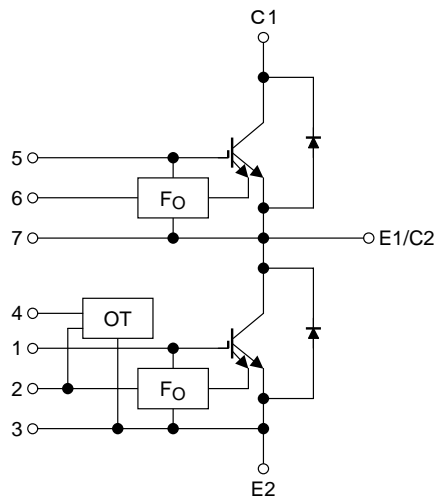


MG400J2YS60A(600V/400A 2in1)

High Power Switching Applications
 Motor Control Applications

- Integrates a complete half bridge power circuit and fault-signal output circuit in one package.
 (short circuit and over temperature)
- The electrodes are isolated from case.
- Low thermal resistance
- $V_{CE(sat)} = 1.8\text{ V (typ.)}$

Equivalent Circuit

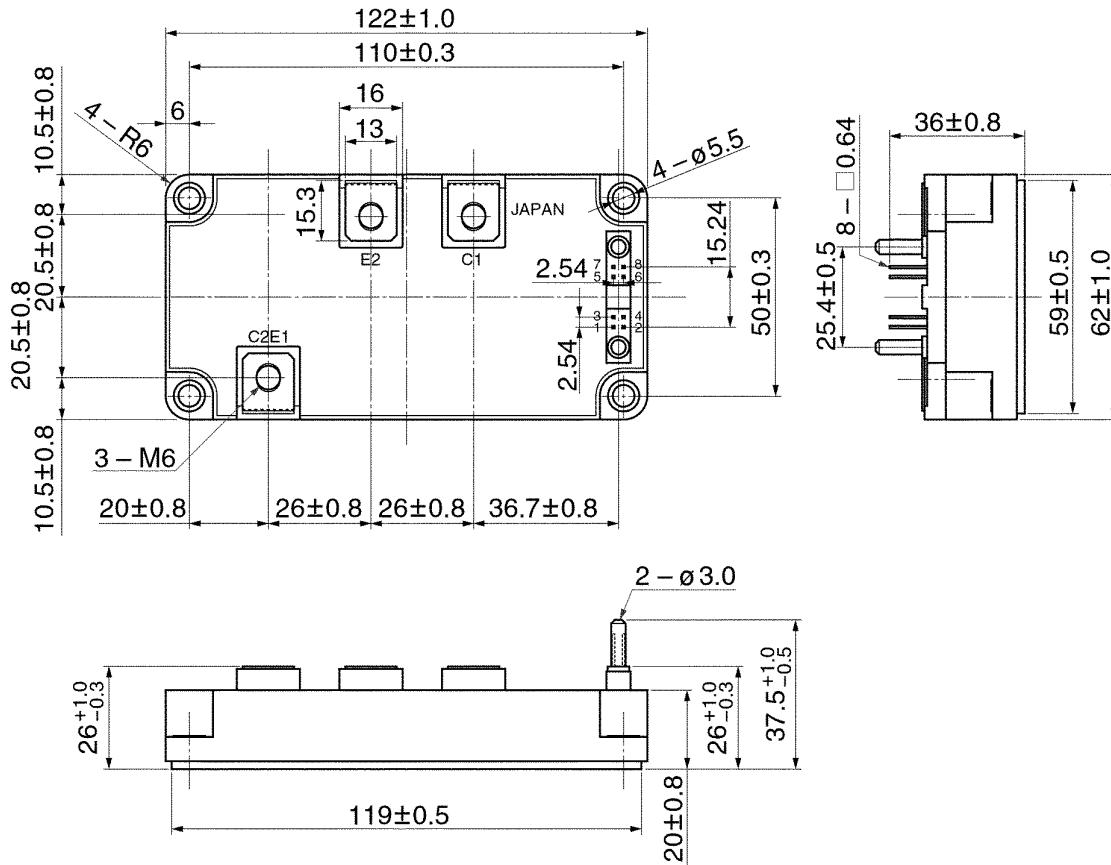


Signal terminal

| | | | | | | | |
|----|-------|----|--------------------|----|-------|----|----------------|
| 1. | G (L) | 2. | F _O (L) | 3. | E (L) | 4. | V _D |
| 5. | G (H) | 6. | F _O (H) | 7. | E (H) | 8. | Open |

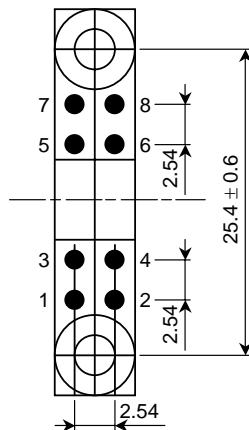
Package Dimensions: 2-123C1B

Unit: mm



- | | | | | | | | |
|----|-------|----|--------------------|----|-------|----|----------------|
| 1. | G (L) | 2. | F _O (L) | 3. | E (L) | 4. | V _D |
| 5. | G (H) | 6. | F _O (H) | 7. | E (H) | 8. | Open |

Signal Terminal Layout



- | | | | | | | | |
|----|-------|----|--------------------|----|-------|----|----------------|
| 1. | G (L) | 2. | F _O (L) | 3. | E (L) | 4. | V _D |
| 5. | G (H) | 6. | F _O (H) | 7. | E (H) | 8. | Open |

Weight: 375 g

Maximum Ratings (Ta = 25°C)

| Stage | Characteristics | Symbol | Rating | Unit | |
|---|-----------------------------|------------|-----------------|------|---|
| Inverter | Collector-emitter voltage | V_{CES} | 600 | V | |
| | Gate-emitter voltage | V_{GES} | ± 20 | V | |
| | Collector current | DC | I_C | 400 | A |
| | | 1 ms | I_{CP} | 800 | |
| | Forward current | DC | I_F | 400 | A |
| | | 1 ms | I_{FM} | 800 | |
| Collector power dissipation (Tc = 25°C) | | P_C | 2160 | W | |
| Control | Control voltage (OT) | V_D | 20 | V | |
| | Fault input voltage | V_{FO} | 20 | V | |
| | Fault input current | I_{FO} | 20 | mA | |
| Module | Junction temperature | T_j | 150 | °C | |
| | Storage temperature range | T_{stg} | -40~125 | °C | |
| | Operation temperature range | T_{ope} | -20~100 | °C | |
| | Isolation voltage | V_{isol} | 2500 (AC 1 min) | V | |
| | Screw torque | — | 3 (M5) | N·m | |

Electrical Characteristics (Tj = 25°C)

1. Inverter Stage

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit | |
|--------------------------------------|--------------------|------------------------|--|---------------------------|------|-------|---------------|---|
| Gate leakage current | | I_{GES} | $V_{GE} = \pm 20 \text{ V}, V_{CE} = 0$ | — | — | +3/-4 | mA | |
| | | | $V_{GE} = +10 \text{ V}, V_{CE} = 0$ | — | — | 100 | nA | |
| Collector cut-off current | | I_{CES} | $V_{CE} = 600 \text{ V}, V_{GE} = 0$ | — | — | 1.0 | mA | |
| Gate-emitter cut-off voltage | | $V_{GE} \text{ (off)}$ | $V_{CE} = 5 \text{ V}, I_C = 400 \text{ mA}$ | 5.0 | 6.5 | 8.0 | V | |
| Collector-emitter saturation voltage | | $V_{CE} \text{ (sat)}$ | $V_{GE} = 15 \text{ V}, I_C = 400 \text{ A}$ | $T_j = 25^\circ\text{C}$ | — | 1.8 | 2.1 | V |
| | | | | $T_j = 125^\circ\text{C}$ | — | — | 2.3 | |
| Input capacitance | | C_{ies} | $V_{CE} = 10 \text{ V}, V_{GE} = 0, f = 1 \text{ MHz}$ | — | 3500 | — | pF | |
| Switching time | Turn-on delay time | $t_d \text{ (on)}$ | $V_{CC} = 300 \text{ V}, I_C = 400 \text{ A}$ $V_{GE} = \pm 15 \text{ V}, R_G = 7.5 \Omega$ (Note 1) | 0.10 | — | 1.00 | μs | |
| | Turn-off time | t_{off} | | — | — | 2.00 | | |
| | Fall time | t_f | | — | — | 0.50 | | |
| Reverse recovery time | t_{rr} | — | | — | 0.50 | | | |
| Forward voltage | | V_F | $I_F = 400 \text{ A}$ | — | 1.8 | 2.2 | V | |

Note 1: Switching time test circuit & timing chart

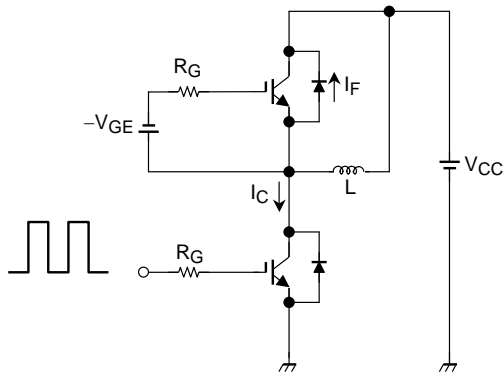
2. Control (Tc = 25°C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------|--------------------|---|-----|------|-----|---------------|
| Fault output current | OC | $V_{GE} = 15 \text{ V}$ | 480 | — | — | A |
| Over temperature | OT | — | 100 | — | 125 | °C |
| Fault output delay time | $t_d \text{ (Fo)}$ | $V_{CC} = 300 \text{ V}, V_{GE} = \pm 15 \text{ V}$ | — | — | 6.5 | μs |

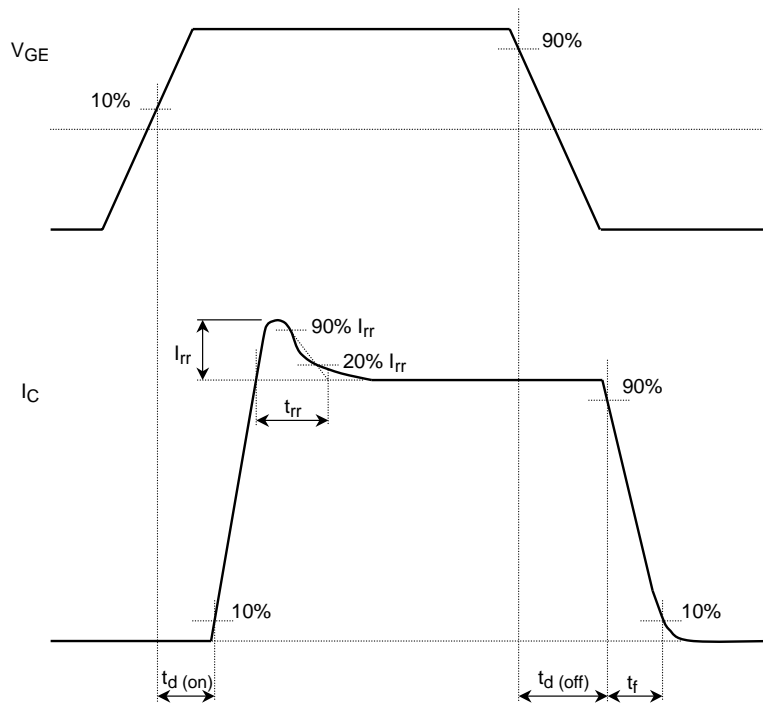
3. Module (Tc = 25°C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------------------|---------------|-----------------------|-----|-------|-------|------|
| Junction to case thermal resistance | $R_{th(j-c)}$ | Inverter IGBT stage | — | — | 0.057 | °C/W |
| | | Inverter FRD stage | — | — | 0.068 | |
| Case to fin thermal resistance | $R_{th(c-f)}$ | With silicon compound | — | 0.013 | — | °C/W |

Switching Time Test Circuit



Timing Chart

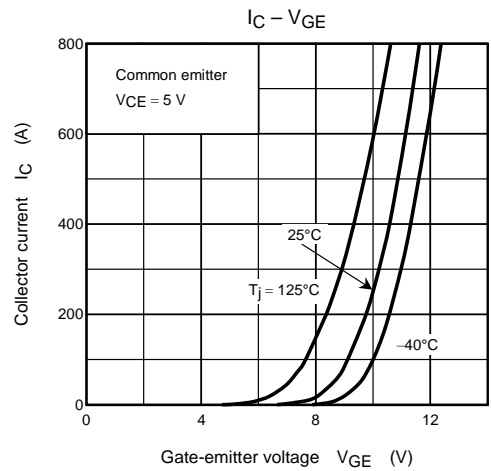
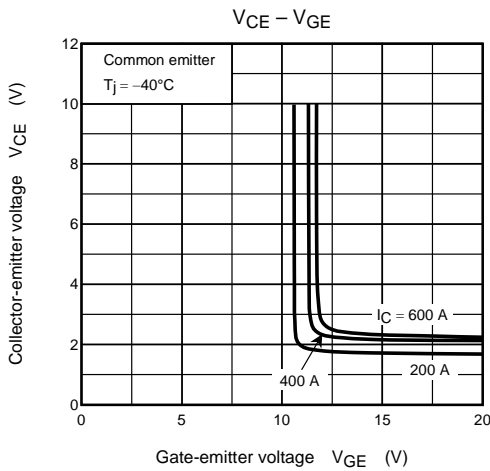
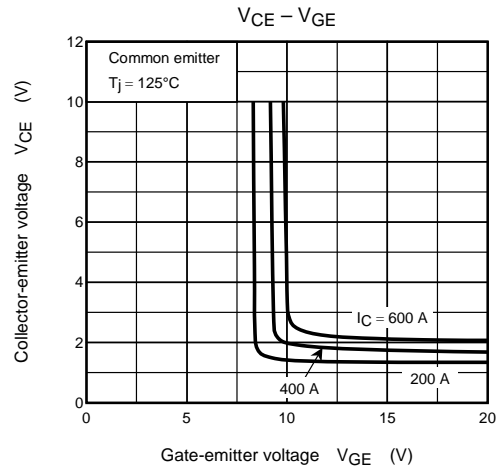
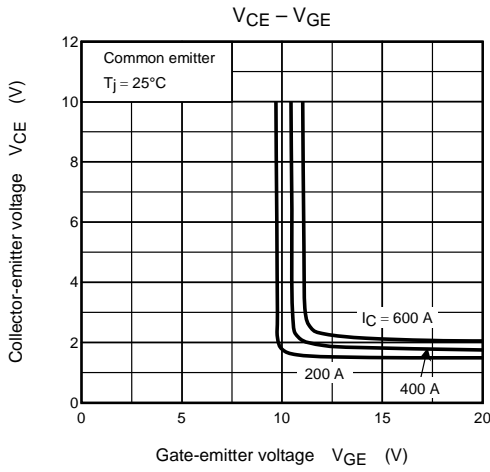
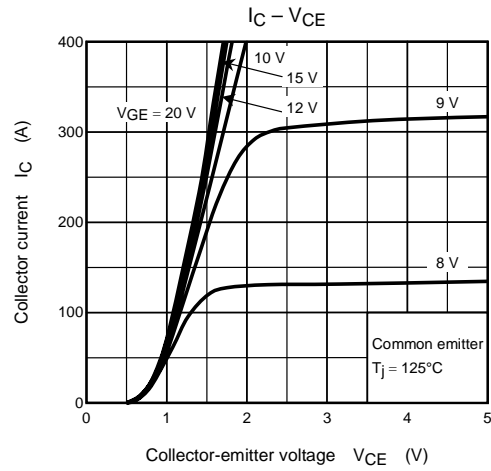
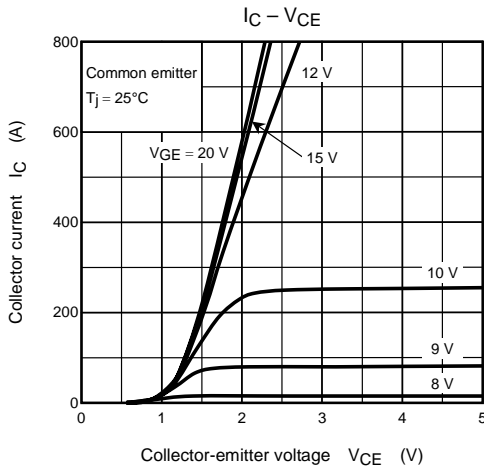


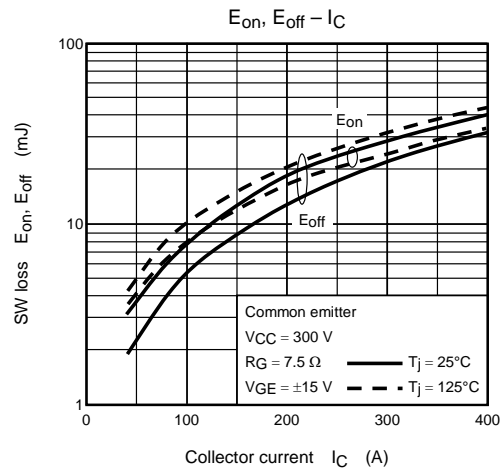
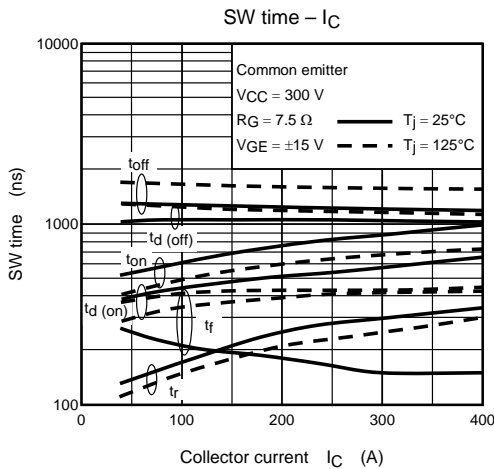
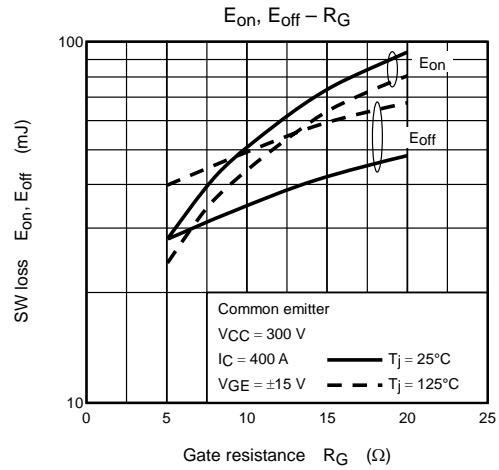
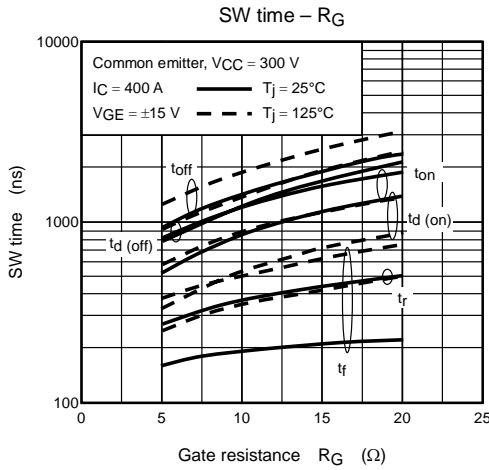
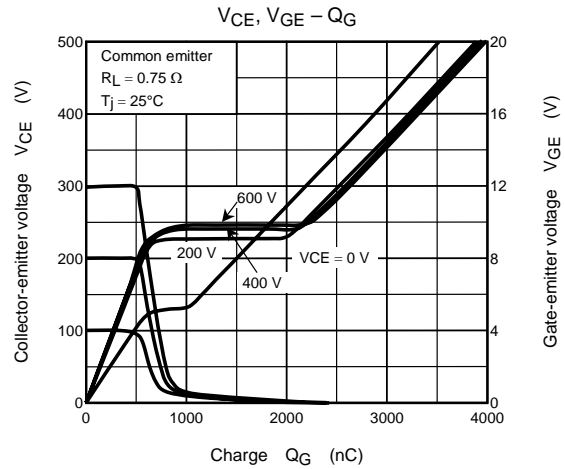
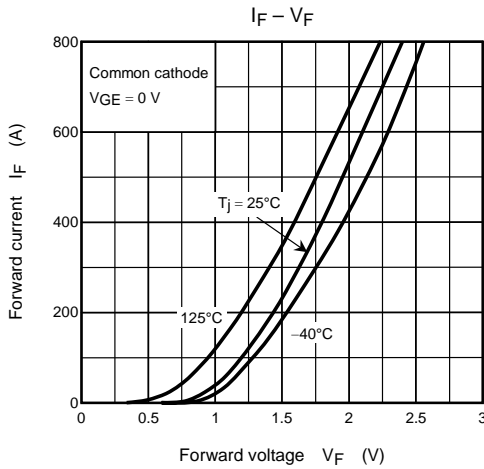
Remark**<Short circuit capability condition>**

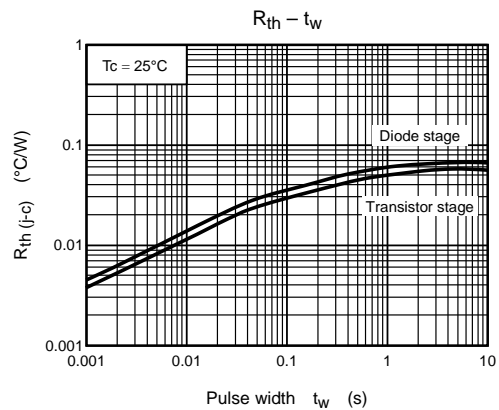
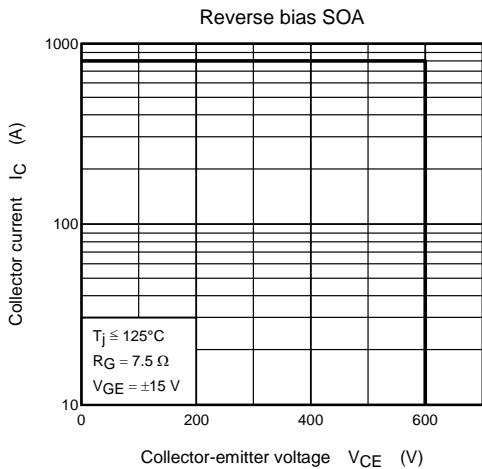
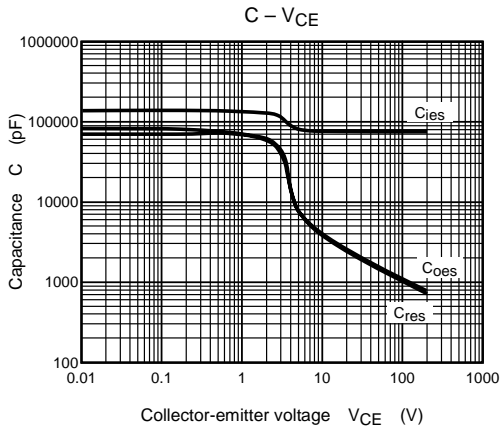
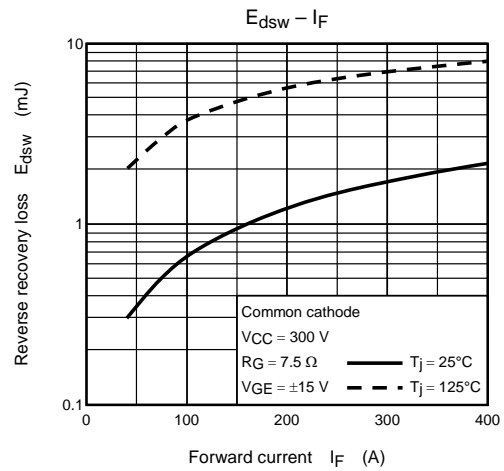
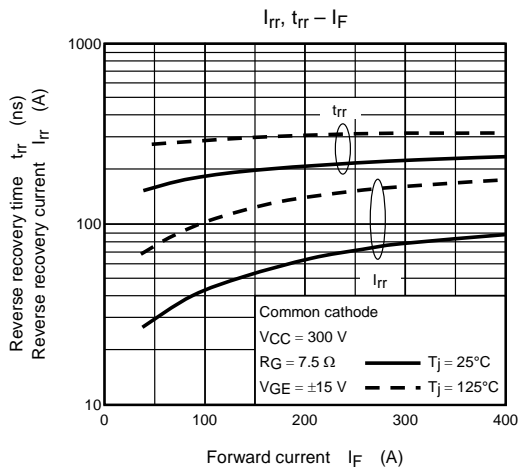
- Short circuit capability is 6 μ s after fault output signal.
Please keep following condition to use fault output signal.
 - $V_{CC} \leq 375$ V
 - 13.8 V $\leq V_{GE} \leq 16.0$ V
 - $R_G \geq 7.5$ Ω
 - $T_j \leq 50^\circ$ C

<Gate voltage>

- To use this product, V_{GE} must be provided higher than 13.8 V.
In case V_{GE} is less than 13.8 V, fault signal FO may not be output even under error conditions.







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