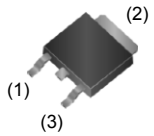
# RGPR30BM40

**400V 30A Ignition IGBT** Datasheet

| | |
|---|---|
| $BV_{CES}$ | 400±30V |
| $I_C$ | 30A |
| $V_{CE(sat)}$ (Typ.) | 1.6V |
| $E_{AS}$ | 300mJ |

## ●Outline

TO-252




## ●Features

1) Low Collector - Emitter Saturation Voltage

2) High Self-Clamped Inductive Switching Energy

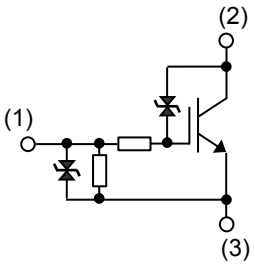
3) Built in Gate-Emitter Protection Diode

4) Built in Gate-Emitter Resistance

5) Qualified to AEC-Q101

6) Pb - free Lead Plating ; RoHS Compliant

## ●Inner Circuit




(1) Gate
(2) Collector
(3) Emitter

## ●Applications

Ignition Coil Driver Circuits

Solenoid Driver Circuits

## ●Packaging Specifications

| | | |
|---|---|---|
| Type | Packaging | Taping |
| | Reel Size (mm) | 330 |
| | Tape Width (mm) | 16 |
| | Basic Ordering Unit (pcs) | 2,500 |
| | Packing Code | TL |
| | Marking | RGPR30BM40 |

## ●Absolute Maximum Ratings (at $T_C$ = 25°C unless otherwise specified)

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Collector - Emitter Voltage | | $V_{CES}$ | 430 | V |
| Emitter-Collector Voltage ($V_{GE}$ = 0V) | | $V_{EC}$ | 25 | V |
| Gate - Emitter Voltage | | $V_{GES}$ | ±10 | V |
| Collector Current | | $I_C$ | 30 | A |
| Avalanche Energy (Single Pulse) | $T_j$ = 25°C | $E_{AS}$ | 300 | mJ |
| | $T_j$ = 150°C | $E_{AS}$ *2 | 180 | mJ |
| Power Dissipation | | $P_D$ | 125 | W |
| Operating Junction Temperature | | $T_j$ | −40 to +175 | °C |
| Storage Temperature | | $T_{stg}$ | −55 to +175 | °C |

## ●Thermal Resistance

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Thermal Resistance IGBT Junction - Case | $R_{\theta(j-c)}$ | - | - | 1.20 | °C/W |

## ●Electrical Characteristics (at $T_j$ = 25°C unless otherwise specified)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Collector - Emitter Breakdown Voltage | $BV_{CES}$ | $I_C$ = 2mA, $V_{GE}$ = 0V | | | | |
| | | $T_j$ = 25°C | 370 | 400 | 430 | V |
| | | $T_j$ = −40 to 175°C*2 | 365 | - | 435 | V |
| Emitter - Collector Breakdown Voltage | $BV_{EC}$ | $I_C$ = −10mA, $V_{GE}$ = 0V | 25 | 35 | - | V |
| Gate - Emitter Breakdown Voltage | $BV_{GES}$ | $I_G$ = ±5mA, $V_{CE}$ = 0V | ±12 | - | ±17 | V |
| Collector Cut - off Current | $I_{CES}$ | $V_{CE}$ = 250V, $V_{GE}$ = 0V | | | | |
| | | $T_j$ = 25°C | - | - | 7 | μA |
| | | $T_j$ = 150°C*2 | - | - | 100 | μA |
| Gate - Emitter Leakage Current | $I_{GES}$ | $V_{GE}$ = ±10V, $V_{CE}$ = 0V | ±0.4 | ±0.6 | ±1.2 | mA |
| Gate - Emitter Threshold Voltage | $V_{GE(th)}$ | $V_{CE}$ = 5V, $I_C$ = 12mA | | | | |
| | | $T_j$ = 25°C | 1.3 | 1.7 | 2.1 | V |
| | | $T_j$ = 150°C*2 | - | 1.3 | - | V |
| Collector - Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$ = 12A, $V_{GE}$ = 5V | | | | |
| | | $T_j$ = 25°C | - | 1.60 | 2.00 | V |
| | | $T_j$ = 150°C | - | 1.80 | - | V |
| Collector - Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$ = 5A, $V_{GE}$ = 4.5V | | | | |
| | | $T_j$ = 25°C | - | 1.17 | 1.50 | V |
| | | $T_j$ = 150°C | - | 1.19 | - | V |

●**Electrical Characteristics** (at $T_j$ = 25°C unless otherwise specified)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Collector - Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$ = 12A, $V_{GE}$ = 4V | | | | |
| | | $T_j$ = 25°C | - | 1.70 | 2.10 | V |
| | | $T_j$ = 150°C | - | 1.90 | - | V |
| Input Capacitance | $C_{ies}$ | $V_{CE}$ = 10V | - | 1330 | - | pF |
| Output Capacitance | $C_{oes}$ | $V_{GE}$ = 0V | - | 220 | - | |
| Reverse Transfer Capacitance | $C_{res}$ | f = 1MHz | - | 71 | - | |
| Total Gate Charge | $Q_g$ | $V_{CE}$ = 12V, $I_C$ = 10A, $V_{GE}$ = 5V | - | 22 | - | nC |
| Turn - on Delay Time[*1,*2] | $t_{d(on)}$ | $I_C$ = 8A, $V_{CC}$ = 300V, $V_{GE}$ = 5V, $R_G$ = 100Ω, L=5mH, $T_j$=25°C | 0.11 | 0.19 | 0.50 | μs |
| Rise Time[*1,*2] | $t_r$ | | 0.10 | 0.18 | 0.50 | |
| Turn - off Delay Time[*1,*2] | $t_{d(off)}$ | | 0.9 | 1.4 | 4.0 | |
| Fall Time[*1,*2] | $t_f$ | | 0.8 | 1.8 | 5.5 | |
| Turn - on Delay Time[*1] | $t_{d(on)}$ | $I_C$ = 8A, $V_{CC}$ = 300V, $V_{GE}$ = 5V, $R_G$ = 100Ω, L=5mH, $T_j$=150°C | - | 0.18 | - | μs |
| Rise Time[*1] | $t_r$ | | - | 0.21 | - | |
| Turn - off Delay Time[*1] | $t_{d(off)}$ | | - | 1.7 | - | |
| Fall Time[*1] | $t_f$ | | - | 3.0 | - | |
| Avalanche Energy (Single Pulse) | $E_{AS}$ | L = 5mH, $V_{GE}$ = 5V, $V_{CC}$ = 30V, $R_G$ = 1kΩ, | | | | |
| | | $T_j$ = 25°C | 300 | - | - | mJ |
| | | $T_j$ = 150°C[*2] | 180 | - | - | mJ |
| Gate Series Resistance | $R_G$ | | 70 | 100 | 130 | Ω |
| Gate - Emitter Resistance | $R_{GE}$ | | 8 | 16 | 24 | kΩ |

*1) Assurance items according to our measurement definition (Fig.18)

*2) Design assurance items

## ●Electrical Characteristic Curves

Fig.1 Typical Output Characteristics

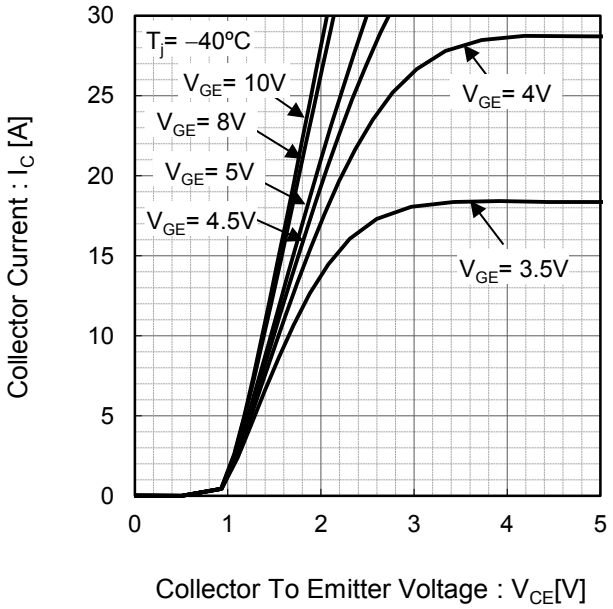



Fig.2 Typical Output Characteristics

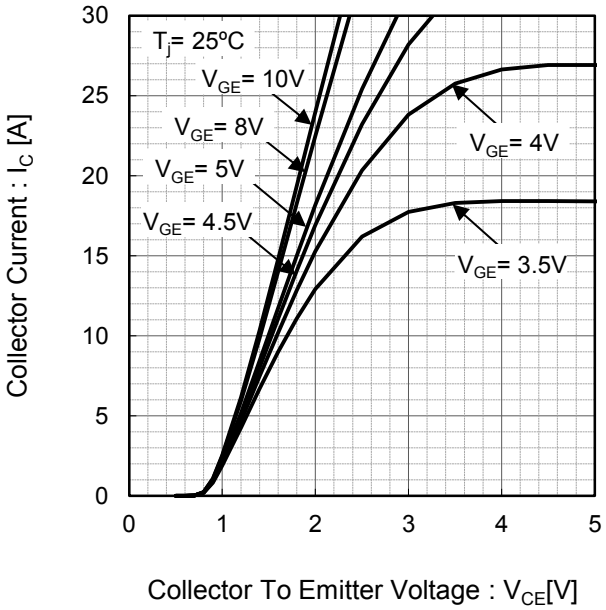



Fig.3 Typical Output Characteristics

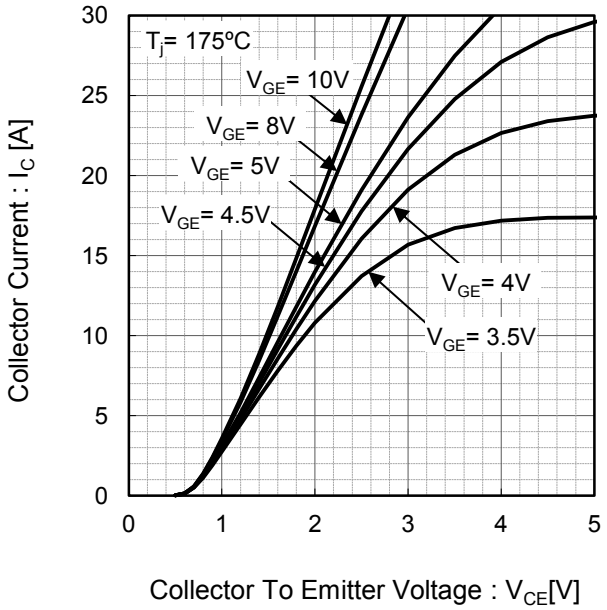
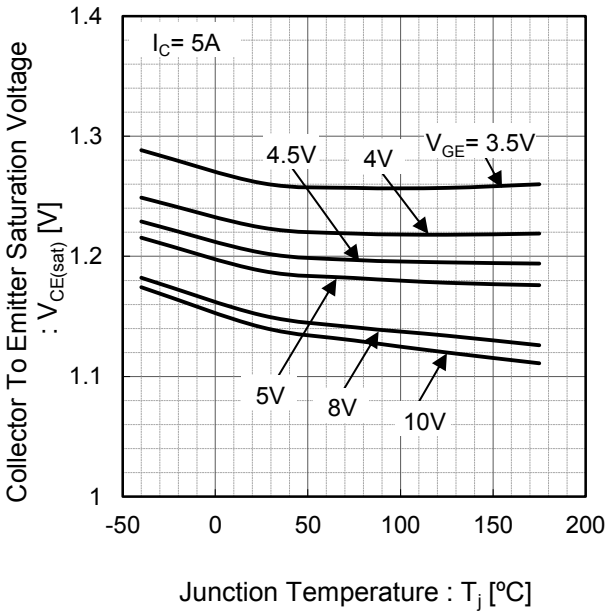



Fig.4 Typical Collector To Emitter Saturation Voltage vs. Junction Temperature



## ●Electrical Characteristic Curves

Fig.5 Typical Collector To Emitter Saturation Voltage vs. Junction Temperature

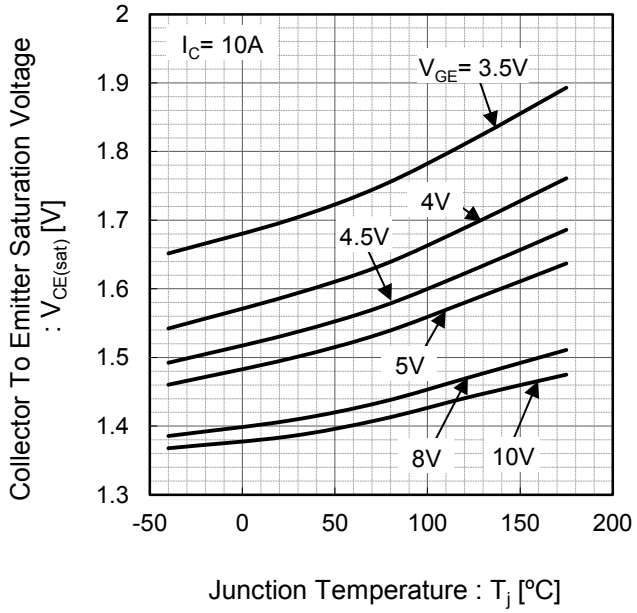



Fig.6 Typical Collector To Emitter Saturation Voltage vs. Junction Temperature

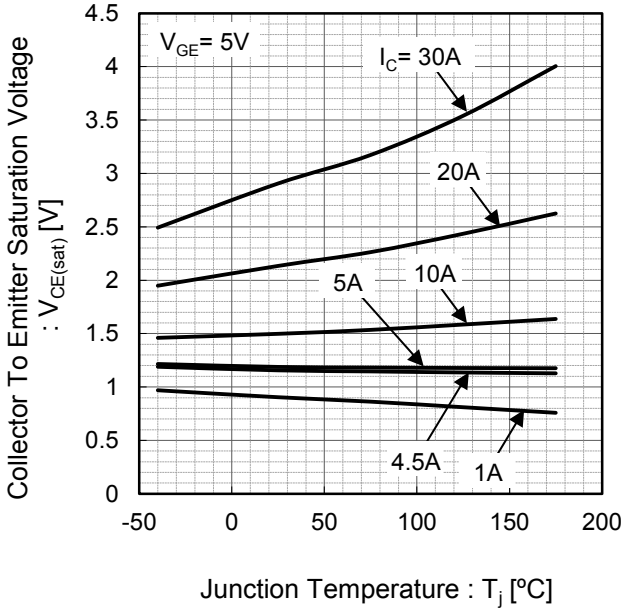



Fig.7 Typical Transfer Characteristics

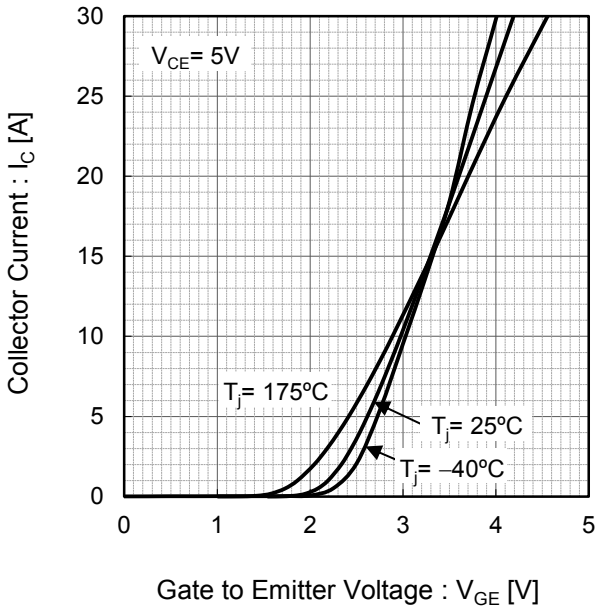
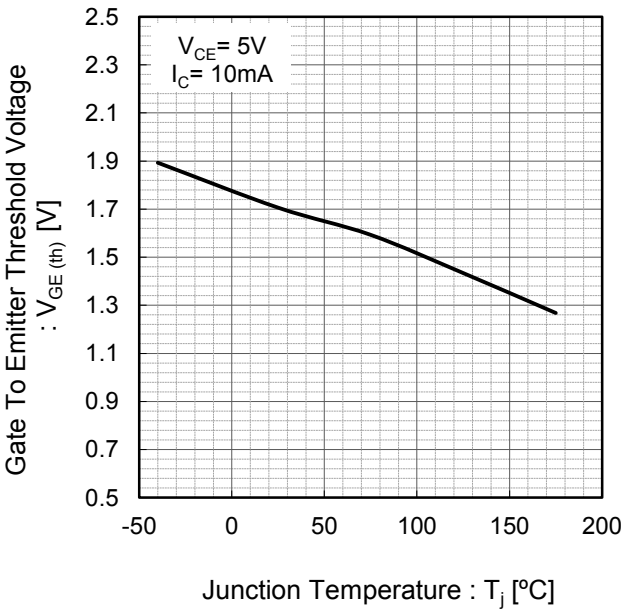



Fig.8 Typical Gate To Emitter Threshold Voltage vs. Junction Temperature



## ●Electrical Characteristic Curves

Fig.9 Typical Leakage Current vs. Junction Temperature

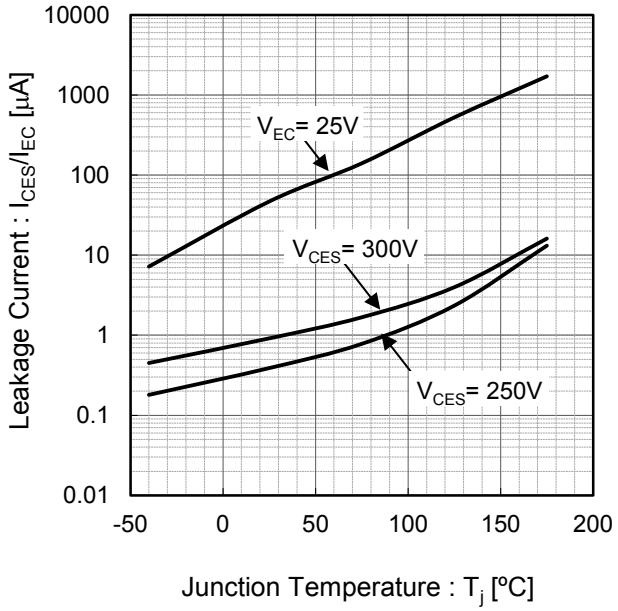



Fig.10 Typical Collector To Emitter Breakdown Voltage vs. Junction Temperature

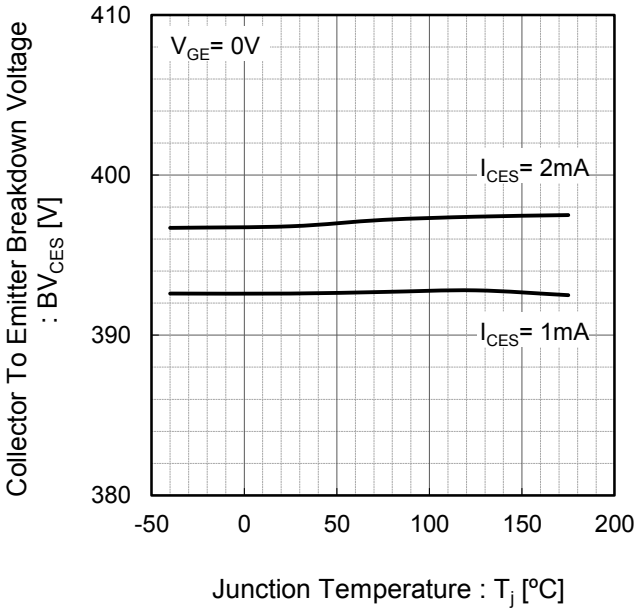



Fig.11 Typical Self Clamped Inductive Switching Current vs. Inductance

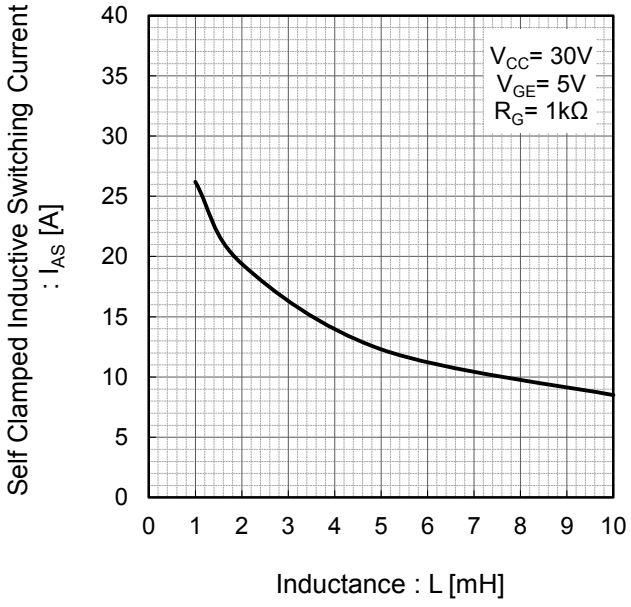
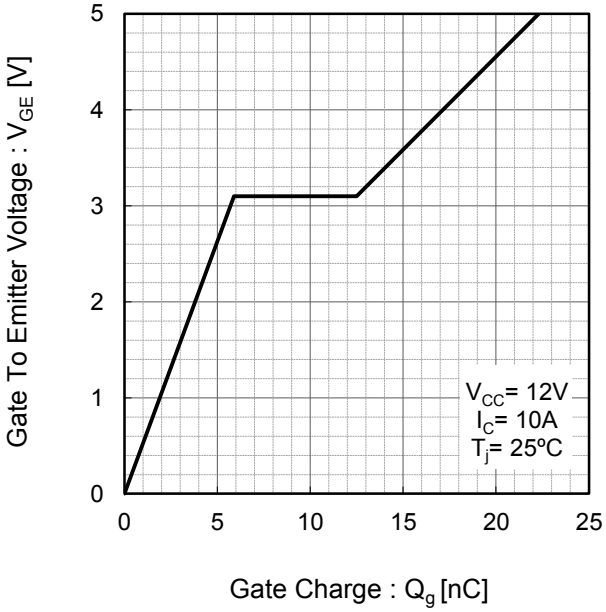



Fig.12 Typical Gate Charge



## ●Electrical Characteristic Curves

Fig.13 Typical Capacitance vs. Collector To Emitter Voltage

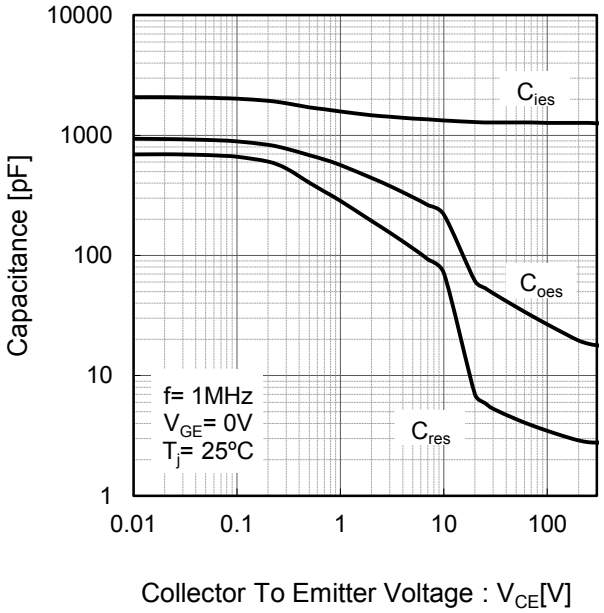



Fig.14 Typical Switching Time vs. Junction Temperature

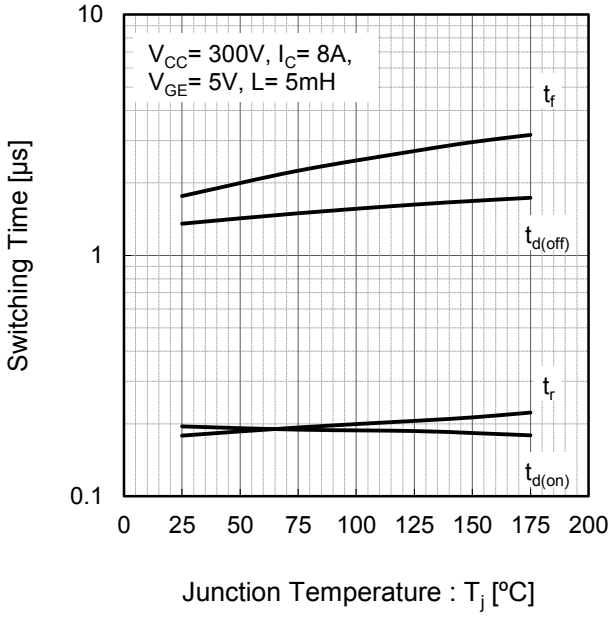
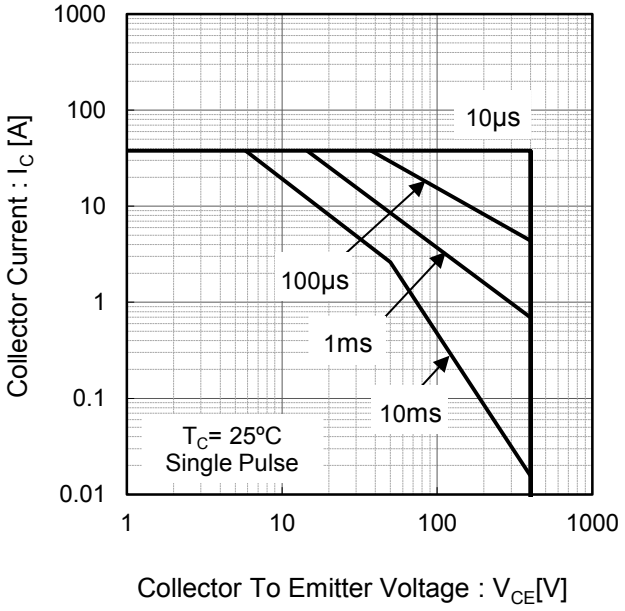
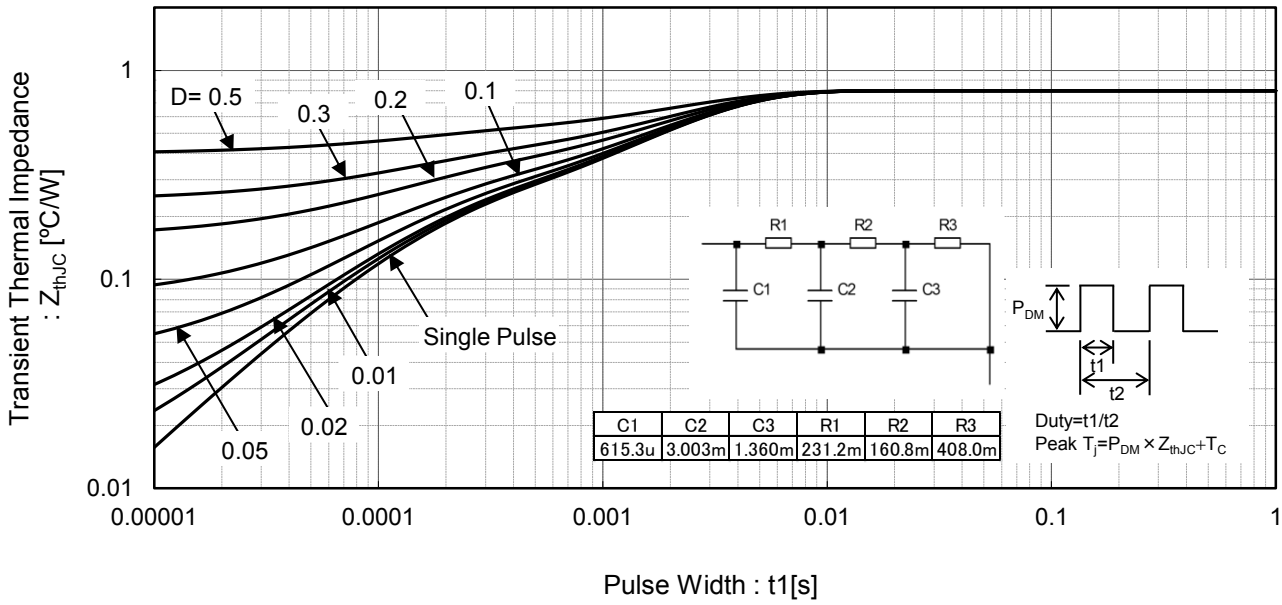



Fig.15 Forward Bias Safe Operating Area



## ●Electrical Characteristic Curves

Fig.16 Transient Thermal Impedance




| C1 | C2 | C3 | R1 | R2 | R3 |
|---|---|---|---|---|---|
| 615.3u | 3.003m | 1.360m | 231.2m | 160.8m | 408.0m |

## ●Inductive Load Switching Circuit and Waveform

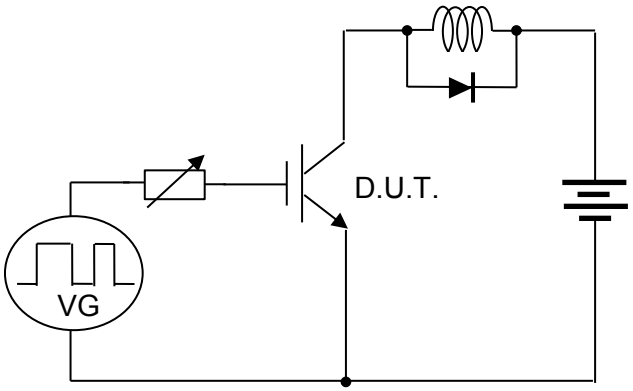



Fig.17 Inductive Load Switching Circuit

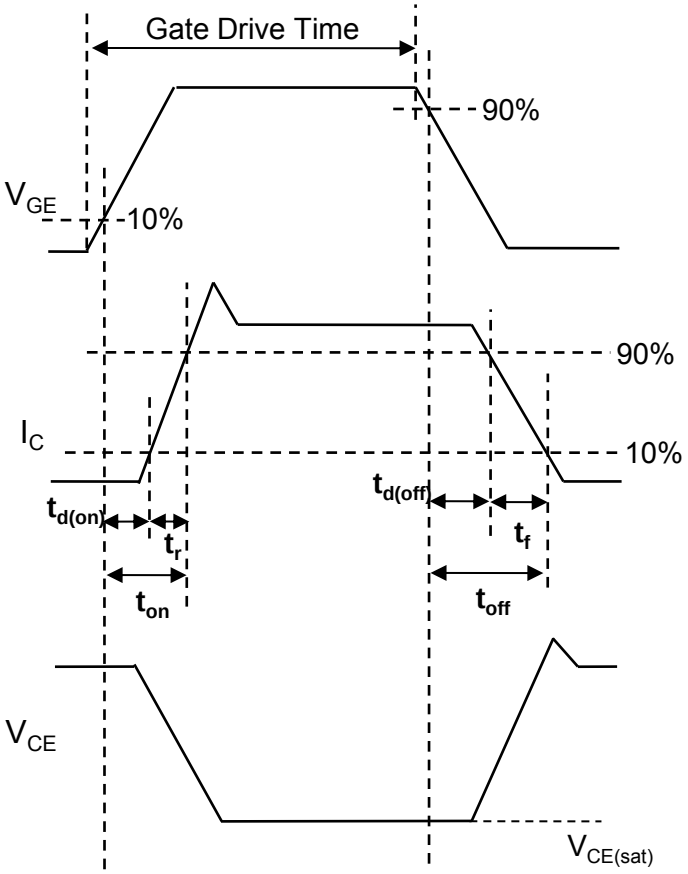



Fig.18 Inductive Load Switching Waveform

## ●Self Clamped Inductive Switching Circuit and Waveform

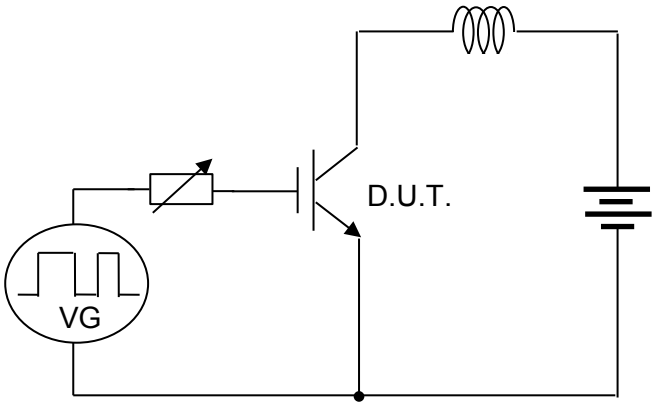



Fig.19 Self Clamped Inductive Switching Ciruit

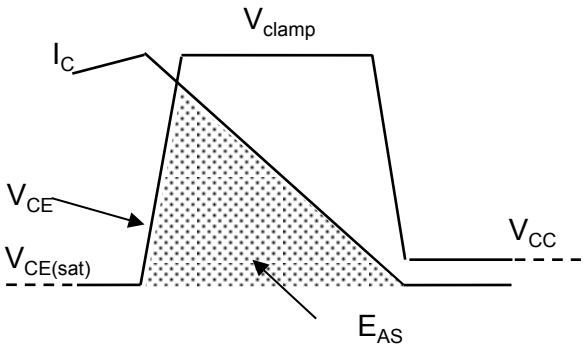



Fig.20 Self Clamped Inductive Switching Waveform

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