

RJH65T47DPQ-A0

650V - 45A - IGBT

Application: Power Factor Correction circuit

R07DS1291EJ0101

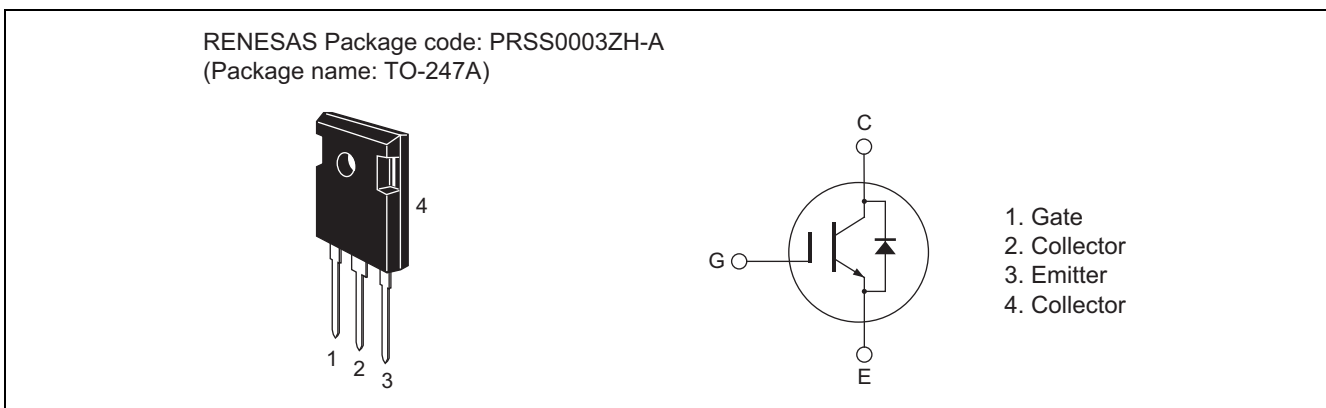
Rev.1.01

Oct 22, 2015

Features

- Low collector to emitter saturation voltage
 $V_{CE(sat)} = 1.8 \text{ V typ. (at } I_C = 45 \text{ A, } V_{GE} = 15 \text{ V, } T_a = 25^\circ\text{C)}$
- Built in fast recovery diode in one package
- Trench gate and thin wafer technology (G7H series)
- High speed switching
 $t_f = 45 \text{ ns typ. (at } V_{CC} = 400 \text{ V, } V_{GE} = 15 \text{ V, } I_C = 45 \text{ A, } R_g = 10 \Omega, T_a = 25^\circ\text{C, Inductive load)}$
- Operation frequency ($20\text{kHz} \leq f < 100\text{kHz}$)
- Not guarantee short circuit withstand time

Outline



Absolute Maximum Ratings

($T_c = 25^\circ\text{C}$)

| Item | Symbol | Ratings | Unit | |
|---|---------------------------------|-------------|--------------------|---|
| Collector to emitter voltage | V_{CES} / V_R | 650 | V | |
| Gate to emitter voltage | V_{GES} | ± 30 | V | |
| Collector current | $T_c = 25^\circ\text{C}$ | I_C | 90 | A |
| | $T_c = 100^\circ\text{C}$ | I_C | 45 | A |
| Collector peak current | $I_{C(peak)}$ ^{Note1} | 335 | A | |
| Collector to emitter diode Forward current | $T_c = 25^\circ\text{C}$ | I_{DF} | 30 | A |
| | $T_c = 100^\circ\text{C}$ | I_{DF} | 15 | A |
| Collector to emitter diode forward peak current | $I_{DF(peak)}$ ^{Note1} | 100 | A | |
| Collector dissipation | P_C ^{Note 2} | 375 | W | |
| Junction to case thermal impedance (IGBT) | θ_{j-c} | 0.40 | $^\circ\text{C/W}$ | |
| Junction to case thermal resistance (Diode) | θ_{j-cd} | 1.33 | $^\circ\text{C/W}$ | |
| Junction temperature | T_j ^{Note2} | 175 | $^\circ\text{C}$ | |
| Storage temperature | T_{stg} | -55 to +150 | $^\circ\text{C}$ | |

Notes: 1. $PW \leq 10 \mu\text{s}$, duty cycle $\leq 1\%$

2. Please use this device in the thermal conditions which the junction temperature does not exceed 175°C .
 Renesas IGBT Application Note is disclosed about reliability test and application condition up to 175°C .

Electrical Characteristics

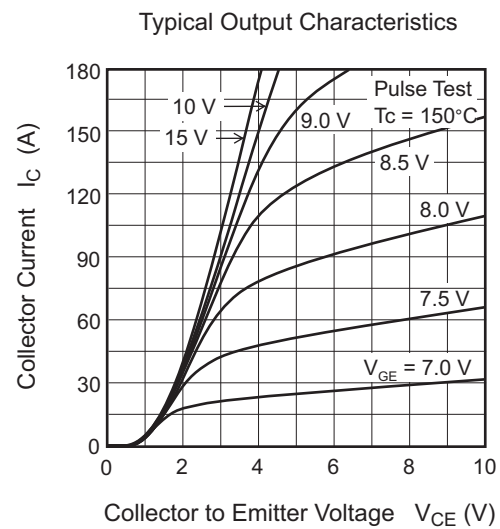
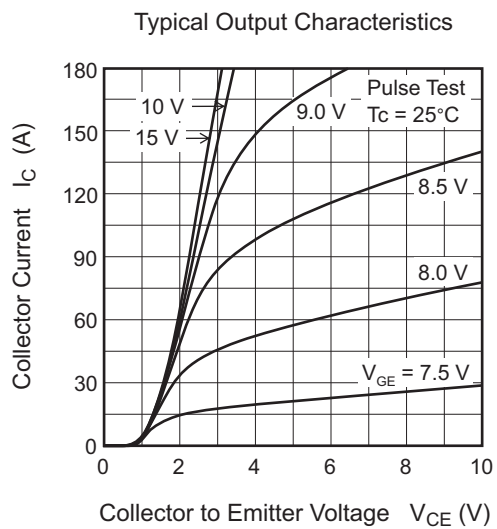
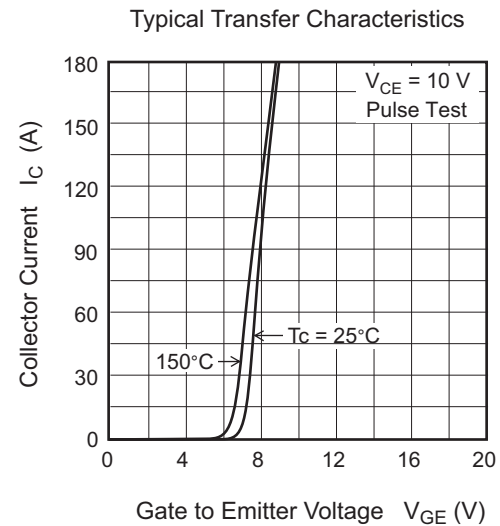
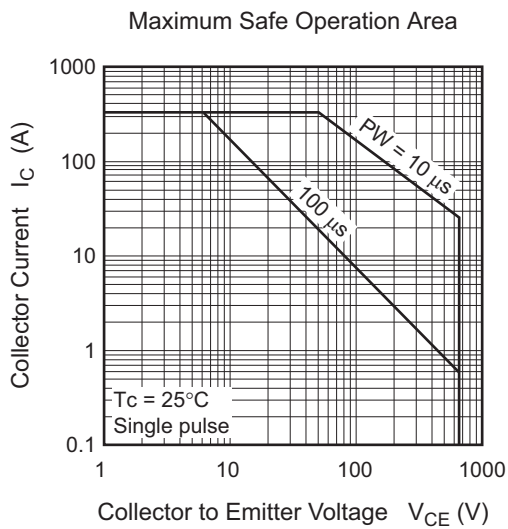
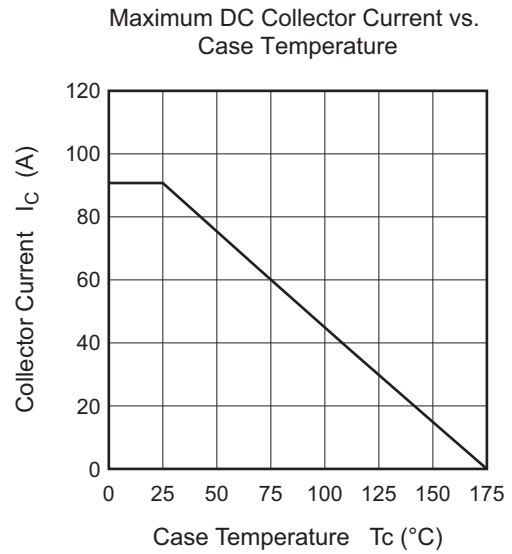
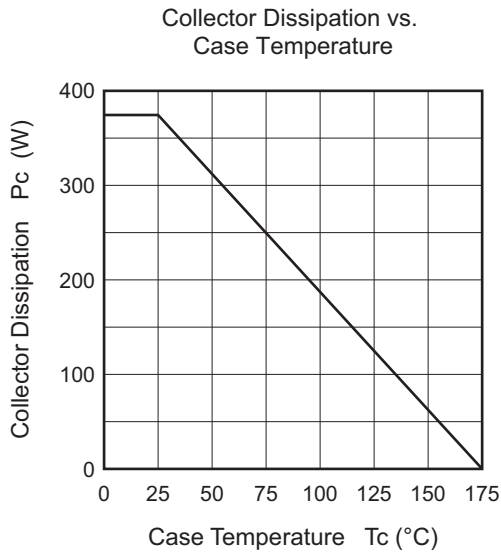
(Ta = 25°C)

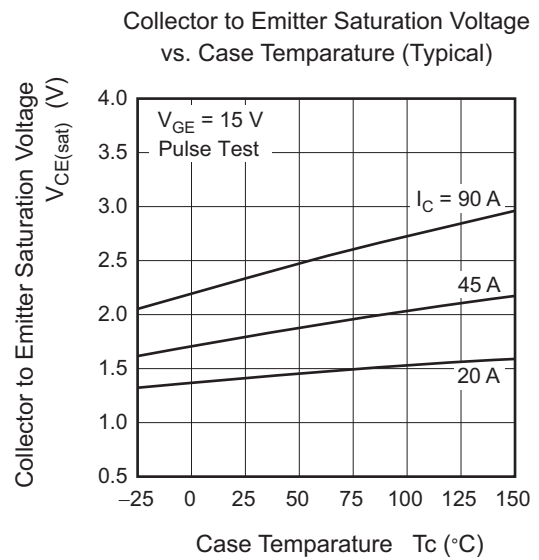
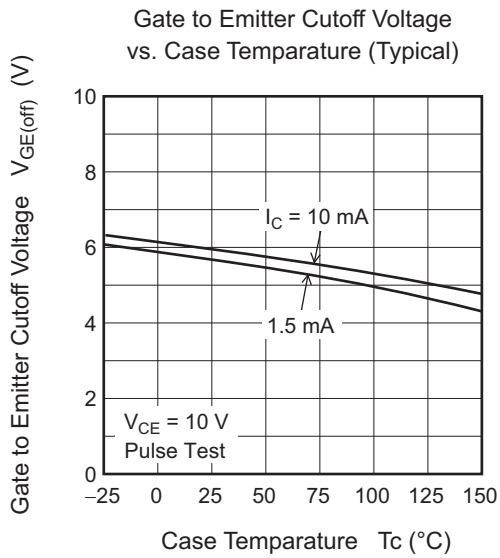
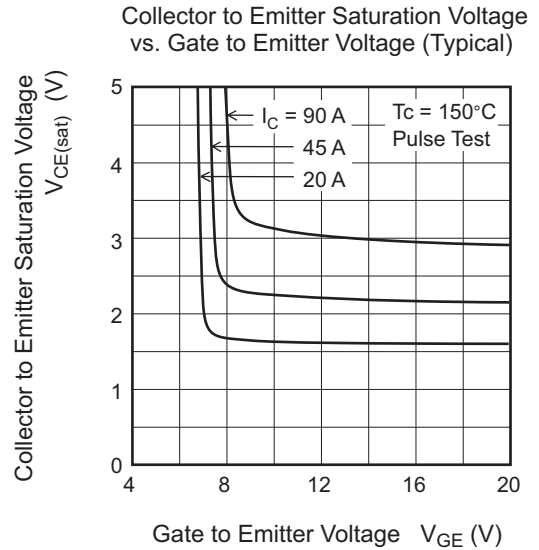
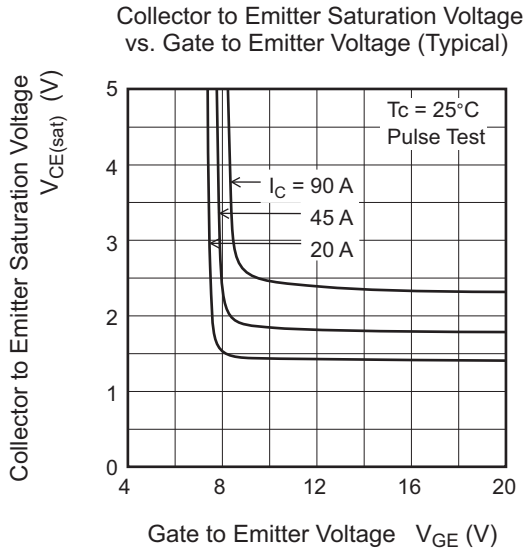
| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|--|----------------------|-----|------|---------|---------------|---|
| Zero gate voltage collector current / Diode reverse current | I_{CES} / I_R | — | — | 100 | μA | $V_{CE} = 650 \text{ V}, V_{GE} = 0$ |
| Gate to emitter leak current | I_{GES} | — | — | ± 1 | μA | $V_{GE} = \pm 30 \text{ V}, V_{CE} = 0$ |
| Gate to emitter cutoff voltage | $V_{GE(\text{off})}$ | 4.0 | — | 7.0 | V | $V_{CE} = 10 \text{ V}, I_C = 1.5 \text{ mA}$ |
| Collector to emitter saturation voltage | $V_{CE(\text{sat})}$ | — | 1.8 | 2.4 | V | $I_C = 45 \text{ A}, V_{GE} = 15 \text{ V}$ ^{Note3} |
| Input capacitance | C_{ies} | — | 3000 | — | nC | $V_{CE} = 25 \text{ V}$ $V_{GE} = 0$ $f = 1 \text{ MHz}$ |
| Output capacitance | C_{oes} | — | 100 | — | nC | |
| Reveres transfer capacitance | C_{res} | — | 60 | — | nC | |
| Total gate charge | Q_g | — | 127 | — | nC | $V_{GE} = 15 \text{ V}$ $V_{CE} = 400 \text{ V}$ $I_C = 45 \text{ A}$ |
| Gate to emitter charge | Q_{ge} | — | 23 | — | nC | |
| Gate to collector charge | Q_{gc} | — | 57 | — | nC | |
| Turn-on delay time | $t_{d(\text{on})}$ | — | 45 | — | ns | $V_{CC} = 400 \text{ V}$ $V_{GE} = 15 \text{ V}$ $I_C = 45 \text{ A}$ $R_g = 10 \Omega$ $T_c = 25 \text{ }^\circ\text{C}$ Inductive load ^{Note4} |
| Rise time | t_r | — | 33 | — | ns | |
| Turn-off delay time | $t_{d(\text{off})}$ | — | 190 | — | ns | |
| Fall time | t_f | — | 45 | — | ns | |
| Turn-on loss energy | E_{on} | — | 0.52 | — | mJ | |
| Turn-off loss energy | E_{off} | — | 0.56 | — | mJ | |
| Total switching energy | E_{total} | — | 1.08 | — | mJ | |
| Turn-on delay time | $t_{d(\text{on})}$ | — | 35 | — | ns | |
| Rise time | t_r | — | 33 | — | ns | |
| Turn-off delay time | $t_{d(\text{off})}$ | — | 186 | — | ns | |
| Fall time | t_f | — | 55 | — | ns | $V_{CC} = 400 \text{ V}$ $V_{GE} = 15 \text{ V}$ $I_C = 45 \text{ A}$ $R_g = 10 \Omega$ $T_c = 150 \text{ }^\circ\text{C}$ Inductive load ^{Note4} |
| Turn-on loss energy | E_{on} | — | 0.69 | — | mJ | |
| Turn-off loss energy | E_{off} | — | 0.77 | — | mJ | |
| Total switching energy | E_{total} | — | 1.46 | — | mJ | |
| FRD forward voltage | V_F | — | 1.7 | 2.2 | V | $I_F = 15 \text{ A}$ ^{Note3} |
| FRD reverse recovery time | t_{rr} | — | 100 | — | ns | $I_F = 15 \text{ A}, di_F/dt = 300 \text{ A}/\mu\text{s}$ |

Notes: 3. Pulse test

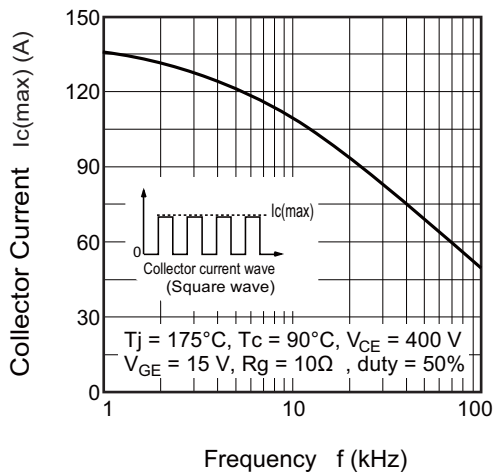
4. Switching time test circuit and waveform are shown below.

Main Characteristics

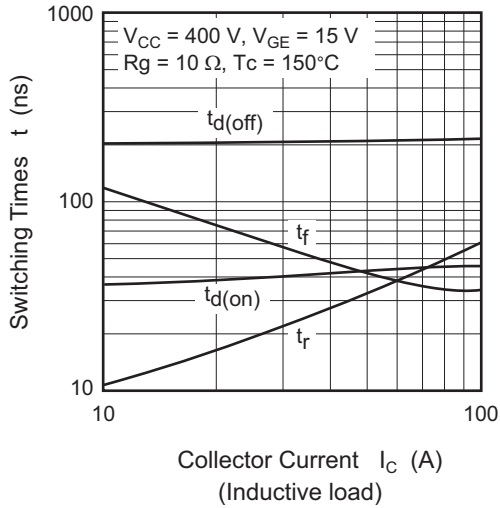




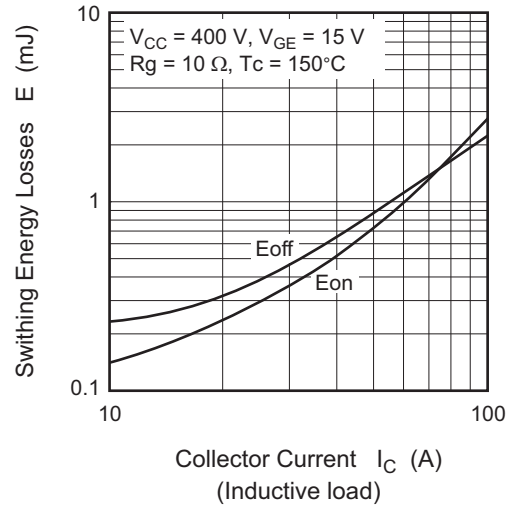
Frequency Characteristics (Typical)



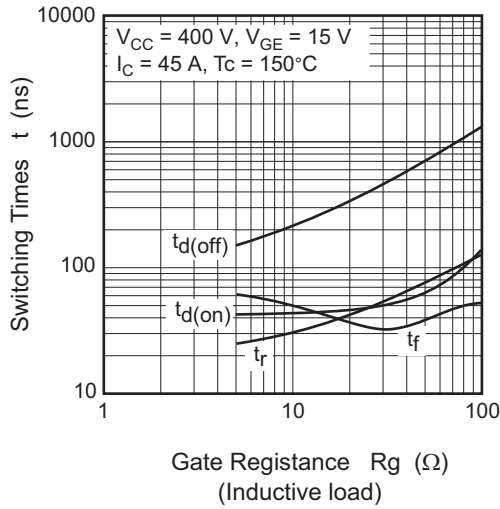
Switching Characteristics (Typical) (1)



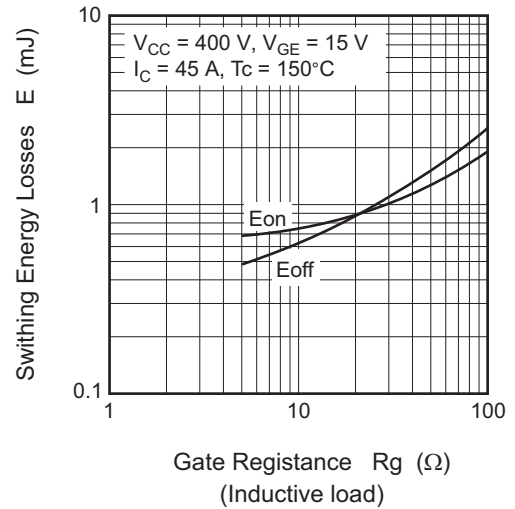
Switching Characteristics (Typical) (2)



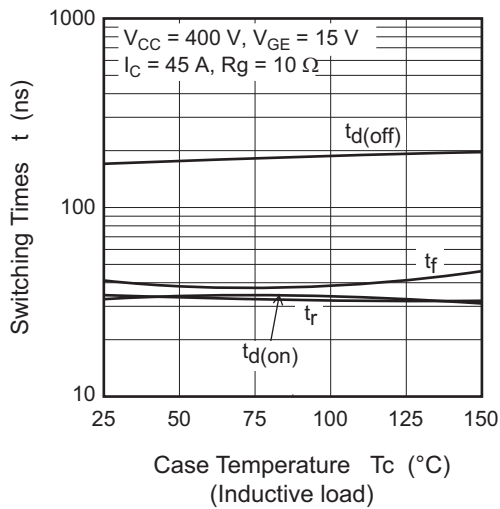
Switching Characteristics (Typical) (3)



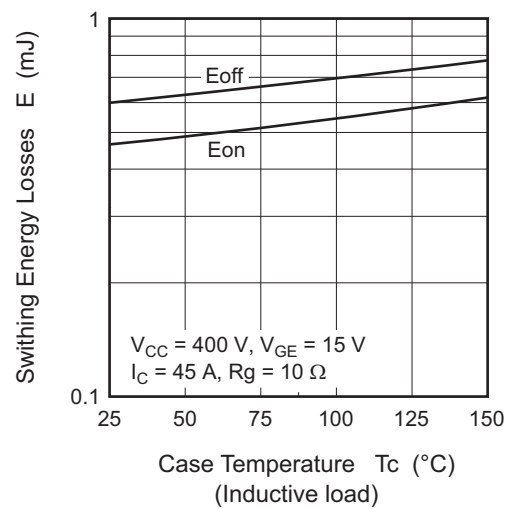
Switching Characteristics (Typical) (4)



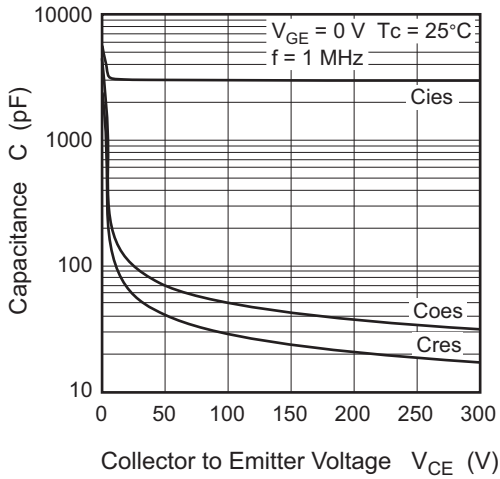
Switching Characteristics (Typical) (5)



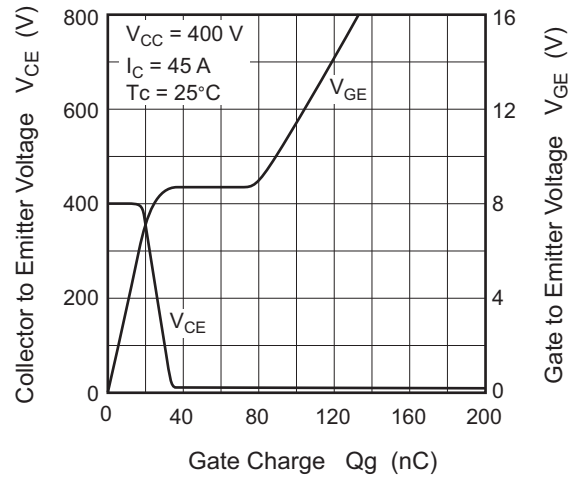
Switching Characteristics (Typical) (6)



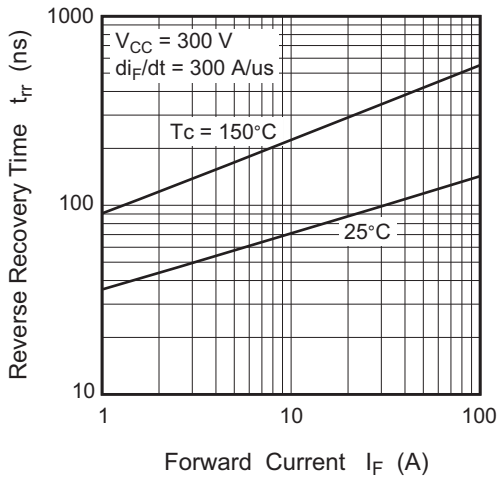
Typical Capacitance vs. Collector to Emitter Voltage



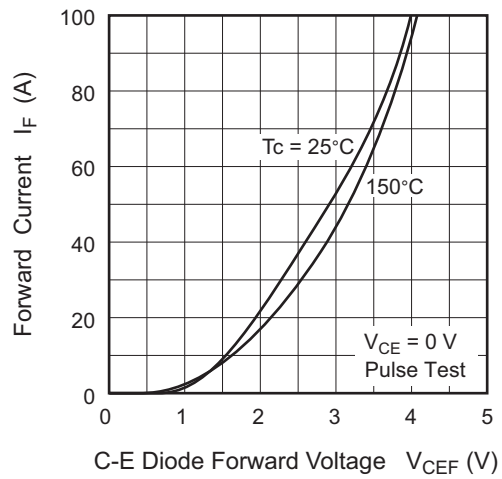
Dynamic Input Characteristics (Typical)

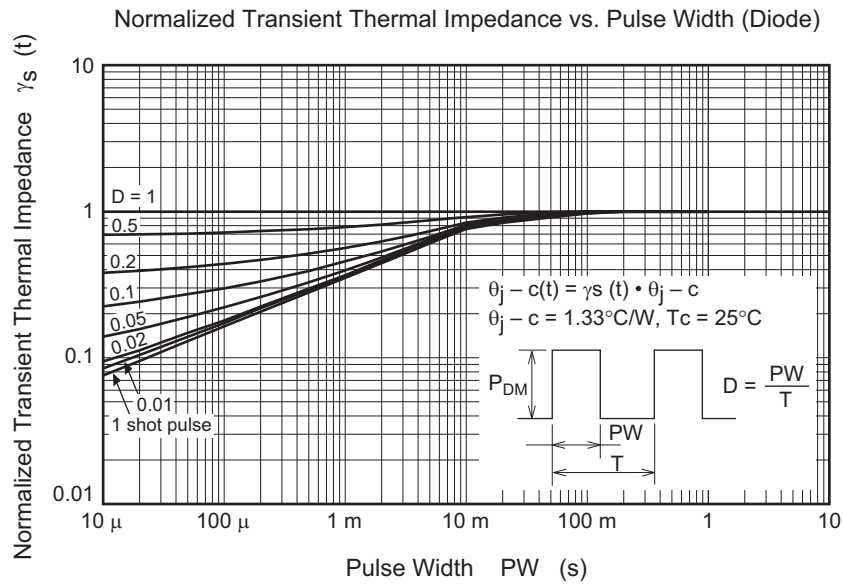
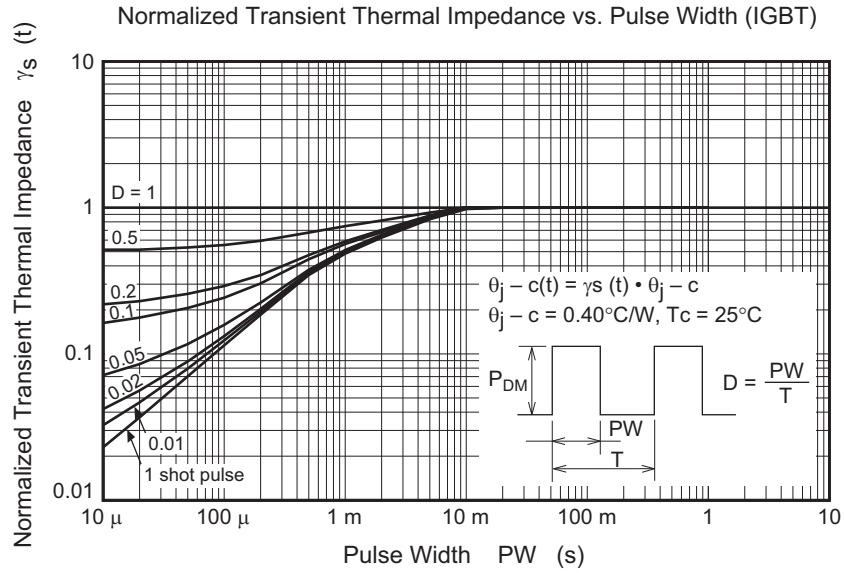


Reverse Recovery Time vs. Forward Current (Typical)

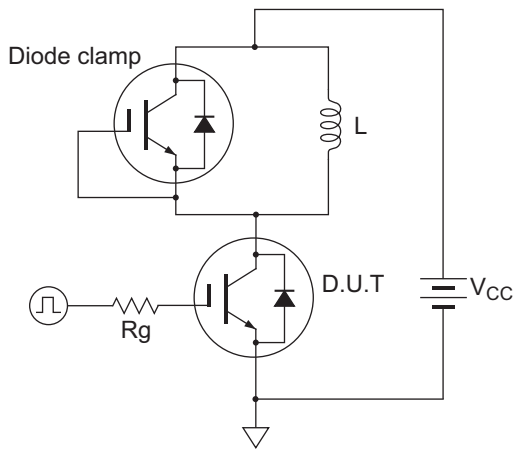


Forward Current vs. Forward Voltage (Typical)

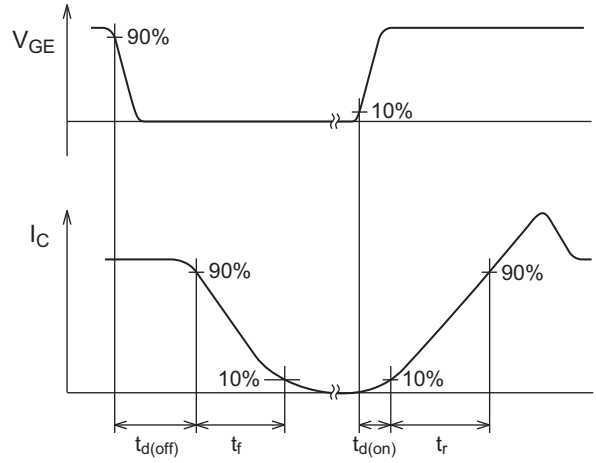




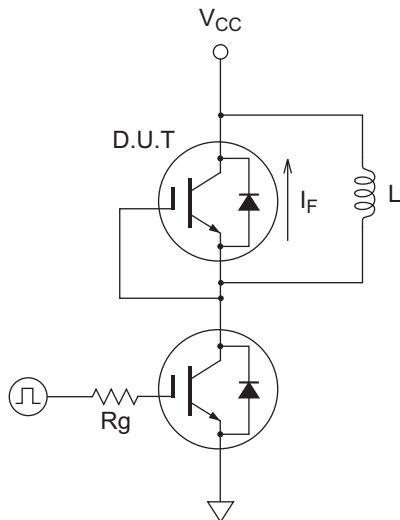
Switching Time Test Circuit



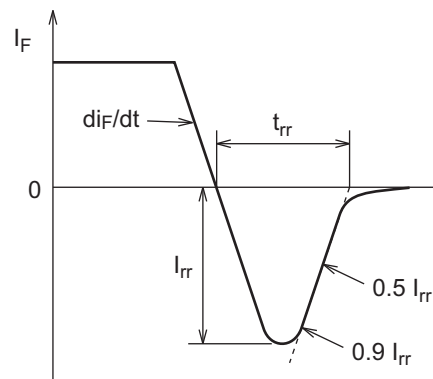
Waveform



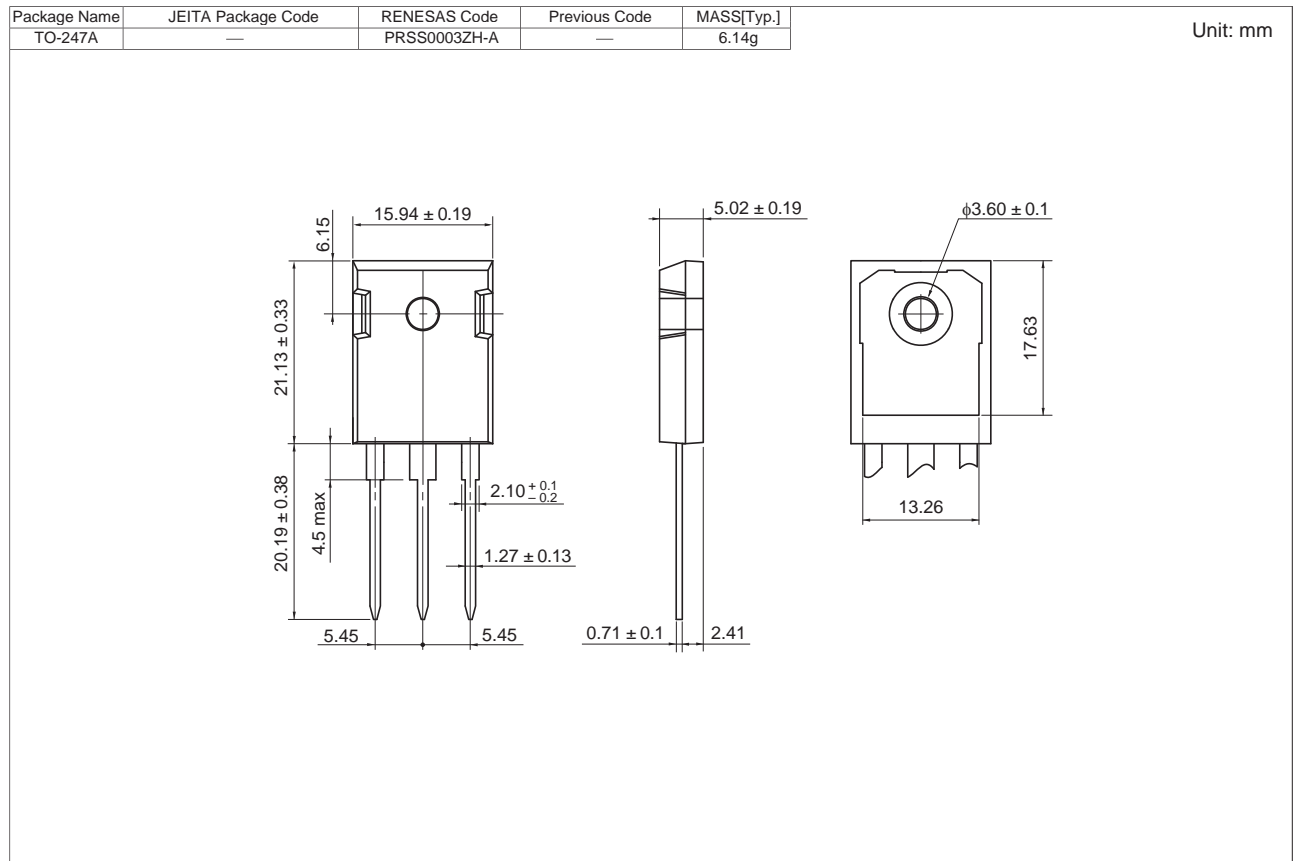
Diode Reverse Recovery Time Test Circuit



Waveform



Package Dimensions



Ordering Information

| Orderable Part Number | Quantity | Shipping Container |
|-----------------------|----------|--------------------|
| RJH65T47DPQ-A0#T0 | 240 pcs | Box (Tube) |

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