

# RJH60F3DPQ-A0

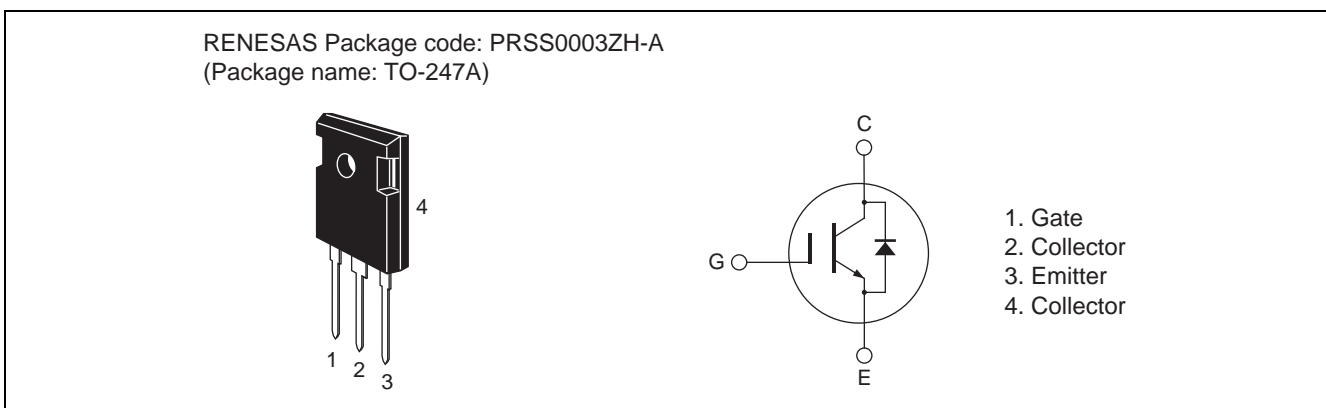
600 V - 20 A - IGBT  
High Speed Power Switching

R07DS0391EJ0200  
Rev.2.00  
Jul 22, 2011

## Features

- Low collector to emitter saturation voltage  
 $V_{CE(sat)} = 1.4 \text{ V typ. (} I_C = 20 \text{ A, } V_{GE} = 15 \text{ V, } T_a = 25^\circ\text{C)}$
- Built in fast recovery diode in one package
- Trench gate and thin wafer technology
- High speed switching  
 $t_f = 92 \text{ ns typ. (at } I_C = 30 \text{ A, } V_{CE} = 400 \text{ V, } V_{GE} = 15 \text{ V, } R_g = 5 \Omega, T_a = 25^\circ\text{C, inductive load)}$

## Outline



## Absolute Maximum Ratings

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

| Item  | Symbol                          | Ratings     | Unit               |   |
|---|---------------------------------|-------------|--------------------|---|
| Collector to Emitter voltage                    | $V_{CES}$                       | 600         | V                  |   |
| Gate to Emitter voltage                         | $V_{GES}$                       | $\pm 30$    | V                  |   |
| Collector current                               | $T_c = 25^\circ\text{C}$        | $I_C$       | 40                 | A |
|   | $T_c = 100^\circ\text{C}$       | $I_C$       | 20                 | A |
| Collector peak current                          | $i_{c(peak)}$ <sup>Note1</sup>  | 80          | A                  |   |
| Collector to emitter diode forward peak current | $i_{DF(peak)}$ <sup>Note2</sup> | 80          | A                  |   |
| Collector dissipation                           | $P_C$                           | 178.5       | W                  |   |
| Junction to case thermal impedance (IGBT)       | $\theta_{j-c}$                  | 0.7         | $^\circ\text{C/W}$ |   |
| Junction to case thermal impedance (Diode)      | $\theta_{j-c}$                  | 2.0         | $^\circ\text{C/W}$ |   |
| Channel temperature                             | $T_j$                           | 150         | $^\circ\text{C}$   |   |
| Storage temperature                             | $T_{stg}$                       | -55 to +150 | $^\circ\text{C}$   |   |

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

2.  $PW \leq 5 \mu\text{s}$ , duty cycle  $\leq 1\%$

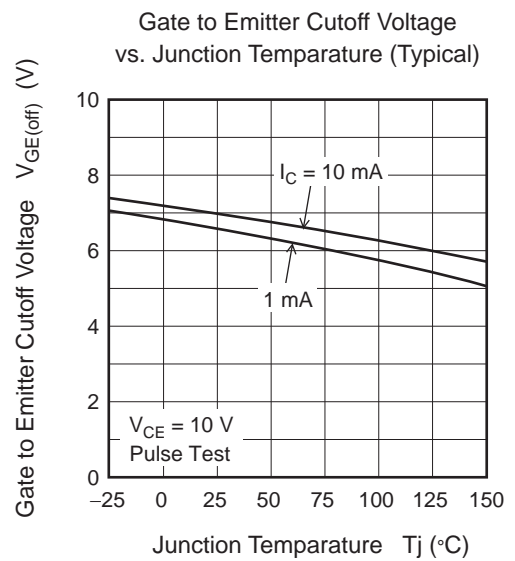
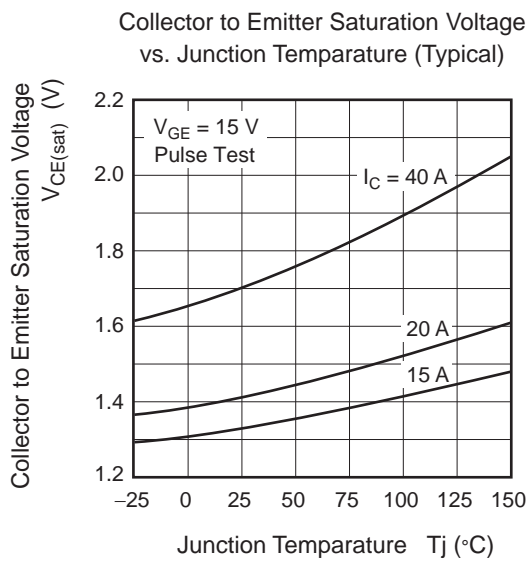
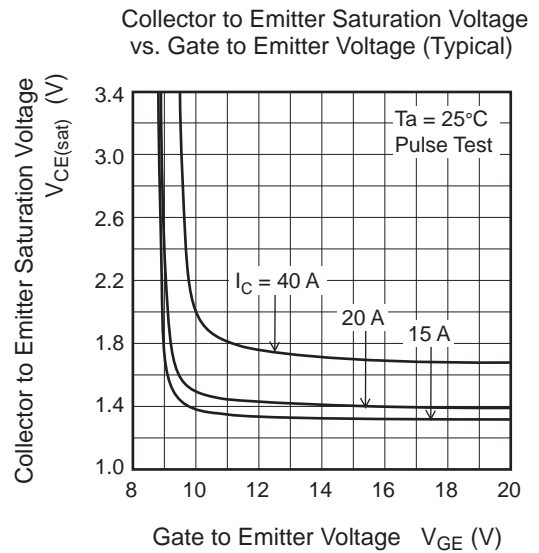
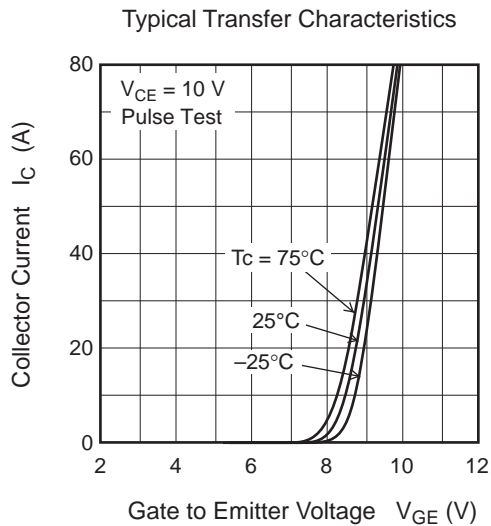
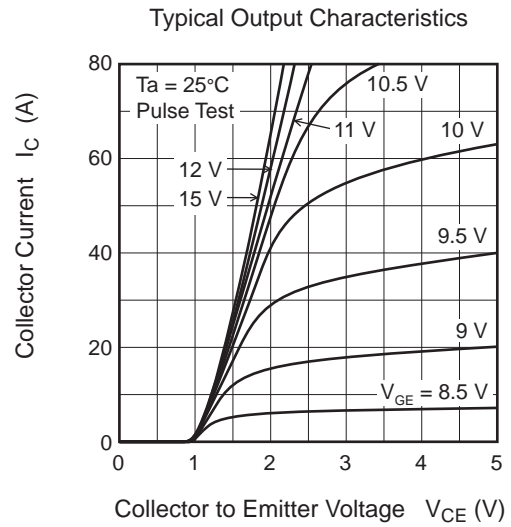
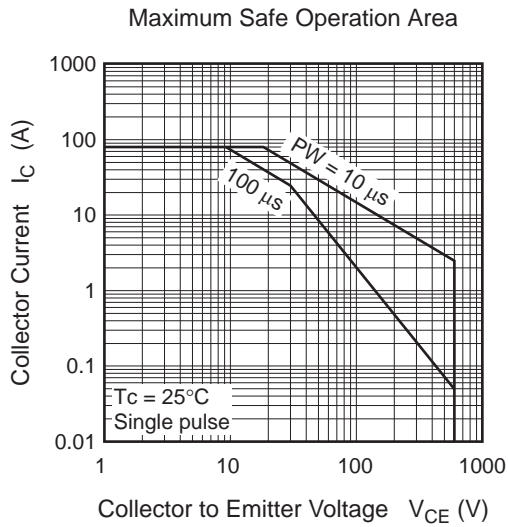
## Electrical Characteristics

(T<sub>j</sub> = 25°C)

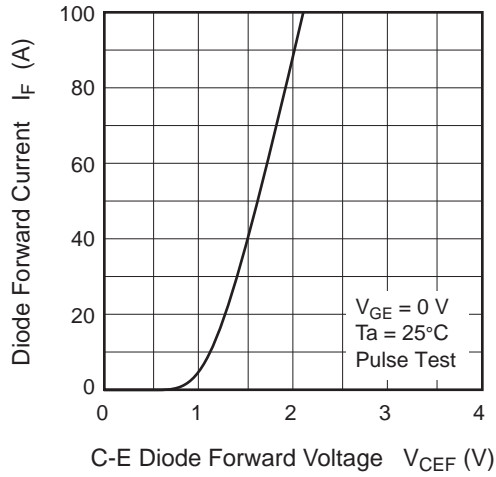
| Item                                    | Symbol               | Min | Typ  | Max  | Unit | Test Conditions  |
|---|----------------------|-----|------|------|------|--|
| Zero gate voltage collector current     | I <sub>CES</sub>     | —   | —    | 100  | μA   | V <sub>CE</sub> = 600V, V <sub>GE</sub> = 0                    |
| Gate to emitter leak current            | I <sub>GES</sub>     | —   | —    | ±1   | μA   | V <sub>GE</sub> = ±30 V, V <sub>CE</sub> = 0                   |
| Gate to emitter cutoff voltage          | V <sub>GE(off)</sub> | 4   | —    | 8    | V    | V <sub>CE</sub> = 10 V, I <sub>C</sub> = 1 mA                  |
| Collector to emitter saturation voltage | V <sub>CE(sat)</sub> | —   | 1.4  | 1.82 | V    | I <sub>C</sub> = 20 A, V <sub>GE</sub> = 15 V <sup>Note3</sup> |
|   |                      | —   | 1.6  | —    | V    | I <sub>C</sub> = 40 A, V <sub>GE</sub> = 15 V <sup>Note3</sup> |
| Input capacitance                       | C <sub>ies</sub>     | —   | 1260 | —    | pF   | V <sub>CE</sub> = 25 V   |
| Output capacitance                      | C <sub>oes</sub>     | —   | 73   | —    | pF   | V <sub>GE</sub> = 0  |
| Reverse transfer capacitance            | C <sub>res</sub>     | —   | 21   | —    | pF   | f = 1 MHz  |
| Switching time                          | t <sub>d(on)</sub>   | —   | 44   | —    | ns   | I <sub>C</sub> = 30 A  |
|   | t <sub>r</sub>       | —   | 96   | —    | ns   | V <sub>CE</sub> = 400 V, V <sub>GE</sub> = 15 V                |
|   | t <sub>d(off)</sub>  | —   | 65   | —    | ns   | R <sub>g</sub> = 5 Ω <sup>Note3</sup>                          |
|   | t <sub>f</sub>       | —   | 92   | —    | ns   | Inductive Load   |
| C-E diode forward voltage               | V <sub>ECF1</sub>    | —   | 1.2  | 2.1  | V    | I <sub>F</sub> = 20 A <sup>Note3</sup>                         |
|   | V <sub>ECF2</sub>    | —   | 1.5  | —    | V    | I <sub>F</sub> = 40 A <sup>Note3</sup>                         |
| C-E diode reverse recovery time         | t <sub>rr</sub>      | —   | 90   | —    | ns   | I <sub>F</sub> = 20 A<br>di <sub>F</sub> /dt = 100 A/μs        |

Notes: 3. Pulse test

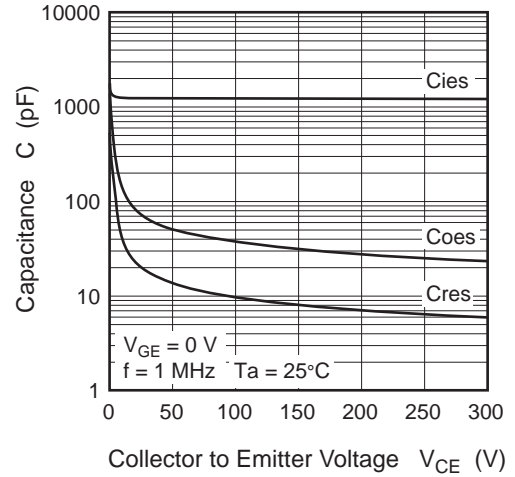
### Main Characteristics



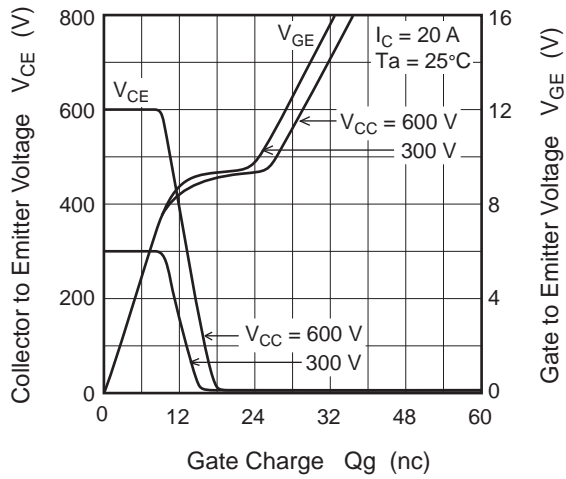
Forward Current vs. Forward Voltage (Typical)



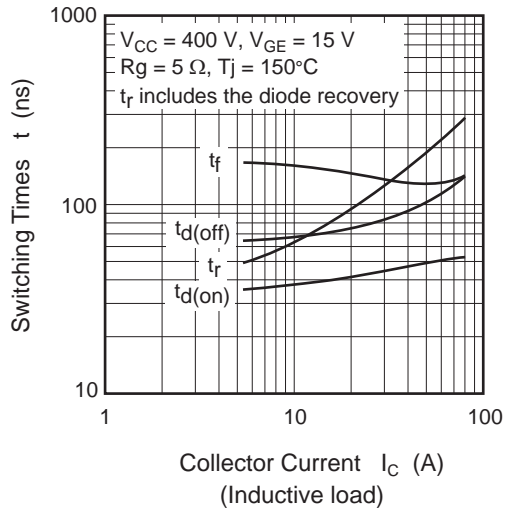
Typical Capacitance vs. Collector to Emitter Voltage



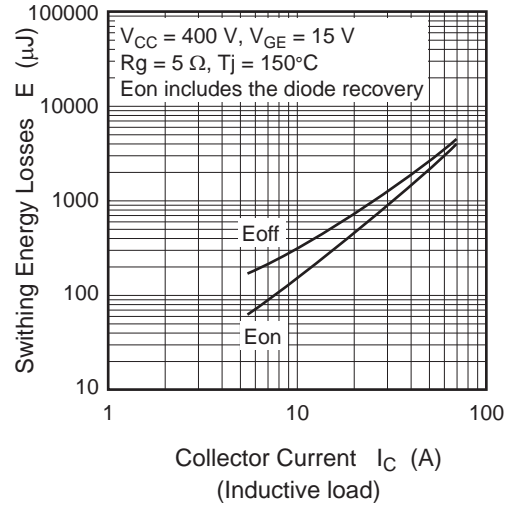
Dynamic Input Characteristics (Typical)



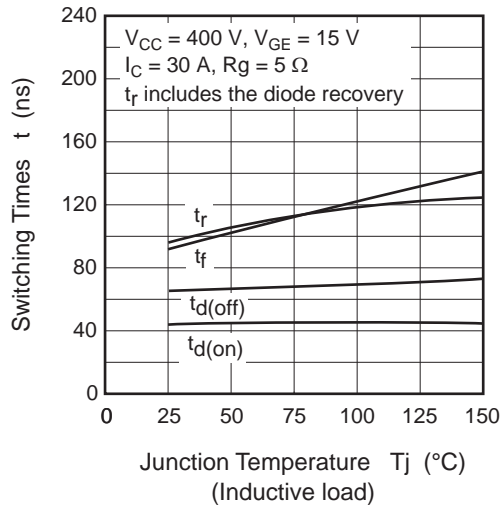
Switching Characteristics (Typical) (1)



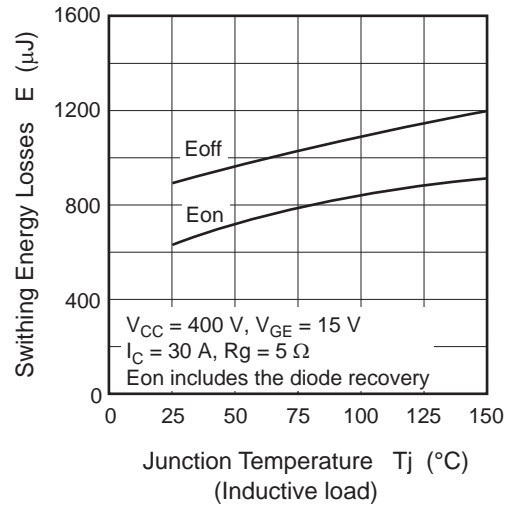
Switching Characteristics (Typical) (2)

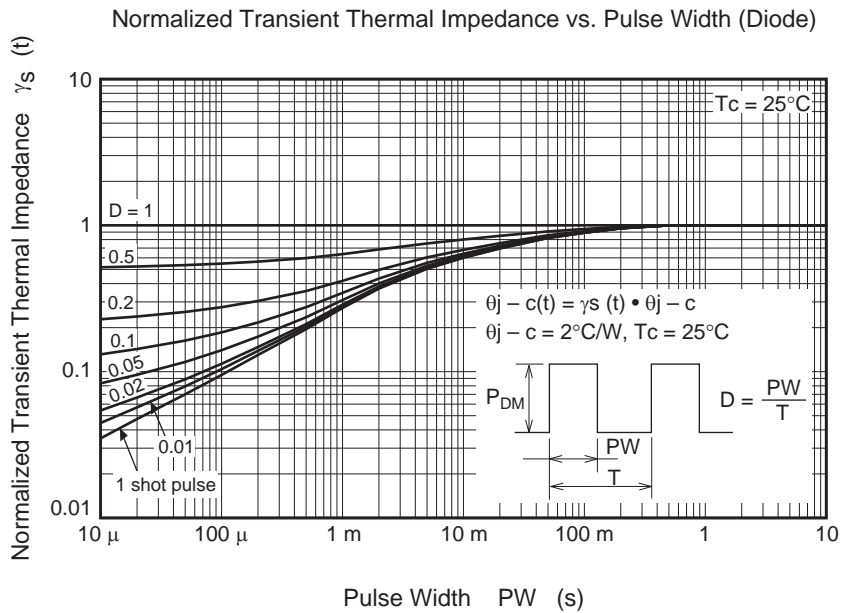
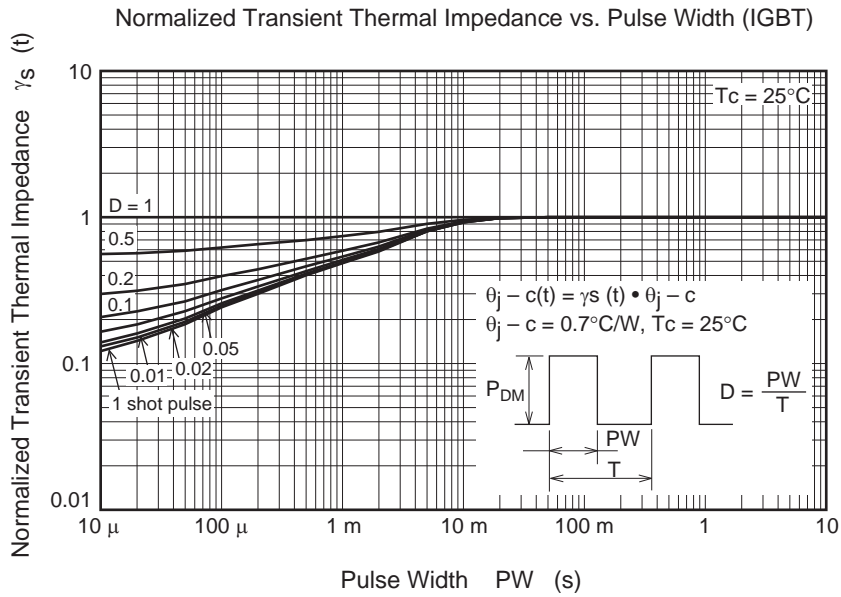


Switching Characteristics (Typical) (3)

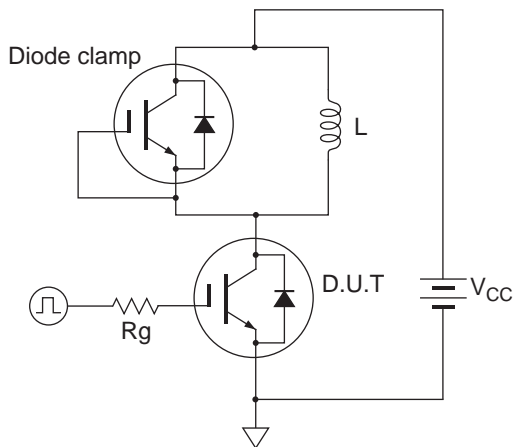


Switching Characteristics (Typical) (4)

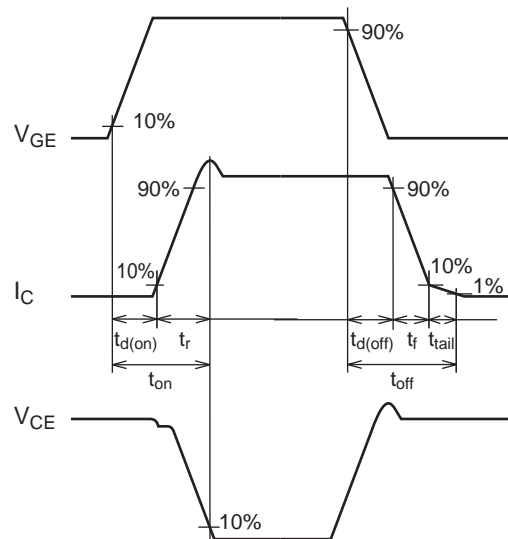




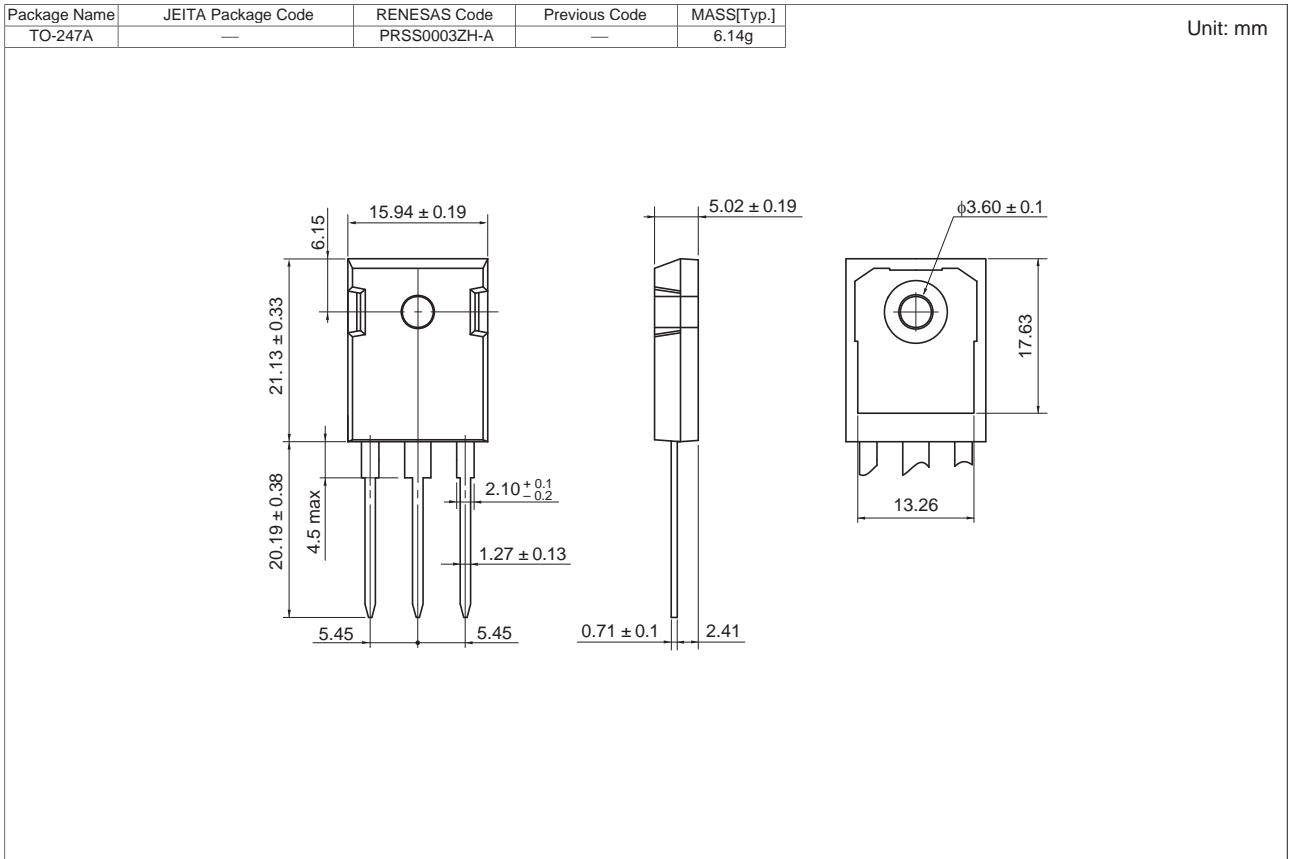
Switching Time Test Circuit



Waveform



### Package Dimensions



### Ordering Information

| Orderable Part Number | Quantity | Shipping Container |
|-----------------------|----------|--------------------|
| RJH60F3DPQ-A0-T0      | 240 pcs  | Box (Tube)         |

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