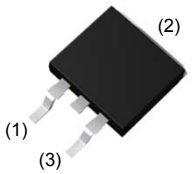
# RGT40NL65D

**650V 20A Field Stop Trench IGBT** Datasheet

| | |
|---|---|
| $V_{CES}$ | 650V |
| $I_{C(100°C)}$ | 20A |
| $V_{CE(sat)}$ (Typ.) | 1.65V |
| $P_D$ | 161W |

## ●Outline

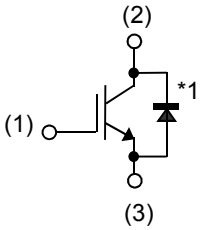
LPDL (TO-263L)




## ●Features

1) Low Collector - Emitter Saturation Voltage
2) Low Switching Loss
3) Short Circuit Withstand Time 5μs
4) Built in Very Fast & Soft Recovery FRD
(RFN - Series)
5) Pb - free Lead Plating ; RoHS Compliant

## ●Inner Circuit




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

*1 Built in FRD

## ●Applications

General Inverter
UPS
Power Conditioner
Welder

## ●Packaging Specifications

| | | |
|---|---|---|
| Type | Packaging | Taping |
| | Reel Size (mm) | 330 |
| | Tape Width (mm) | 24 |
| | Basic Ordering Unit (pcs) | 1,000 |
| | Packing Code | TL |
| | Marking | RGT40NL65D |

## ●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 | $I_C$ | 40 | A |
| | $T_C$ = 100°C | $I_C$ | 20 | A |
| Pulsed Collector Current | | $I_{CP}$ *1 | 60 | A |
| Diode Forward Current | $T_C$ = 25°C | $I_F$ | 35 | A |
| | $T_C$ = 100°C | $I_F$ | 20 | A |
| Diode Pulsed Forward Current | | $I_{FP}$ *1 | 60 | A |
| Power Dissipation | $T_C$ = 25°C | $P_D$ | 161 | W |
| | $T_C$ = 100°C | $P_D$ | 70 | 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 | $R_{\theta(j-c)}$ | - | - | 0.93 | °C/W |
| Thermal Resistance Diode Junction - Case | $R_{\theta(j-c)}$ | - | - | 2.12 | °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 | - | - | 10 | μA |
| Gate - Emitter Leakage Current | $I_{GES}$ | $V_{GE}$ = ±30V, $V_{CE}$ = 0V | - | - | ±200 | nA |
| Gate - Emitter Threshold Voltage | $V_{GE(th)}$ | $V_{CE}$ = 5V, $I_C$ = 13.3mA | 5.0 | 6.0 | 7.0 | V |
| Collector - Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$ = 20A, $V_{GE}$ = 15V | | | | V |
| | | $T_j$ = 25°C | - | 1.65 | 2.1 | |
| | | $T_j$ = 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 | - | 1070 | - | pF |
| Output Capacitance | $C_{oes}$ | $V_{GE}$ = 0V | - | 45 | - | |
| Reverse Transfer Capacitance | $C_{res}$ | f = 1MHz | - | 18 | - | |
| Total Gate Charge | $Q_g$ | $V_{CE}$ = 300V | - | 40 | - | nC |
| Gate - Emitter Charge | $Q_{ge}$ | $I_C$ = 20A | - | 9 | - | |
| Gate - Collector Charge | $Q_{gc}$ | $V_{GE}$ = 15V | - | 15 | - | |
| Turn - on Delay Time | $t_{d(on)}$ | $I_C$ = 20A, $V_{CC}$ = 400V | - | 22 | - | ns |
| Rise Time | $t_r$ | $V_{GE}$ = 15V, $R_G$ = 10Ω | - | 27 | - | |
| Turn - off Delay Time | $t_{d(off)}$ | $T_j$ = 25°C | - | 75 | - | |
| Fall Time | $t_f$ | Inductive Load | - | 60 | - | |
| Turn - on Delay Time | $t_{d(on)}$ | $I_C$ = 20A, $V_{CC}$ = 400V | - | 22 | - | ns |
| Rise Time | $t_r$ | $V_{GE}$ = 15V, $R_G$ = 10Ω | - | 29 | - | |
| Turn - off Delay Time | $t_{d(off)}$ | $T_j$ = 175°C | - | 84 | - | |
| Fall Time | $t_f$ | Inductive Load | - | 120 | - | |
| Reverse Bias Safe Operating Area | RBSOA | $I_C$ = 60A, $V_{CC}$ = 520V<br>$V_P$ = 650V, $V_{GE}$ = 15V<br>$R_G$ = 50Ω, $T_j$ = 175°C | FULL SQUARE | | | - |
| Short Circuit Withstand Time | $t_{sc}$ | $V_{CC}$ ≦ 360V<br>$V_{GE}$ = 15V<br>$T_j$ = 25°C | 5 | - | - | µs |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Diode Forward Voltage | $V_F$ | $I_F$ = 20A<br>$T_j$ = 25°C<br>$T_j$ = 175°C | -<br>- | 1.45<br>1.25 | 1.9<br>- | V |
| Diode Reverse Recovery Time | $t_{rr}$ | $I_F$ = 20A<br>$V_{CC}$ = 400V<br>$di_F/dt$ = 200A/μs<br>$T_j$ = 25°C | - | 58 | - | ns |
| Diode Peak Reverse Recovery Current | $I_{rr}$ | | - | 6.3 | - | A |
| Diode Reverse Recovery Charge | $Q_{rr}$ | | - | 0.20 | - | μC |
| Diode Reverse Recovery Time | $t_{rr}$ | $I_F$ = 20A<br>$V_{CC}$ = 400V<br>$di_F/dt$ = 200A/μs<br>$T_j$ = 175°C | - | 256 | - | ns |
| Diode Peak Reverse Recovery Current | $I_{rr}$ | | - | 10.4 | - | A |
| Diode Reverse Recovery Charge | $Q_{rr}$ | | - | 1.35 | - | μC |

## ●Electrical Characteristic Curves

Fig.1 Power Dissipation vs. Case Temperature

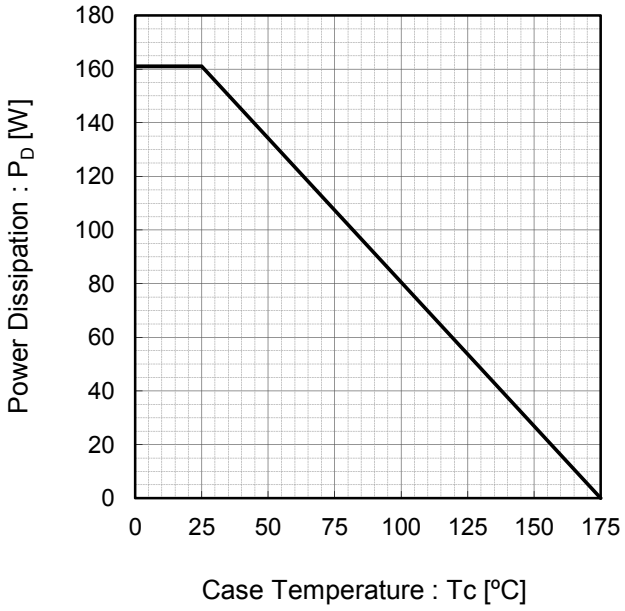



Fig.2 Collector Current vs. Case Temperature

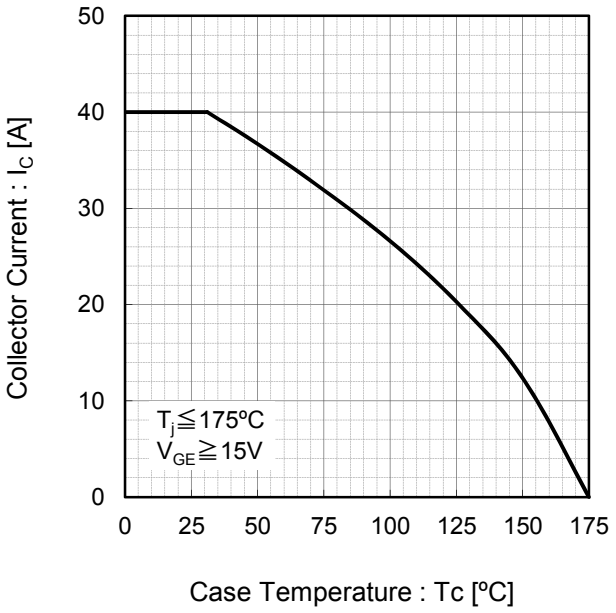



Fig.3 Forward Bias Safe Operating Area

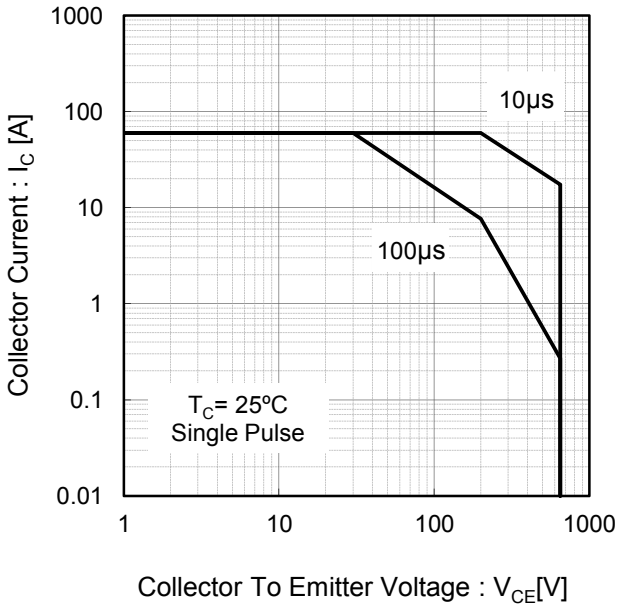
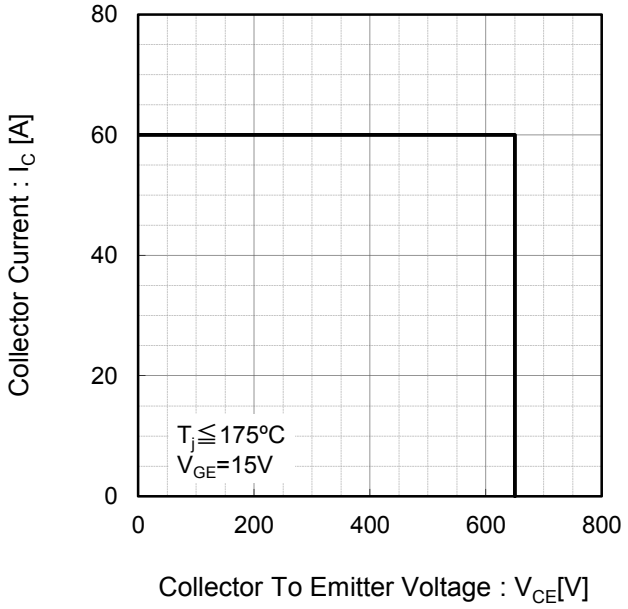



Fig.4 Reverse Bias Safe Operating Area



## ●Electrical Characteristic Curves

Fig.5 Typical Output Characteristics

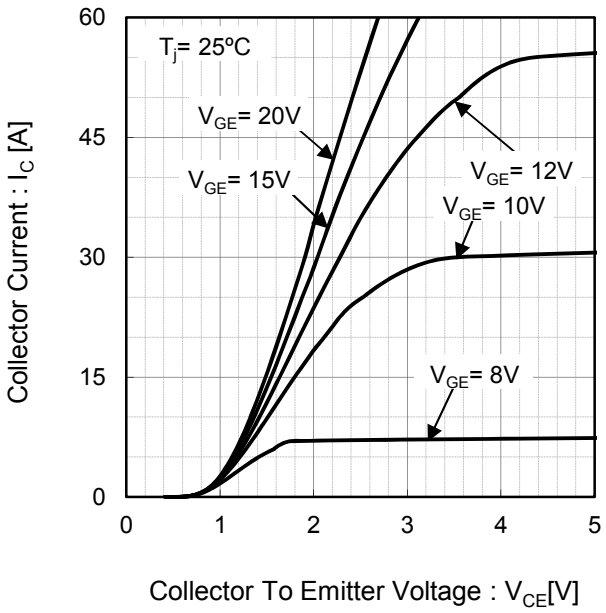



Fig.6 Typical Output Characteristics

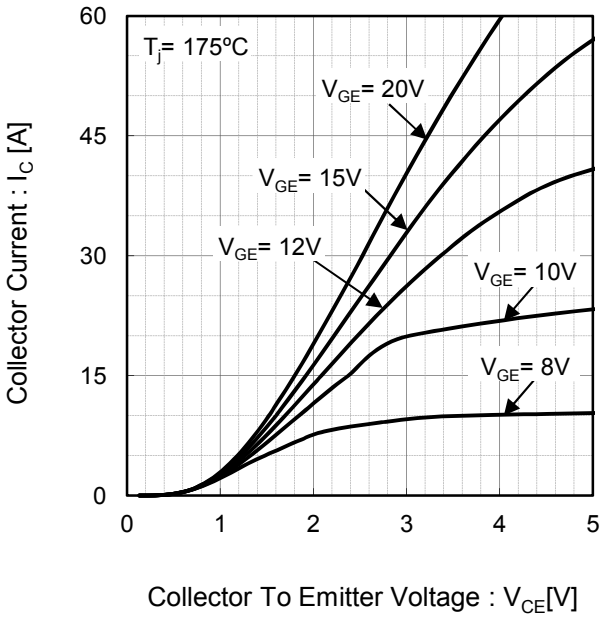



Fig.7 Typical Transfer Characteristics

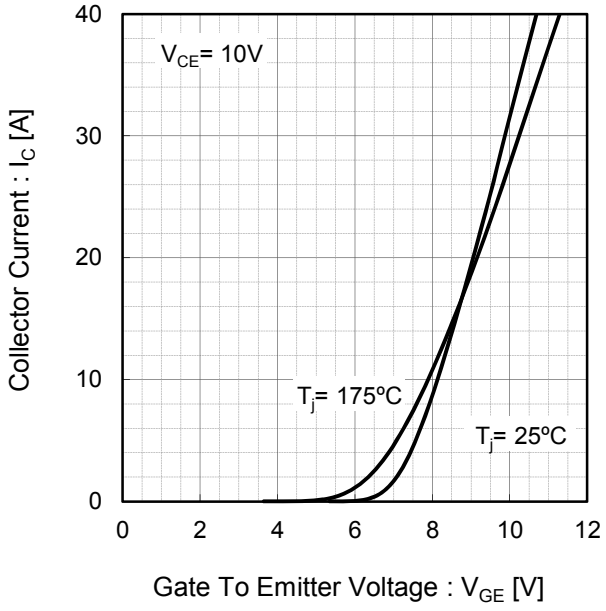
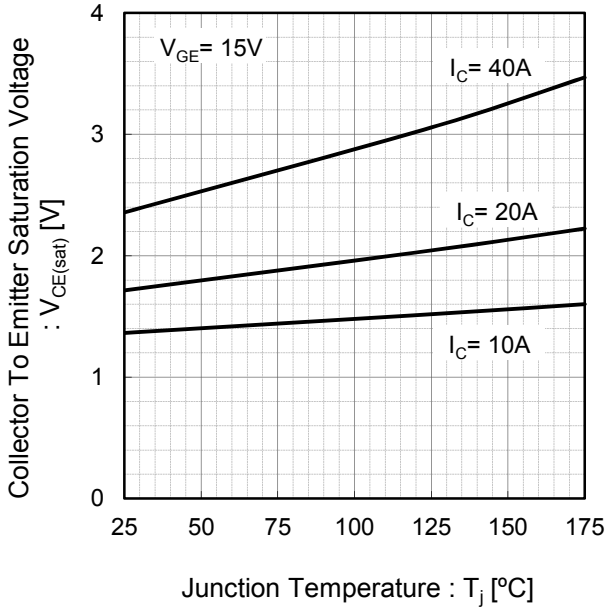



Fig.8 Typical Collector To Emitter Saturation Voltage vs. Junction Temperature



## ●Electrical Characteristic Curves

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

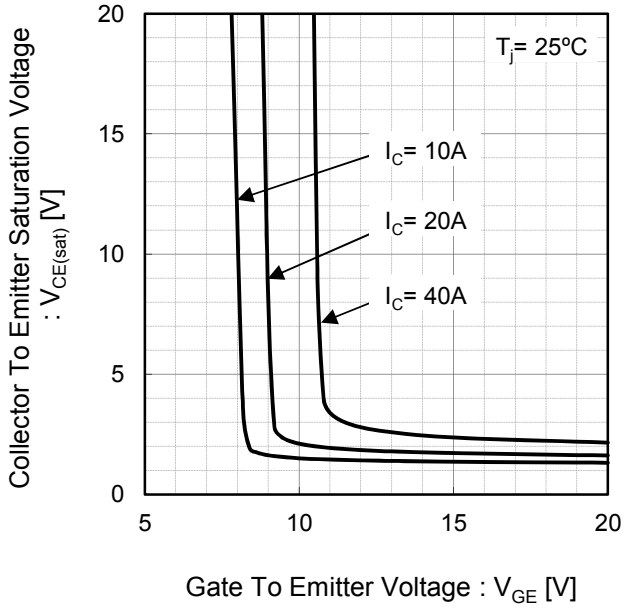



Fig.10 Typical Collector To Emitter Saturation Voltage vs. Gate To Emitter Voltage

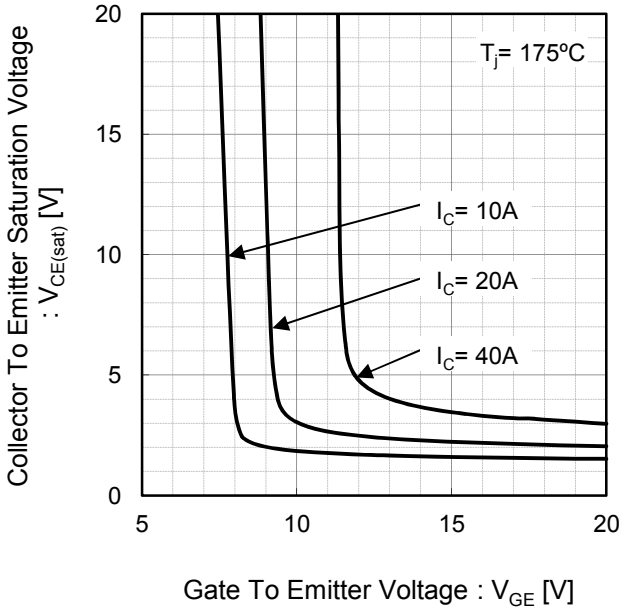



Fig.11 Typical Switching Time vs. Collector Current

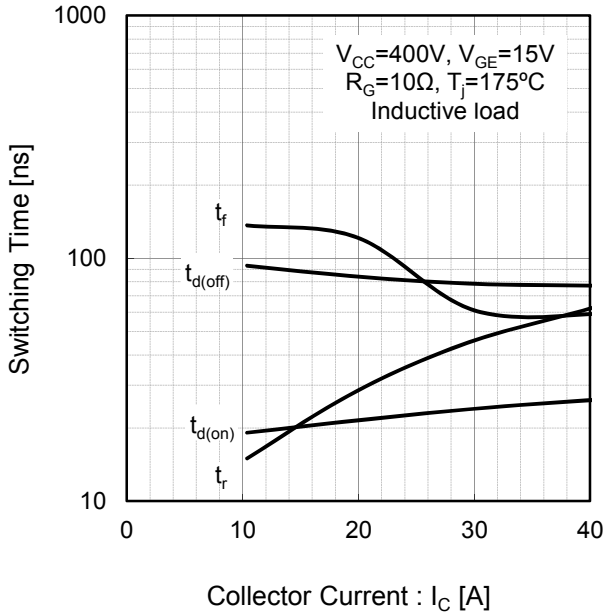
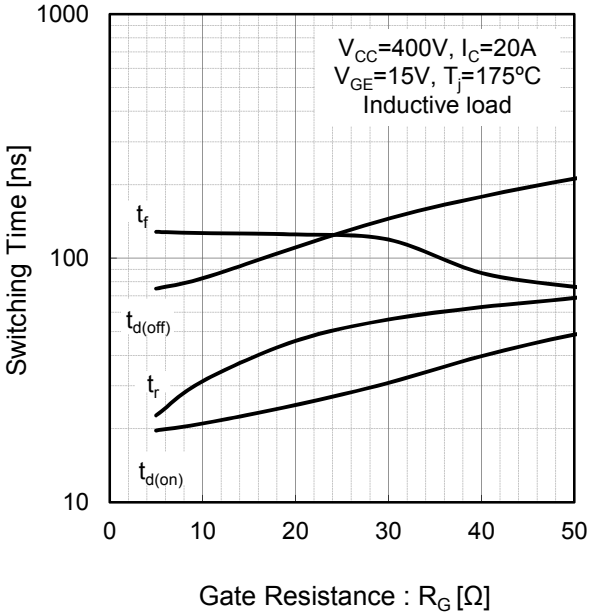



Fig.12 Typical Switching Time vs. Gate Resistance



## ●Electrical Characteristic Curves

Fig.13 Typical Switching Energy Losses vs. Collector Current

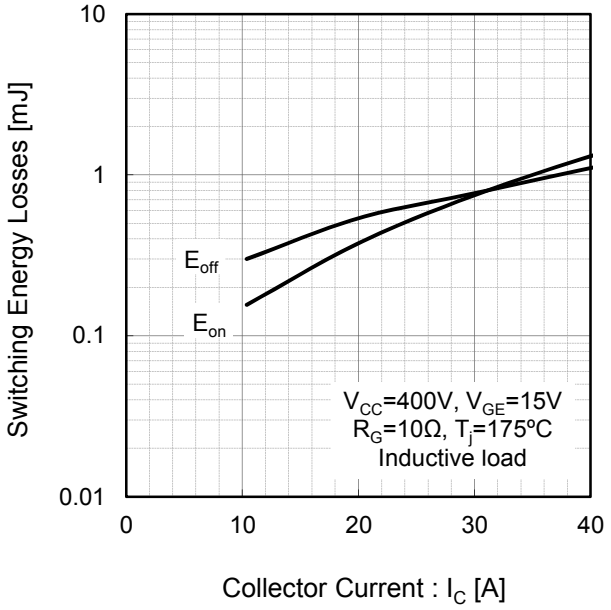



Fig.14 Typical Switching Energy Losses vs. Gate Resistance

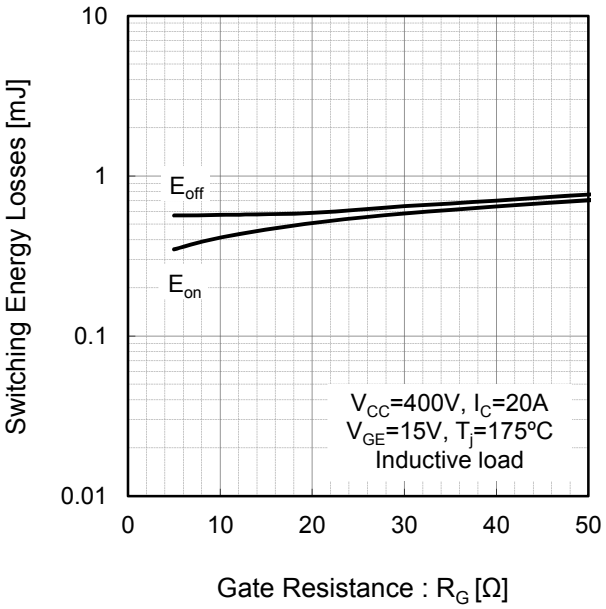



Fig.15 Typical Capacitance vs. Collector To Emitter Voltage

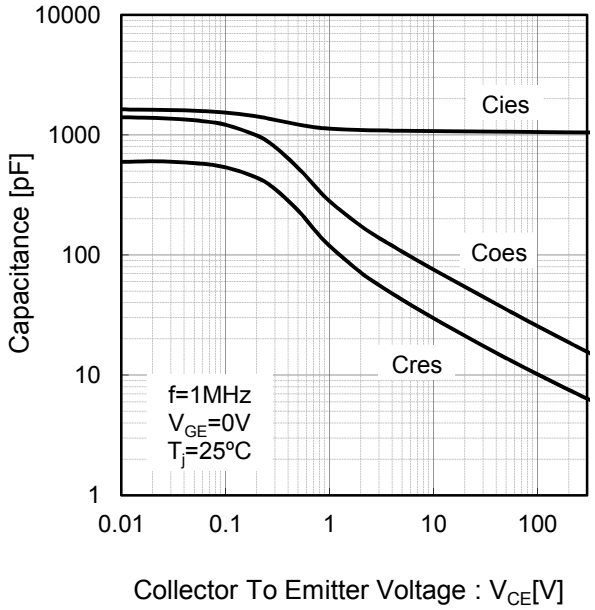
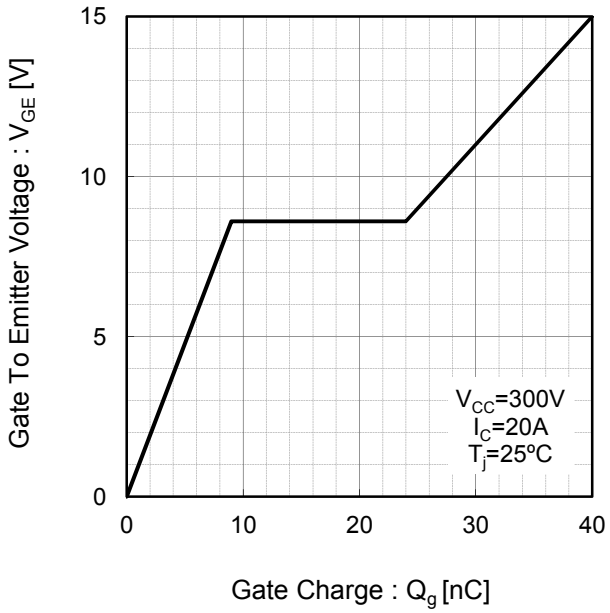



Fig.16 Typical Gate Charge



## ●Electrical Characteristic Curves

Fig.17 Typical Diode Forward Current vs. Forward Voltage

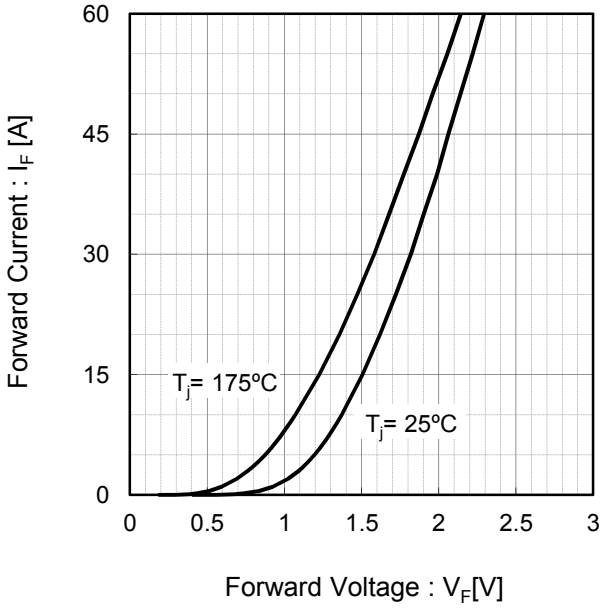



Fig.18 Typical Diode Reverse Recovery Time vs. Forward Current

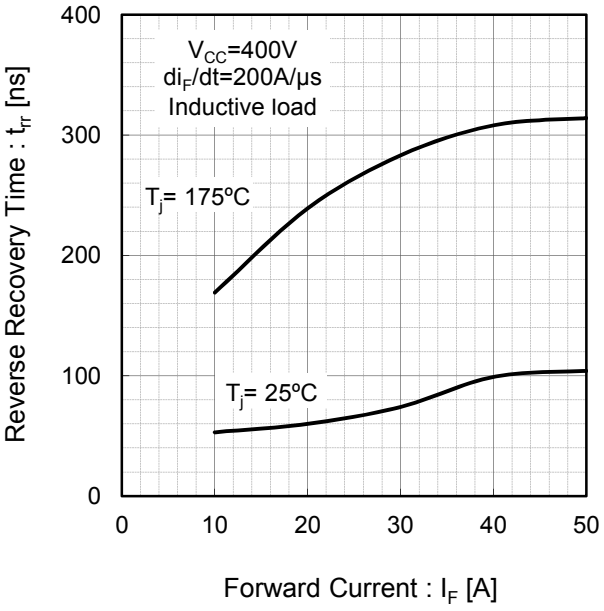



Fig.19 Typical Diode Reverse Recovery Current vs. Forward Current

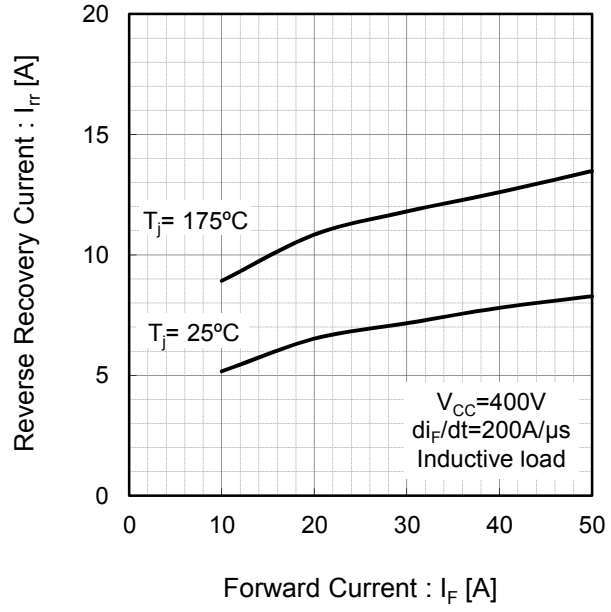
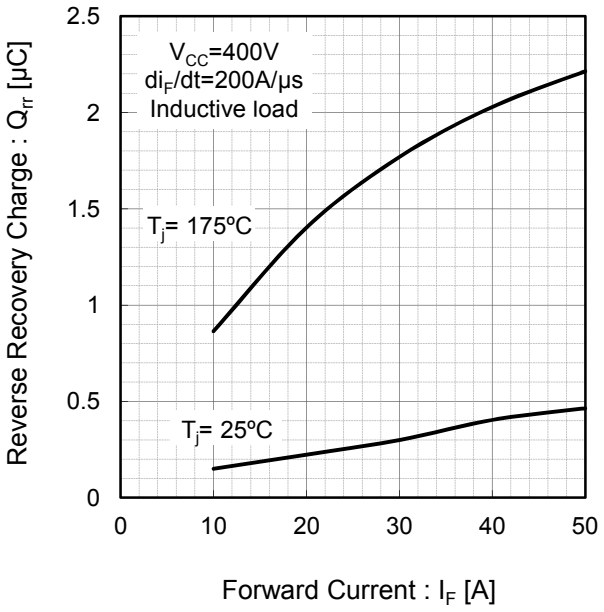



Fig.20 Typical Diode Reverse Recovery Charge vs. Forward Current



## ●Electrical Characteristic Curves

Fig.21 IGBT Transient Thermal Impedance

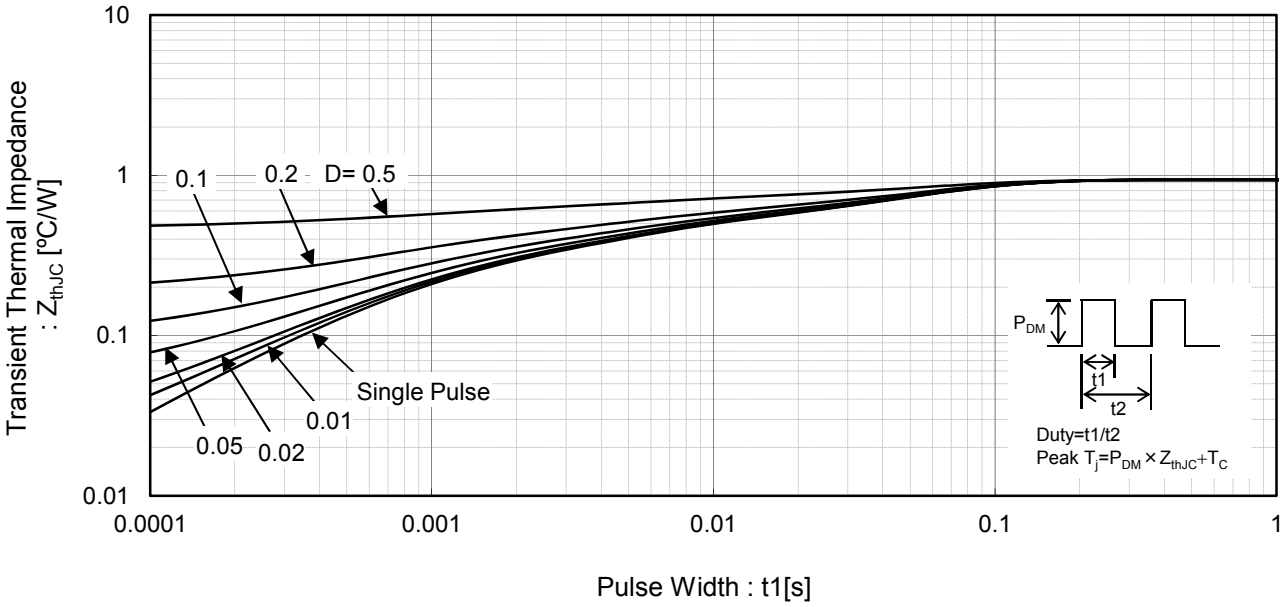
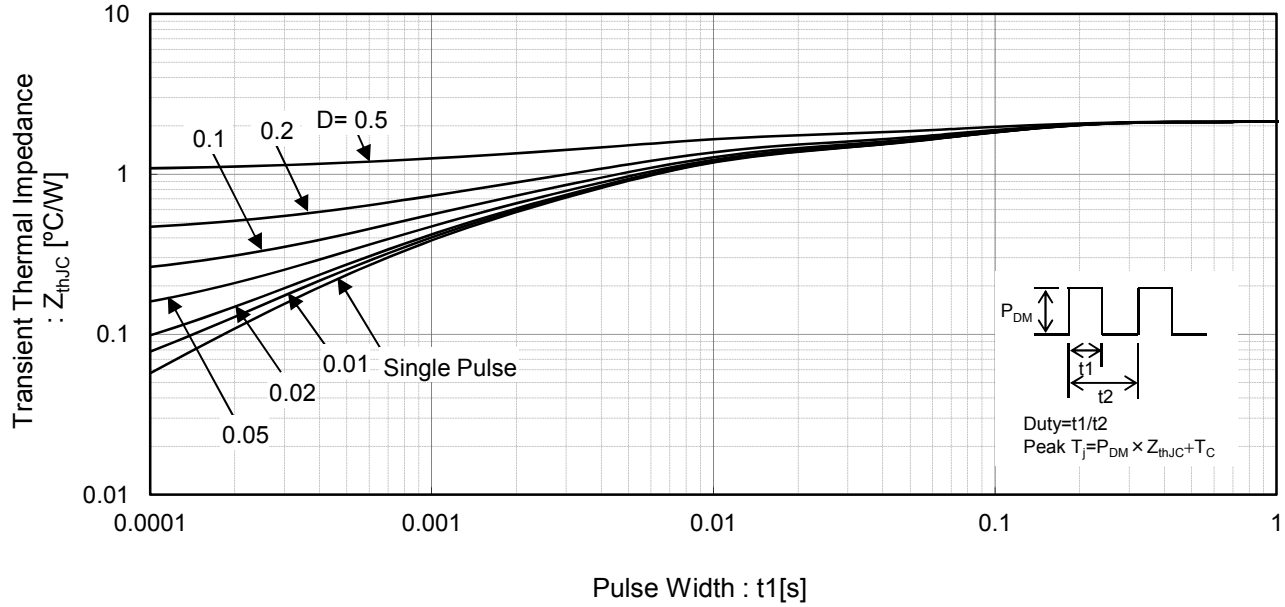



Fig.22 Diode Transient Thermal Impedance



## ●Inductive Load Switching Circuit and Waveform

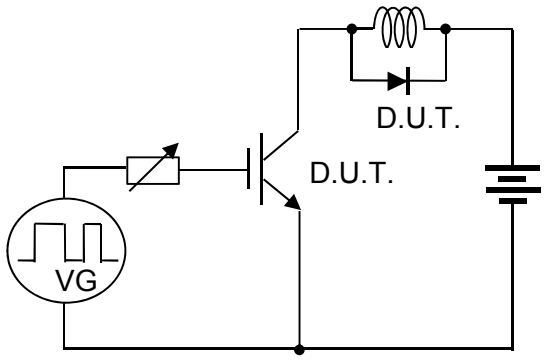



Fig.23 Inductive Load Circuit

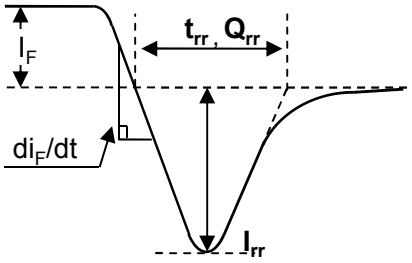



Fig.25 Diode Reverce Recovery Waveform

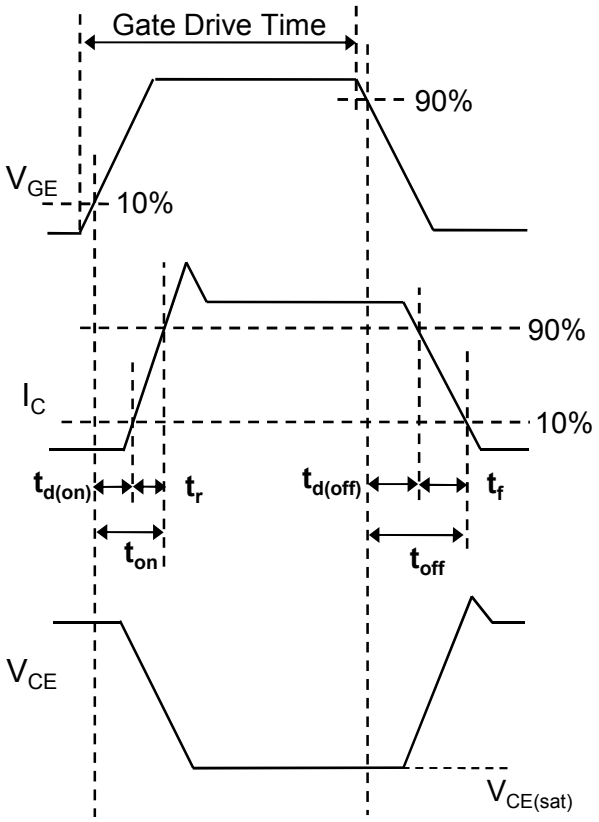



Fig.24 Inductive Load Waveform

## 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 are intended for use in general electronic equipment (i.e. AV/OA devices, communication, consumer systems, gaming/entertainment sets) as well as the applications indicated in this document.

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

8) 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, servers, solar cells, and power transmission systems.

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

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

11) 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.

12) 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.

13) 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.

14) 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/

# X-ON Electronics

Largest Supplier of Electrical and Electronic Components

***Click to view similar products for*** IGBT Transistors ***category:***

***Click to view products by*** ROHM ***manufacturer:***

Other Similar products are found below :

748152A APT20GT60BRDQ1G APT50GT60BRG NGTB10N60FG STGFW20V60DF APT30GP60BG APT45GR65B2DU30 GT50JR22(STA1ES) TIG058E8-TL-H VS-CPV364M4KPBF NGTB25N120FL2WAG NGTG40N120FL2WG RJH60F3DPQ-A0#T0 APT40GR120B2SCD10 APT15GT120BRG APT20GT60BRG NGTB75N65FL2WAG NGTG15N120FL2WG IXA30RG1200DHGLB IXA40RG1200DHGLB APT70GR65B2DU40 NTE3320 IHFW40N65R5SXKSA1 APT70GR120J APT35GP120JDQ2 IKZA40N65RH5XKSA1 IKFW75N65ES5XKSA1 IKFW50N65ES5XKSA1 IKFW50N65EH5XKSA1 IKFW40N65ES5XKSA1 IKFW60N65ES5XKSA1 IMBG120R090M1HXTMA1 IMBG120R220M1HXTMA1 XD15H120CX1 XD25H120CX0 XP15PJS120CL1B1 IGW30N60H3FKSA1 STGWA8M120DF3 IGW08T120FKSA1 IGW75N60H3FKSA1 HGTG40N60B3 FGH60N60SMD_F085 FGH75T65UPD STGWA15H120F2 IKA10N60TXKSA1 IHW20N120R5XKSA1 RJH60D2DPP-M0#T2 IKP20N60TXKSA1 IHW20N65R5XKSA1 IDW40E65D2FKSA1