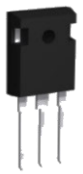
# RGS60TS65HR

**650V 30A Field Stop Trench IGBT** Datasheet

| | |
|---|---|
| $V_{CES}$ | 650V |
| $I_{C\ (100°C)}$ | 30A |
| $V_{CE(sat)\ (Typ.)}$ | 1.65V |
| $P_D$ | 223W |

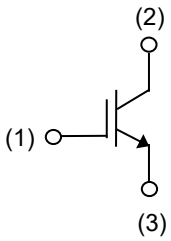
## ●Outline

TO-247N



(1)(2)(3)

## ●Inner Circuit




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

## ●Features

1) Low Collector - Emitter Saturation Voltage
2) Short Circuit Withstand Time 8μs
3) Qualified to AEC-Q101
4) Pb - free Lead Plating ; RoHS Compliant

## ●Application

Heater for Automotive

## ●Packaging Specifications

| | | |
|---|---|---|
| Type | Packaging | Tube |
| | Reel Size (mm) | - |
| | Tape Width (mm) | - |
| | Basic Ordering Unit (pcs) | 450 |
| | Packing Code | C11 |
| | Marking | RGS60TS65 |

## ●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 | $I_C$ | 56 | A |
| | $T_C$ = 100°C | $I_C$ | 30 | A |
| Pulsed Collector Current | | $I_{CP}$ *1 | 90 | A |
| Power Dissipation | $T_C$ = 25°C | $P_D$ | 223 | W |
| | $T_C$ = 100°C | $P_D$ | 111 | W |
| Operating Junction Temperature | | $T_j$ | -40 to +175 | °C |
| Storage Temperature | | $T_{stg}$ | -55 to +175 | °C |

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


© 2019 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

## ●Thermal Resistance

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Thermal Resistance IGBT Junction - Case | $R_{\theta(j-c)}$ | - | - | 0.67 | °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℃[*2] | - | - | 5 | 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, $I_C$ = 1.5mA | 5.0 | 6.0 | 7.0 | V |
| Collector - Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$ = 30A, $V_{GE}$ = 15V, | | | | |
| | | $T_j$ = 25°C | - | 1.65 | 2.10 | V |
| | | $T_j$ = 175°C | - | 2.15 | - | V |


© 2019 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

## ●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, | - | 980 | - | pF |
| Output Capacitance | $C_{oes}$ | $V_{GE}$ = 0V, | - | 80 | - | |
| Reverse transfer Capacitance | $C_{res}$ | f = 1MHz | - | 13 | - | |
| Total Gate Charge | $Q_g$ | $V_{CE}$ = 300V, | - | 36 | - | nC |
| Gate - Emitter Charge | $Q_{ge}$ | $I_C$ = 30A, | - | 10 | - | |
| Gate - Collector Charge | $Q_{gc}$ | $V_{GE}$ = 15V | - | 15 | - | |
| Turn - on Delay Time | $t_{d(on)}$ | $I_C$ = 30A, $V_{CC}$ = 400V, $V_{GE}$ = 15V, $R_G$ = 10Ω, $T_j$ = 25°C Inductive Load *$E_{on}$ include diode reverse recovery | - | 28 | - | ns |
| Rise Time | $t_r$ | | - | 12 | - | |
| Turn - off Delay Time | $t_{d(off)}$ | | - | 104 | - | |
| Fall Time | $t_f$ | | - | 101 | - | |
| Turn - on Switching Loss | $E_{on}$ | | - | 0.66 | - | mJ |
| Turn - off Switching Loss | $E_{off}$ | | - | 0.81 | - | |
| Turn - on Delay Time | $t_{d(on)}$ | $I_C$ = 30A, $V_{CC}$ = 400V, $V_{GE}$ = 15V, $R_G$ = 10Ω, $T_j$ = 175°C Inductive Load *$E_{on}$ include diode reverse recovery | - | 29 | - | ns |
| Rise Time | $t_r$ | | - | 17 | - | |
| Turn - off Delay Time | $t_{d(off)}$ | | - | 131 | - | |
| Fall Time | $t_f$ | | - | 159 | - | |
| Turn - on Switching Loss | $E_{on}$ | | - | 0.88 | - | mJ |
| Turn - off Switching Loss | $E_{off}$ | | - | 1.13 | - | |
| Reverse Bias Safe Operating Area | RBSOA | $I_C$ = 90A, $V_{CC}$ = 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


© 2019 ROHM Co., Ltd. All rights reserved.


Downloaded from Arrow.com.

## ●Electrical Characteristic Curves

Fig.1 Power Dissipation vs. Case Temperature

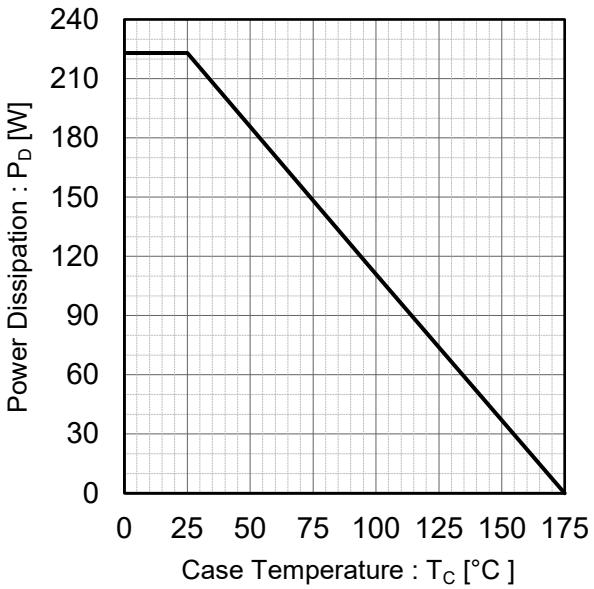



Fig.2 Collector Current vs. Case Temperature

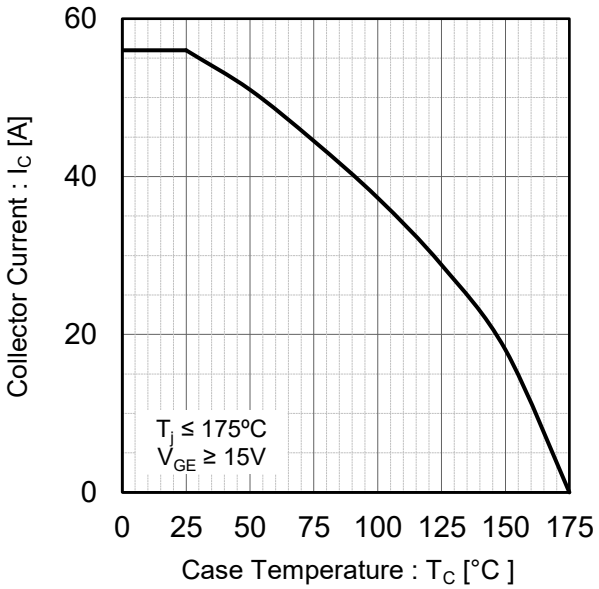



Fig.3 Forward Bias Safe Operating Area

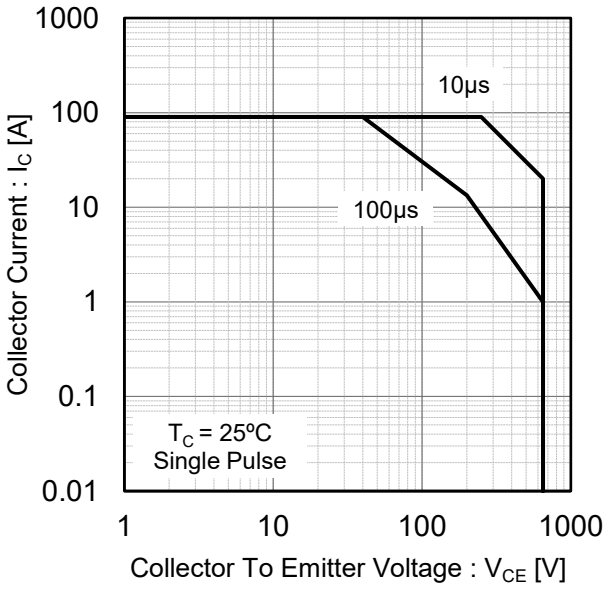
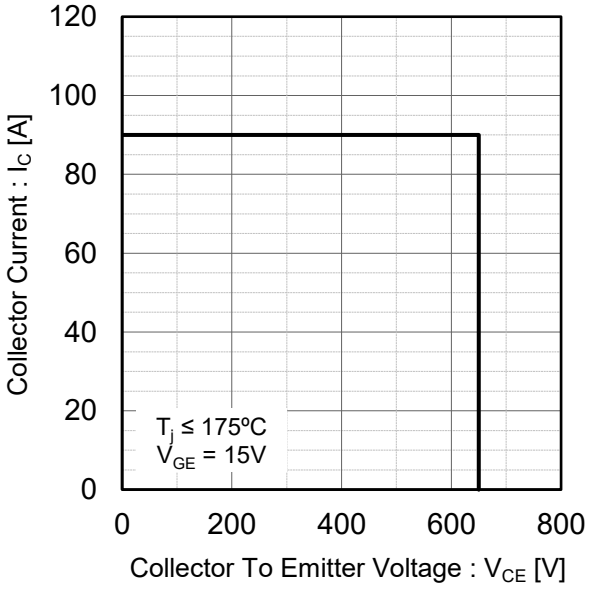



Fig.4 Reverse Bias Safe Operating Area





© 2019 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

## ●Electrical Characteristic Curves

Fig.5 Typical Output Characteristics

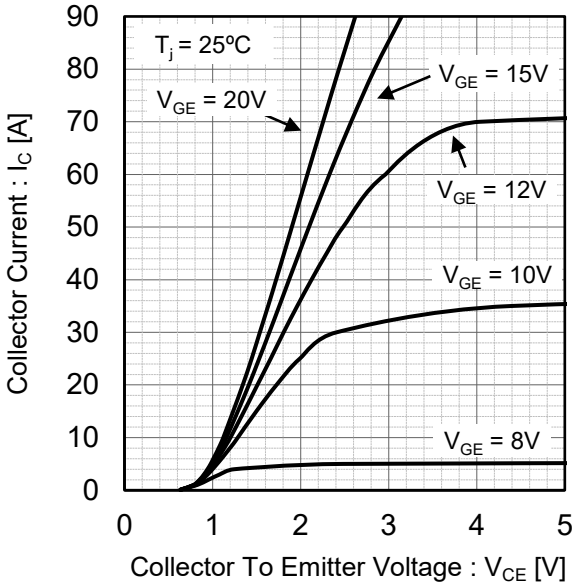



Fig.6 Typical Output Characteristics

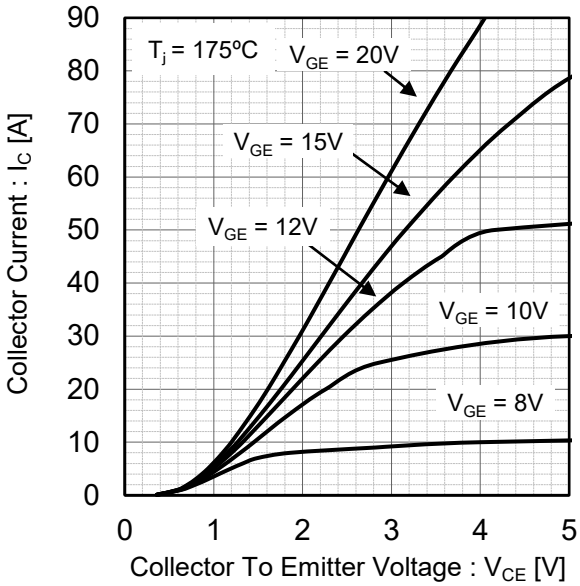



Fig.7 Typical Transfer Characteristics

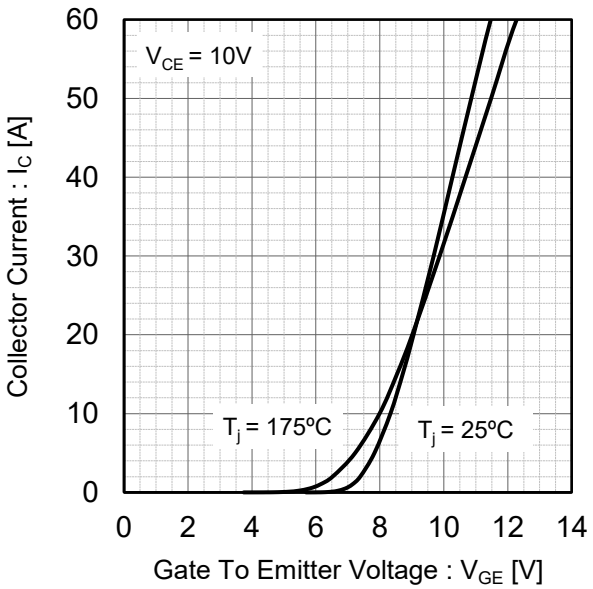
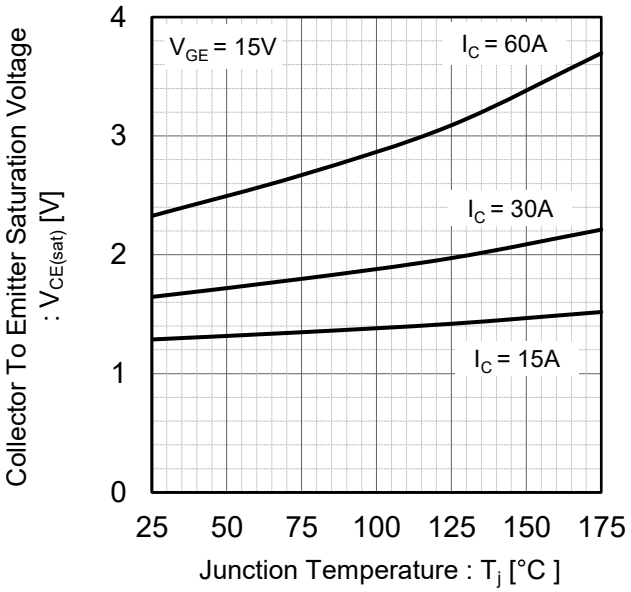



Fig.8 Typical Collector To Emitter Saturation Voltage vs. Junction Temperature





© 2019 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

## ●Electrical Characteristic Curves

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

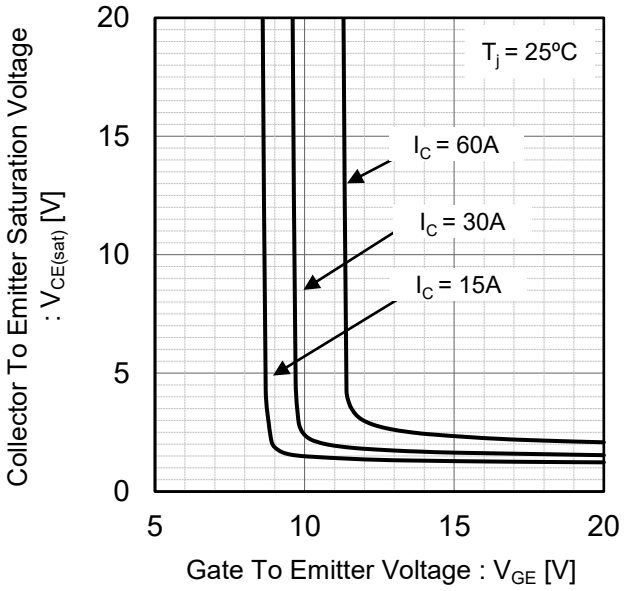



Fig.10 Typical Collector To Emitter Saturation Voltage vs. Gate To Emitter Voltage

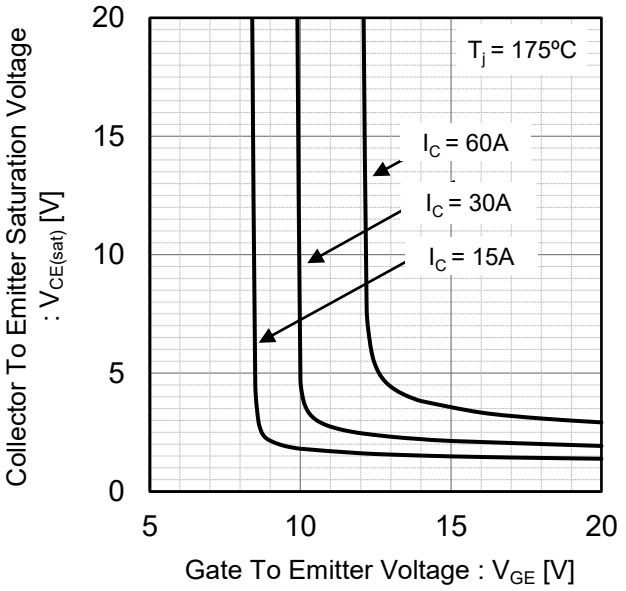



Fig.11 Typical Switching Time vs. Collector Current

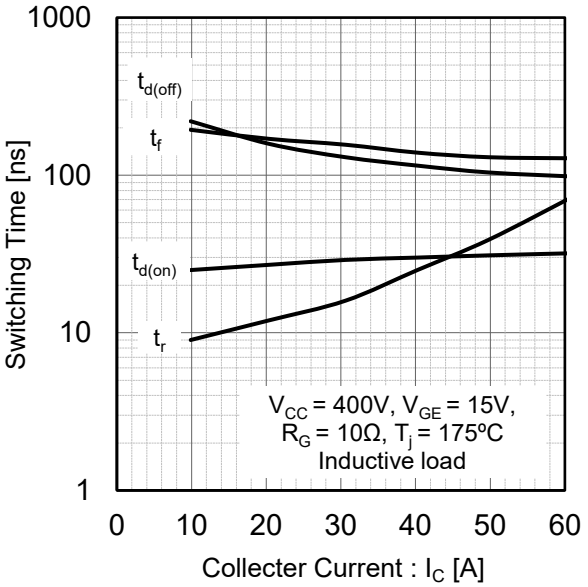
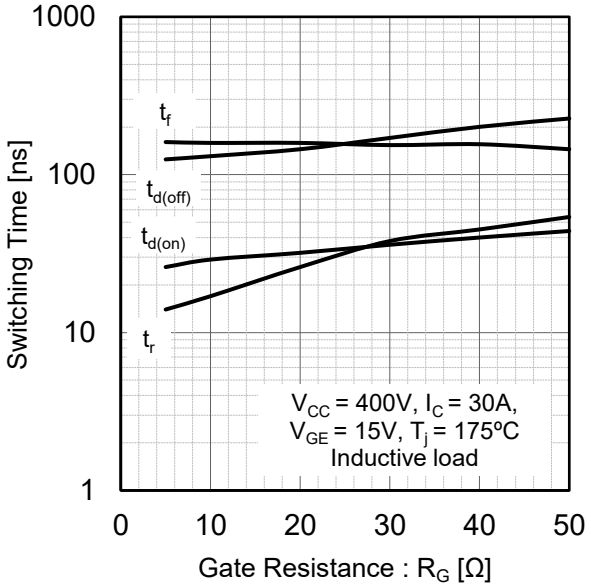



Fig.12 Typical Switching Time vs. Gate Resistance





© 2019 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

## ●Electrical Characteristic Curves

Fig.13 Typical Switching Energy Losses vs. Collector Current

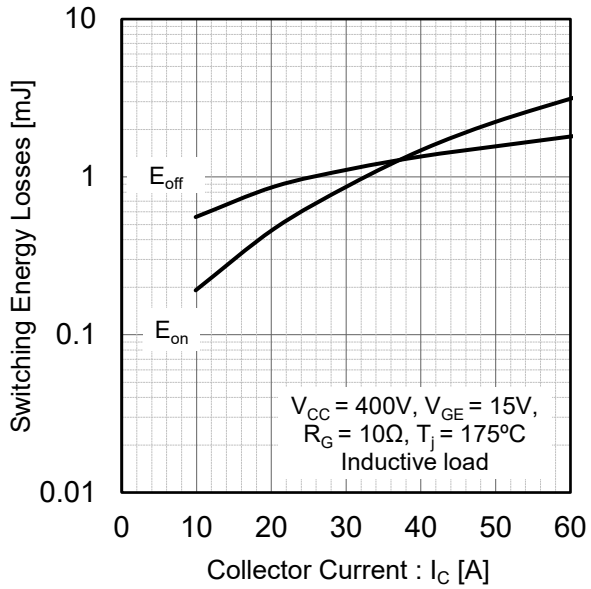



Fig.14 Typical Switching Energy Losses vs. Gate Resistance

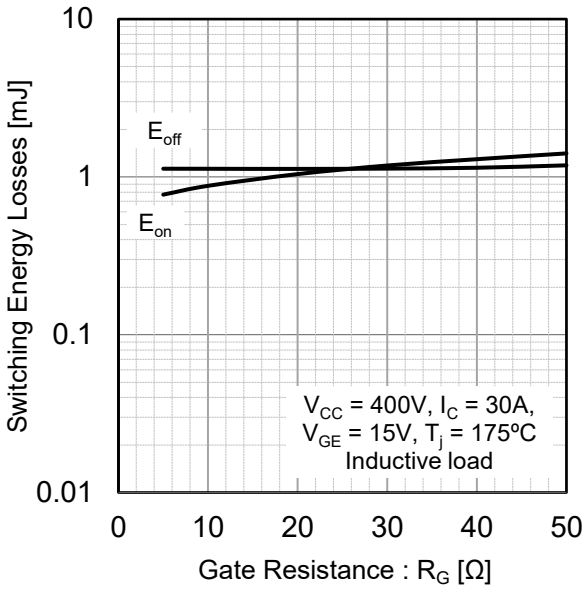



Fig.15 Typical Capacitance vs. Collector To Emitter Voltage

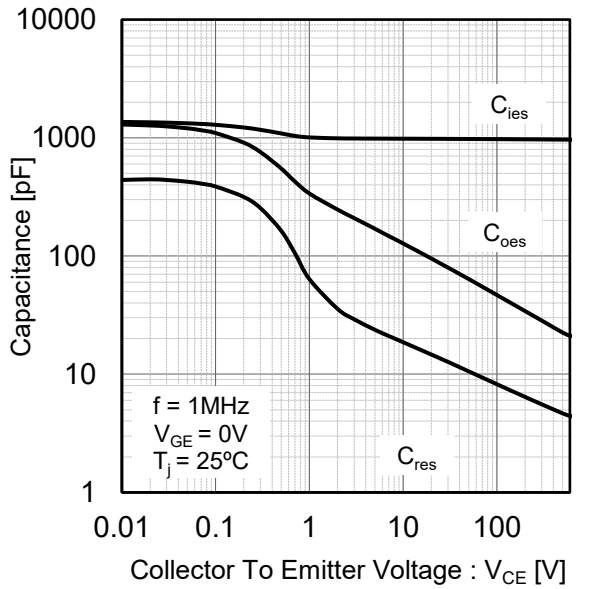
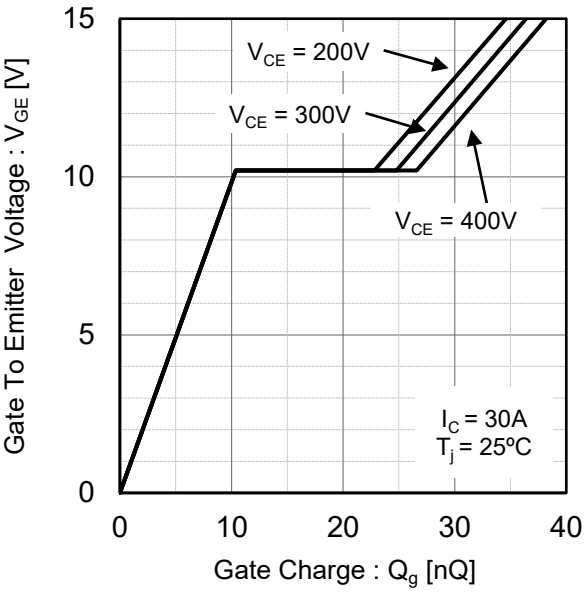



Fig.16 Typical Gate Charge



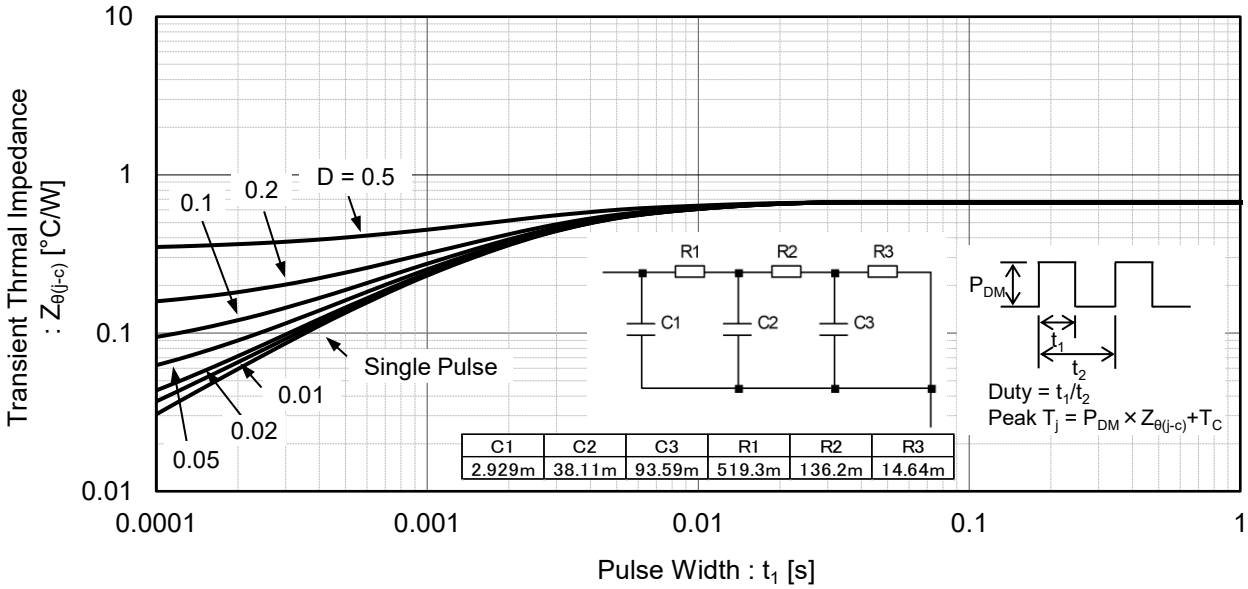


© 2019 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

## ●Electrical Characteristic Curves

Fig.17 IGBT Transient Thermal Impedance




| C1 | C2 | C3 | R1 | R2 | R3 |
|---|---|---|---|---|---|
| 2.929m | 38.11m | 93.59m | 519.3m | 136.2m | 14.64m |


© 2019 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

## ●Inductive Load Switching Circuit and Waveform

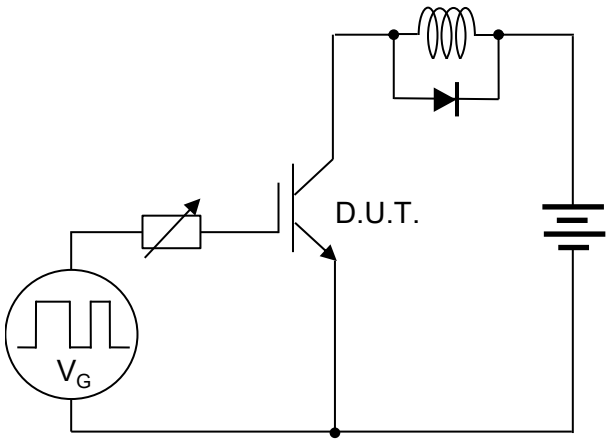



Fig.18 Inductive Load Circuit

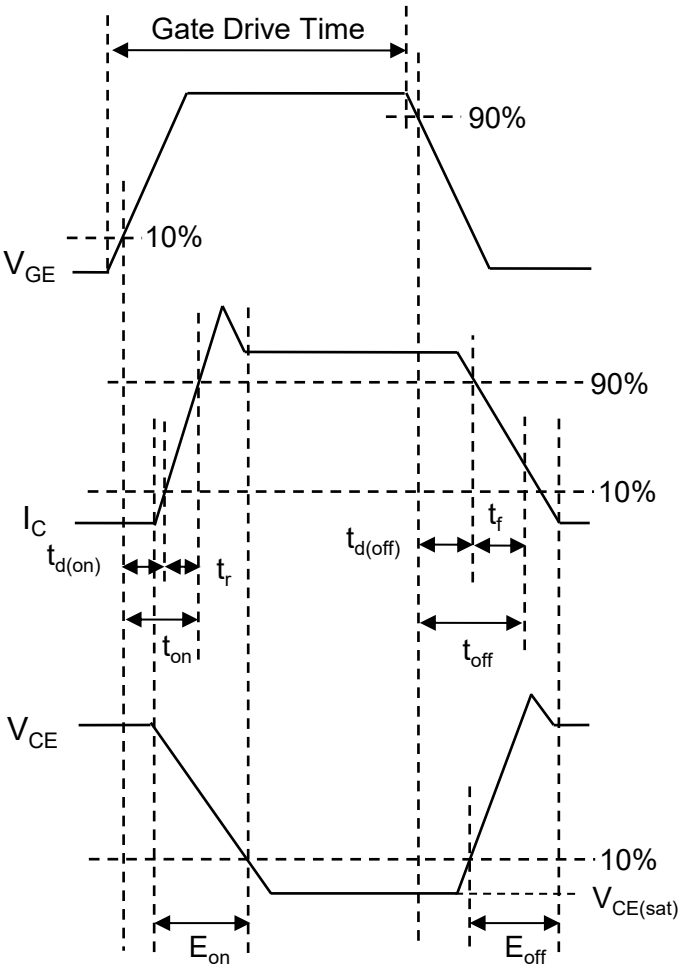



Fig.19 Inductive Load Waveform


© 2019 ROHM Co., Ltd. All rights reserved.

Downloaded from Arrow.com.

## Notes

1) The information contained herein is subject to change without notice.

2) Before you use our Products, please contact our sales representative and verify the latest specifications :

3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Poducts beyond the rating specified by ROHM.

4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM or any other parties. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.

6) The Products specified in this document are not designed to be radiation tolerant.

7) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative : transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, and power transmission systems.

8) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.

9) ROHM shall have no responsibility for any damages or injury arising from non-compliance with the recommended usage conditions and specifications contained herein.

10) ROHM has used reasonable care to ensur the accuracy of the information contained in this document. However, ROHM does not warrants that such information is error-free, and ROHM shall have no responsibility for any damages arising from any inaccuracy or misprint of such information.

11) Please use the Products in accordance with any applicable environmental laws and regulations, such as the RoHS Directive. For more details, including RoHS compatibility, please contact a ROHM sales office. ROHM shall have no responsibility for any damages or losses resulting non-compliance with any applicable laws or regulations.

12) When providing our Products and technologies contained in this document to other countries, you must abide by the procedures and provisions stipulated in all applicable export laws and regulations, including without limitation the US Export Administration Regulations and the Foreign Exchange and Foreign Trade Act.

13) This document, in part or in whole, may not be reprinted or reproduced without prior consent of ROHM.

ROHM SEMICONDUCTOR

Thank you for your accessing to ROHM product informations.
More detail product informations and catalogs are available, please contact us.

ROHM Customer Support System

http://www.rohm.com/contact/


© 2015 ROHM Co., Ltd. All rights reserved.


Downloaded from Arrow.com.