FAIRCHILD SEMICONDUCTOR®

IGBT

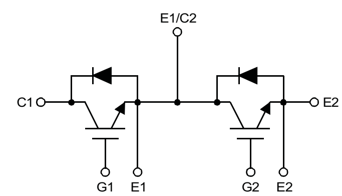
FMG2G150US60E

Molding Type Module

General Description

Fairchild's Insulated Gate Bipolar Transistor (IGBT) power modules provide low conduction and switching losses as well as short circuit ruggedness. They are designed for applications such as motor control, uninterrupted power supplies (UPS) and general inverters where short circuit ruggedness is a required feature.

Package Code : 7PM-GA



Internal Circuit Diagram

Features

- UL Certified No. E209204
- Short Circuit rated 10us @ T_C = 100°C, V_{GE} = 15V
- High Speed Switching
- Low Saturation Voltage : $V_{CE(sat)}$ = 2.2 V @ I_C = 150A
- High Input Impedance
- Fast & Soft Anti-Parallel FWD

Application

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

Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Description		FMG2G150US60E	Units
V_{CES}	Collector-Emitter Voltage		600	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Collector Current	@ T_C = 25°C	150	A
$I_{CM\ (1)}$	Pulsed Collector Current		300	A
I_F	Diode Continuous Forward Current	@ T_C = 100°C	150	A
I_{FM}	Diode Maximum Forward Current		300	A
T_{SC}	Short Circuit Withstand Time	@ T_C = 100°C	10	us
P_D	Maximum Power Dissipation	@ T_C = 25°C	500	W
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 Terminals Screw : M5		2.0	N.m
	Mounting Screw : M6		2.5	N.m

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

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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}	G-E Leakage Current	$V_{GE} = V_{GES}$, V_{CE} = 0V	--	--	± 100	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	V_{GE} = 0V, I_C = 150mA	5.0	6.0	8.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 150A, V_{GE} = 15V	--	2.2	2.8	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	--	12840	--	pF
C_{oes}	Output Capacitance		--	1400	--	pF
C_{res}	Reverse Transfer Capacitance		--	354	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 150A, R_G = 2.0Ω, V_{GE} = 15V Inductive Load, T_C = 25°C	--	40	--	ns
t_r	Rise Time		--	70	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	90	--	ns
t_f	Fall Time		--	110	200	ns
E_{on}	Turn-On Switching Loss		--	1.6	--	mJ
E_{off}	Turn-Off Switching Loss		--	4.8	--	mJ
E_{ts}	Total Switching Loss		--	6.4	--	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 150A, R_G = 2.0Ω, V_{GE} = 15V Inductive Load, T_C = 125°C	--	40	--	ns
t_r	Rise Time		--	80	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	100	--	ns
t_f	Fall Time		--	300	--	ns
E_{on}	Turn-On Switching Loss		--	2.0	--	mJ
E_{off}	Turn-Off Switching Loss		--	8.0	--	mJ
E_{ts}	Total Switching Loss		--	10.0	--	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 = 150A, V_{GE} = 15V	--	620	700	nC
Q_{ge}	Gate-Emitter Charge		--	120	--	nC
Q_{gc}	Gate-Collector Charge		--	270	--	nC

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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 = 150A	T_C = 25°C	--	1.9	2.8	V
			T_C = 100°C	--	1.8	--	
t_{rr}	Diode Reverse Recovery Time	I_F = 150A di / dt = 300 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	--	15	20	A
			T_C = 100°C	--	22	--	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	--	675	1270	nC
			T_C = 100°C	--	1430	--	

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)	--	0.20	°C/W
$R_{\theta JC}$	Junction-to-Case (DIODE Part, per 1/2 Module)	--	0.47	°C/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.03	--	°C/W
Weight	Weight of Module	--	270	g

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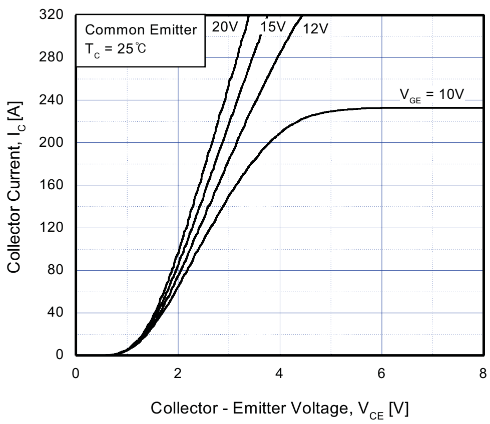

Fig 1. Typical Output Characteristics

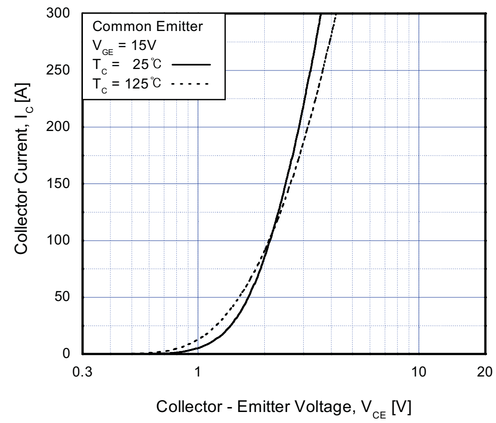

Fig 2. Typical Saturation Voltage Characteristics

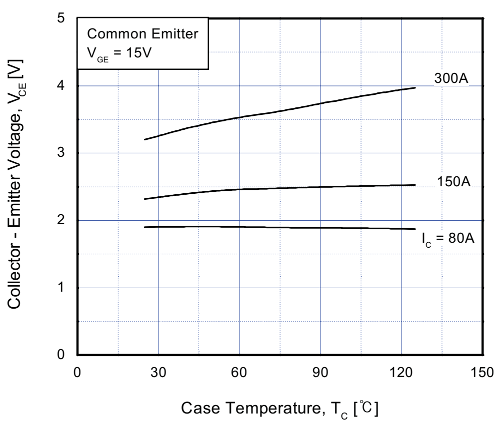

Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level

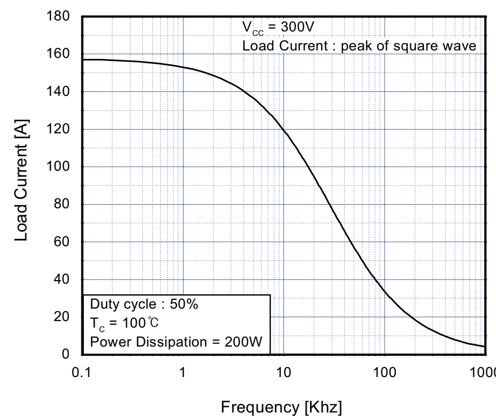

Fig 4. Load Current vs. Frequency

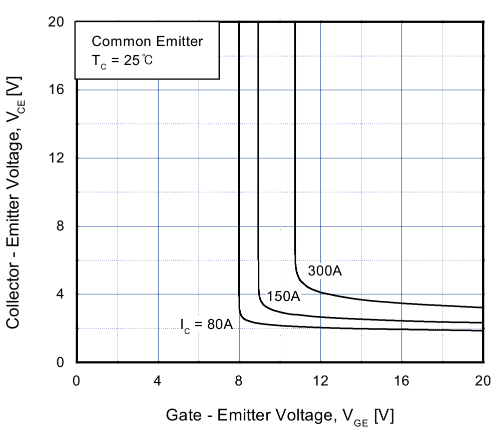

Fig 5. Saturation Voltage vs. V_{GE}

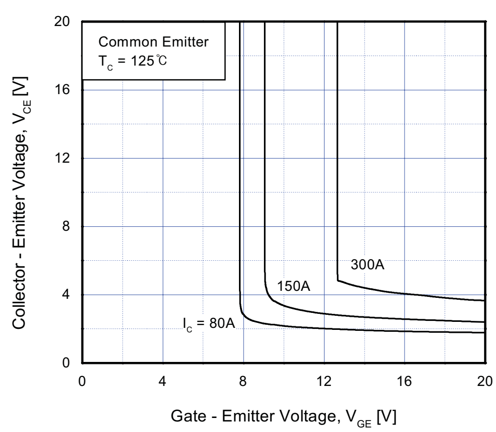

Fig 6. Saturation Voltage vs. V_{GE}

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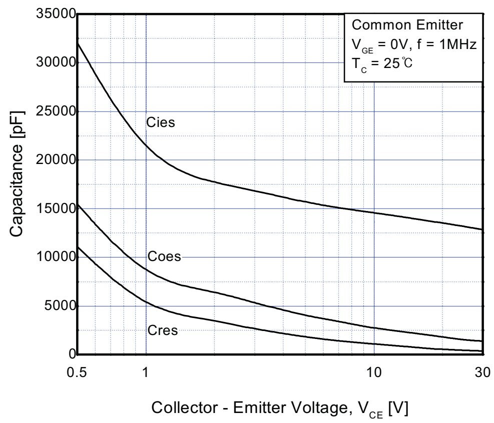

Fig 7. Capacitance Characteristics

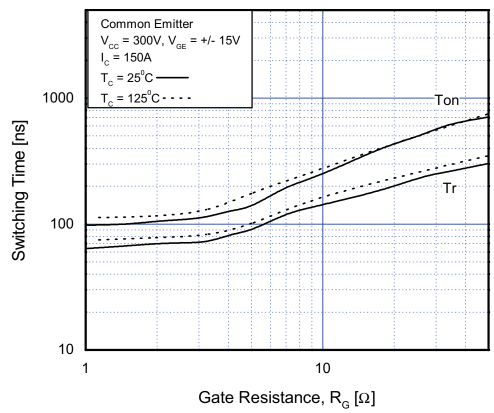

Fig 8. Turn-On Characteristics vs.

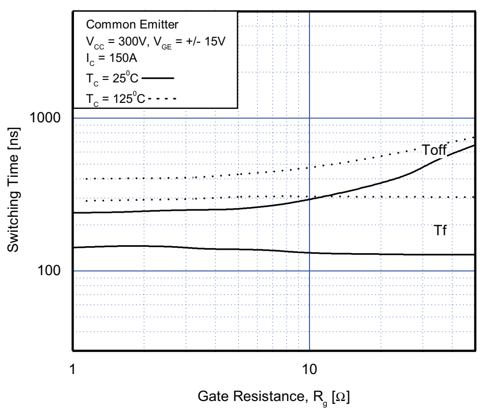

Fig 9. Turn-Off Characteristics vs. Gate Resistance

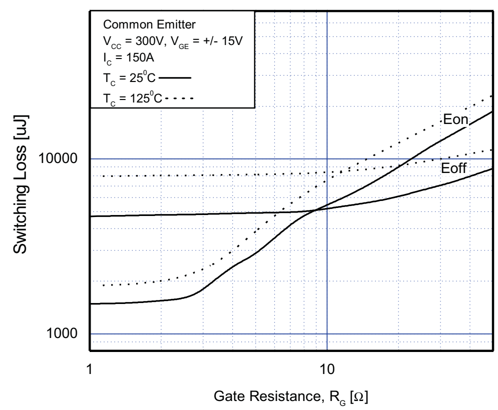

Fig 10. Switching Loss vs. Gate Resistance

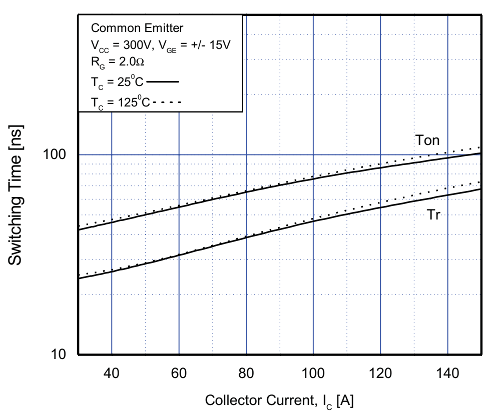

Fig 11. Turn-On Characteristics vs. Collector Current

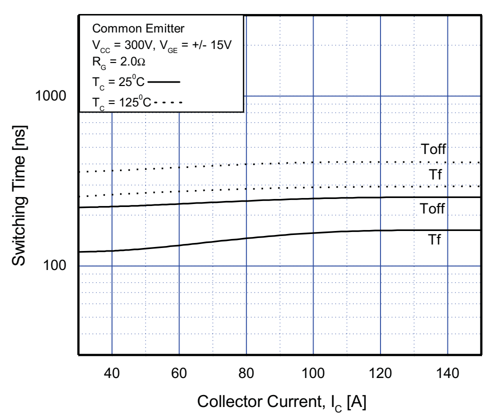

Fig 12. Turn-Off Characteristics vs. Collector Current

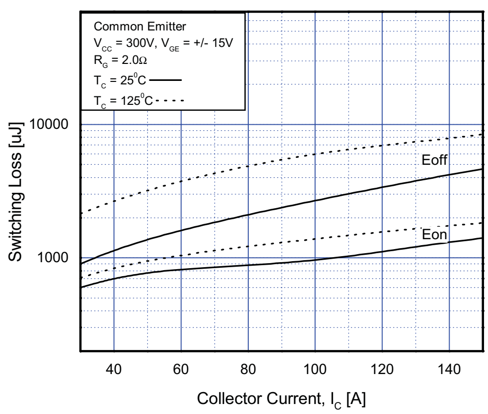

Fig 13. Switching Loss vs. Collector Current

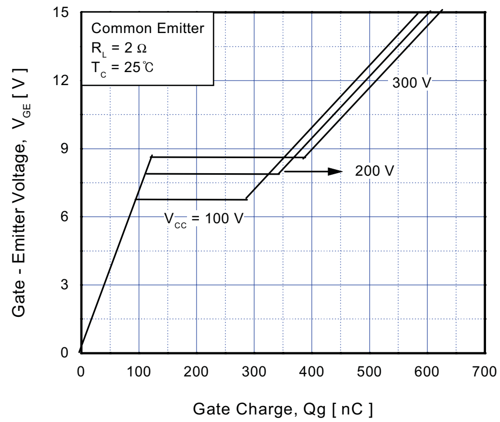

Fig 14. Gate Charge Characteristics

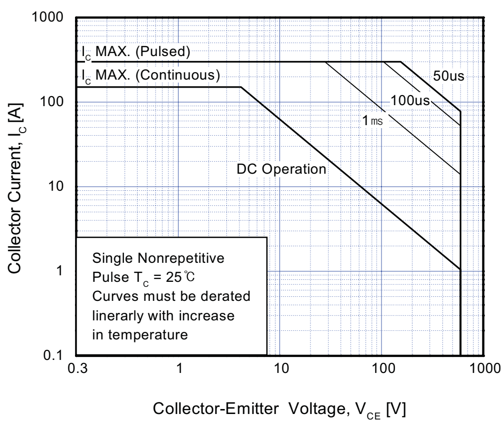

Fig 15. SOA Characteristics

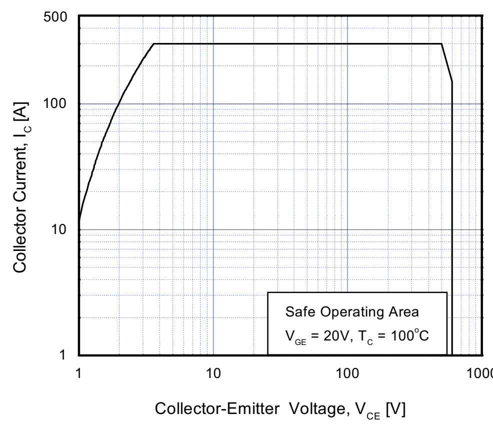

Fig 16. Turn-Off SOA Characteristics

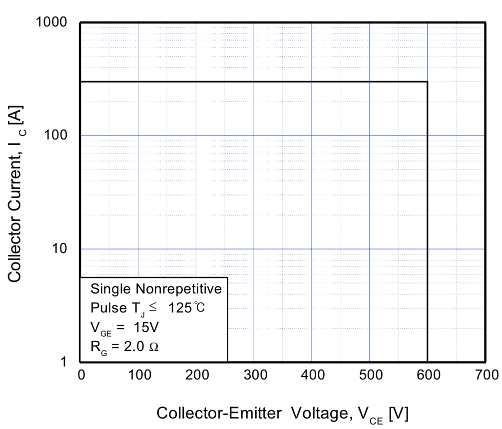

Fig 17. RBSOA Characteristics

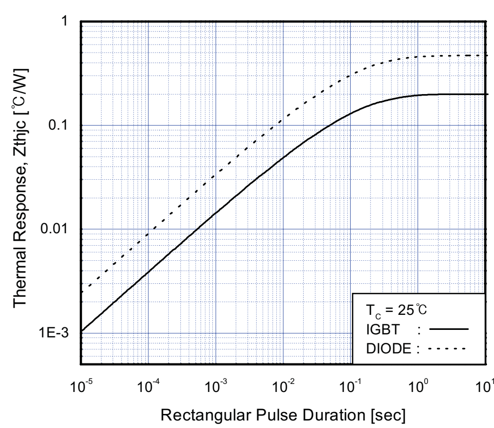

Fig 18. Transient Thermal Impedance

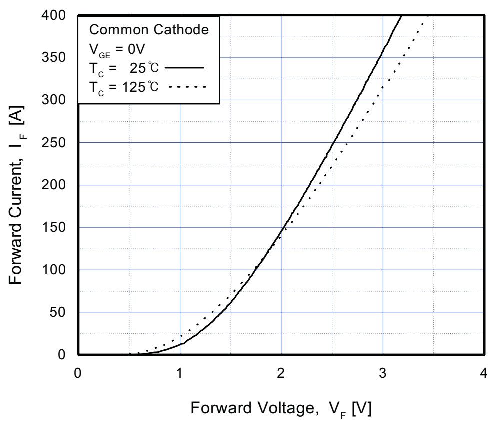

Fig 19. Forward Characteristics

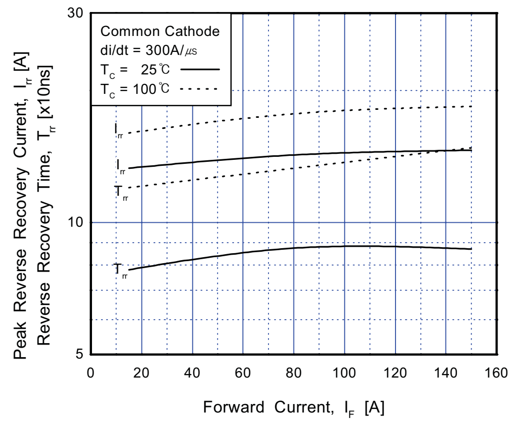

Fig 20. Reverse Recovery Characteristics

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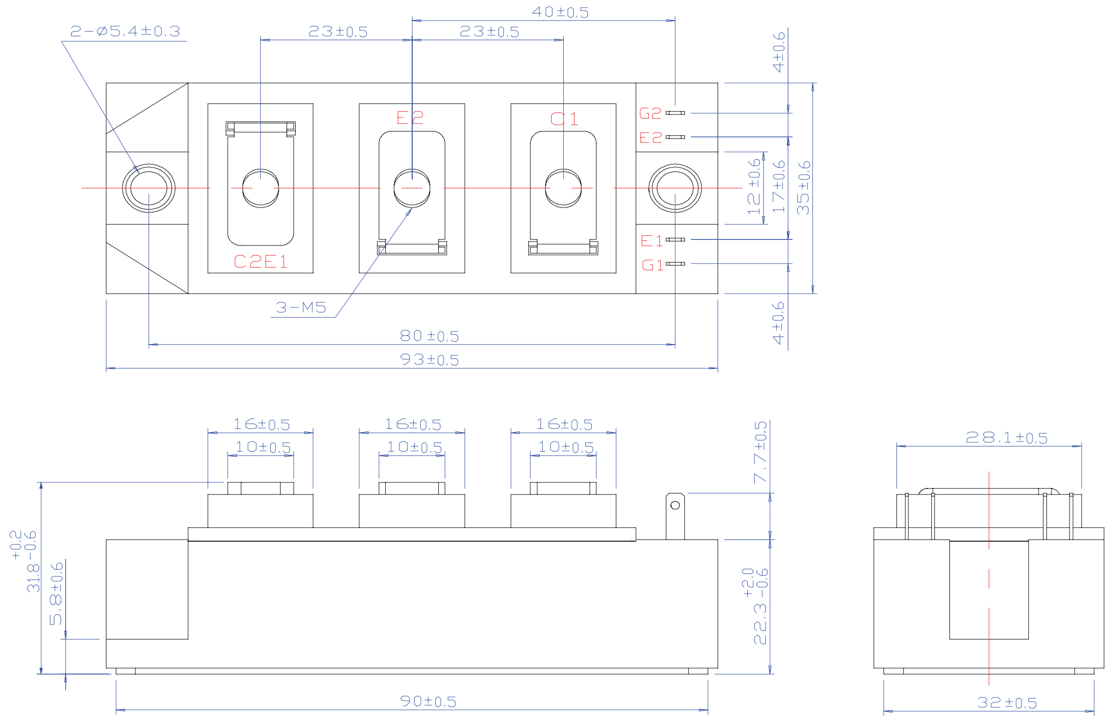
Package Dimension

7PM-GA



Dimensions in Millimeters

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