

# RJH60A83RDPD-A0

600V - 10A - IGBT

Application: Inverter

R07DS1093EJ0200

Rev.2.00

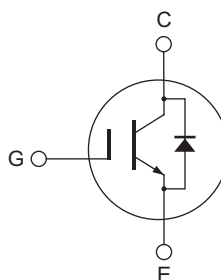
Mar 24, 2015

## Features

- Reverse conducting IGBT with monolithic diode
- Short circuit withstand time (5  $\mu$ s typ.)
- Low collector to emitter saturation voltage  
 $V_{CE(sat)} = 2.1$  V typ. (at  $I_C = 10$  A,  $V_{GE} = 15$  V,  $T_a = 25^\circ\text{C}$ )
- Built-in fast recovery diode ( $t_{tr} = 130$  ns typ.) in one package
- Trench gate and thin wafer technology
- High speed switching  
 $t_f = 45$  ns typ. (at  $V_{CC} = 300$  V,  $V_{GE} = 15$  V,  $I_C = 10$  A,  $R_g = 5$   $\Omega$ ,  $T_a = 25^\circ\text{C}$ , inductive load)

## Outline

RENESAS Package code: PRSS0004ZK-A  
(Package name : TO-252A)



1. Gate
2. Collector
3. Emitter
4. Collector

## Absolute Maximum Ratings

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

| Item                                                 | Symbol                          | Ratings     | Unit                        |
|------------------------------------------------------|---------------------------------|-------------|-----------------------------|
| Collector to emitter voltage / diode reverse voltage | $V_{CES} / V_R$                 | 600         | V                           |
| Gate to emitter voltage                              | $V_{GES}$                       | $\pm 30$    | V                           |
| Collector current                                    | $T_C = 25^\circ\text{C}$        | $I_C$       | 20                          |
|                                                      | $T_C = 100^\circ\text{C}$       | $I_C$       | 10                          |
| Collector peak current                               | $I_{C(peak)}$ <sup>Note1</sup>  | 40          | A                           |
| Collector to emitter diode forward current           | $I_{DF}$                        | 10          | A                           |
| Collector to emitter diode forward peak current      | $I_{DF(peak)}$ <sup>Note1</sup> | 40          | A                           |
| Collector dissipation                                | $P_C$ <sup>Note2</sup>          | 51          | W                           |
| Junction to case thermal resistance                  | $\theta_{j-c}$ <sup>Note2</sup> | 2.45        | $^\circ\text{C} / \text{W}$ |
| Junction temperature                                 | $T_j$                           | 150         | $^\circ\text{C}$            |
| Storage temperature                                  | $T_{stg}$                       | -55 to +150 | $^\circ\text{C}$            |

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

2. Value at  $T_C = 25^\circ\text{C}$

## Electrical Characteristics

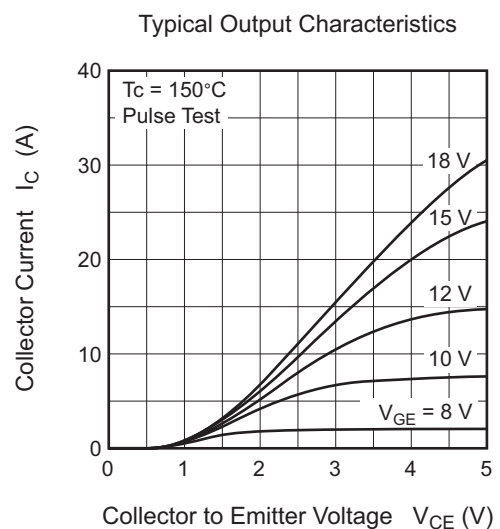
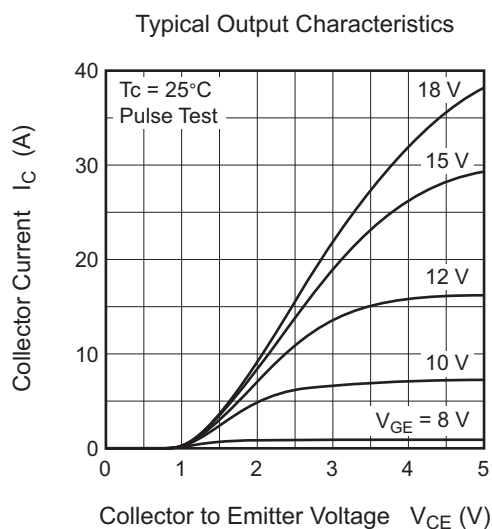
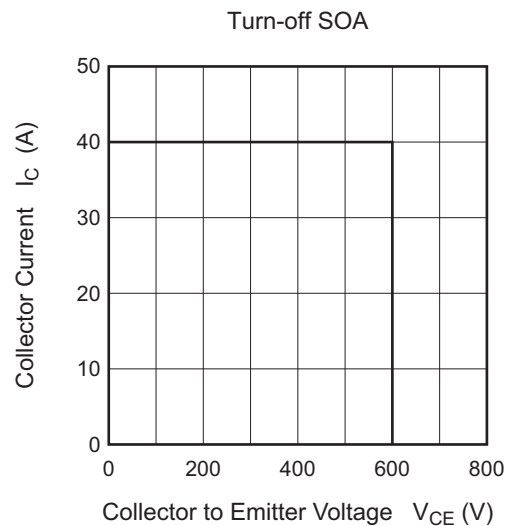
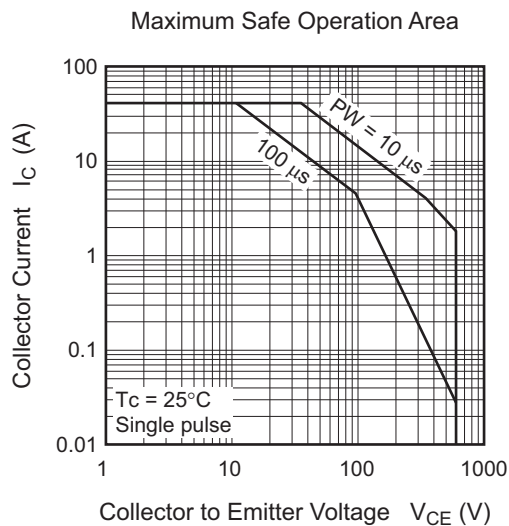
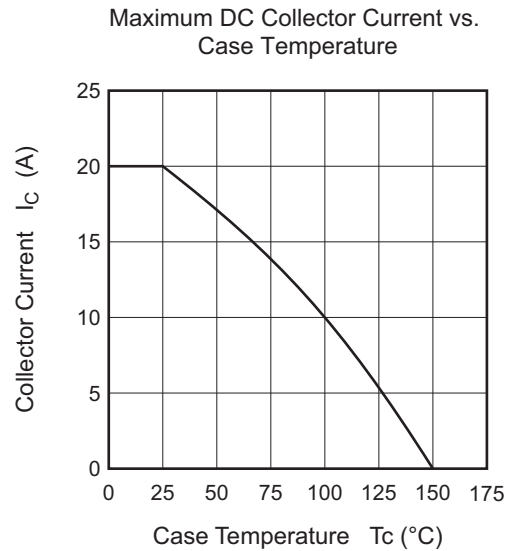
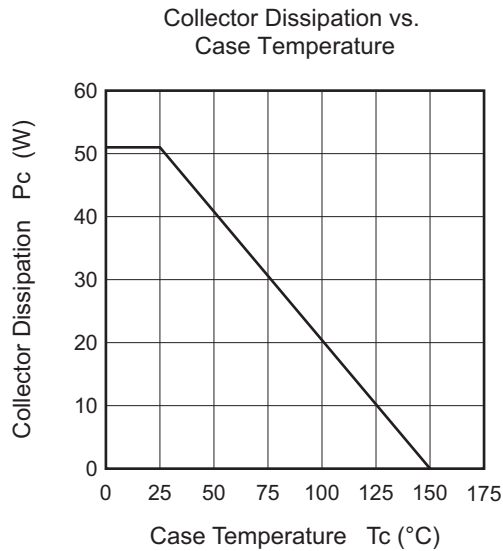
(Ta = 25°C)

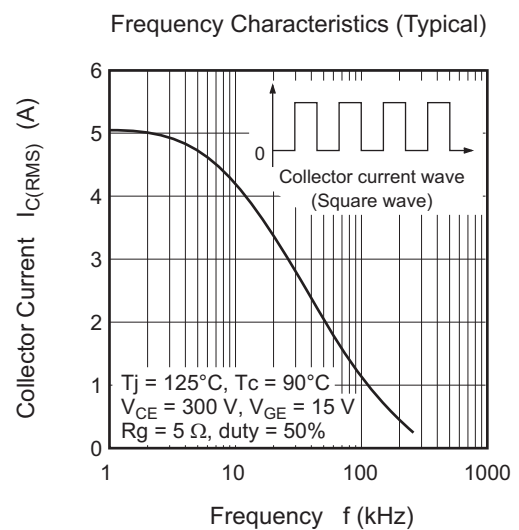
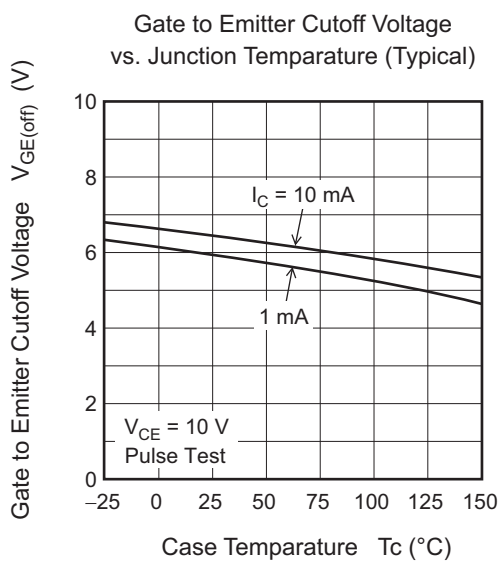
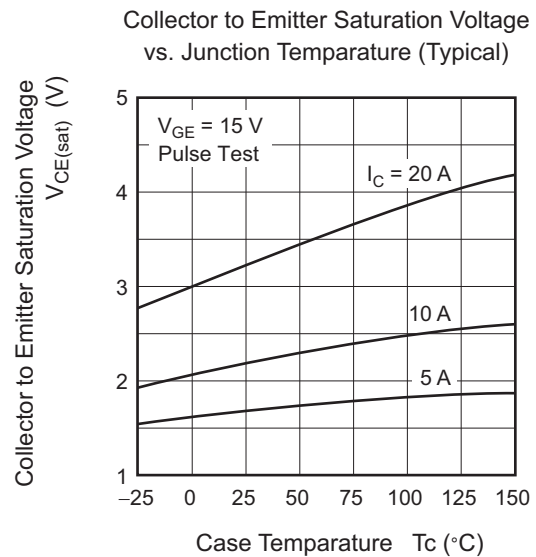
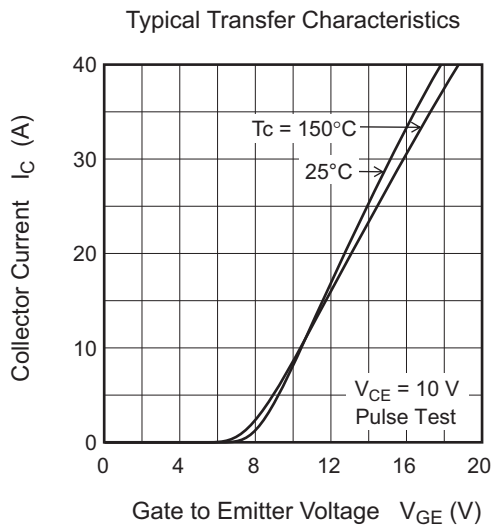
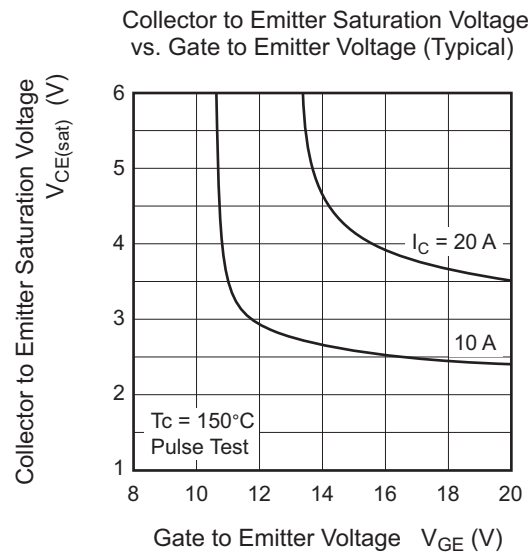
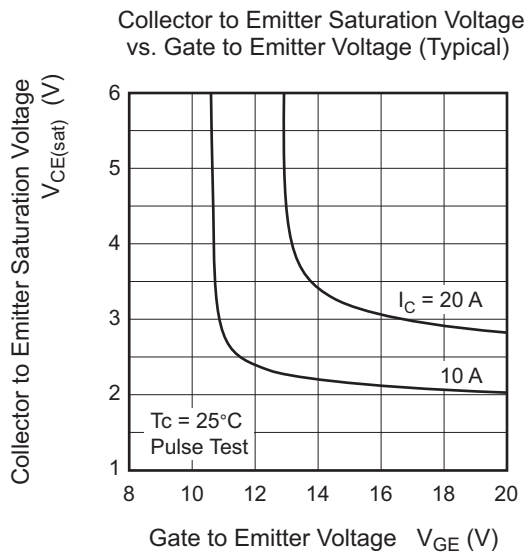
| Item                                                           | Symbol          | Min | Typ  | Max       | Unit    | Test Conditions                                                                           |
|----------------------------------------------------------------|-----------------|-----|------|-----------|---------|-------------------------------------------------------------------------------------------|
| Zero gate voltage collector current<br>/ diode reverse current | $I_{CES} / I_R$ | —   | —    | 1         | $\mu A$ | $V_{CE} = 600 V, V_{GE} = 0 V$                                                            |
| Gate to emitter leak current                                   | $I_{GES}$       | —   | —    | $\pm 100$ | nA      | $V_{GE} = \pm 30 V, V_{CE} = 0 V$                                                         |
| Gate to emitter cutoff voltage                                 | $V_{GE(off)}$   | 4.5 | —    | 7.5       | V       | $V_{CE} = 10 V, I_C = 1 mA$                                                               |
| Collector to emitter saturation voltage                        | $V_{CE(sat)}$   | —   | 2.1  | 2.6       | V       | $I_C = 10 A, V_{GE} = 15 V$ Note3                                                         |
|                                                                | $V_{CE(sat)}$   | —   | 3.1  | —         | V       | $I_C = 20 A, V_{GE} = 15 V$ Note3                                                         |
| Input capacitance                                              | $C_{ies}$       | —   | 280  | —         | pF      | $V_{CE} = 25 V$<br>$V_{GE} = 0 V$<br>$f = 1 MHz$                                          |
| Output capacitance                                             | $C_{oes}$       | —   | 19   | —         | pF      |                                                                                           |
| Reveres transfer capacitance                                   | $C_{res}$       | —   | 11   | —         | pF      |                                                                                           |
| Total gate charge                                              | $Q_g$           | —   | 19.7 | —         | nC      | $V_{GE} = 15 V$<br>$V_{CE} = 300 V$<br>$I_C = 10 A$                                       |
| Gate to emitter charge                                         | $Q_{ge}$        | —   | 3.4  | —         | nC      |                                                                                           |
| Gate to collector charge                                       | $Q_{gc}$        | —   | 12.0 | —         | nC      |                                                                                           |
| Turn-on delay time                                             | $t_{d(on)}$     | —   | 31   | —         | ns      | $V_{CC} = 300V$<br>$V_{GE} = 15 V$<br>$I_C = 10 A,$<br>$R_g = 5 \Omega$<br>Inductive load |
| Rise time                                                      | $t_r$           | —   | 14   | —         | ns      |                                                                                           |
| Turn-off delay time                                            | $t_{d(off)}$    | —   | 54   | —         | ns      |                                                                                           |
| Fall time                                                      | $t_f$           | —   | 45   | —         | ns      |                                                                                           |
| Turn-on energy                                                 | $E_{on}$        | —   | 0.23 | —         | mJ      |                                                                                           |
| Turn-off energy                                                | $E_{off}$       | —   | 0.16 | —         | mJ      |                                                                                           |
| Total switching energy                                         | $E_{total}$     | —   | 0.39 | —         | mJ      |                                                                                           |
| Short circuit withstand time                                   | $t_{sc}$        | 3.0 | 5.0  | —         | $\mu s$ | $V_{CE} \leq 360 V, V_{GE} = 15 V$<br>$T_j = 100^\circ C$                                 |

|                                   |          |   |      |   |         |                                         |
|-----------------------------------|----------|---|------|---|---------|-----------------------------------------|
| FRD Forward voltage               | $V_F$    | — | 2.3  | — | V       | $I_F = 10 A$ Note3                      |
| FRD reverse recovery time         | $t_{rr}$ | — | 130  | — | ns      | $I_F = 10 A$<br>$di_F/dt = 100 A/\mu s$ |
| FRD reverse recovery charge       | $Q_{rr}$ | — | 0.28 | — | $\mu C$ |                                         |
| FRD peak reverse recovery current | $I_{rr}$ | — | 5.9  | — | A       |                                         |

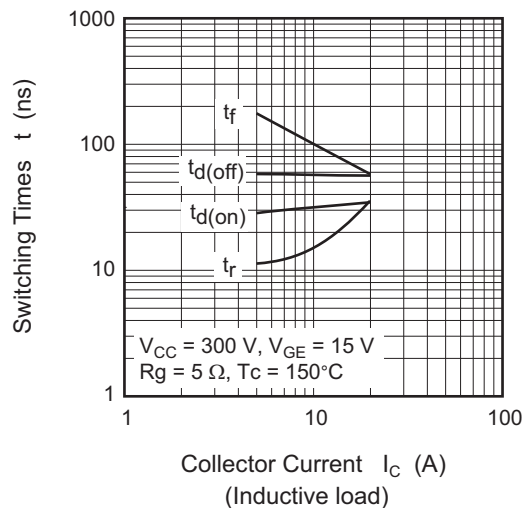
Notes: 3. Pulse test.

## Main Characteristics

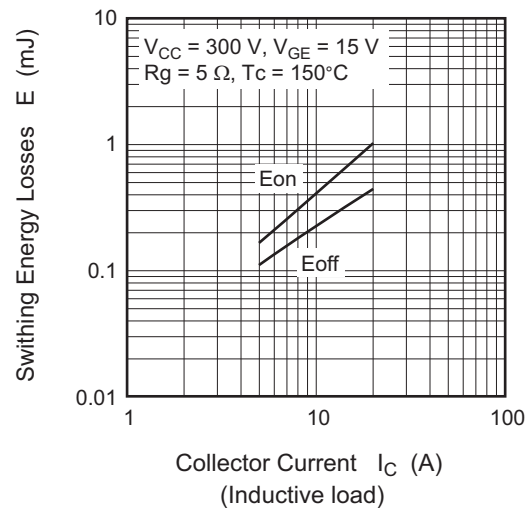




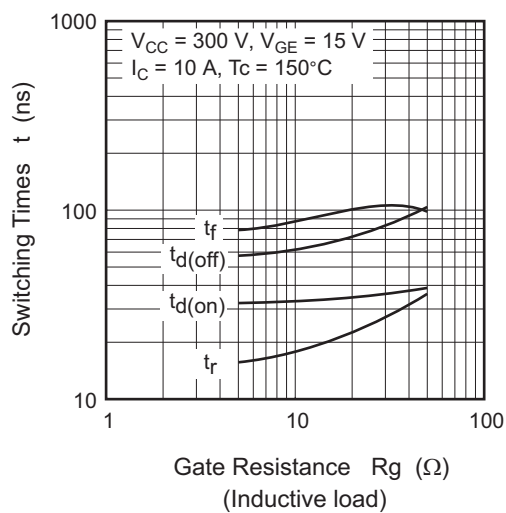
Switching Characteristics (Typical) (1)



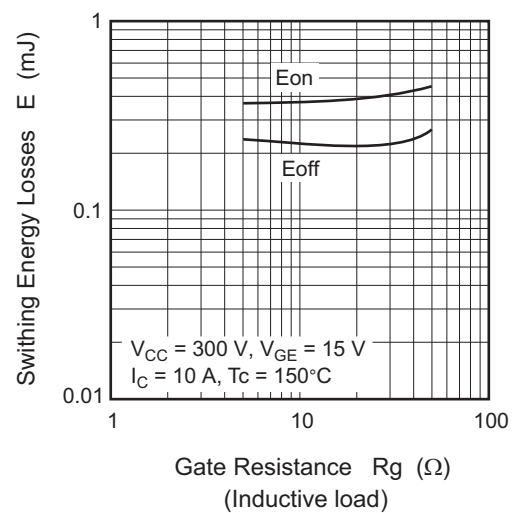
Switching Characteristics (Typical) (2)



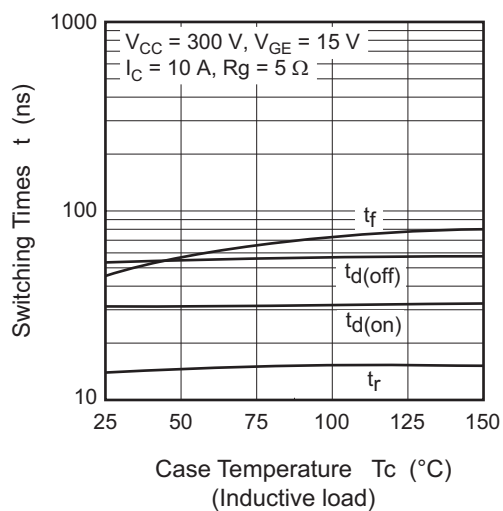
Switching Characteristics (Typical) (3)



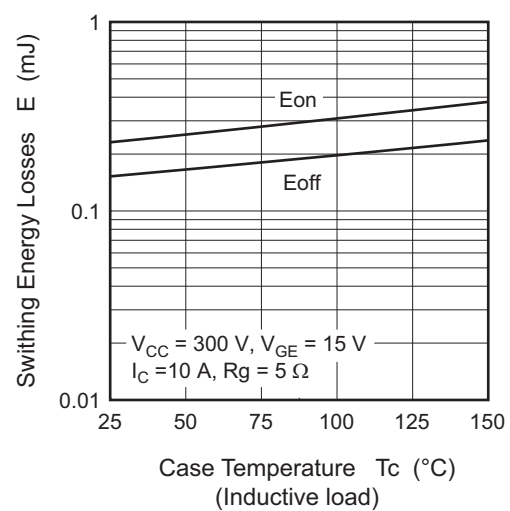
Switching Characteristics (Typical) (4)

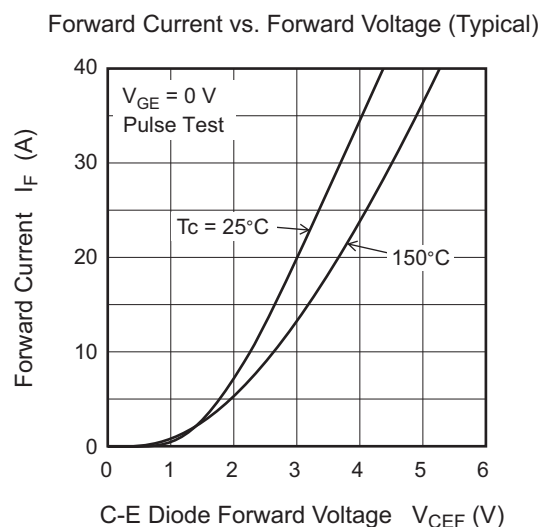
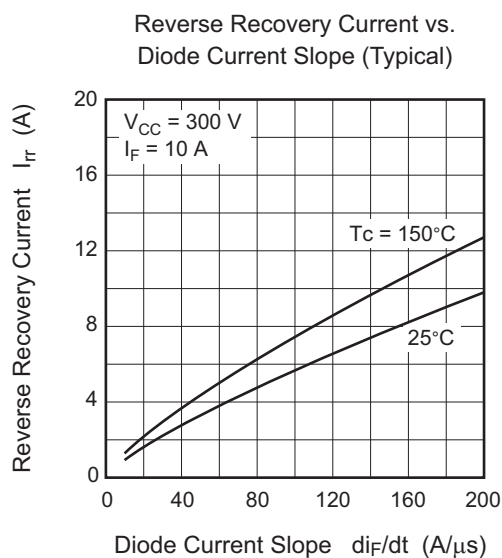
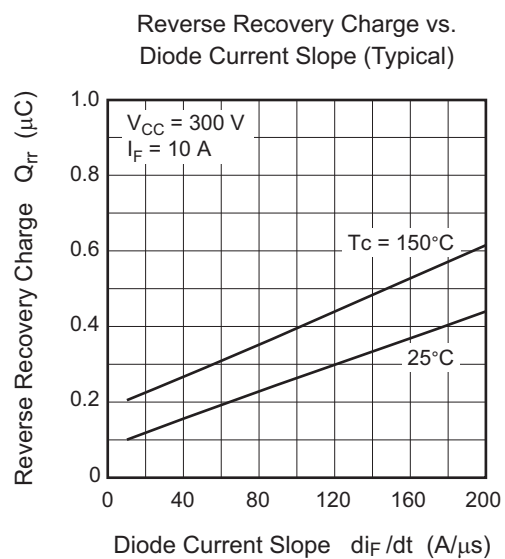
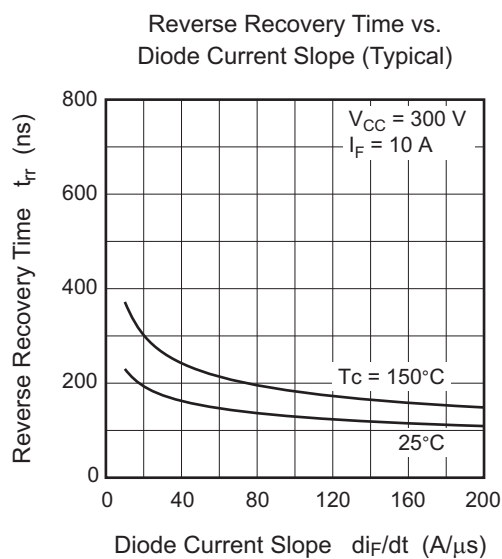
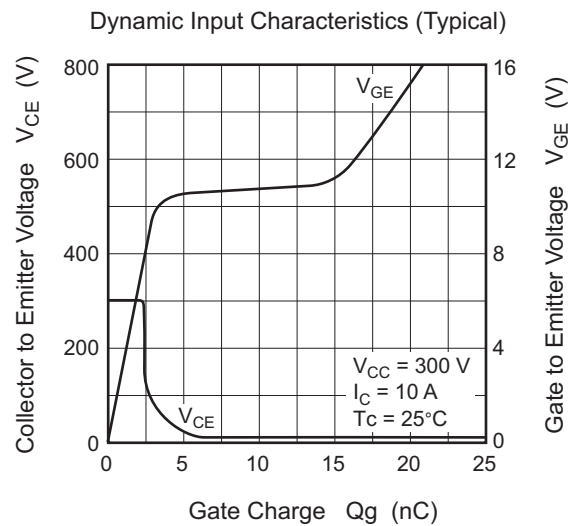
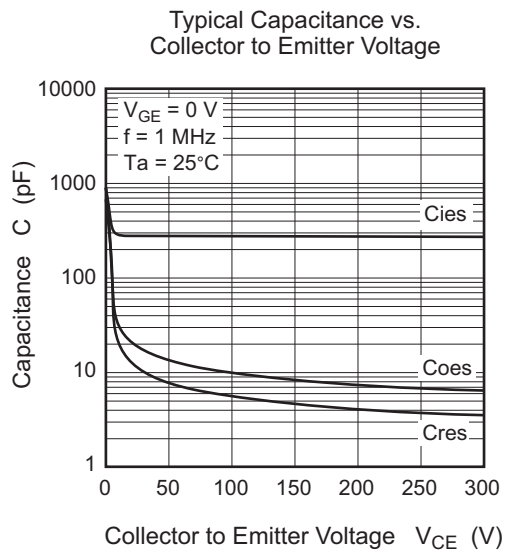


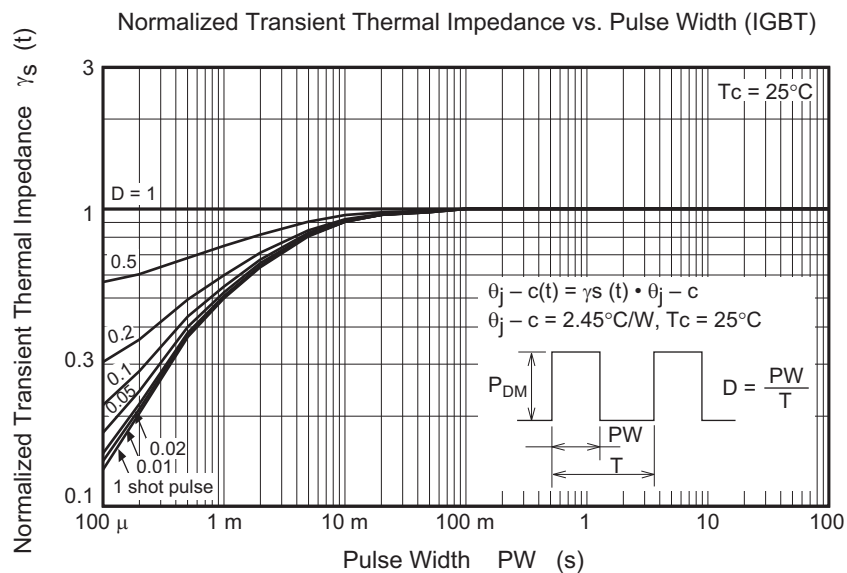
Switching Characteristics (Typical) (5)



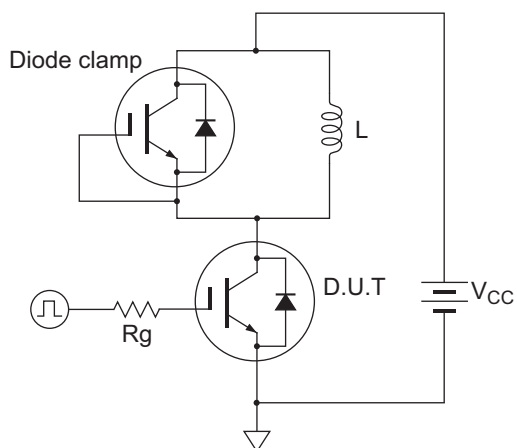
Switching Characteristics (Typical) (6)



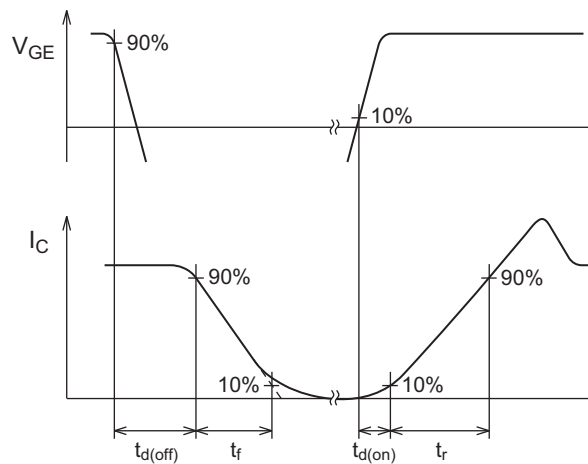




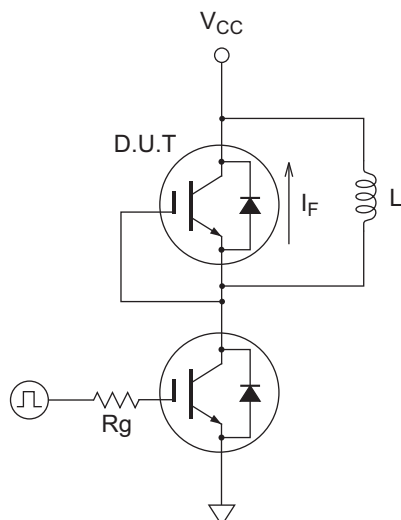
Switching Time Test Circuit



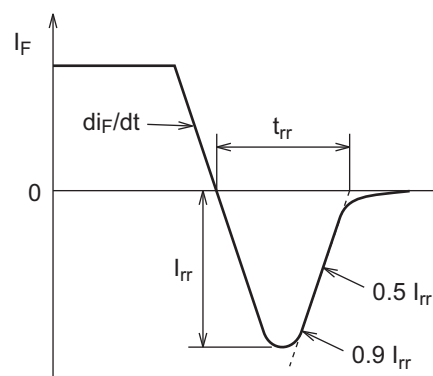
Waveform



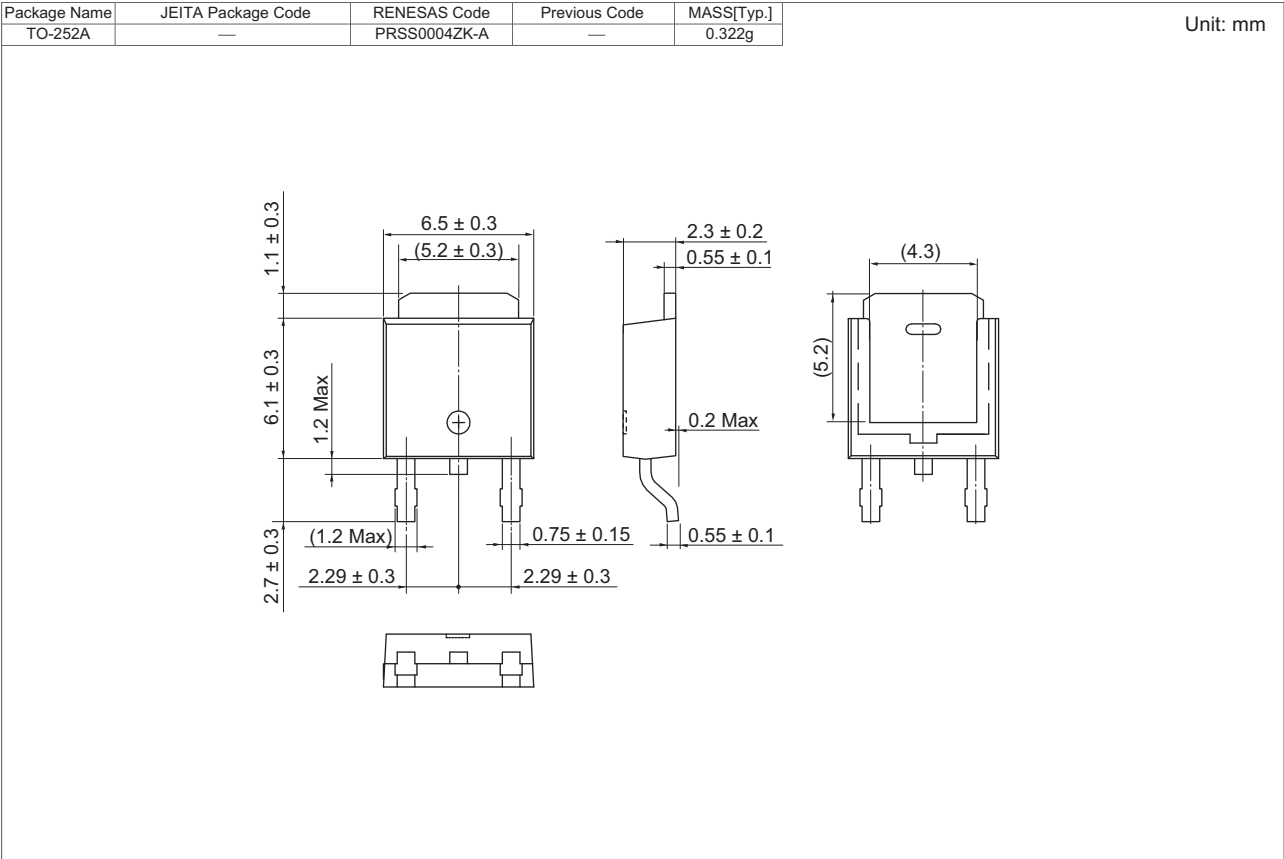
Diode Reverse Recovery Time Test Circuit



Waveform



Package Dimension



Ordering Information

| Orderable Part No. | Quantity | Shipping Container |
|--------------------|----------|--------------------|
| RJH60A83RDPD-A0#J2 | 3000 pcs | Taping             |

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