

# RJH60D1DPE

600V - 10A - IGBT

Application: Inverter

R07DS0157EJ0400

Rev.4.00

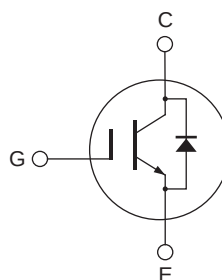
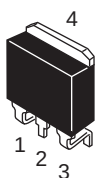
Apr 19, 2012

## Features

- Short circuit withstand time (5  $\mu$ s typ.)
- Low collector to emitter saturation voltage  
 $V_{CE(sat)} = 1.9$  V typ. (at  $I_C = 10$  A,  $V_{GE} = 15$  V,  $T_a = 25^\circ\text{C}$ )
- Built in fast recovery diode (100 ns typ.) in one package
- Trench gate and thin wafer technology
- High speed switching  
 $t_f = 75$  ns typ. (at  $V_{CC} = 300$  V,  $V_{GE} = 15$  V,  $I_C = 10$  A,  $R_g = 5$   $\Omega$ , inductive load)

## Outline

RENESAS Package code: PRSS0004AE-B  
(Package name: LDKPAK (S)-(1) )



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

## 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          | A                           |
|                                                      | $T_c = 100^\circ\text{C}$ | $I_C$                                  | 10          | A                           |
| Collector peak current                               |                           | $i_{c(\text{peak})}$ <sup>Note1</sup>  | 40          | A                           |
| Collector to emitter diode forward current           |                           | $i_{DF}$                               | 10          | A                           |
| Collector to Emitter diode forward peak current      |                           | $i_{DF(\text{peak})}$ <sup>Note1</sup> | 40          | A                           |
| Collector dissipation                                |                           | $P_C$ <sup>Note2</sup>                 | 52          | W                           |
| Junction to case thermal resistance (IGBT)           |                           | $\theta_{j-c}$ <sup>Note2</sup>        | 2.38        | $^\circ\text{C} / \text{W}$ |
| Junction to case thermal resistance (Diode)          |                           | $\theta_{j-cd}$ <sup>Note2</sup>       | 2.8         | $^\circ\text{C} / \text{W}$ |
| 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  $T_c = 25^\circ\text{C}$

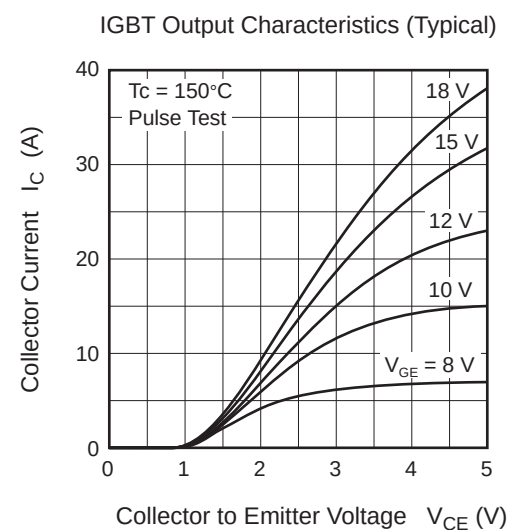
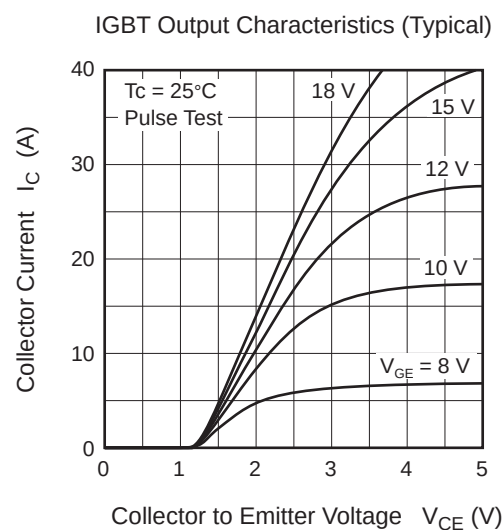
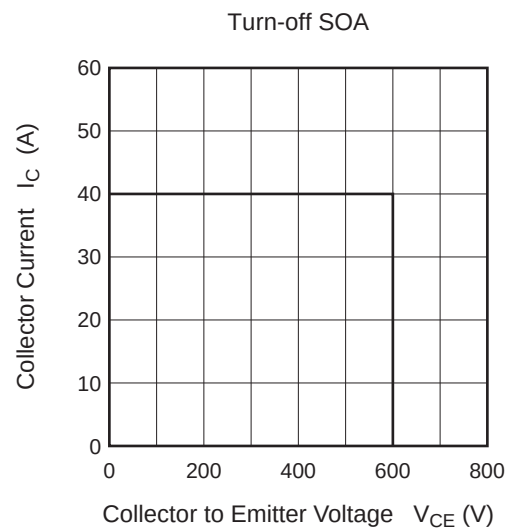
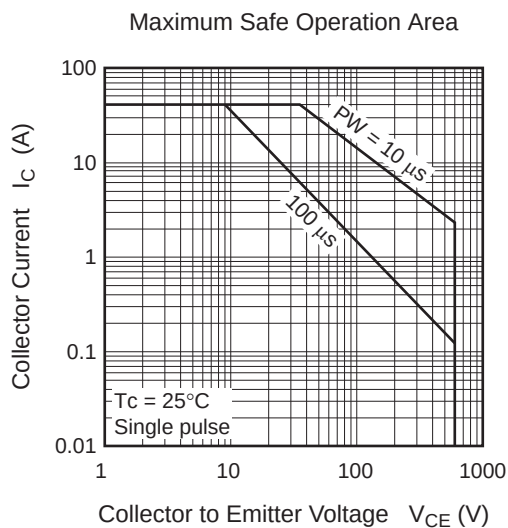
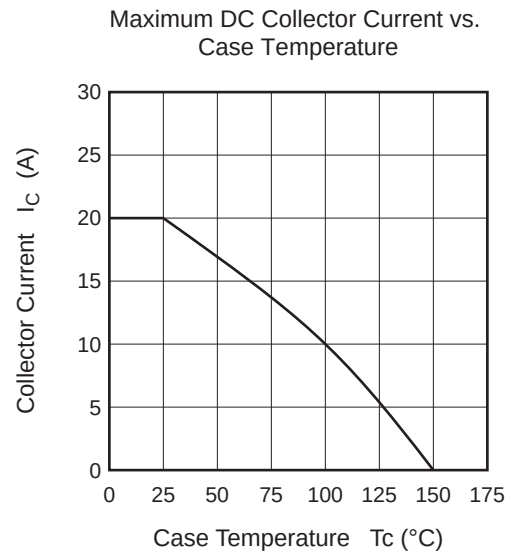
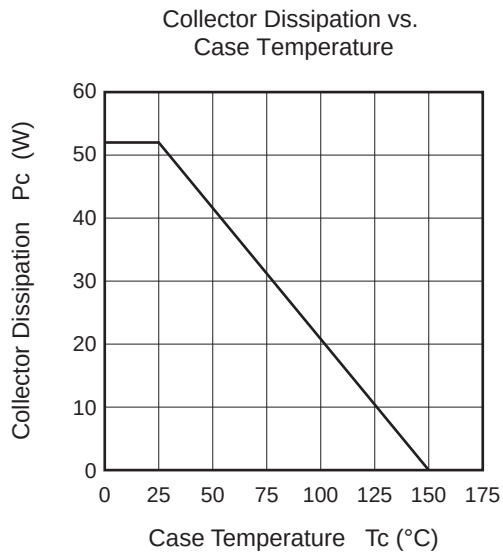
## Electrical Characteristics

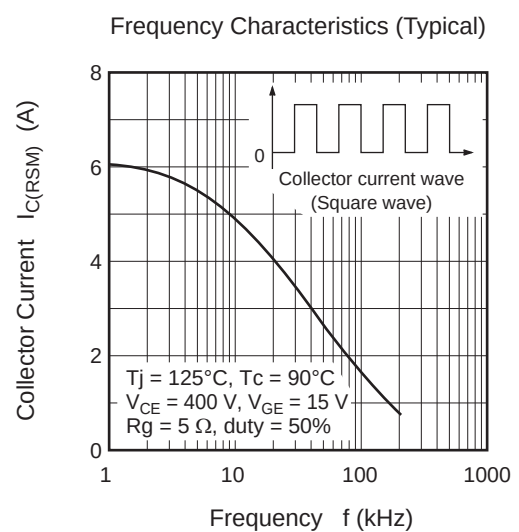
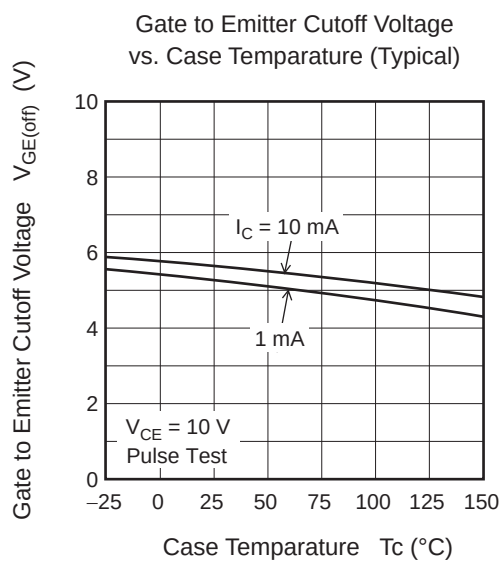
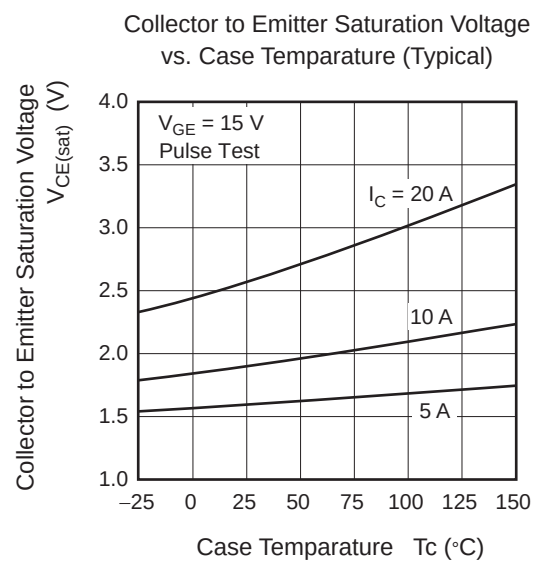
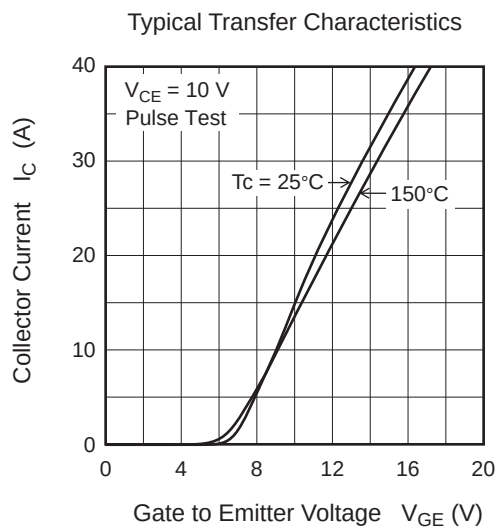
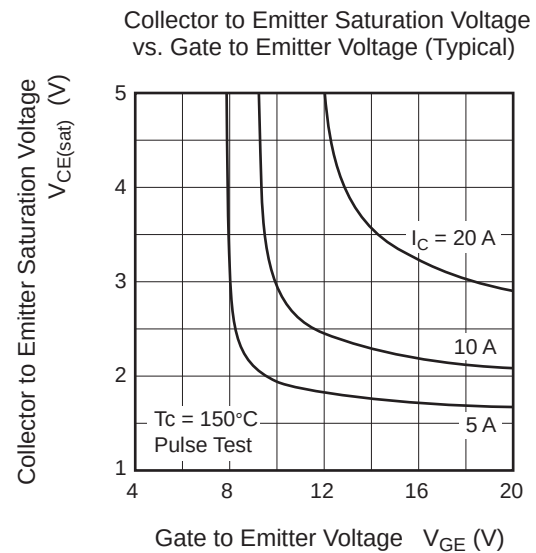
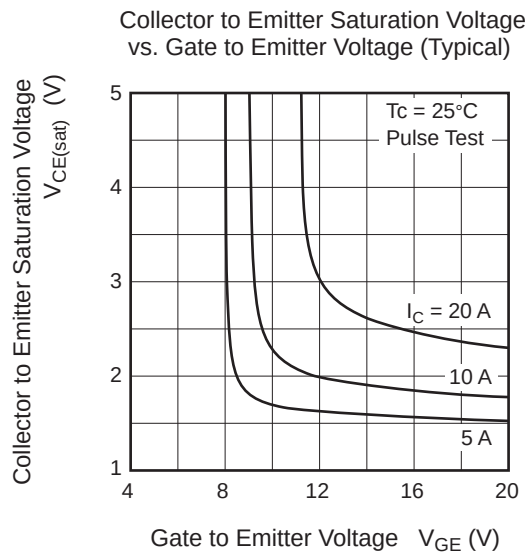
(Ta = 25°C)

| Item                                                        | Symbol          | Min | Typ  | Max     | Unit    | Test Conditions                                                                            |
|-------------------------------------------------------------|-----------------|-----|------|---------|---------|--------------------------------------------------------------------------------------------|
| Collector to emitter breakdown voltage                      | $V_{BR(CES)}$   | 600 | —    | —       | V       | $I_C = 10 \mu A$ , $V_{GE} = 0$                                                            |
| Zero gate voltage collector current / Diode reverse current | $I_{CES} / I_R$ | —   | —    | 5       | $\mu A$ | $V_{CE} = 600 V$ , $V_{GE} = 0$                                                            |
| Gate to emitter leak current                                | $I_{GES}$       | —   | —    | $\pm 1$ | $\mu A$ | $V_{GE} = \pm 30 V$ , $V_{CE} = 0$                                                         |
| Gate to emitter cutoff voltage                              | $V_{GE(off)}$   | 4.0 | —    | 6.0     | V       | $V_{CE} = 10 V$ , $I_C = 1 mA$                                                             |
| Collector to emitter saturation voltage                     | $V_{CE(sat)}$   | —   | 1.9  | 2.5     | V       | $I_C = 10 A$ , $V_{GE} = 15 V$ <sup>Note3</sup>                                            |
|                                                             | $V_{CE(sat)}$   | —   | 2.6  | —       | V       | $I_C = 20 A$ , $V_{GE} = 15 V$ <sup>Note3</sup>                                            |
| Input capacitance                                           | $C_{ies}$       | —   | 275  | —       | pF      | $V_{CE} = 25 V$                                                                            |
| Output capacitance                                          | $C_{oes}$       | —   | 30   | —       | pF      | $V_{GE} = 0$                                                                               |
| Reveres transfer capacitance                                | $C_{res}$       | —   | 7.5  | —       | pF      | $f = 1 MHz$                                                                                |
| Total gate charge                                           | $Q_g$           | —   | 13.0 | —       | nC      | $V_{GE} = 15 V$                                                                            |
| Gate to emitter charge                                      | $Q_{ge}$        | —   | 3.0  | —       | nC      | $V_{CE} = 300 V$                                                                           |
| Gate to collector charge                                    | $Q_{gc}$        | —   | 5.0  | —       | nC      | $I_C = 10 A$                                                                               |
| Turn-on delay time                                          | $t_{d(on)}$     | —   | 30   | —       | ns      | $V_{CC} = 300V$<br>$V_{GE} = 15 V$<br>$I_C = 10 A$ ,<br>$R_g = 5 \Omega$<br>Inductive load |
| Rise time                                                   | $t_r$           | —   | 13   | —       | ns      |                                                                                            |
| Turn-off delay time                                         | $t_{d(off)}$    | —   | 42   | —       | ns      |                                                                                            |
| Fall time                                                   | $t_f$           | —   | 75   | —       | ns      |                                                                                            |
| Turn-on energy                                              | $E_{on}$        | —   | 0.10 | —       | mJ      |                                                                                            |
| Turn-off energy                                             | $E_{off}$       | —   | 0.13 | —       | mJ      |                                                                                            |
| Total switching energy                                      | $E_{total}$     | —   | 0.23 | —       | mJ      |                                                                                            |
| Short circuit withstand time                                | $t_{sc}$        | 3.0 | 5.0  | —       | $\mu s$ | $V_{CC} \leq 360V$ , $V_{GE} = 15 V$                                                       |
| FRD forward voltage                                         | $V_F$           | —   | 1.2  | 1.6     | V       | $I_F = 10 A$ <sup>Note3</sup>                                                              |
| FRD reverse recovery time                                   | $t_{rr}$        | —   | 100  | —       | ns      | $I_F = 10 A$<br>$di_F/dt = 100 A/\mu s$                                                    |
| FRD reverse recovery charge                                 | $Q_{rr}$        | —   | 0.18 | —       | $\mu C$ |                                                                                            |
| FRD peak reverse recovery current                           | $I_{rr}$        | —   | 4.8  | —       | A       |                                                                                            |

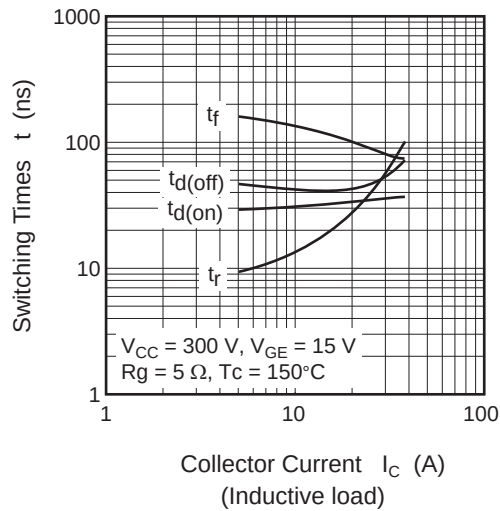
Notes: 3. Pulse test.

# Main Characteristics

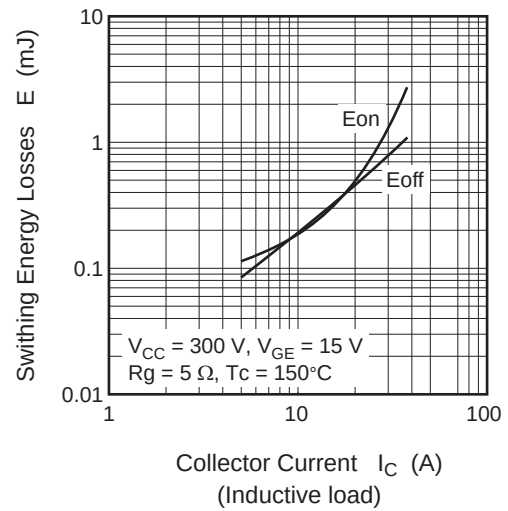




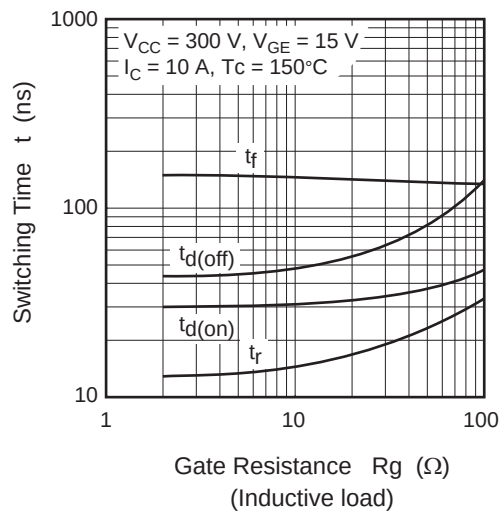
Switching Characteristics (Typical) (1)



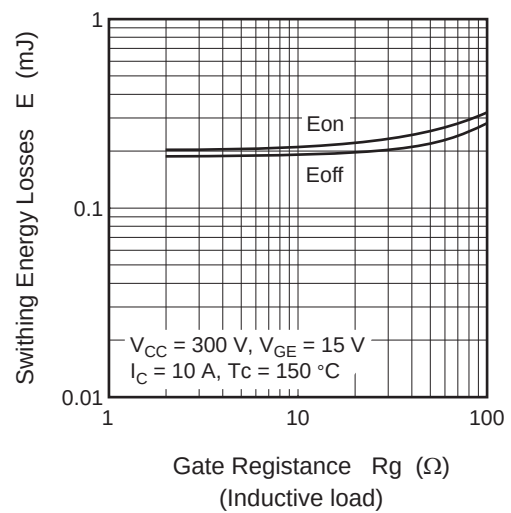
Switching Characteristics (Typical) (2)



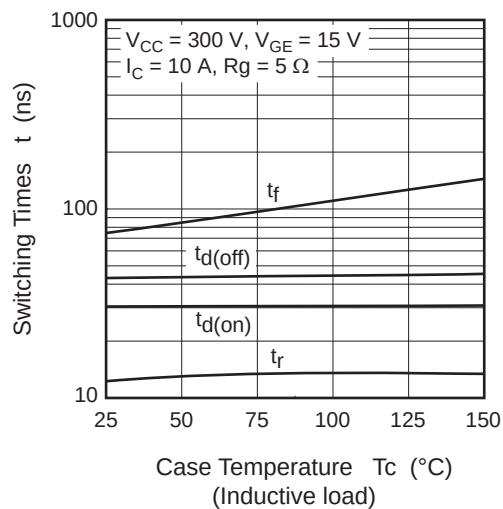
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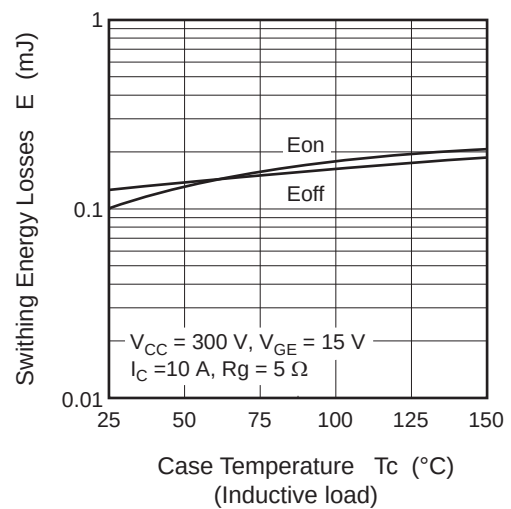
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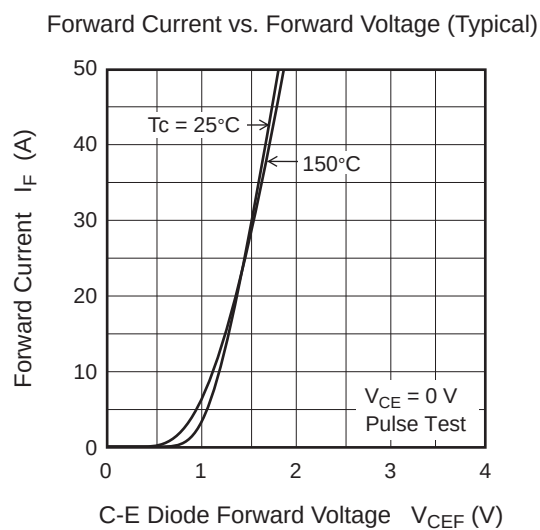
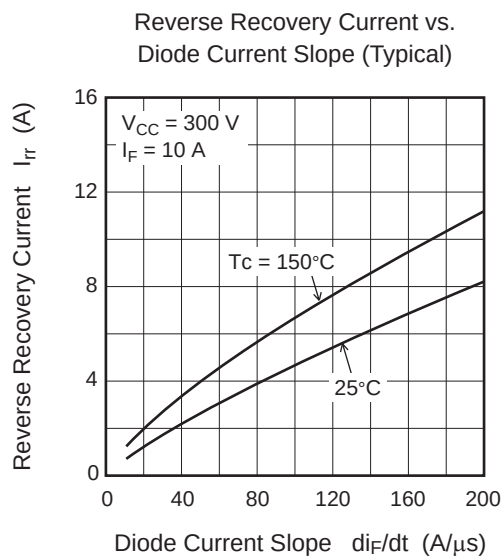
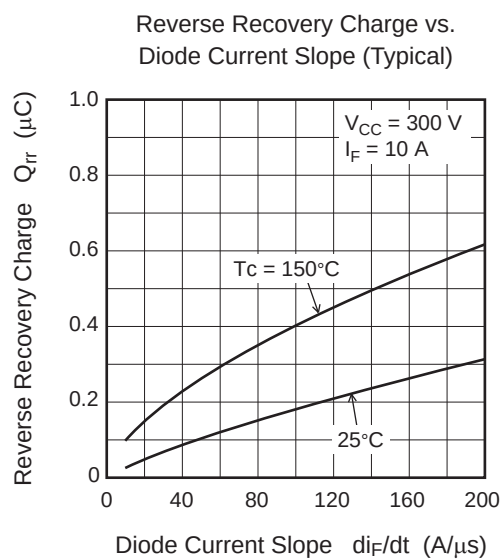
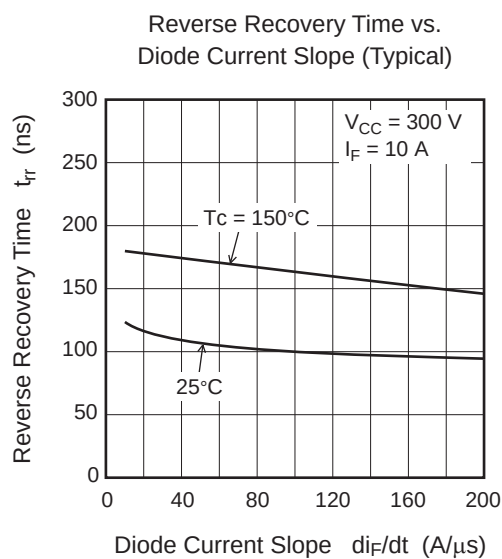
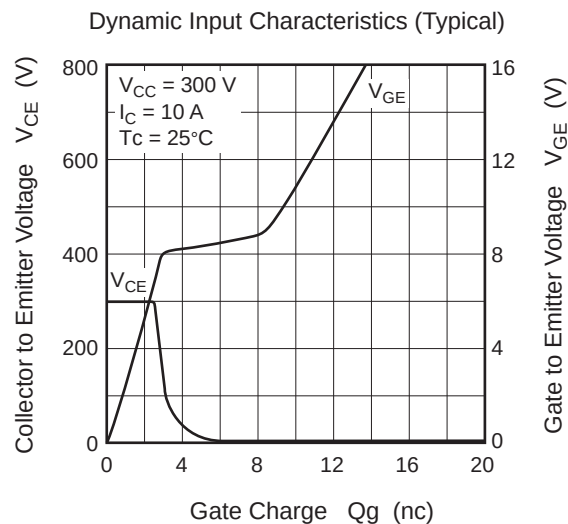
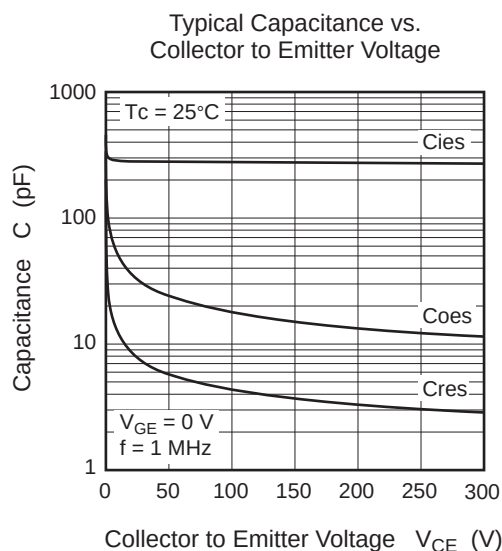


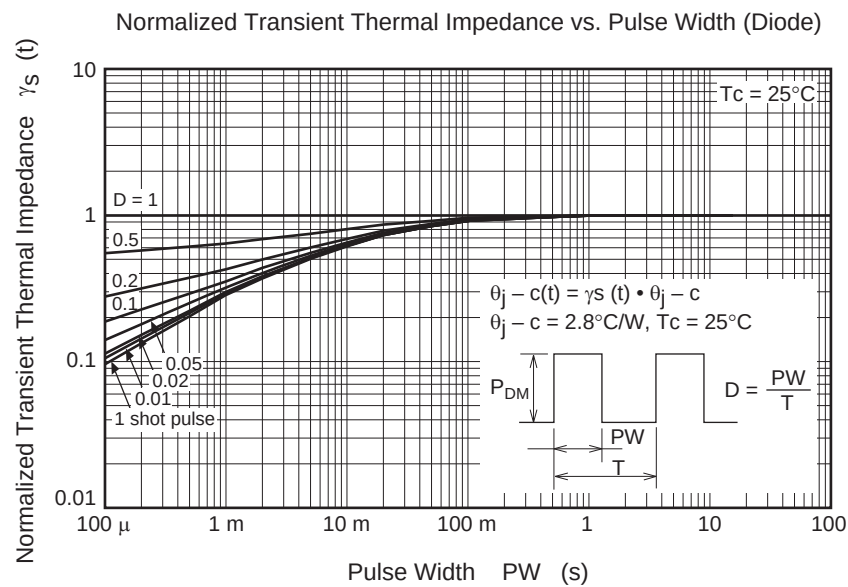
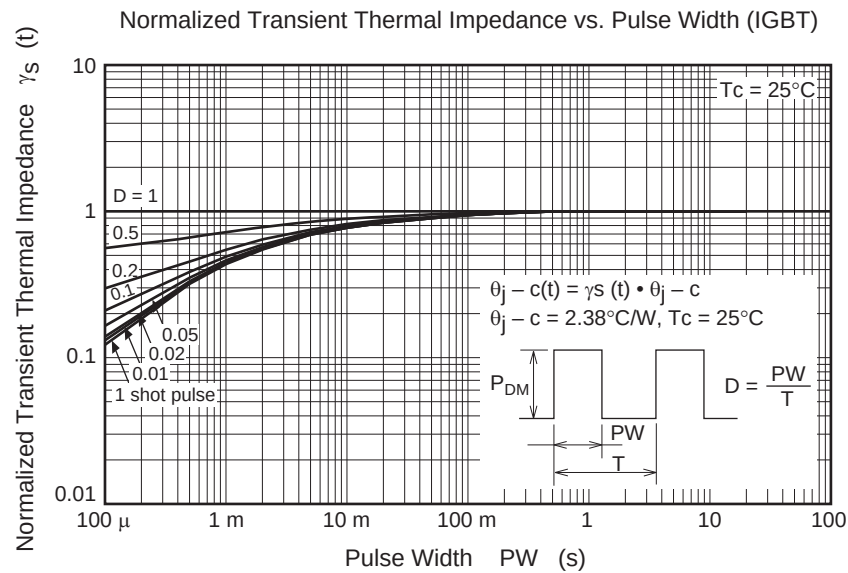
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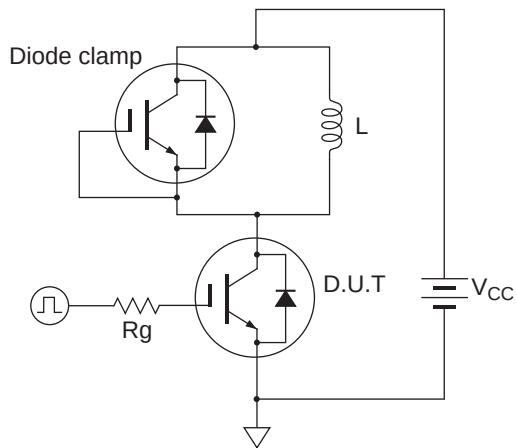
Switching Characteristics (Typical) (6)



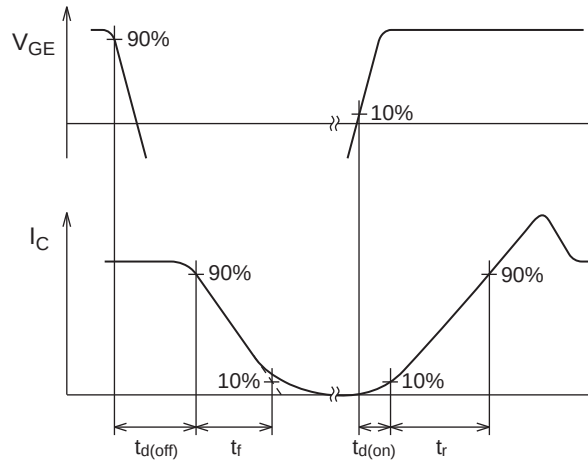




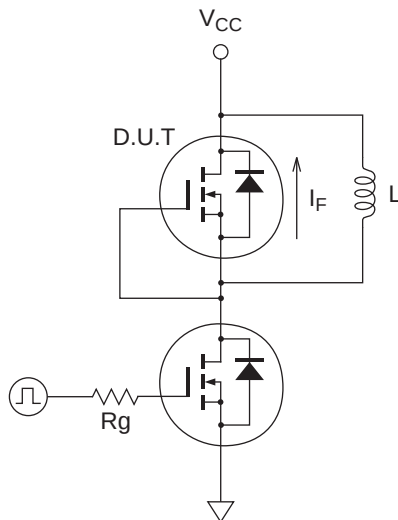
Switching Time Test Circuit



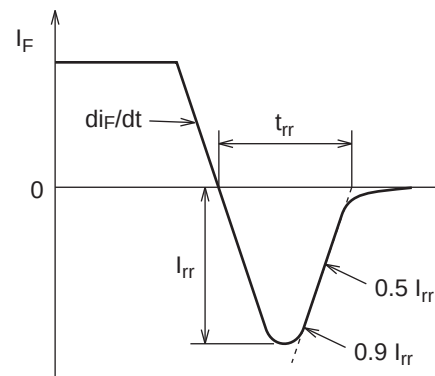
Waveform



Diode Reverse Recovery Time Test Circuit

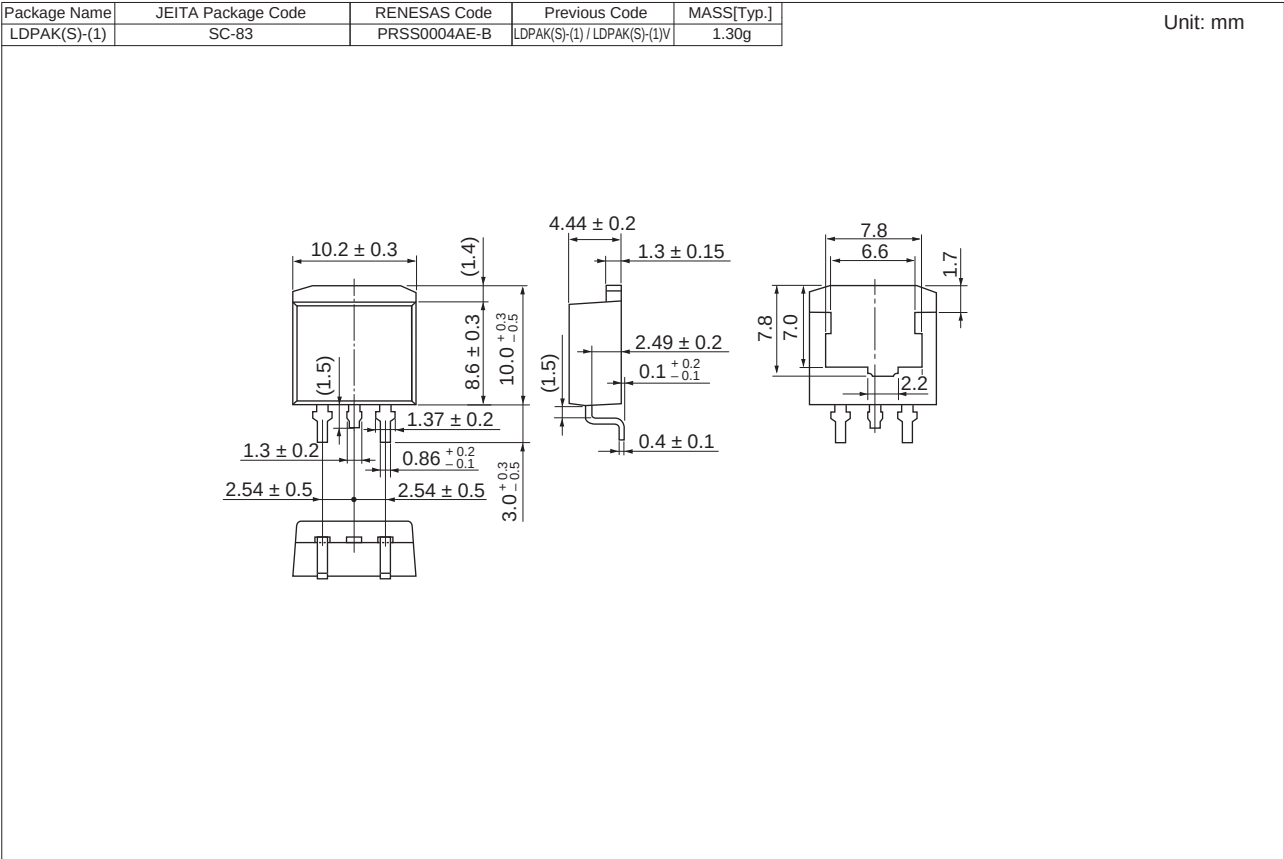


Waveform





Package Dimension



Ordering Information

| Orderable Part No. | Quantity | Shipping Container |
|--------------------|----------|--------------------|
| RJH60D1DPE-00#J3   | 1000 pcs | Taping             |

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