# RGS30NL65HRBTL

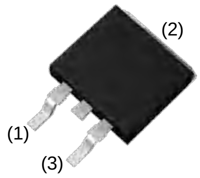
**650V 15A Field Stop Trench IGBT**

Datasheet

| | |
|---|---|
| $V_{CES}$ | 650V |
| $I_C$ | 15A |
| $V_{CE(sat)}$ (Typ.) | 1.65V |
| $P_D$ | 150W |

**●Outline**

LPDL (TO-263L)




**●Features**

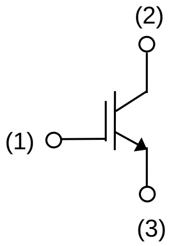
1) Qualified to AEC-Q101

2) Low Collector - Emitter Saturation Voltage

3) Short Circuit Withstand Time 8μs

4) Pb - free Lead Plating ; RoHS Compliant

**●Inner Circuit**




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

**●Application**

General Inverter

for Automotive and Industrial Use

Heater for Automotive

**●Packaging Specifications**

| | | |
|---|---|---|
| Type | Packaging | Taping |
| | Reel Size (mm) | 330 |
| | Tape Width (mm) | 24 |
| | Basic Ordering Unit (pcs) | 1,000 |
| | Packing Code | TL |
| | Marking | RGS30NL65 |

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

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Collector - Emitter Voltage | | $V_{CES}$ | 650 | V |
| Gate - Emitter Voltage | | $V_{GES}$ | ±30 | V |
| Collector Current | $T_C$ = 25°C | $I_C$ | 34 | A |
| | $T_C$ = 100°C | $I_C$ | 23 | A |
| Pulsed Collector Current | | $I_{CP}$ *1 | 45 | A |
| Power Dissipation | $T_C$ = 25°C | $P_D$ | 150 | W |
| | $T_C$ = 100°C | $P_D$ | 75 | W |
| Operating Junction Temperature | | $T_j$ | -40 to +175 | °C |
| Storage Temperature | | $T_{stg}$ | -55 to +175 | °C |

*1 Pulse width limited by $T_{jmax.}$

## ●Thermal Resistance

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Thermal Resistance IGBT Junction - Case | $R_{\theta(j-c)}$ | - | - | 1.00 | °C/W |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Collector - Emitter Breakdown Voltage | $BV_{CES}$ | $I_C$ = 10μA, $V_{GE}$ = 0V | 650 | - | - | V |
| Collector Cut - off Current | $I_{CES}$ | $V_{CE}$ = 650V, $V_{GE}$ = 0V, $T_j$ = 25℃ | - | - | 10 | μA |
| | | Tj = 175°C | - | 0.1 | - | mA |
| Gate - Emitter Leakage Current | $I_{GES}$ | $V_{GE}$ = ±30V, $V_{CE}$ = 0V | - | - | ±200 | nA |
| Gate - Emitter Threshold Voltage | $V_{GE(th)}$ | $V_{CE}$ = 5V, $I_C$ = 0.75mA | 5.0 | 6.0 | 7.0 | V |
| Collector - Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$ = 15A, $V_{GE}$ = 15V, $T_j$ = 25°C | - | 1.65 | 2.10 | V |
| | | $T_j$ = 175°C | - | 2.15 | - | |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Input Capacitance | $C_{ies}$ | $V_{CE}$ = 30V, $V_{GE}$ = 0V, f = 1MHz | - | 667 | - | pF |
| Output Capacitance | $C_{oes}$ | | - | 44 | - | |
| Reverse transfer Capacitance | $C_{res}$ | | - | 6 | - | |
| Total Gate Charge | $Q_g$ | $V_{CE}$ = 400V, $I_C$ = 15A, $V_{GE}$ = 15V | - | 22 | - | nC |
| Gate - Emitter Charge | $Q_{ge}$ | | - | 6 | - | |
| Gate - Collector Charge | $Q_{gc}$ | | - | 9 | - | |
| Turn - on Delay Time | $t_{d(on)}$ | $I_C$ = 15A, $V_{CC}$ = 400V, $V_{GE}$ = 15V, $R_G$ = 10Ω, $T_j$ = 25°C Inductive Load *$E_{on}$ include diode reverse recovery | - | 21 | - | ns |
| Rise Time | $t_r$ | | - | 11 | - | |
| Turn - off Delay Time | $t_{d(off)}$ | | - | 93 | - | |
| Fall Time | $t_f$ | | - | 98 | - | |
| Turn - on Switching Loss | $E_{on}$ | | - | 0.36 | - | mJ |
| Turn - off Switching Loss | $E_{off}$ | | - | 0.40 | - | |
| Turn - on Delay Time | $t_{d(on)}$ | $I_C$ = 15A, $V_{CC}$ = 400V, $V_{GE}$ = 15V, $R_G$ = 10Ω, $T_j$ = 175°C Inductive Load *$E_{on}$ include diode reverse recovery | - | 21 | - | ns |
| Rise Time | $t_r$ | | - | 12 | - | |
| Turn - off Delay Time | $t_{d(off)}$ | | - | 119 | - | |
| Fall Time | $t_f$ | | - | 151 | - | |
| Turn - on Switching Loss | $E_{on}$ | | - | 0.37 | - | mJ |
| Turn - off Switching Loss | $E_{off}$ | | - | 0.55 | - | |
| Reverse Bias Safe Operating Area | RBSOA | $I_C$ = 45A, $V_{CC}$ = 520V, $V_P$ = 650V, $V_{GE}$ = 15V, $R_G$ = 50Ω, $T_j$ = 175°C | FULL SQUARE | | | - |
| Short Circuit Withstand Time | $t_{sc}$ | $V_{CC}$ ≦ 360V, $V_{GE}$ = 15V, $T_j$ = 25°C | 8 | - | - | μs |
| Short Circuit Withstand Time | $t_{sc}$ *2 | $V_{CC}$ ≦ 360V, $V_{GE}$ = 15V, $T_j$ = 150°C | 6 | - | - | μs |

*2 Design assurance without measurement

## ●Electrical Characteristic Curves

Fig.1 Power Dissipation vs. Case Temperature

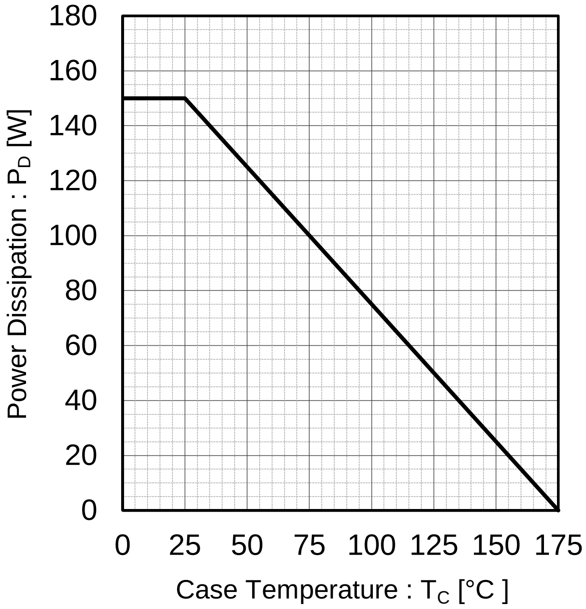



Fig.2 Collector Current vs. Case Temperature

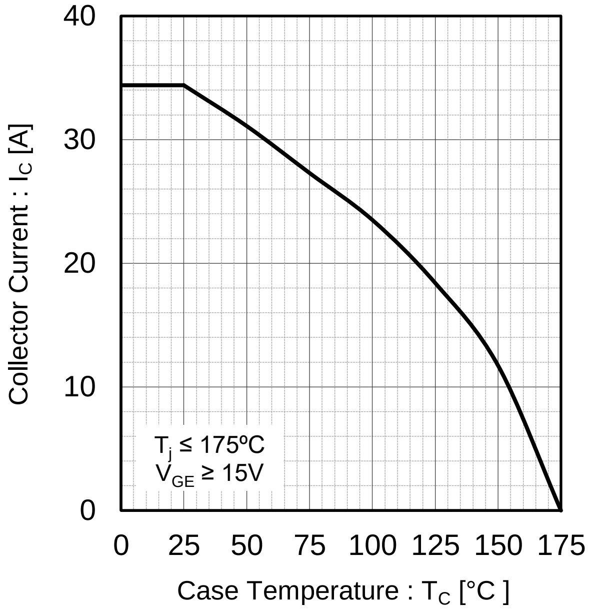



Fig.3 Forward Bias Safe Operating Area

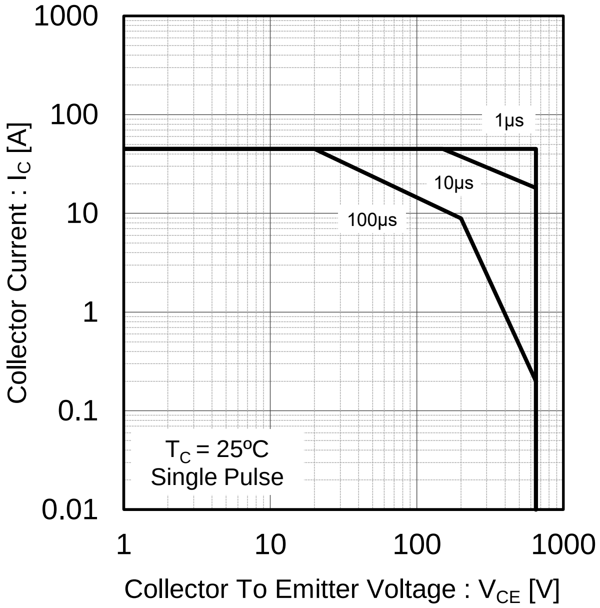
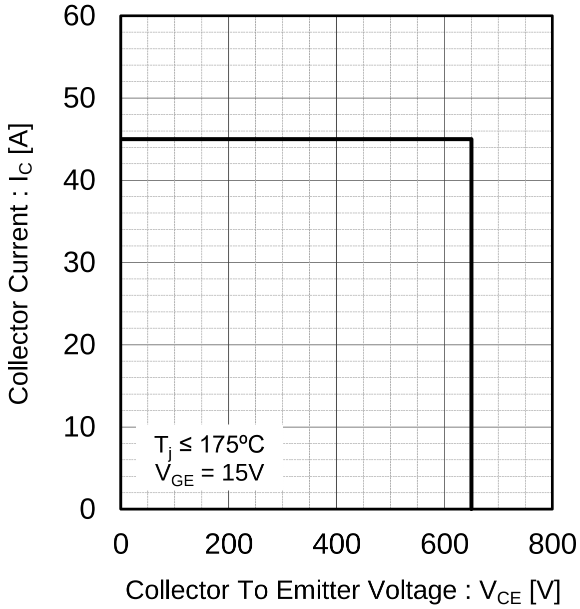



Fig.4 Reverse Bias Safe Operating Area



## ●Electrical Characteristic Curves

Fig.5 Typical Output Characteristics

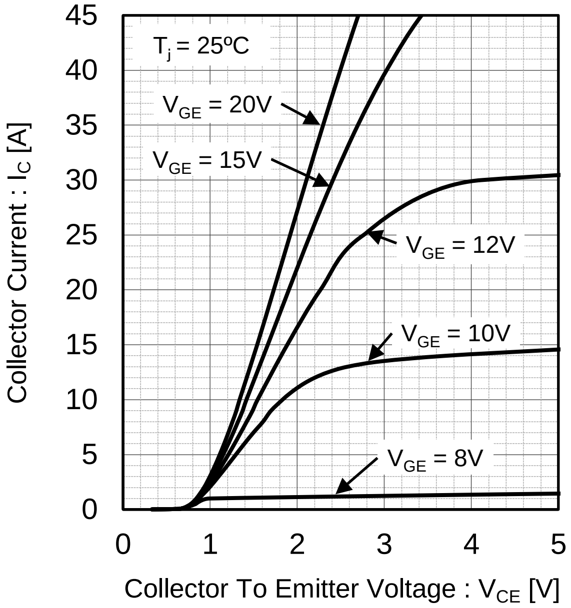



Fig.6 Typical Output Characteristics

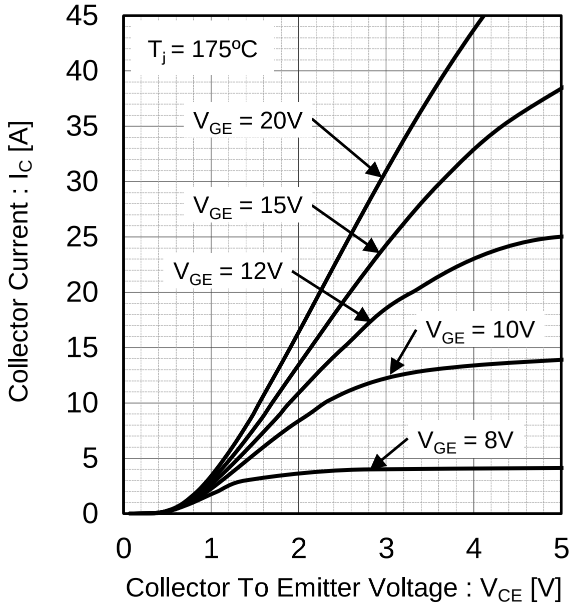



Fig.7 Typical Transfer Characteristics

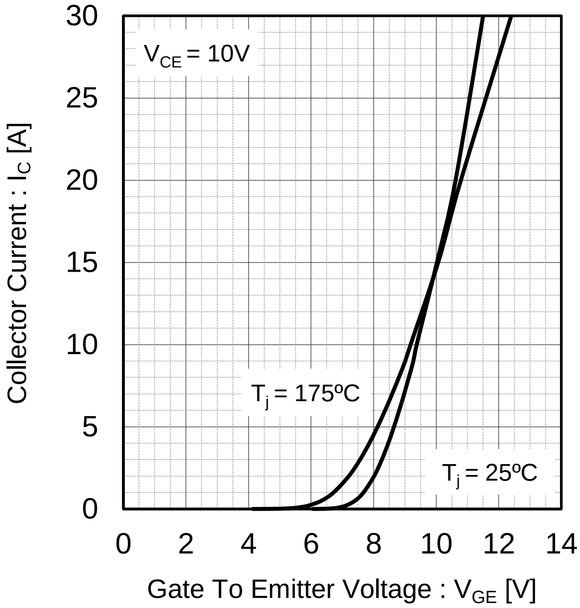
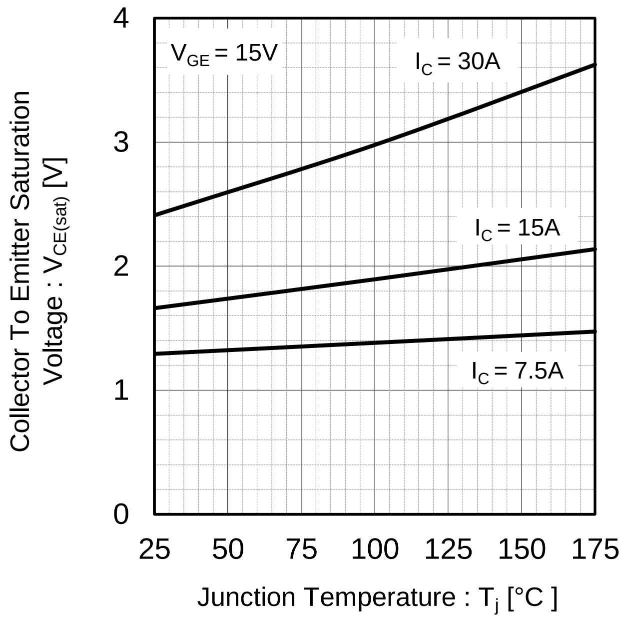



Fig.8 Typical Collector to Emitter Saturation Voltage vs. Junction Temperature



## ●Electrical Characteristic Curves

Fig.9 Typical Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage

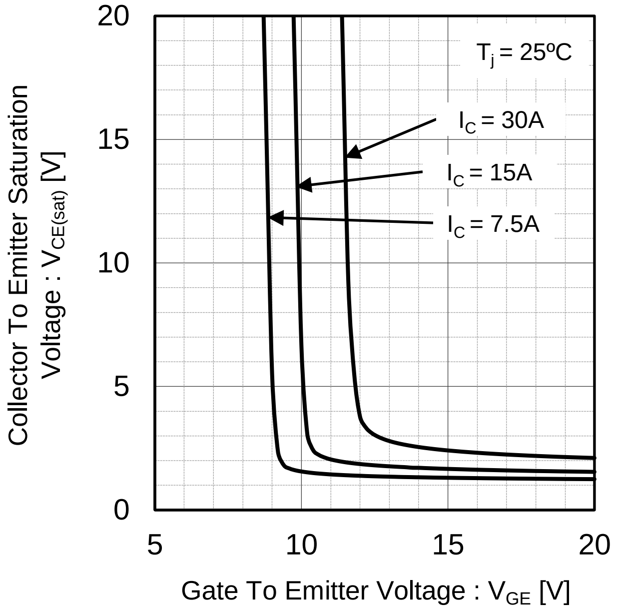



Fig.10 Typical Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage

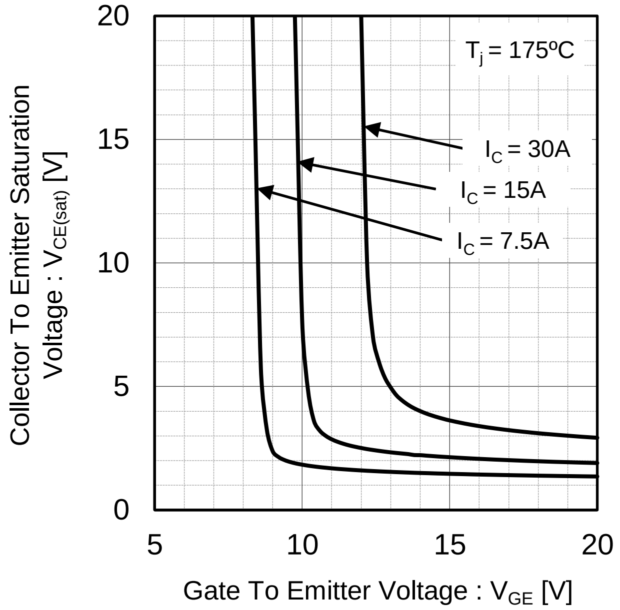



Fig.11 Typical Capacitance vs. Collector to Emitter Voltage

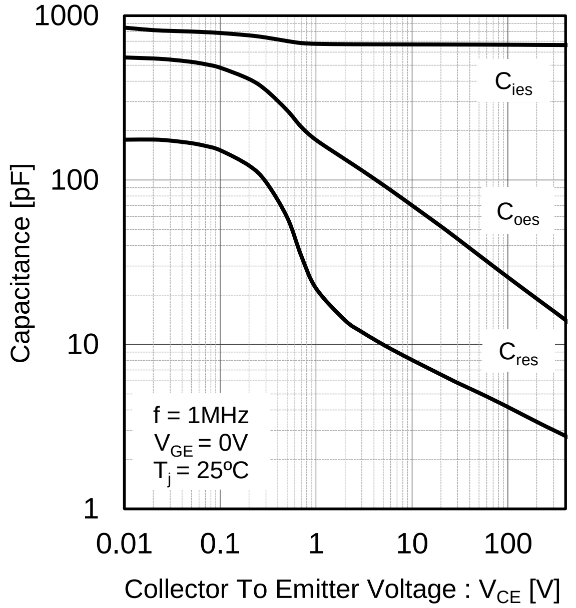
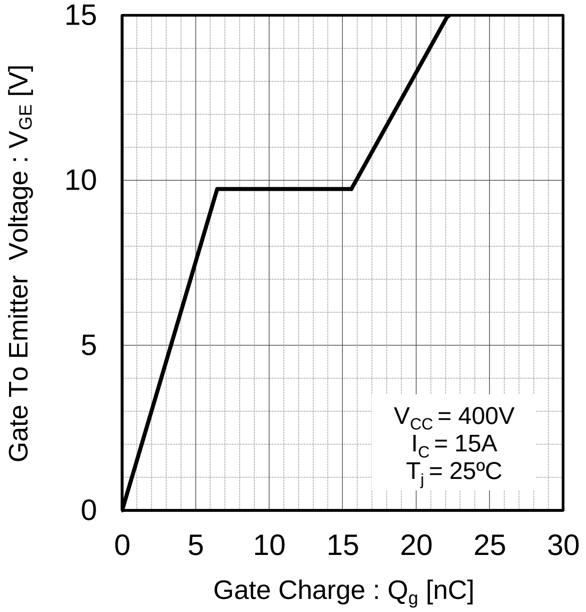



Fig.12 Typical Gate Charge



## ●Electrical Characteristic Curves

Fig.13 Typical Switching Time vs. Collector Current

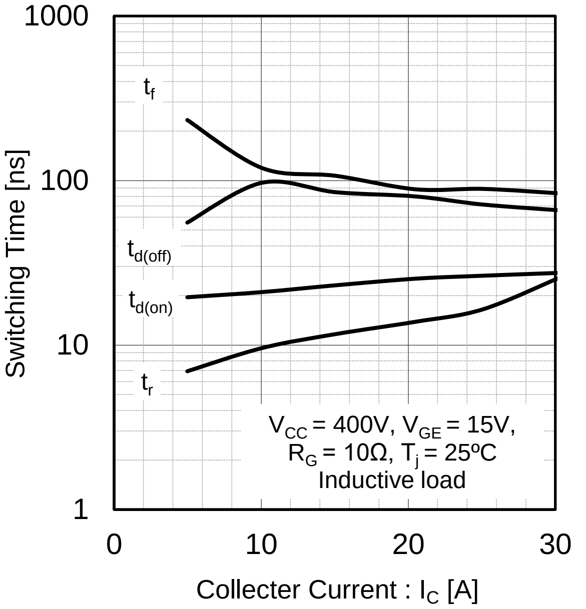



Fig.14 Typical Switching Time vs. Gate Resistance

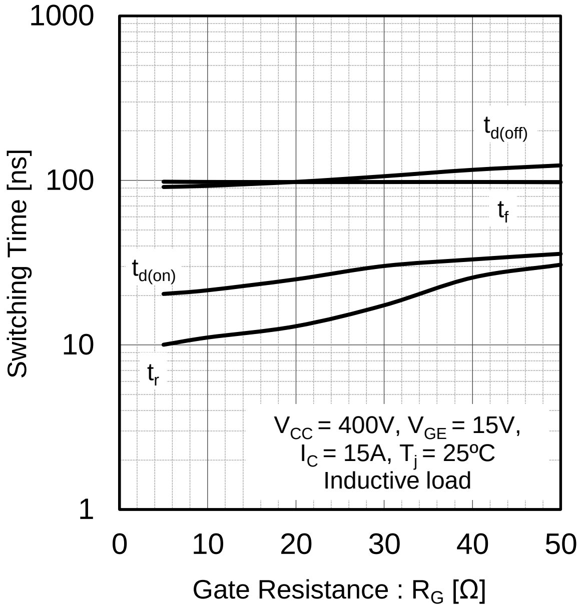



Fig.15 Typical Switching Energy Losses vs. Collector Current

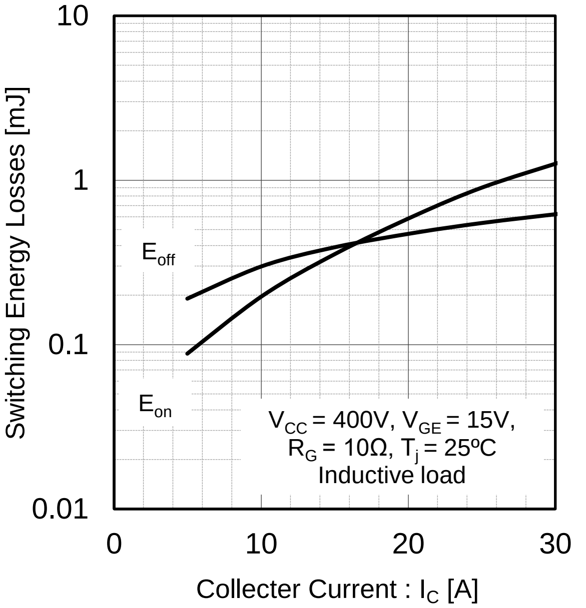
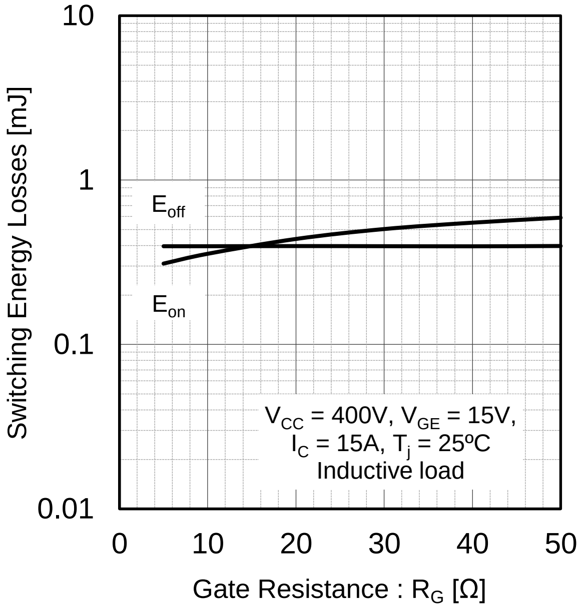



Fig.16 Typical Switching Energy Losses vs. Gate Resistance



## ●Electrical Characteristic Curves

Fig.17 Typical Switching Time
vs. Collector Current

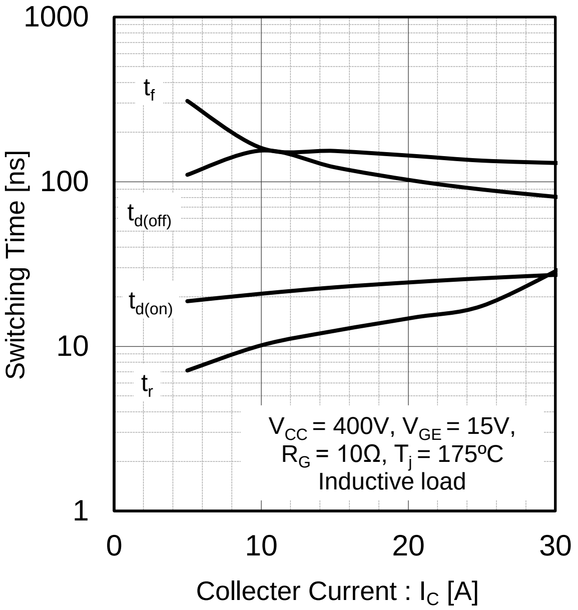



Fig.18 Typical Switching Time
vs. Gate Resistance

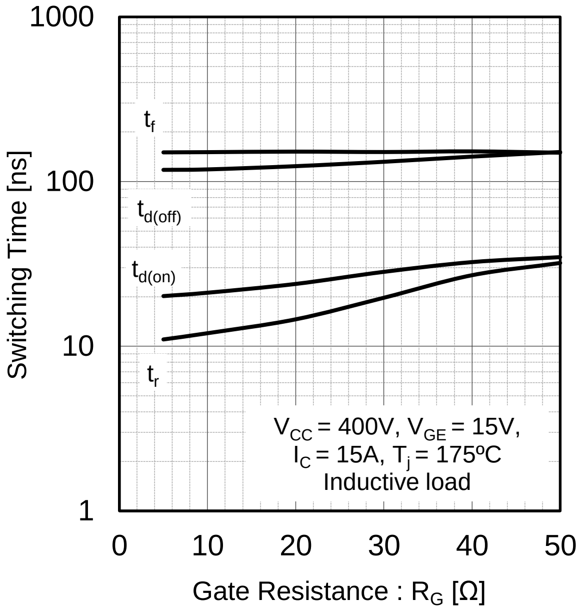



Fig.19 Typical Switching Energy Losses
vs. Collector Current

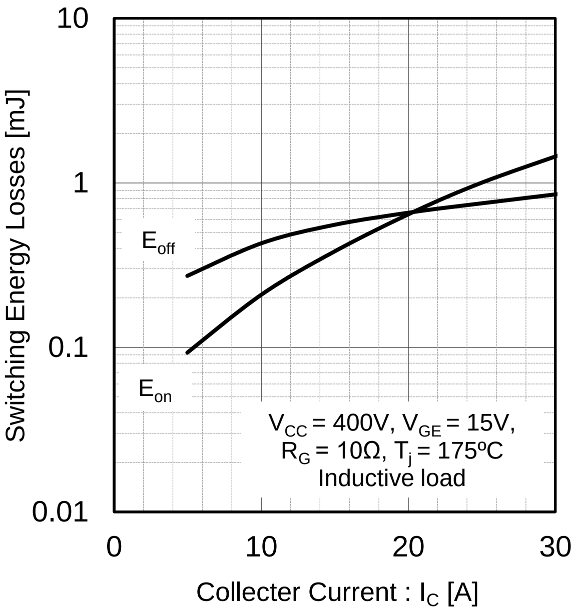
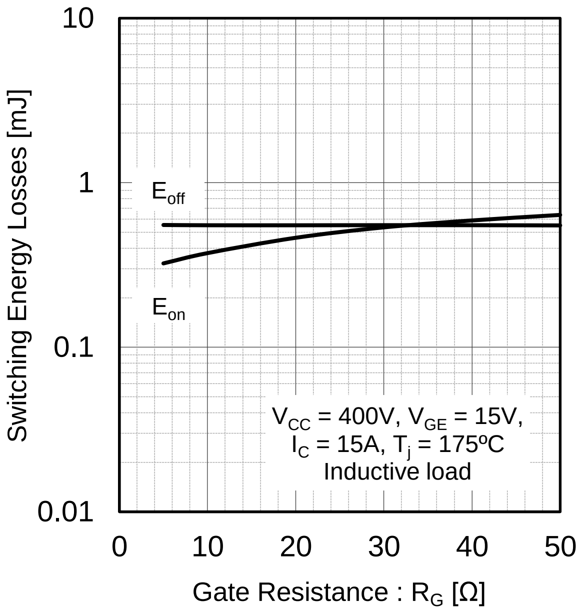
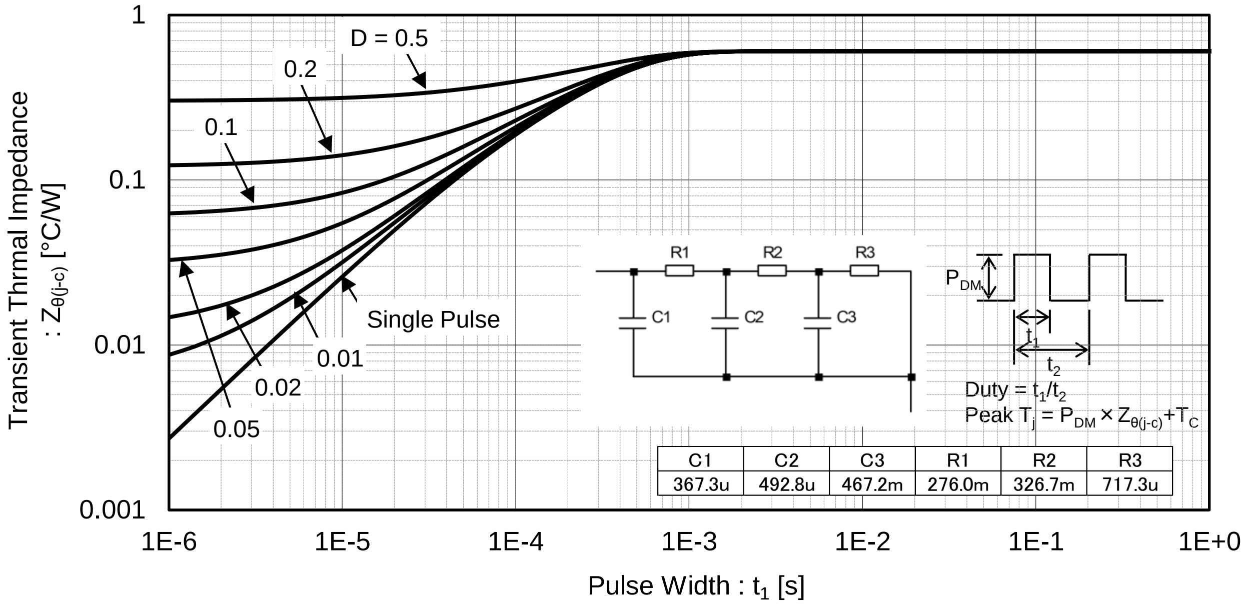



Fig.20 Typical Switching Energy Losses
vs. Gate Resistance



## ●Electrical Characteristic Curves

Fig.21 Typical IGBT Transient Thermal Impedance



## ●Inductive Load Switching Circuit and Waveform

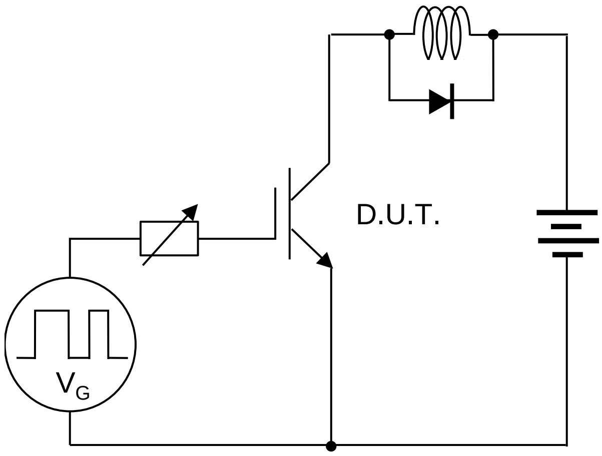



Fig.22 Inductive Load Circuit

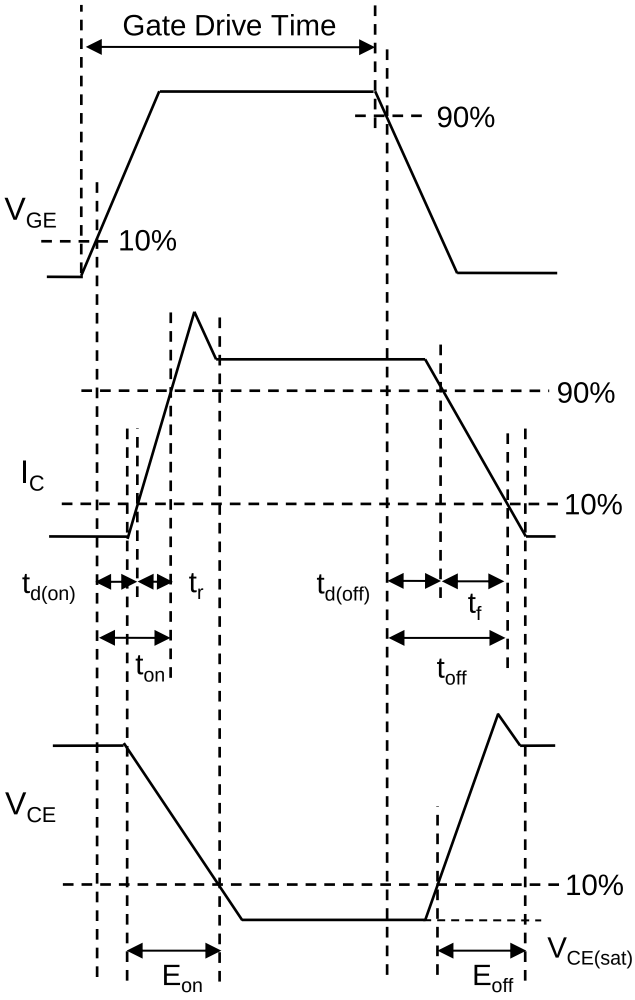



Fig.23 Inductive Load Waveform

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