

# FMG2G300LS60E

## 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

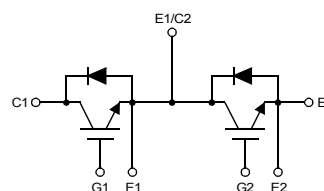
- Short Circuit Rated Time; 10us @  $T_C = 100^\circ\text{C}$ ,  $V_{GE} = 15\text{V}$
- Low Saturation Voltage:  $V_{CE(sat)} = 1.4\text{V}$  @  $I_C = 300\text{A}$
- High Input Impedance
- Fast & Soft Anti-Parallel FWD
- UL Certified No.E209204

### Application

- AC/ DC Welder



Package Code : 7PM-HA



Internal Circuit Diagram

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

| Symbol          | Description                                              | FMG2G300LS60E | Units            |
|-----------------|----------------------------------------------------------|---------------|------------------|
| $V_{CES}$       | Collector-Emitter Voltage                                | 600           | V                |
| $V_{GES}$       | Gate-Emitter Voltage                                     | $\pm 20$      | V                |
| $I_C$           | Collector Current                                        | 300           | A                |
| $I_{CM(1)}$     | Pulsed Collector Current                                 | 600           | A                |
| $I_F$           | Diode Continuous Forward Current                         | 300           | A                |
| $I_{FM}$        | Diode Maximum Forward Current                            | 600           | A                |
| $P_D$           | Maximum Power Dissipation                                | 892           | 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 : M5                                | 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** $T_C = 25^\circ\text{C}$  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  | --        | $V/^\circ C$ |
| $I_{CES}$                      | 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        | $I_C = 300mA, V_{CE} = V_{GE}$ | 5.0 | 6.5 | 8.5 | V |
| $V_{CE(sat)}$ | Collector to Emitter Saturation Voltage | $I_C = 300A, V_{GE} = 15V$     | --  | 1.4 | 1.8 | V |

**Switching Characteristics**

|              |                              |                                                                                                        |    |      |    |         |
|--------------|------------------------------|--------------------------------------------------------------------------------------------------------|----|------|----|---------|
| $t_{d(on)}$  | Turn-On Delay Time           | $V_{CC} = 300V, I_C = 300A,$<br>$R_G = 10\Omega, V_{GE} = 15V,$<br>Inductive Load, $T_C = 25^\circ C$  | -- | 0.23 | -- | $\mu s$ |
| $t_r$        | Rise Time                    |                                                                                                        | -- | 0.21 | -- | $\mu s$ |
| $t_{d(off)}$ | Turn-Off Delay Time          |                                                                                                        | -- | 0.43 | -- | $\mu s$ |
| $t_f$        | Fall Time                    |                                                                                                        | -- | 2.43 | -- | $\mu s$ |
| $E_{on}$     | Turn-On Switching Loss       |                                                                                                        | -- | 13   | -- | mJ      |
| $E_{off}$    | Turn-Off Switching Loss      | $V_{CC} = 300V, I_C = 300A,$<br>$R_G = 10\Omega, V_{GE} = 15V,$<br>Inductive Load, $T_C = 125^\circ C$ | -- | 180  | -- | mJ      |
| $t_{d(on)}$  | Turn-On Delay Time           |                                                                                                        | -- | 0.3  | -- | $\mu s$ |
| $t_r$        | Rise Time                    |                                                                                                        | -- | 0.23 | -- | $\mu s$ |
| $t_{d(off)}$ | Turn-Off Delay Time          |                                                                                                        | -- | 0.46 | -- | $\mu s$ |
| $t_f$        | Fall Time                    |                                                                                                        | -- | 4.1  | -- | $\mu s$ |
| $E_{on}$     | Turn-On Switching Loss       | $V_{CC} = 300V, V_{GE} = 15V$<br>@ $T_C = 100^\circ C$                                                 | 10 | --   | -- | $\mu s$ |
| $E_{off}$    | Turn-Off Switching Loss      |                                                                                                        | -- | 990  | -- | nC      |
| $T_{sc}$     | Short Circuit Withstand Time |                                                                                                        | -- | 210  | -- | nC      |
| $Q_g$        | Total Gate Charge            | $V_{CE} = 300V, I_C = 300A,$<br>$V_{GE} = 15V$                                                         | -- | 350  | -- | nC      |
| $Q_{ge}$     | Gate-Emitter Charge          |                                                                                                        | -- |      |    |         |
| $Q_{gc}$     | Gate-Collector Charge        |                                                                                                        | -- |      |    |         |

**Electrical Characteristics of DIODE** $T_C = 25^\circ\text{C}$  unless otherwise noted

| Symbol          | Parameter                           | Test Conditions                             |                        | Min. | Typ. | Max. | Units |
|-----------------|-------------------------------------|---------------------------------------------|------------------------|------|------|------|-------|
| V <sub>FM</sub> | Diode Forward Voltage               | I <sub>F</sub> = 300A                       | 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> = 300A<br>di / dt = 600 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 |                                             | T <sub>C</sub> = 25°C  | --   | 32   | 42   | A     |
|                 |                                     |                                             | T <sub>C</sub> = 100°C | --   | 63   | --   |       |
| Q <sub>rr</sub> | Diode Reverse Recovery Charge       |                                             | T <sub>C</sub> = 25°C  | --   | 1440 | 2700 | nC    |
|                 |                                     |                                             | T <sub>C</sub> = 100°C | --   | 4095 | --   |       |

**Thermal Characteristics**

| Symbol          | Parameter                                     | Typ.  | Max. | Units        |
|-----------------|-----------------------------------------------|-------|------|--------------|
| $R_{\theta JC}$ | Junction-to-Case (IGBT Part, per 1/2 Module)  | --    | 0.14 | $^\circ C/W$ |
| $R_{\theta JC}$ | Junction-to-Case (DIODE Part, per 1/2 Module) | --    | 0.22 | $^\circ C/W$ |
| $R_{\theta JC}$ | Case-to-Sink (Conductive grease applied)      | 0.035 | --   | $^\circ C/W$ |
| Weight          | Weight of Module                              | 240   | --   | g            |

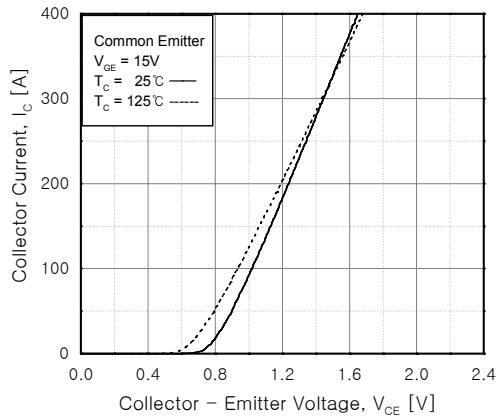


Fig 1. Typical Output Characteristics

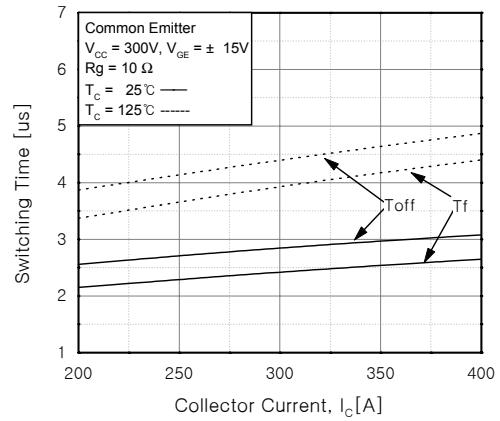


Fig 2. Turn-Off Characteristics vs. Collector Current

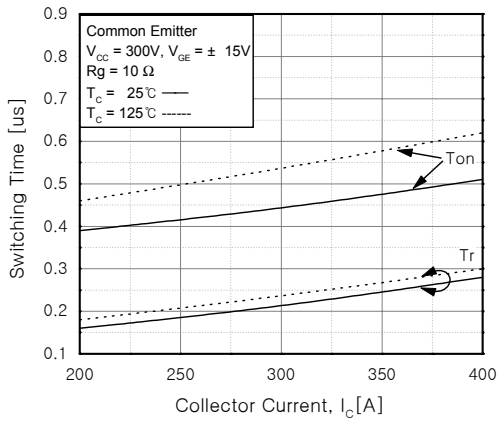


Fig 3. Turn-On Characteristics vs. Collector Current

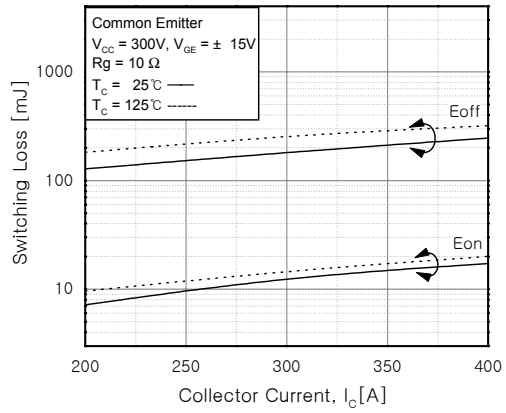


Fig 4. Switching Loss vs. Collector Current

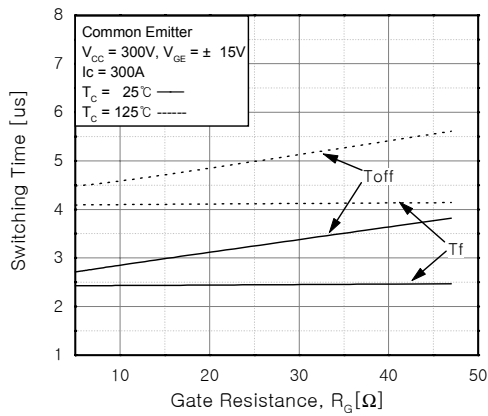


Fig 5. Turn-Off Characteristics vs. Gate Resistance

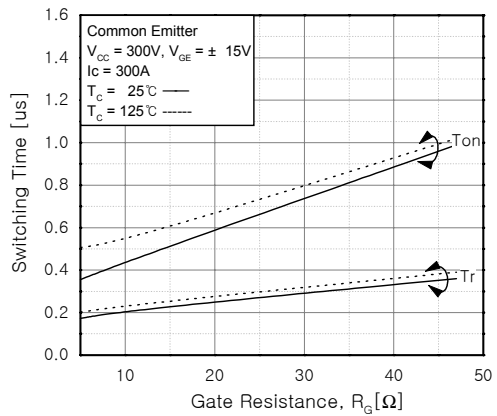


Fig 6. Turn-On Characteristics vs. Gate Resistance

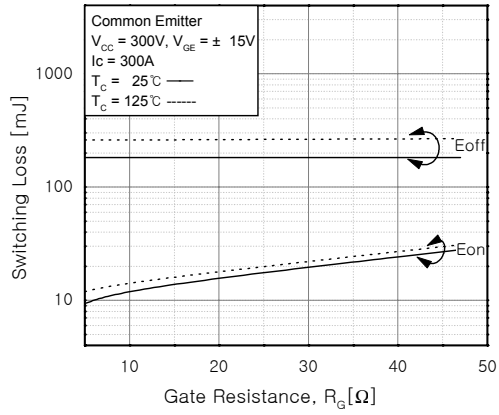


Fig 7. Switching Loss vs. Gate Resistance

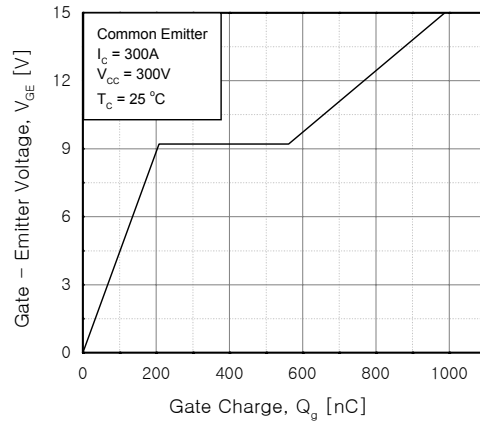


Fig 8. Gate Charge Characteristics

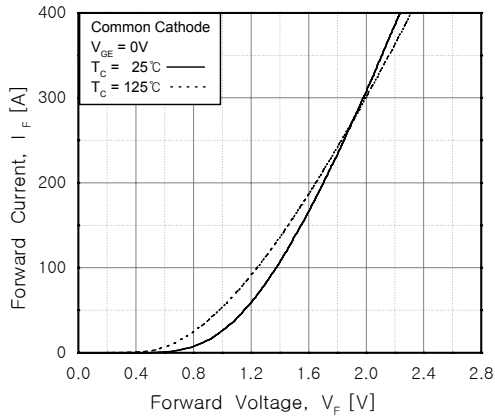


Fig 9. Forward Characteristics (diode)

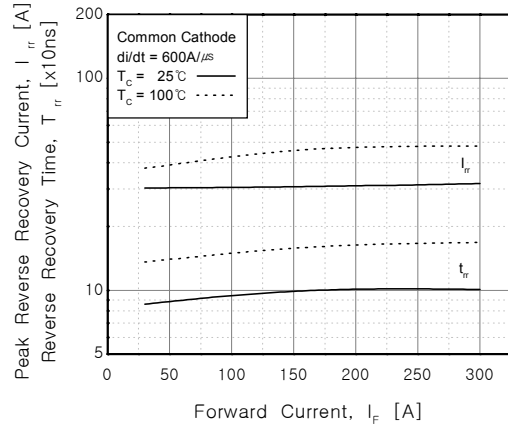
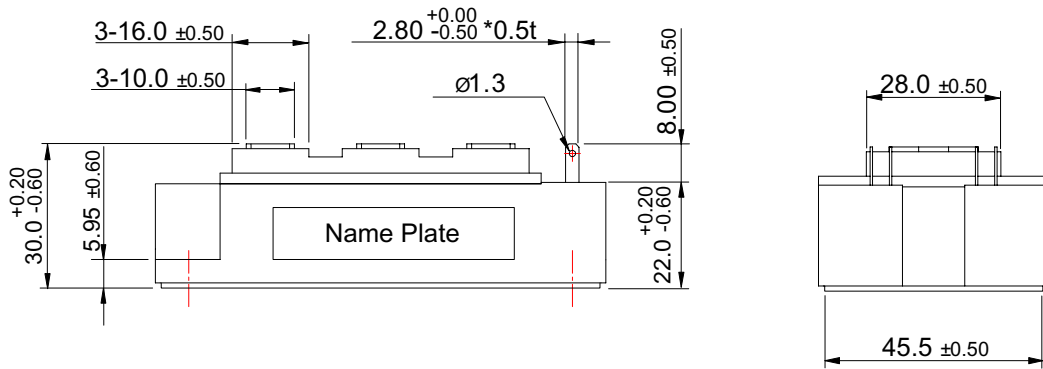
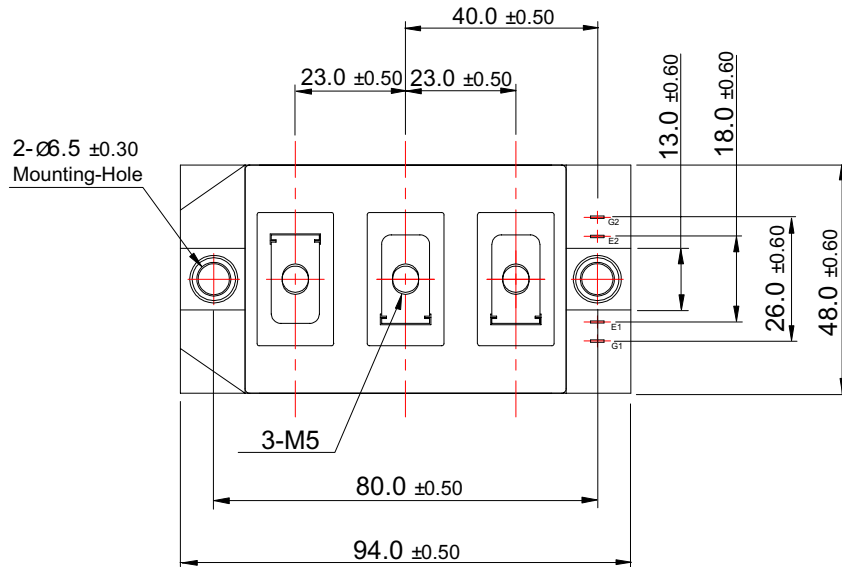


Fig 10. Reverse Recovery Characteristics(diode)

# Package Dimension

## 7PM-HA



## TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

|                                      |                     |                        |                              |                        |
|--------------------------------------|---------------------|------------------------|------------------------------|------------------------|
| ACE <sup>x</sup> ™                   | FAST <sup>®</sup>   | ISOPLANAR™             | Power247™                    | SuperFET™              |
| ActiveArray™                         | FASTr™              | LittleFET™             | PowerSaver™                  | SuperSOT™-3            |
| Bottomless™                          | FPS™                | MICROCOUPLER™          | PowerTrench <sup>®</sup>     | SuperSOT™-6            |
| CoolFET™                             | FRFET™              | MicroFET™              | QFET <sup>®</sup>            | SuperSOT™-8            |
| CROSSVOLT™                           | GlobalOptoisolator™ | MicroPak™              | QS™                          | SyncFET™               |
| DOME™                                | GTO™                | MICROWIRE™             | QT Optoelectronics™          | TinyLogic <sup>®</sup> |
| EcoSPARK™                            | HiSeC™              | MSX™                   | Quiet Series™                | TINYOPTO™              |
| E <sup>2</sup> CMOS™                 | I <sup>2</sup> C™   | MSXPro™                | RapidConfigure™              | TruTranslation™        |
| EnSigna™                             | i-Lo™               | OCX™                   | RapidConnect™                | UHC™                   |
| FACT™                                | ImpliedDisconnect™  | OCXPro™                | μSerDes™                     | UltraFET <sup>®</sup>  |
| FACT Quiet Series™                   |                     | OPTOLOGIC <sup>®</sup> | SILENT SWITCHER <sup>®</sup> | VCX™                   |
| Across the board. Around the world.™ |                     | OPTOPLANAR™            | SMART START™                 |                        |
| The Power Franchise <sup>®</sup>     |                     | PACMAN™                | SPM™                         |                        |
| Programmable Active Droop™           |                     | POP™                   | Stealth™                     |                        |

## DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

## LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## PRODUCT STATUS DEFINITIONS

### Definition of Terms

| Datasheet Identification | Product Status         | Definition                                                                                                                                                                                                            |
|--------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Advance Information      | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.                                                                                    |
| Preliminary              | First Production       | This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design. |
| No Identification Needed | Full Production        | This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.                                                       |
| Obsolete                 | Not In Production      | This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.                                                   |