

FMG2G400US60

Molding Type Module

General Description

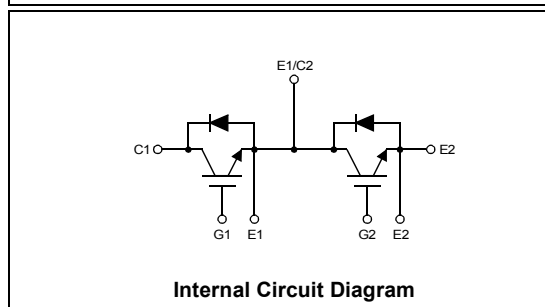
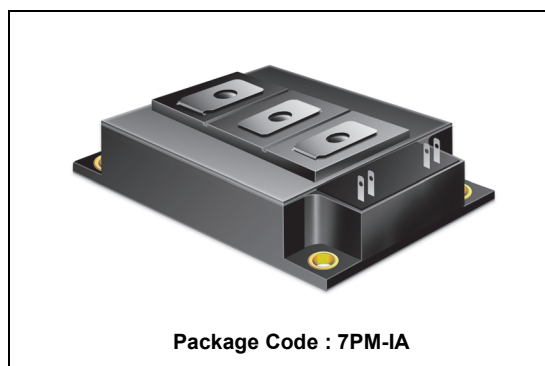
Fairchild IGBT Power Module provides low conduction and switching losses as well as short circuit ruggedness. It's designed for the applications such as motor control, uninterrupted power supplies (UPS) and general inverters where short-circuit ruggedness is required.

Features

- Short Circuit Rated Time; 10us @ $T_C = 100^\circ\text{C}$, $V_{GE} = 15\text{V}$
- High Speed Switching
- Low Saturation Voltage : $V_{CE(sat)} = 2.1\text{V}$ @ $I_C = 400\text{A}$
- High Input Impedance
- Fast & Soft Anti-Parallel FWD
- UL Certified No.E209204

Application

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



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

| Symbol | Description | FMG2G400US60 | Units |
|-----------------|-------------------------------------------------------------|--------------|------------------|
| V_{CES} | Collector-Emitter Voltage | 600 | V |
| V_{GES} | Gate-Emitter Voltage | ± 20 | V |
| I_C | Collector Current @ $T_C = 80^\circ\text{C}$ | 400 | A |
| $I_{CM(1)}$ | Pulsed Collector Current | 800 | A |
| I_F | Diode Continuous Forward Current @ $T_C = 80^\circ\text{C}$ | 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_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 |
| ΔBV _{CES} /ΔT _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 | T _C = 25°C | -- | 90 | 130 | ns |
| | | | T _C = 100°C | -- | 130 | -- | |
| I _{rr} | Diode Peak Reverse Recovery Current | di / dt = 800 A/us | T _C = 25°C | -- | 35 | 46 | A |
| | | | T _C = 100°C | -- | 76 | -- | |
| Q _{rr} | Diode Reverse Recovery Charge | I _F = 400A | T _C = 25°C | -- | 1580 | 3000 | nC |
| | | | T _C = 100°C | -- | 4940 | -- | |

Thermal Characteristics

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

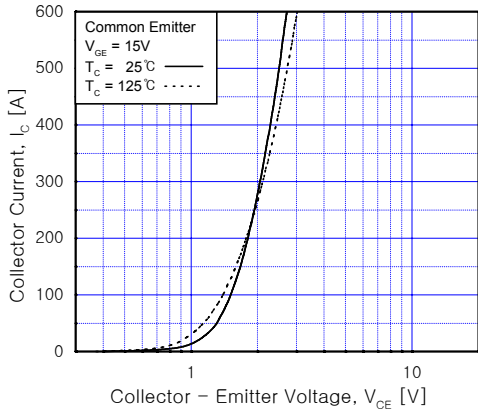


Fig 1. Typical Output Characteristics

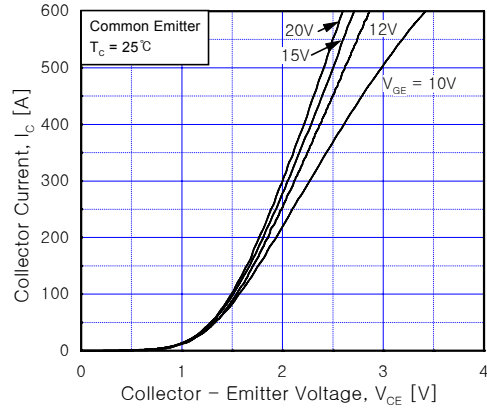


Fig 2. Typical Saturation Voltage Characteristics

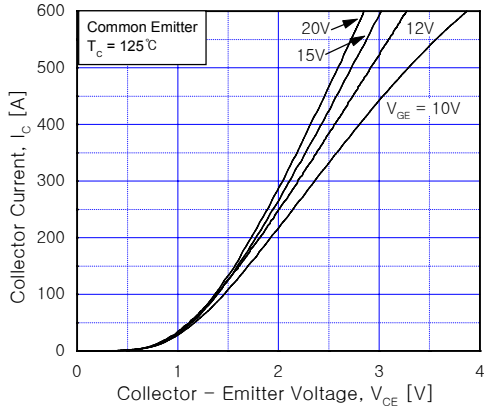


Fig 3. Typical Saturation Voltage Characteristics

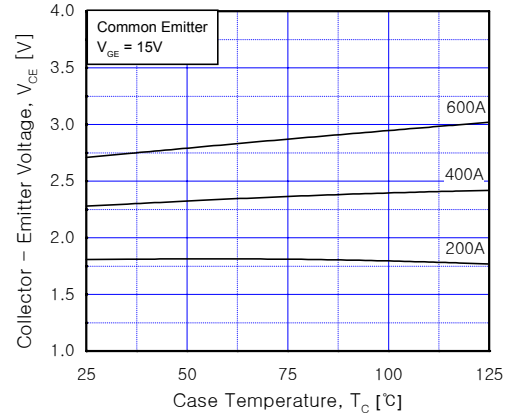


Fig 4. Saturation Voltage vs. Case Temperature at Variant Current Level

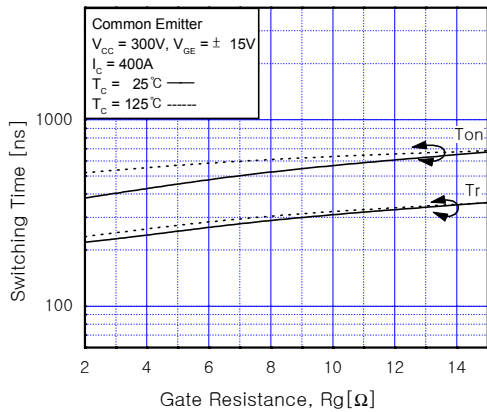


Fig 5. Turn-On Characteristics vs. Gate Resistance

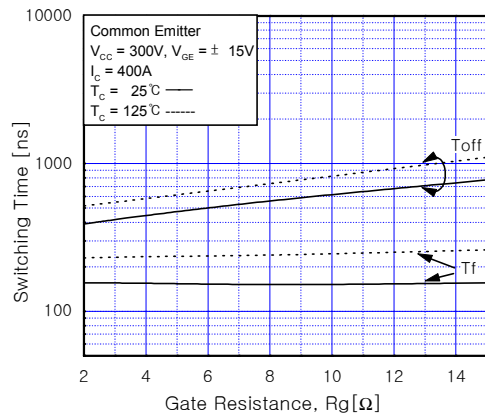


Fig 6. Turn-Off Characteristics vs. Gate Resistance

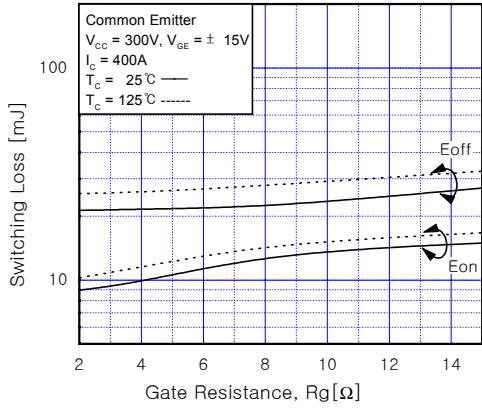


Fig 7. Switching Loss vs. Gate Resistance

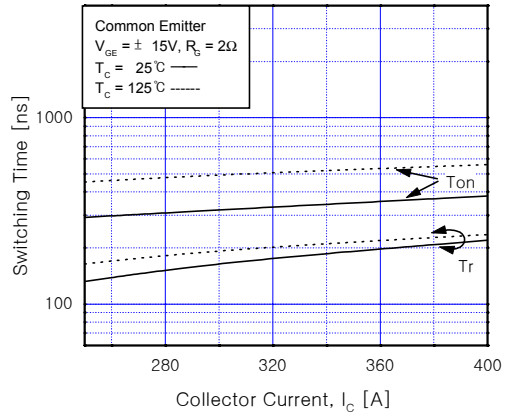


Fig 8. Turn-On Characteristics vs. Collector Current

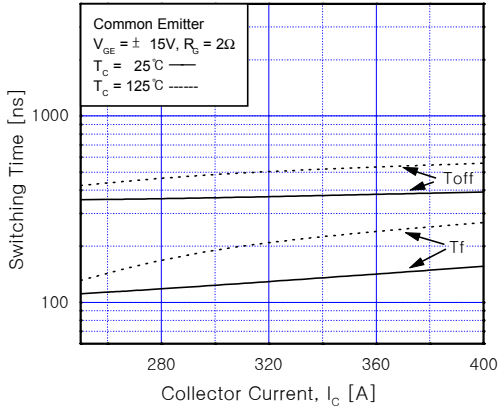


Fig 9. Turn-Off Characteristics vs. Collector Current

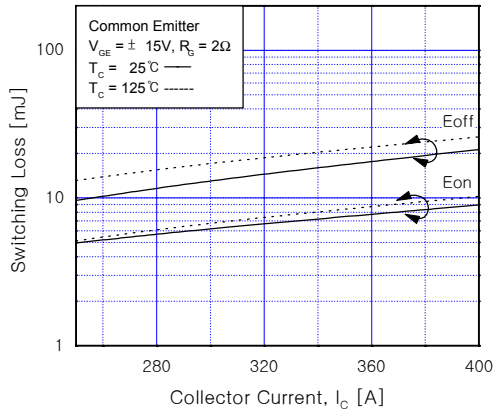


Fig 10. Switching Loss vs. Collector Current

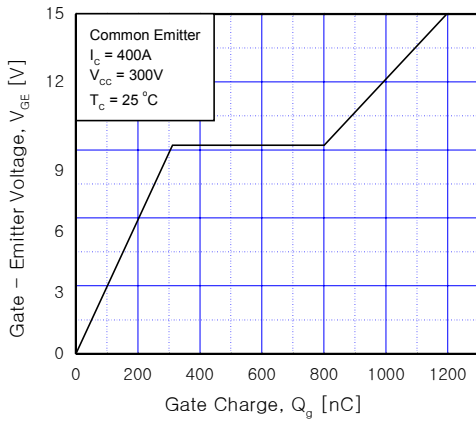


Fig 11. Gate Charge Characteristics

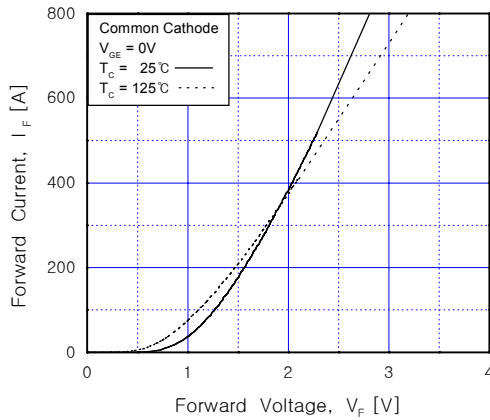


Fig 12. Forward Characteristics (diode)

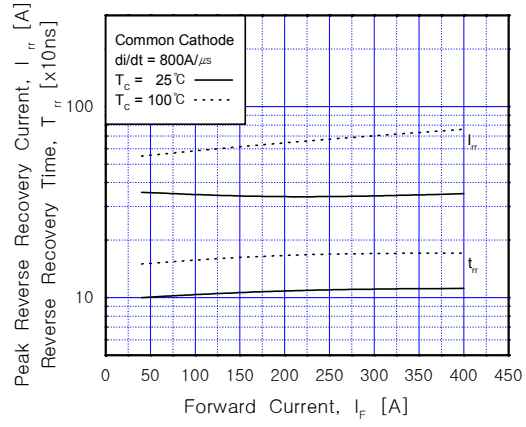
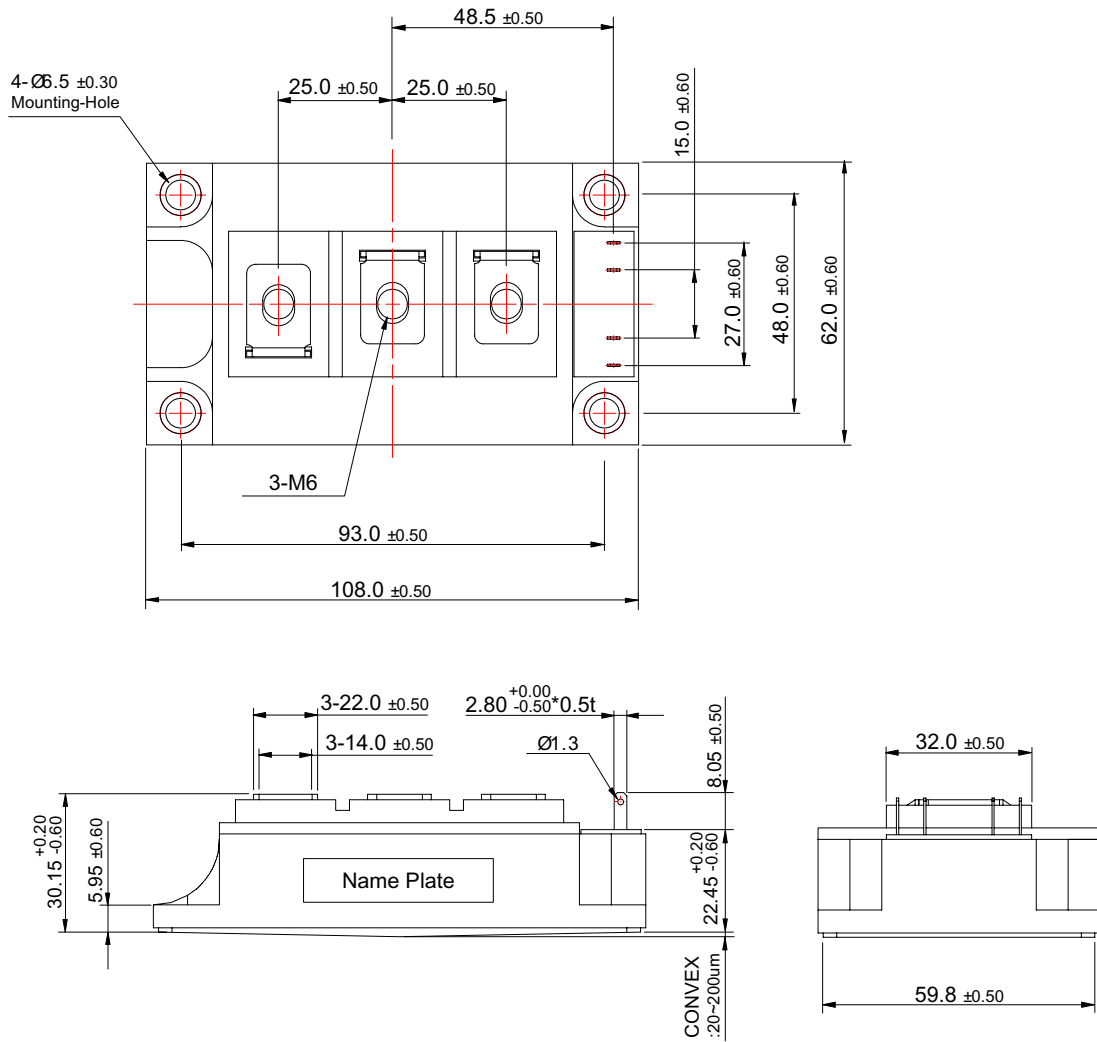


Fig 13. Reverse Recovery Characteristics(diode)

Package Dimension

7PM-IA



Dimensions in Millimeters

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