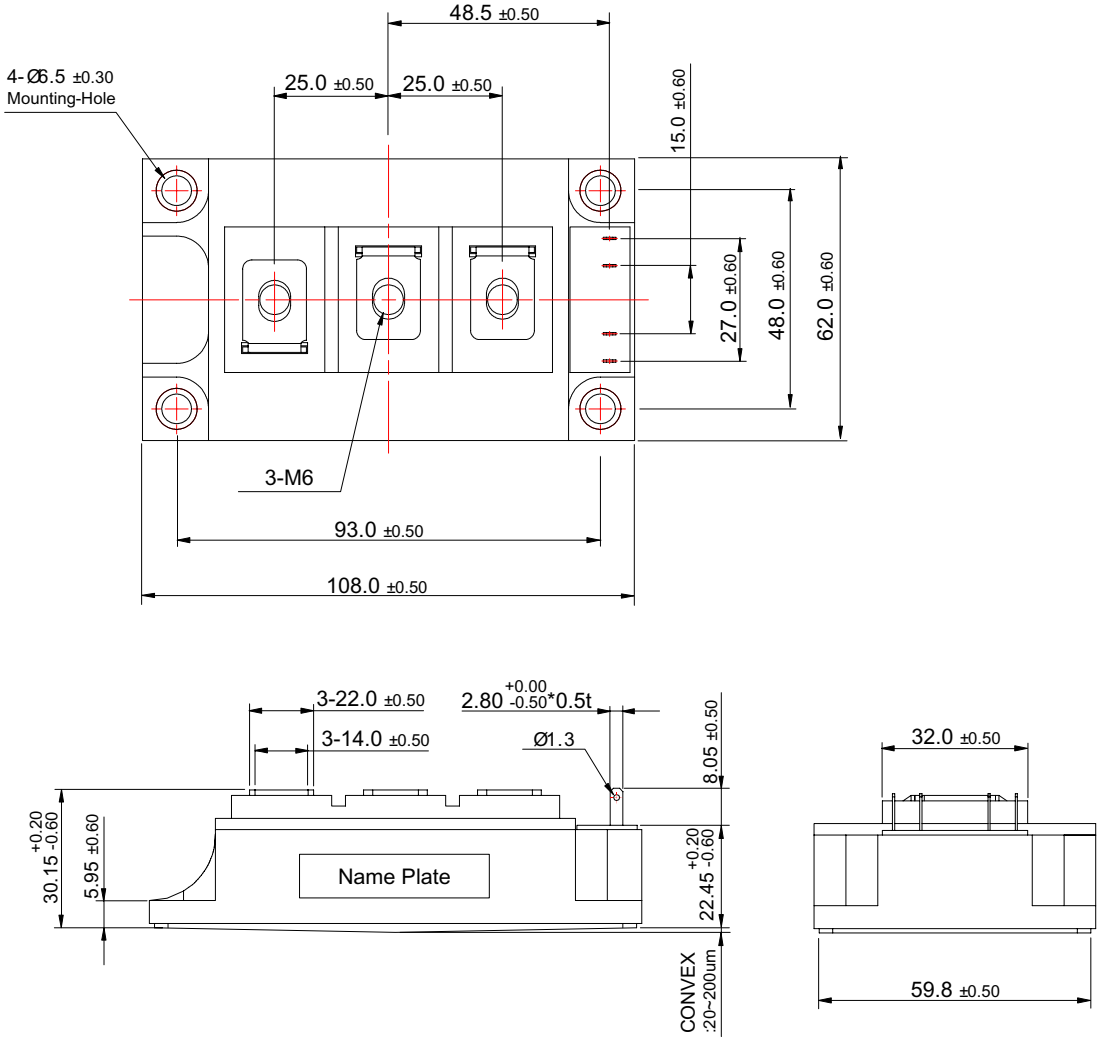


Fig 13. Reverse Recovery Characteristics(diode)

Package Dimension

7PM-IA



Dimensions in Millimeters

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