

# RJP65T43DPM

650V - 20A - IGBT

Application: Power Factor Correction circuit

R07DS1201EJ0100

Rev.1.00

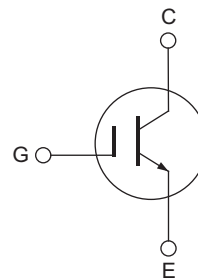
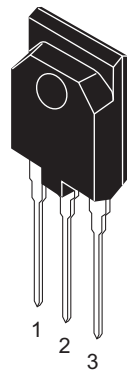
Apr 23, 2014

## Features

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

## Outline

RENESAS Package code: PRSS0003ZA-A  
 (Package name: TO-3PFM)



1. Gate
2. Collector
3. Emitter

## Absolute Maximum Ratings

(T<sub>c</sub> = 25°C)

| Item                                      | Symbol                              | Ratings              | Unit |   |
|---|-------------------------------------|----------------------|------|---|
| Collector to emitter voltage              | $V_{CES}$                           | 650                  | V    |   |
| Gate to emitter voltage                   | $V_{GES}$                           | ±30                  | V    |   |
| Collector current                         | $T_c = 25^\circ\text{C}$            | $I_C^{\text{Note1}}$ | 40   | A |
|   | $T_c = 100^\circ\text{C}$           | $I_C^{\text{Note1}}$ | 20   | A |
| Collector peak current                    | $i_{c(\text{peak})}^{\text{Note1}}$ | 150                  | A    |   |
| Collector dissipation                     | $P_C$                               | 68.8                 | W    |   |
| Junction to case thermal impedance (IGBT) | $\theta_{j-c}^{\text{Note2}}$       | 2.18                 | °C/W |   |
| Junction temperature                      | $T_J^{\text{Note3}}$                | 175                  | °C   |   |
| Storage temperature                       | $T_{stg}$                           | -55 to +150          | °C   |   |

Notes: 1. Pulse width limited by safe operating area.

2. Value at T<sub>c</sub> = 25°C

3. 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

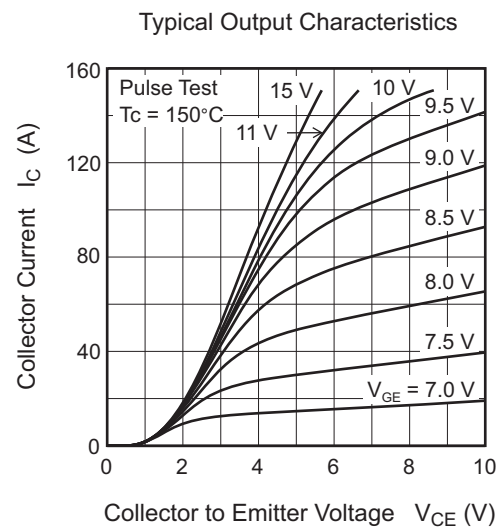
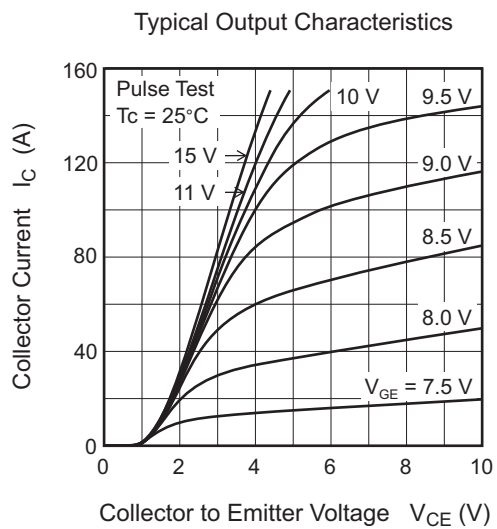
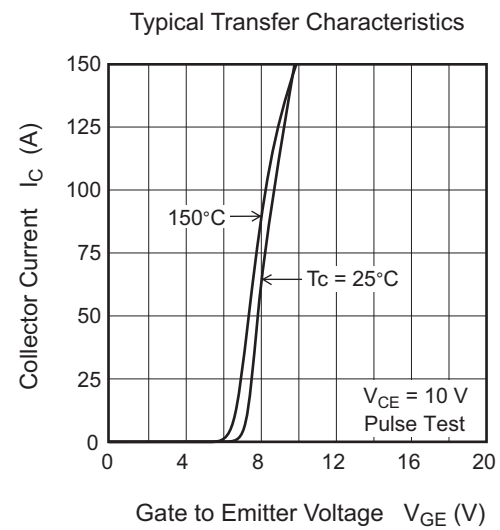
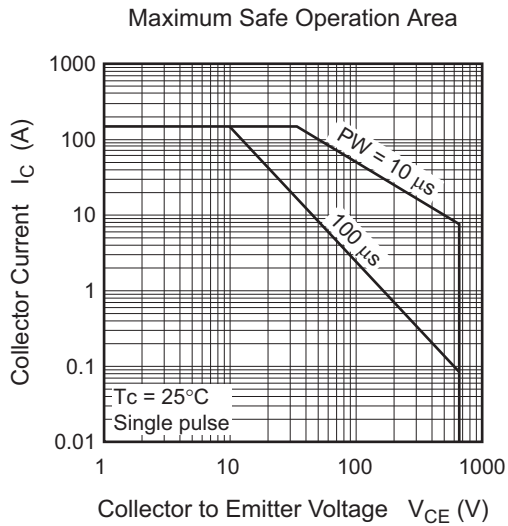
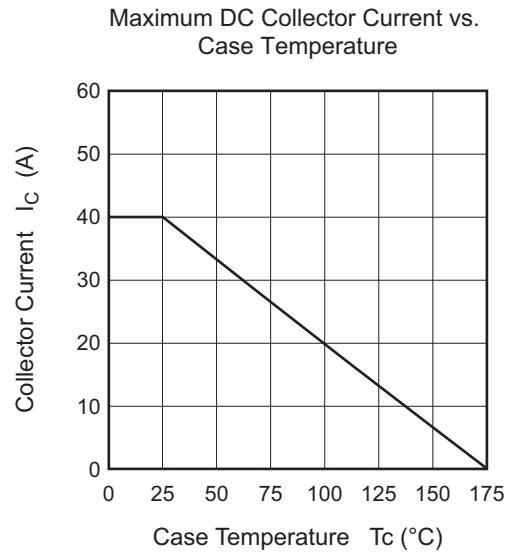
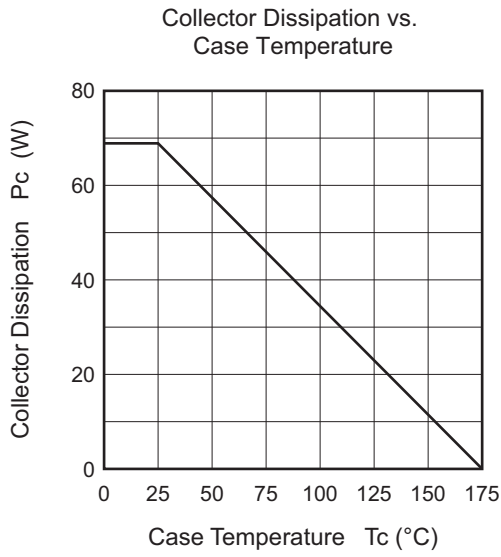
(Ta = 25°C)

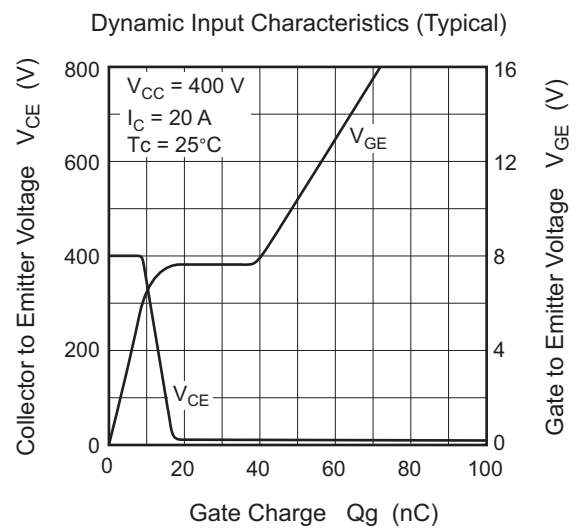
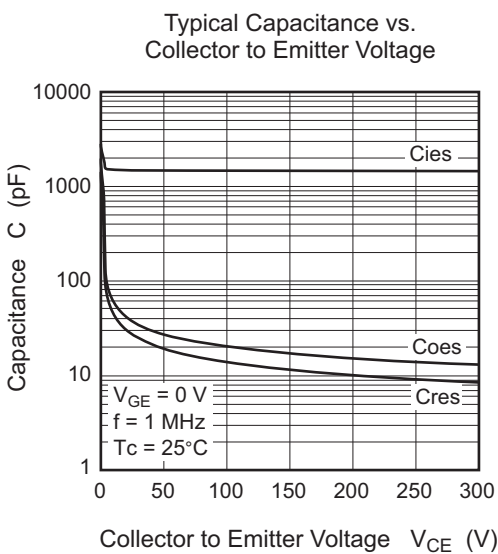
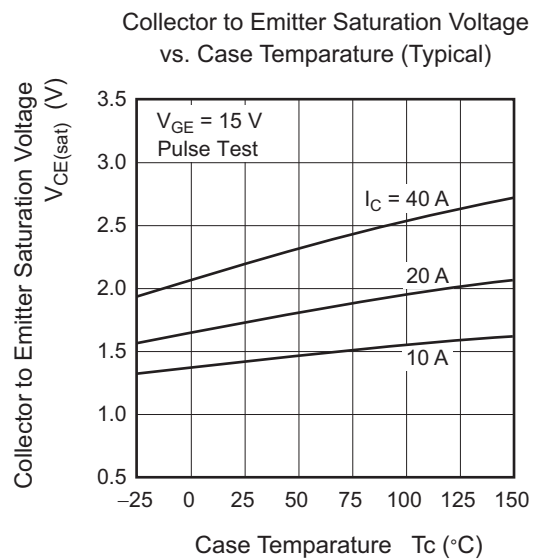
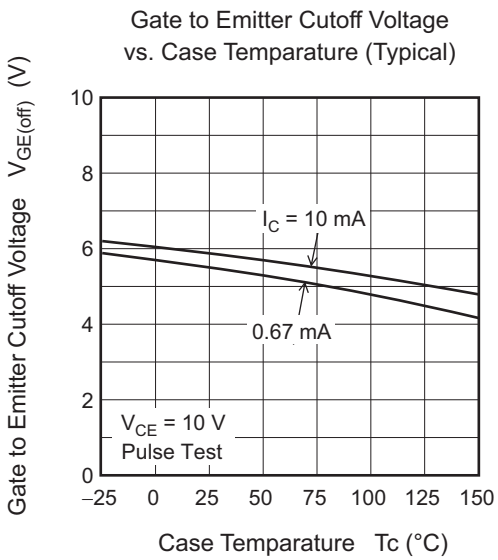
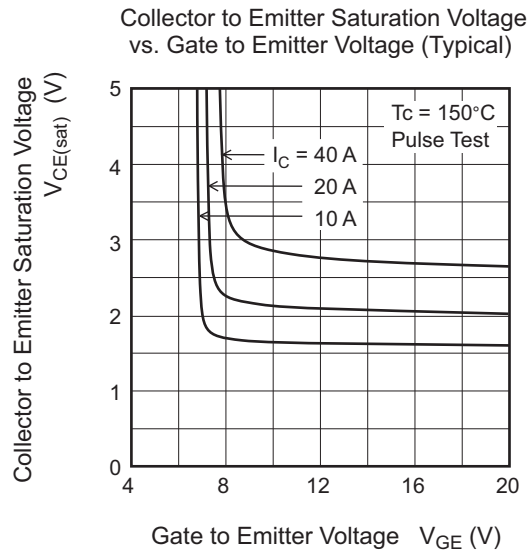
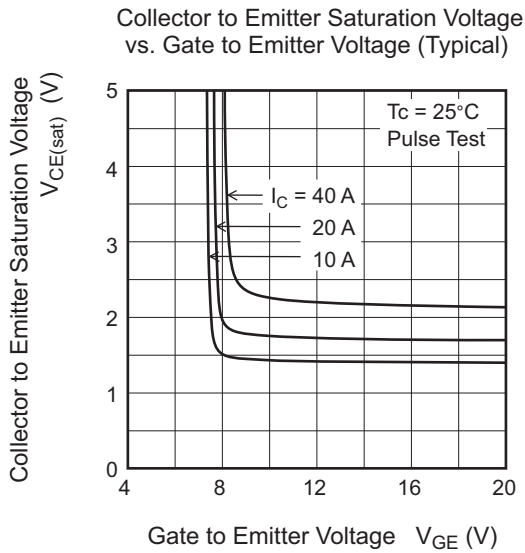
| Item                                    | Symbol        | Min | Typ  | Max     | Unit          | Test Conditions  |
|---|---------------|-----|------|---------|---------------|--|
| Zero gate voltage collector current     | $I_{CES}$     | —   | —    | 1       | $\mu\text{A}$ | $V_{CE} = 650\text{ V}, V_{GE} = 0$                        |
| Gate to emitter leak current            | $I_{GES}$     | —   | —    | $\pm 1$ | $\mu\text{A}$ | $V_{GE} = \pm 30\text{ V}, V_{CE} = 0$                     |
| Gate to emitter cutoff voltage          | $V_{GE(off)}$ | 4.0 | —    | 7.0     | V             | $V_{CE} = 10\text{ V}, I_C = 0.67\text{ mA}$               |
| Collector to emitter saturation voltage | $V_{CE(sat)}$ | —   | 1.8  | 2.4     | V             | $I_C = 20\text{ A}, V_{GE} = 15\text{ V}$ <sup>Note4</sup> |
| Input capacitance                       | $C_{ies}$     | —   | 1550 | —       | pF            | $V_{CE} = 25\text{ V}$                                     |
| Output capacitance                      | $C_{oes}$     | —   | 37   | —       | pF            | $V_{GE} = 0$   |
| Reveres transfer capacitance            | $C_{res}$     | —   | 26   | —       | pF            | $f = 1\text{ MHz}$   |
| Total gate charge                       | $Q_g$         | —   | 69   | —       | nC            | $V_{GE} = 15\text{ V}$                                     |
| Gate to emitter charge                  | $Q_{ge}$      | —   | 10   | —       | nC            | $V_{CE} = 400\text{ V}$                                    |
| Gate to collector charge                | $Q_{gc}$      | —   | 30   | —       | nC            | $I_C = 20\text{ A}$  |
| Turn-on delay time                      | $t_{d(on)}$   | —   | 30   | —       | ns            | $V_{CC} = 400\text{ V}$                                    |
| Rise time                               | $t_r$         | —   | 20   | —       | ns            | $V_{GE} = 15\text{ V}$                                     |
| Turn-off delay time                     | $t_{d(off)}$  | —   | 100  | —       | ns            | $I_C = 20\text{ A}$  |
| Fall time                               | $t_f$         | —   | 45   | —       | ns            | $R_g = 10\ \Omega$   |
| Turn-on loss energy                     | $E_{on}$      | —   | 0.4  | —       | mJ            | $T_C = 25\ \text{°C}$                                      |
| Turn-off loss energy                    | $E_{off}$     | —   | 0.2  | —       | mJ            | Inductive load <sup>Note5</sup>                            |
| Total switching energy                  | $E_{total}$   | —   | 0.6  | —       | mJ            |  |
| Turn-on delay time                      | $t_{d(on)}$   | —   | 31   | —       | ns            | $V_{CC} = 400\text{ V}$                                    |
| Rise time                               | $t_r$         | —   | 25   | —       | ns            | $V_{GE} = 15\text{ V}$                                     |
| Turn-off delay time                     | $t_{d(off)}$  | —   | 110  | —       | ns            | $I_C = 20\text{ A}$  |
| Fall time                               | $t_f$         | —   | 45   | —       | ns            | $R_g = 10\ \Omega$   |
| Turn-on loss energy                     | $E_{on}$      | —   | 0.54 | —       | mJ            | $T_C = 150\ \text{°C}$                                     |
| Turn-off loss energy                    | $E_{off}$     | —   | 0.29 | —       | mJ            | Inductive load <sup>Note5</sup>                            |
| Total switching energy                  | $E_{total}$   | —   | 0.83 | —       | mJ            |  |

Notes: 4. Pulse test

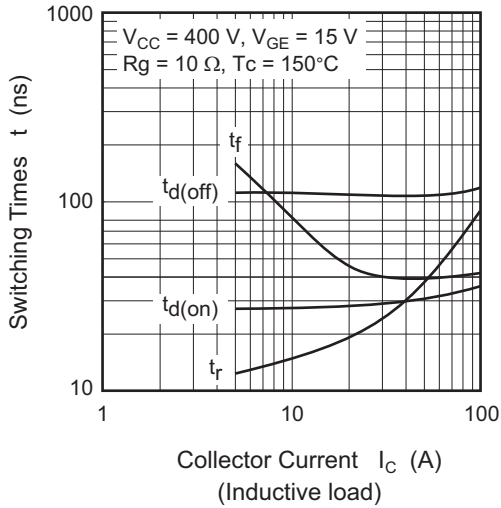
5. Switching time test circuit and waveform are shown below.

### Main Characteristics

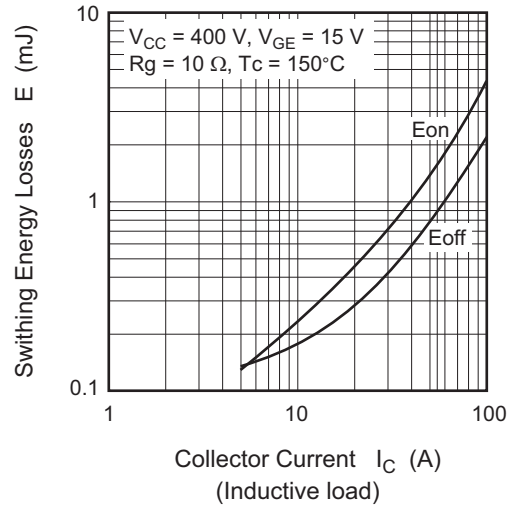




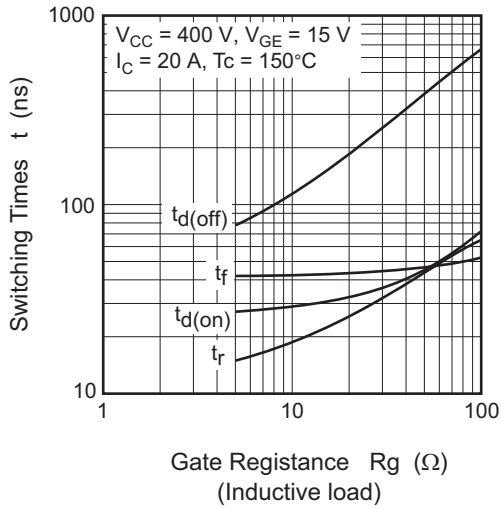
Switching Characteristics (Typical) (1)



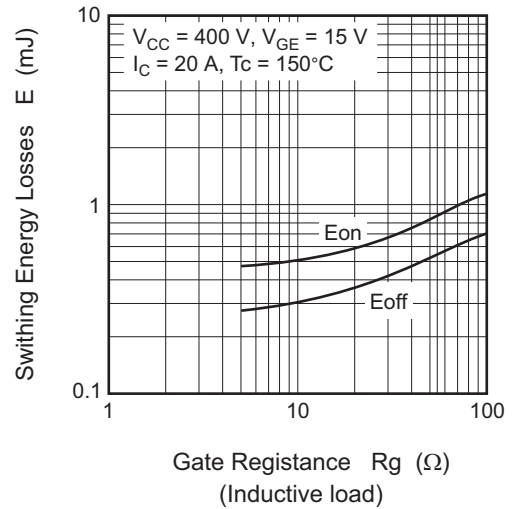
Switching Characteristics (Typical) (2)



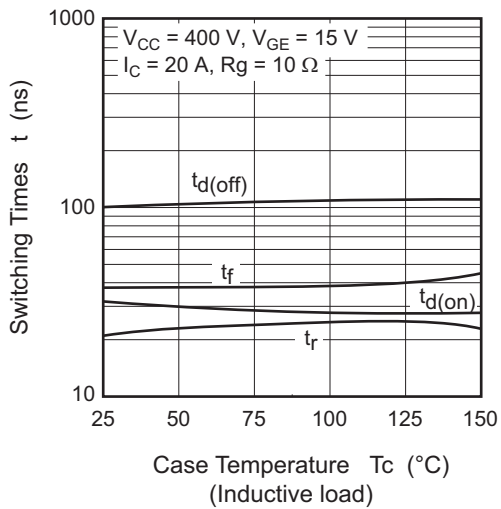
Switching Characteristics (Typical) (3)



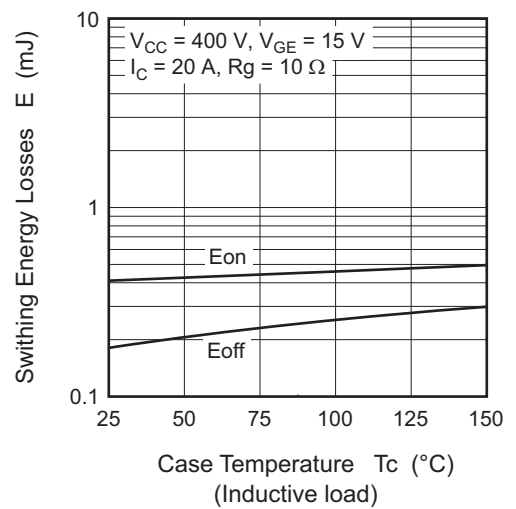
Switching Characteristics (Typical) (4)

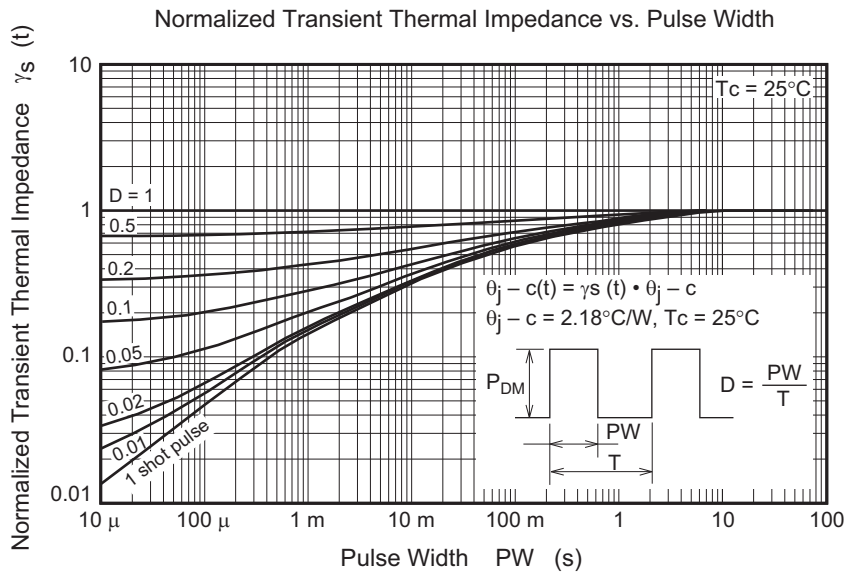


Switching Characteristics (Typical) (5)

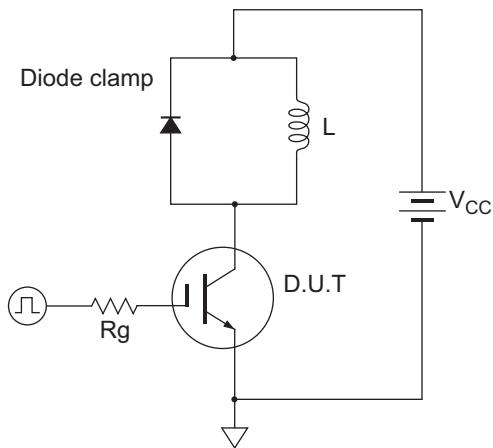


Switching Characteristics (Typical) (6)

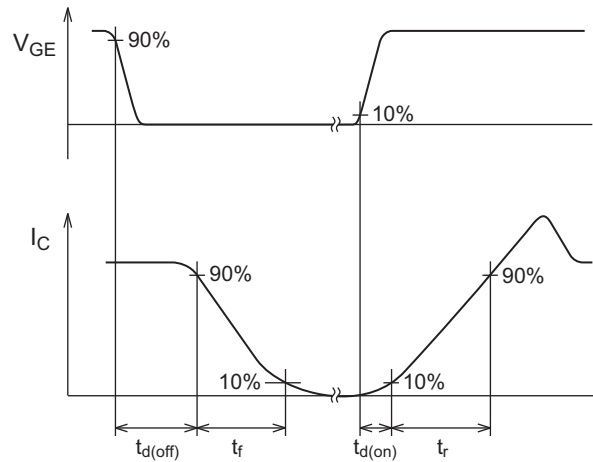




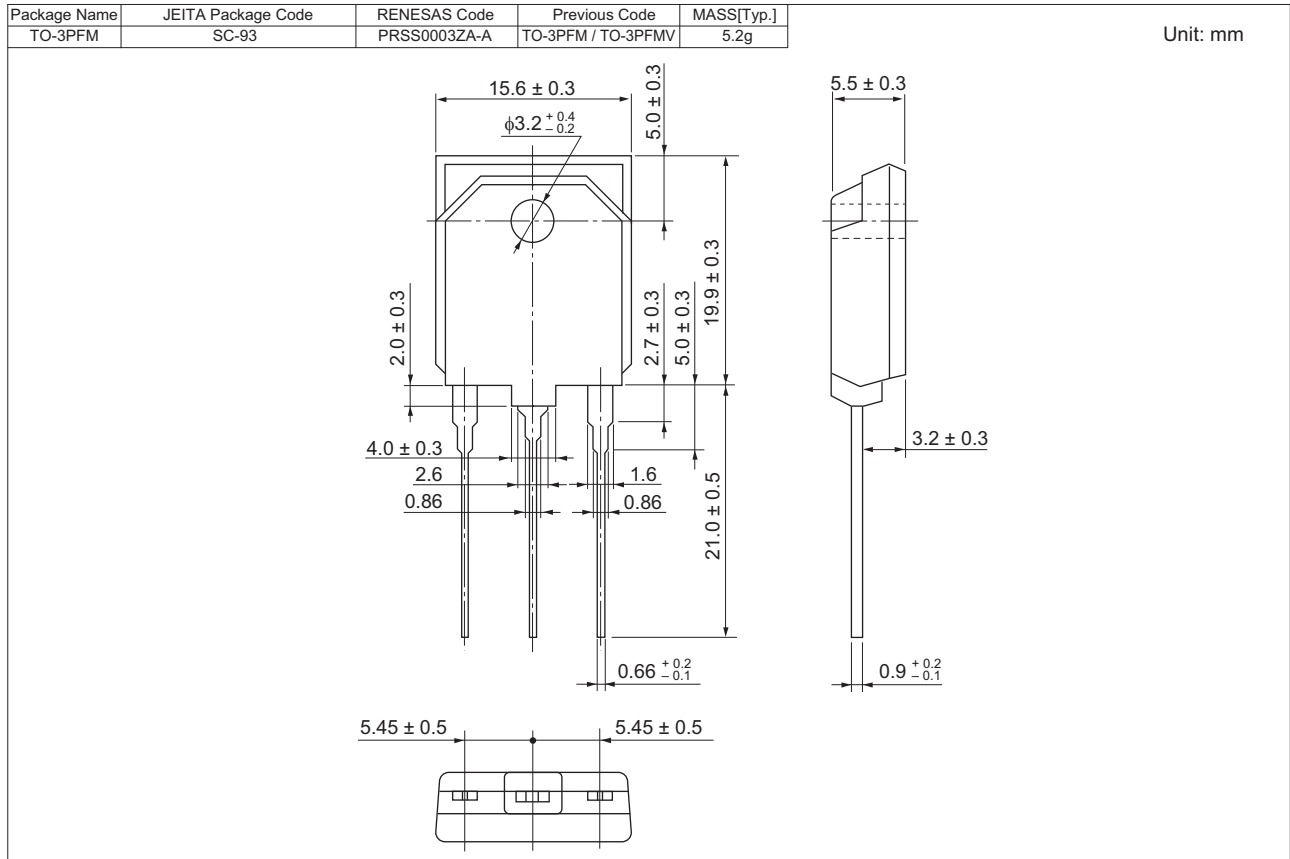
Switching Time Test Circuit



Waveform



### Package Dimensions



### Ordering Information

| Orderable Part Number | Quantity | Shipping Container |
|-----------------------|----------|--------------------|
| RJP65T43DPM-00#T1     | 360 pcs  | Box (Tube)         |

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