# RJP65T43DPM

## 650V - 20A - IGBT
## High Speed Switching

R07DS1201EJ0200
Rev.2.00
Dec.01.2020

### Features

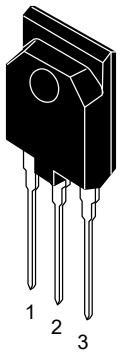
- Trench gate and thin wafer technology (G7H series)
- Isolated package
- Low collector to emitter saturation voltage
  $V_{CE(sat)}$ = 1.8 V typ. (at $I_C$ = 20 A, $V_{GE}$ = 15 V, Ta = 25 °C)
- High speed switching
  $t_f$ = 28 ns typ. (at $V_{CC}$ = 400 V, $V_{GE}$ = 15 V, $I_C$ = 20 A, $R_g$ = 10 Ω, Ta = 25 °C)
- Operation frequency (20 kHz ≤ f ≤ 100kHz)
- Not guarantee short circuit withstand time
- Applications: PFC
- Quality grade: Standard

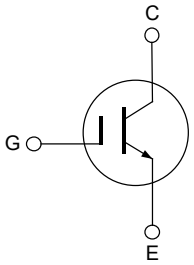
### Key Performance

| Type | $V_{CES}$ | $I_C$ | $V_{CE(sat)}$, $T_C$=25°C | $T_j$ |
|---|---|---|---|---|
| RJP65T43DPM | 650 V | 20 A | 1.8 V | 175 °C |

### Outline

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




1. Gate
2. Collector
3. Emitter

## Absolute Maximum Ratings

(Tc = 25 °C)

| Item | | Symbol | Ratings | Unit |
|---|---|---|---|---|
| Collector to emitter voltage | | $V_{CES}$ | 650 | V |
| Gate to emitter voltage | | $V_{GES}$ | ±30 | V |
| Collector current | Tc = 25 °C | $I_C$ Notes1 | 40 | A |
| | Tc = 100 °C | $I_C$ Notes1 | 20 | A |
| Collector peak current | | ic(peak) Notes1 | 150 | A |
| Collector dissipation | | $P_C$ | 68.8 | W |
| Junction temperature | | Tj Notes2 | 175 | °C |
| Storage temperature | | Tstg | –55 to +150 | °C |

Note: Continuous heavy condition (e.g. high temperature/voltage/current or high variation of temperature) may affect a reliability even if it is within the absolute maximum ratings. Please consider derating condition for appropriate reliability in reference Renesas Semiconductor Reliability Handbook (Recommendation for Handling and Usage of Semiconductor Devices) and individual reliability data.

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

## Thermal Resistance Characteristics

(Tc = 25 °C)

| Item | Symbol | Max. Value Notes3 | Unit |
|---|---|---|---|
| Junction to case thermal resistance | $R_{th(j-c)}$ | 2.18 | °C/W |

Notes: 3. Designed target value on Renesas measurement condition. (Not tested)

## Electrical Characteristics

(Tc = 25 °C)

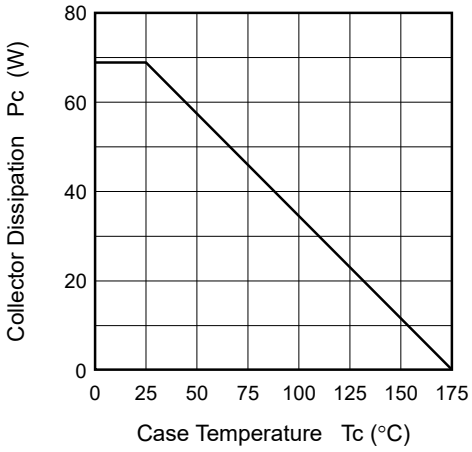
| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Collector to emitter leakage current | $I_{CES}$ | — | — | 1 | μA | $V_{CE}$ = 650 V, $V_{GE}$ = 0 V |
| Gate to emitter leakage current | $I_{GES}$ | — | — | ±1 | μA | $V_{GE}$ = ±30 V, $V_{CE}$ = 0 V |
| Gate to emitter threshold voltage | $V_{GE(th)}$ | 4.0 | — | 7.0 | V | $V_{CE}$ = 10V, $I_C$ = 0.67 mA |
| Collector to emitter saturation voltage | $V_{CE(sat)}$ | — | 1.8 | 2.4 | V | $I_C$ = 20 A, $V_{GE}$ = 15V Notes4 |
| Input capacitance | Cies | — | 1320 | — | pF | $V_{CE}$ = 25 V<br>$V_{GE}$ = 0 V<br>f = 1 MHz |
| Output capacitance | Coes | — | 37 | — | pF | |
| Reveres transfer capacitance | Cres | — | 26 | — | pF | |
| Total gate charge | Qg | — | 70 | — | nC | $V_{GE}$ = 15 V<br>$V_{CE}$ = 400 V<br>$I_C$ = 20 A |
| Gate to emitter charge | Qge | — | 8 | — | nC | |
| Gate to collector charge | Qgc | — | 31 | — | nC | |
| Turn-on delay time | $t_{d(on)}$ | — | 30 | — | Ns | $V_{CC}$ = 400 V<br>$V_{GE}$ = 15 V<br>$I_C$ = 20 A<br>Rg = 10 Ω<br>$T_C$ = 25 °C<br>Inductive load Notes5 |
| Rise time | $t_r$ | — | 20 | — | ns | |
| Turn-off delay time | $t_{d(off)}$ | — | 107 | — | ns | |
| Fall time | $t_f$ | — | 28 | — | ns | |
| Turn-on loss energy | $E_{on}$ | — | 0.17 | — | mJ | |
| Turn-off loss energy | $E_{off}$ | — | 0.11 | — | mJ | |
| Total switching energy | $E_{total}$ | — | 0.28 | — | mJ | |
| Turn-on delay time | $t_{d(on)}$ | — | 31 | — | Ns | $V_{CC}$ = 400 V<br>$V_{GE}$ = 15 V<br>$I_C$ = 20 A<br>Rg = 10 Ω<br>$T_C$ = 150 °C<br>Inductive load Notes5 |
| Rise time | $t_r$ | — | 20 | — | ns | |
| Turn-off delay time | $t_{d(off)}$ | — | 114 | — | ns | |
| Fall time | $t_f$ | — | 51 | — | ns | |
| Turn-on loss energy | $E_{on}$ | — | 0.25 | — | mJ | |
| Turn-off loss energy | $E_{off}$ | — | 0.24 | — | mJ | |
| Total switching energy | $E_{total}$ | — | 0.49 | — | mJ | |

Notes: 4. Pulse test

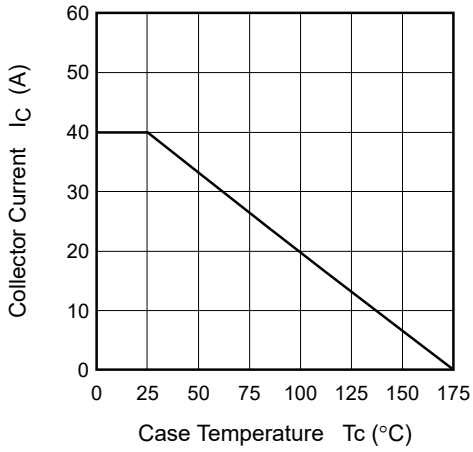
5. Switching time test circuit and waveform are shown below.

## Main Characteristics

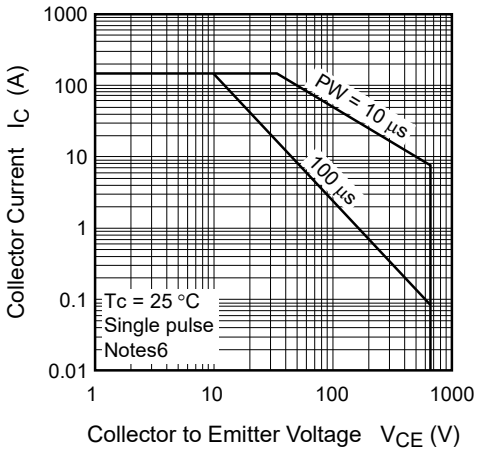
Collector Dissipation vs. Case Temperature



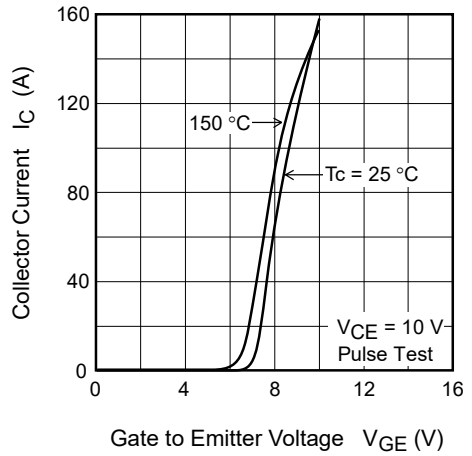

Maximum DC Collector Current vs. Case Temperature



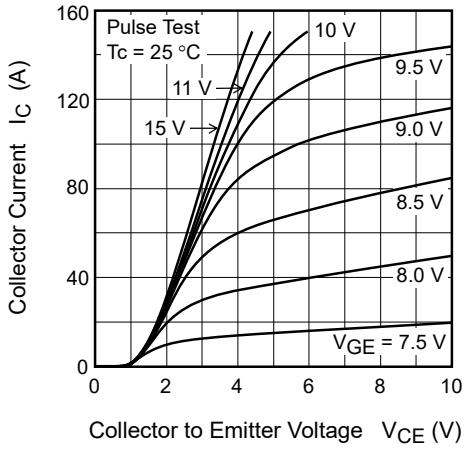

Forward Bias Safe Operation Area



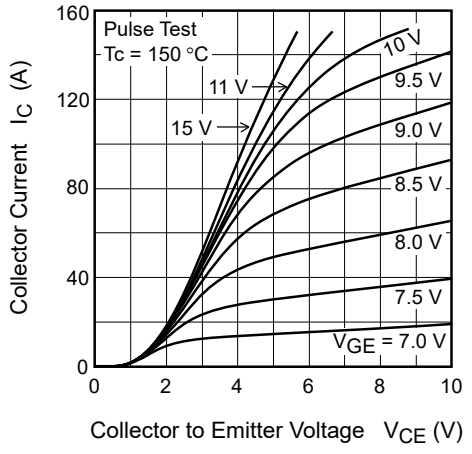

Typical Transfer Characteristics




Typical Output Characteristics

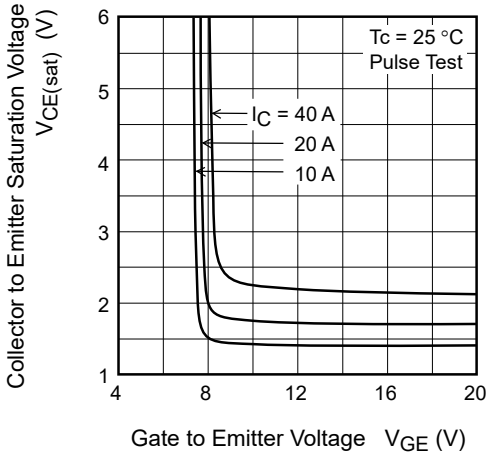



Typical Output Characteristics

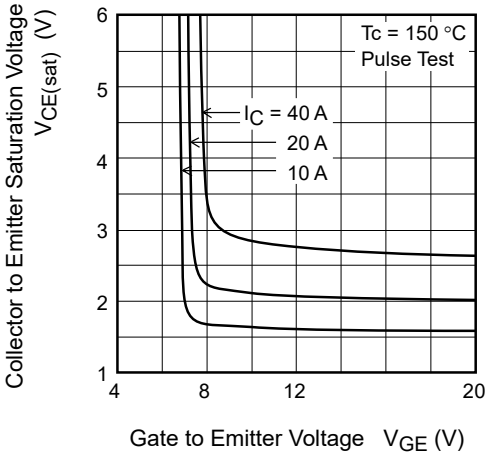



Notes: 6. Designed target value on Renesas measurement condition. (Not tested)
Renesas recommends that operating conditions are designed according to a document “Power MOS FET・IGBT Attention of Handling Semiconductor Devices”.

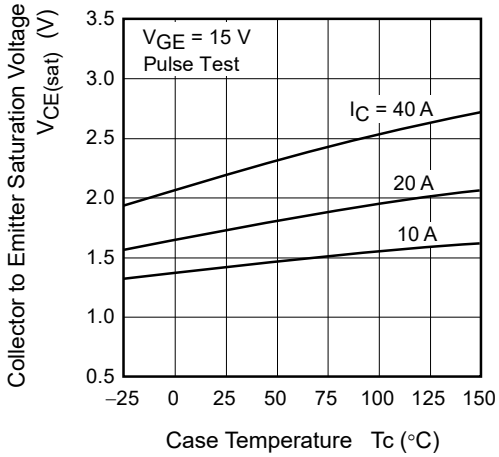
Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage (Typical)



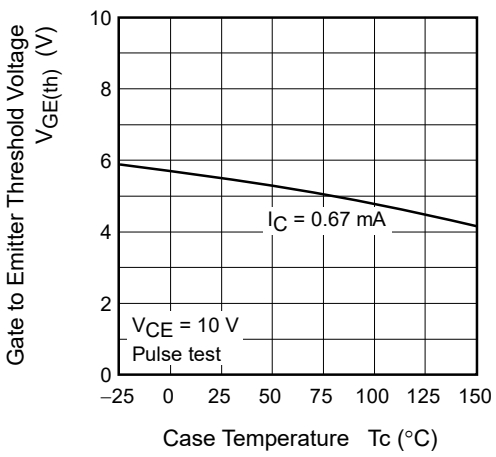

Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage (Typical)



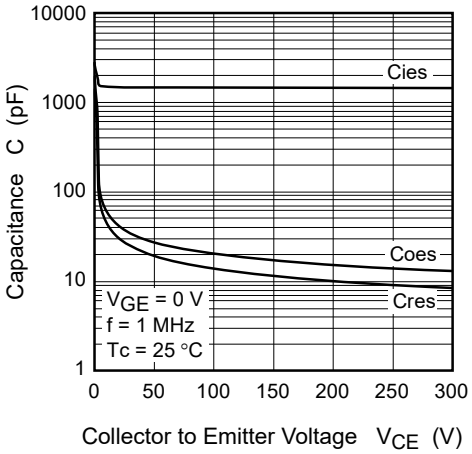

Collector to Emitter Saturation Voltage vs. Case Temperature (Typical)



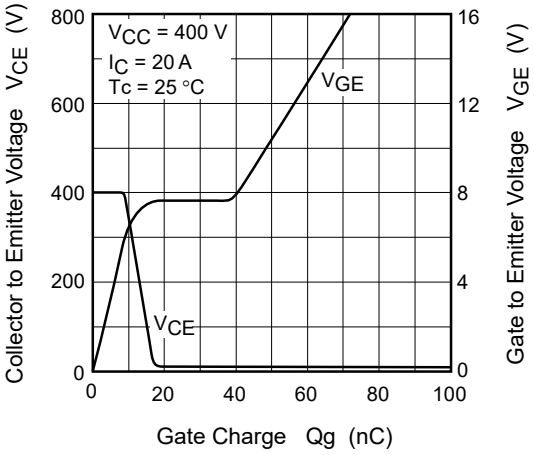

Gate to Emitter Cutoff Voltage vs. Case Temperature (Typical)



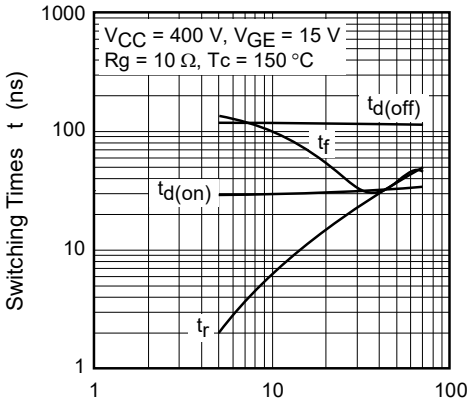

Typical Capacitance vs. Collector to Emitter Voltage



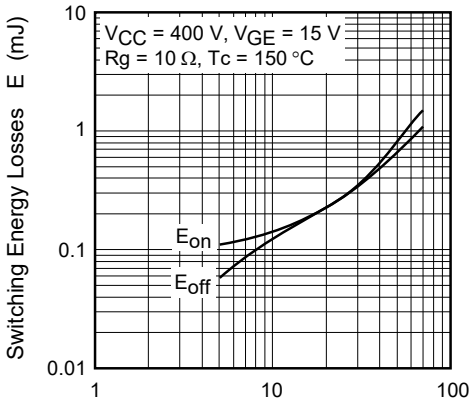

Dynamic Input Characteristics (Typical)



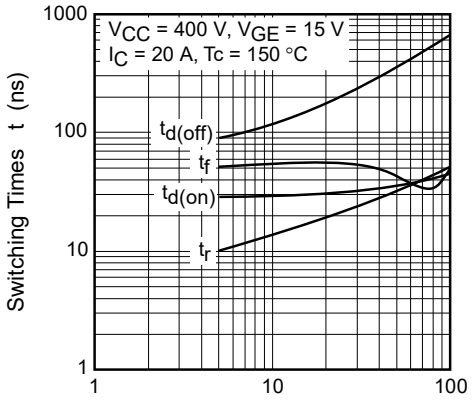
Switching Characteristics (Typical) (1)



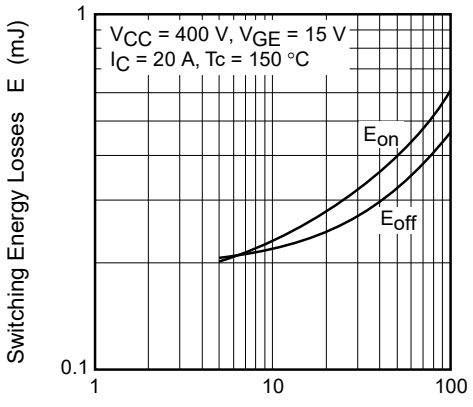

Switching Characteristics (Typical) (2)



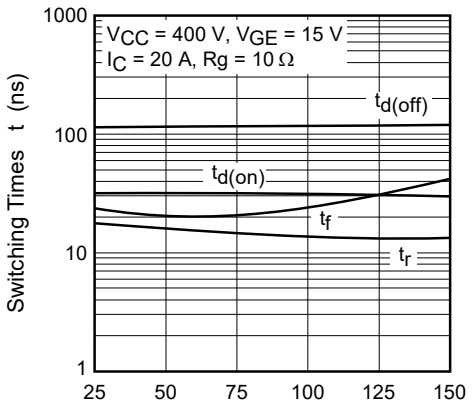

Switching Characteristics (Typical) (3)



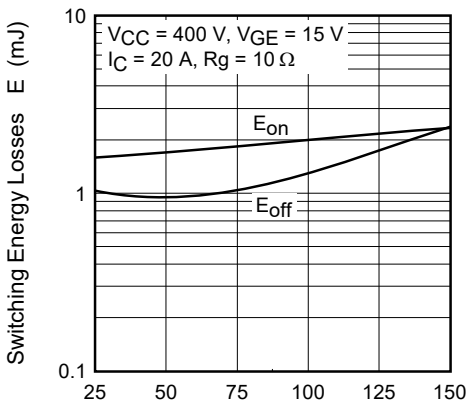

Switching Characteristics (Typical) (4)



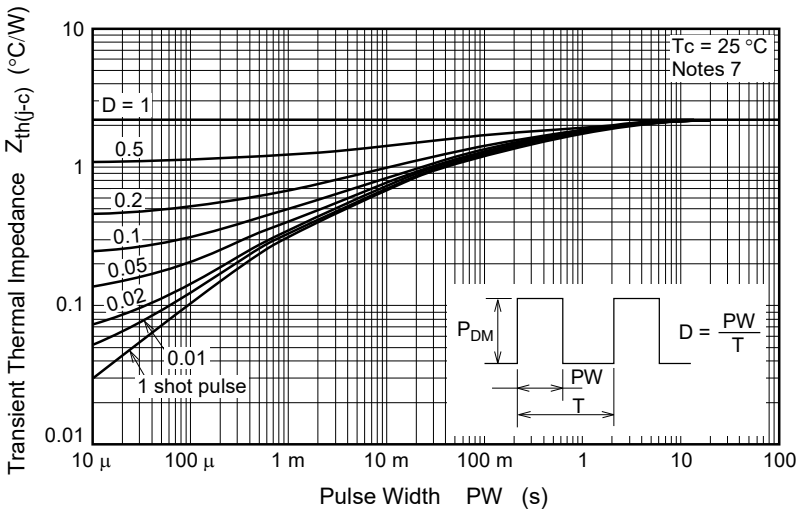

Switching Characteristics (Typical) (5)



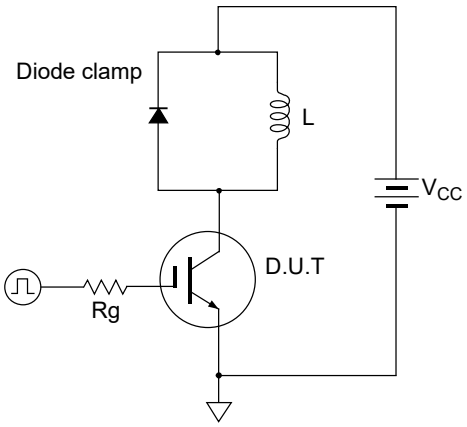

Switching Characteristics (Typical) (6)



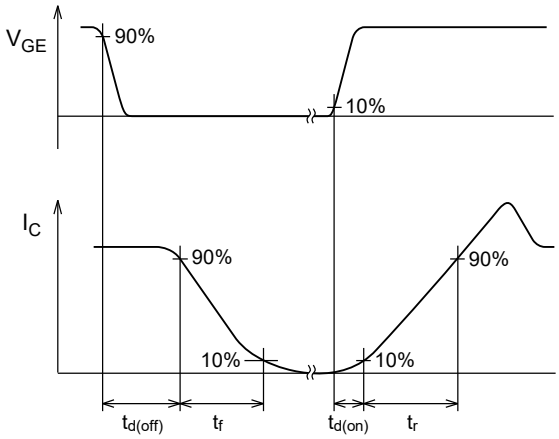
Transient Thermal Impedance vs. Pulse Width




Switching Time Test Circuit




Waveform

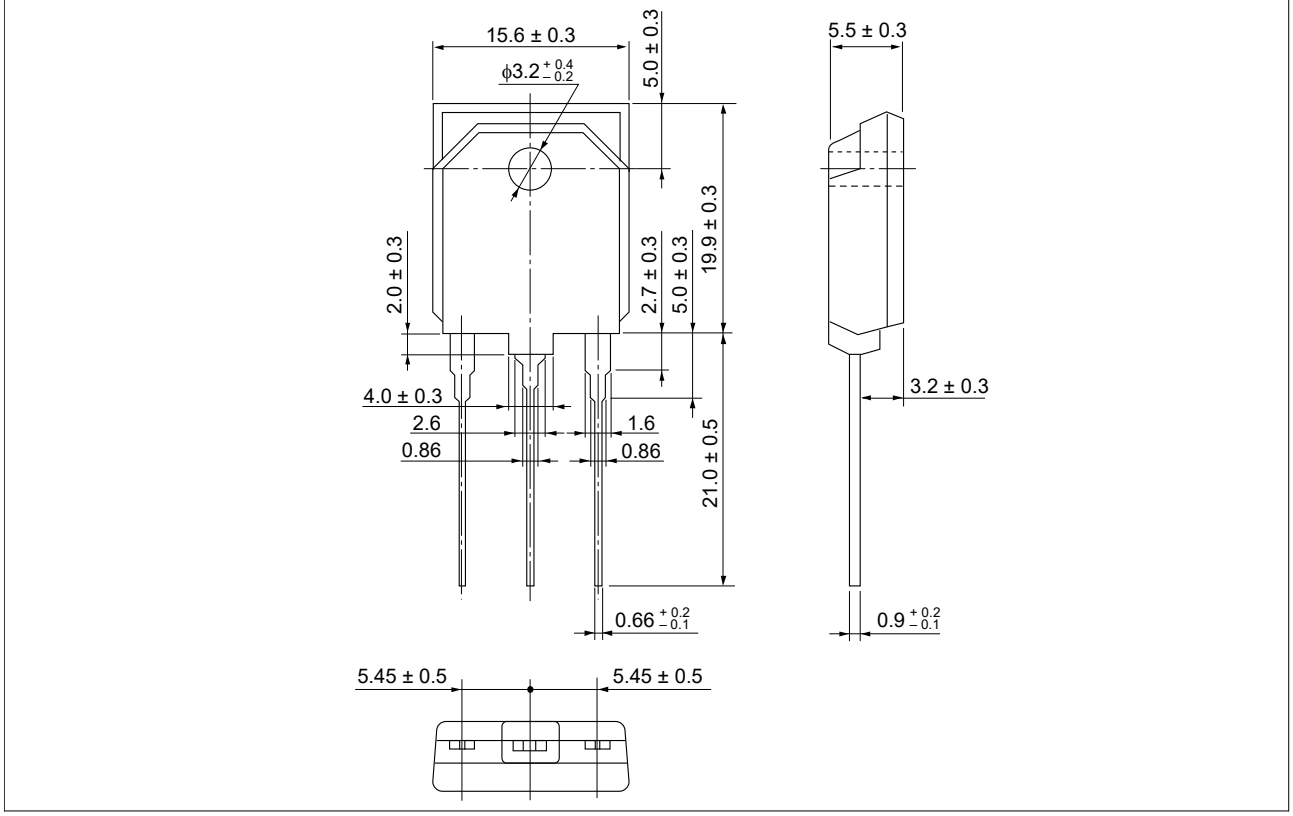



Notes: 7. Designed target value on Renesas measurement condition. (Not tested)

## Package Dimensions

| Package Name | JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|---|
| TO-3PFM | SC-93 | PRSS0003ZA-A | TO-3PFM / TO-3PFMV | 5.2g |

Unit: mm




## Ordering Information

| Orderable Part No. | Quantity | Shipping Container |
|---|---|---|
| RJP65T43DPM-00#T1 | 360 pcs | Box (Tube) |

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