

# RJH65D27BDPQ-A0

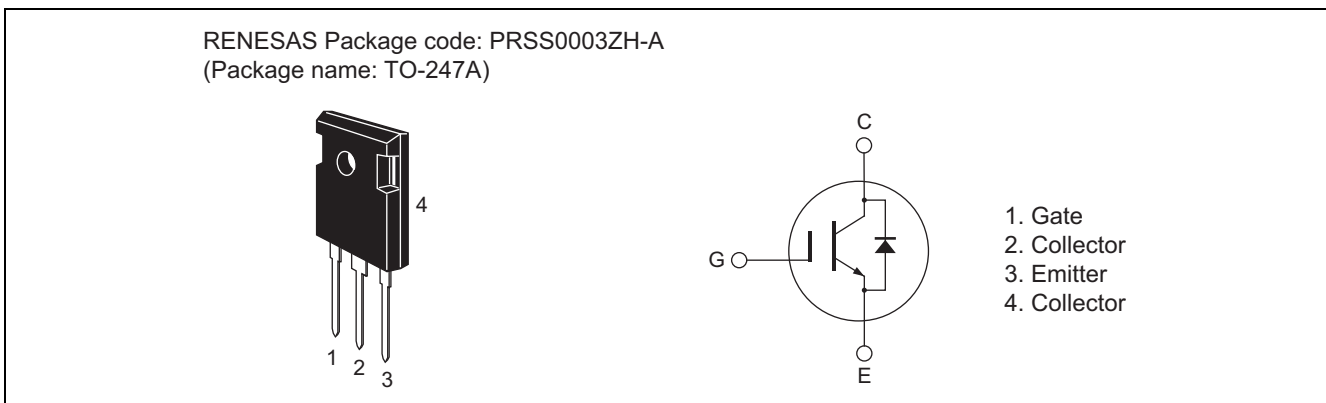
650V - 50A - IGBT  
Application: Inverter

R07DS1328EJ0110  
Rev.1.10  
Mar 01, 2016

## Features

- Low collector to emitter saturation voltage  
 $V_{CE(sat)} = 1.3 \text{ V typ. (at } I_C = 50 \text{ A, } V_{GE} = 15 \text{ V, } T_a = 25^\circ\text{C)}$
- Built in fast recovery diode in one package
- Trench gate and thin wafer technology
- High speed switching  
 $t_f = 120 \text{ ns typ. (at } V_{CC} = 400 \text{ V, } V_{GE} = \pm 15 \text{ V, } I_C = 50 \text{ A, } R_g = 10 \Omega, \text{ inductive load)}$
- Operation frequency ( $10\text{kHz} \leq f < 20\text{kHz}$ )

## Outline



## Absolute Maximum Ratings

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

Item	Symbol	Ratings	Unit
Collector to emitter voltage / diode reverse voltage	$V_{CES} / V_R$	650	V
Gate to emitter voltage	$V_{GES}$	$\pm 30$	V
Collector current	$T_c = 25^\circ\text{C}$	$I_C$	A
	$T_c = 100^\circ\text{C}$	$I_C$	A
Collector peak current	$i_{c(peak)}$ <sup>Note1</sup>	200	A
Clamped inductive load current	$I_{CL}$ <sup>Note2</sup>	150	A
Collector to emitter diode forward current	$T_c = 25^\circ\text{C}$	$I_{DF}$	A
	$T_c = 100^\circ\text{C}$	$I_{DF}$	A
Collector to emitter diode forward peak current	$I_{DF(peak)}$ <sup>Note1</sup>	200	A
Collector dissipation	$P_C$ <sup>Note3</sup>	375	W
Junction to case thermal resistance (IGBT)	$\theta_{j-c}$ <sup>Note3</sup>	0.40	$^\circ\text{C/W}$
Junction to case thermal resistance (Diode)	$\theta_{j-cd}$ <sup>Note3</sup>	0.50	$^\circ\text{C/W}$
Junction temperature	$T_j$ <sup>Note3</sup>	175	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

Note: Continuous heavy condition (e.g. high temperature/voltage/current or high variation of temperature) may affect a reliability even if it are 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.

## Electrical Characteristics

(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Zero gate voltage collector current / Diode reverse current	$I_{CES} / I_R$	—	—	100	$\mu\text{A}$	$V_{CE} = 650 \text{ V}, V_{GE} = 0$
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	$V_{GE(off)}$	4.5	—	6.5	V	$V_{CE} = 10 \text{ V}, I_C = 1 \text{ mA}$
Collector to emitter saturation voltage	$V_{CE(sat)}$	—	1.3	1.65	V	$I_C = 50 \text{ A}, V_{GE} = 15 \text{ V}$ <sup>Note4</sup>
Input capacitance	$C_{ies}$	—	2850	—	pF	$V_{CE} = 25 \text{ V}$
Output capacitance	$C_{oes}$	—	175	—	pF	$V_{GE} = 0$
Reverse transfer capacitance	$C_{res}$	—	80	—	pF	$f = 1 \text{ MHz}$
Total gate charge	$Q_g$	—	175	—	nC	$V_{GE} = 15 \text{ V}$
Gate to emitter charge	$Q_{ge}$	—	25	—	nC	$V_{CE} = 400 \text{ V}$
Gate to collector charge	$Q_{gc}$	—	90	—	nC	$I_C = 50 \text{ A}$
Turn-on delay time	$t_{d(on)}$	—	20	—	ns	$V_{CC} = 400 \text{ V}$
Rise time	$t_r$	—	35	—	ns	$V_{GE} = \pm 15 \text{ V}$
Turn-off delay time	$t_{d(off)}$	—	165	—	ns	$I_C = 50 \text{ A}$
Fall time	$t_f$	—	120	—	ns	$R_g = 10 \Omega$
Turn-on energy	$E_{on}$	—	1.0	—	mJ	(Inductive load) <sup>Note5</sup>
Turn-off energy	$E_{off}$	—	1.5	—	mJ	
Total switching energy	$E_{total}$	—	2.5	—	mJ	
Turn-on delay time	$t_{d(on)}$	—	20	—	ns	$V_{CC} = 400 \text{ V}$
Rise time	$t_r$	—	35	—	ns	$V_{GE} = \pm 15 \text{ V}$
Turn-off delay time	$t_{d(off)}$	—	200	—	ns	$I_C = 50 \text{ A}$
Fall time	$t_f$	—	140	—	ns	$R_g = 10 \Omega$
Turn-on energy	$E_{on}$	—	1.5	—	mJ	$T_C = 150^\circ\text{C}$
Turn-off energy	$E_{off}$	—	1.9	—	mJ	(Inductive load) <sup>Note5</sup>
Total switching energy	$E_{total}$	—	3.4	—	mJ	
Short circuit withstand time	$t_{sc}$	3	—	—	$\mu\text{s}$	$V_{CC} \leq 360 \text{ V}, V_{GE} = 15 \text{ V}$ $T_C = 150^\circ\text{C}$

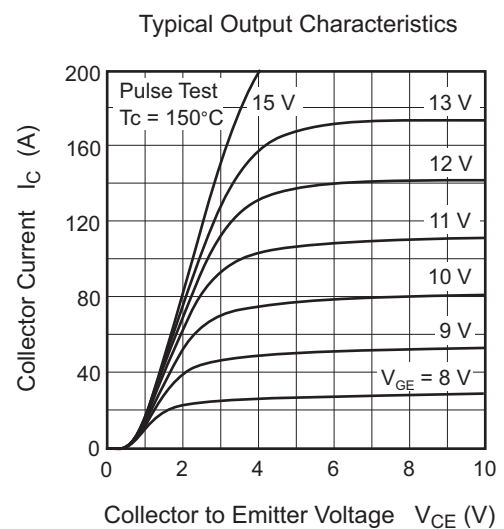
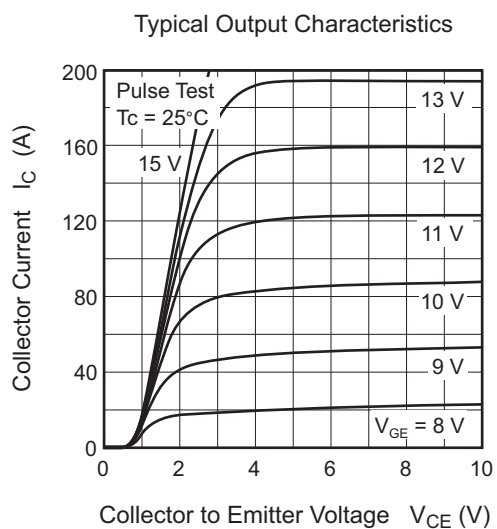
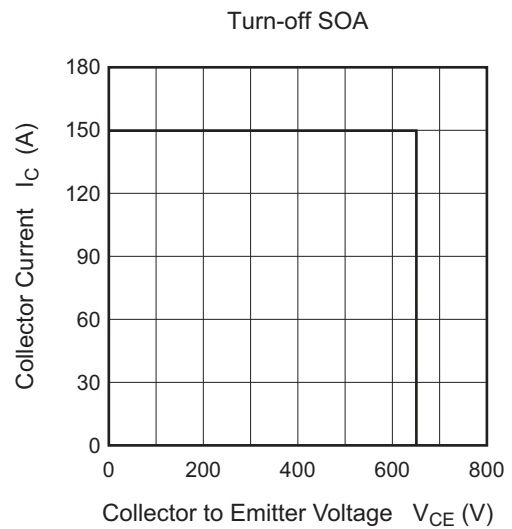
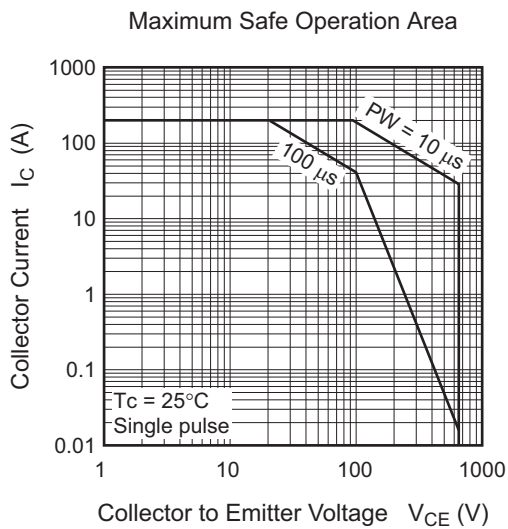
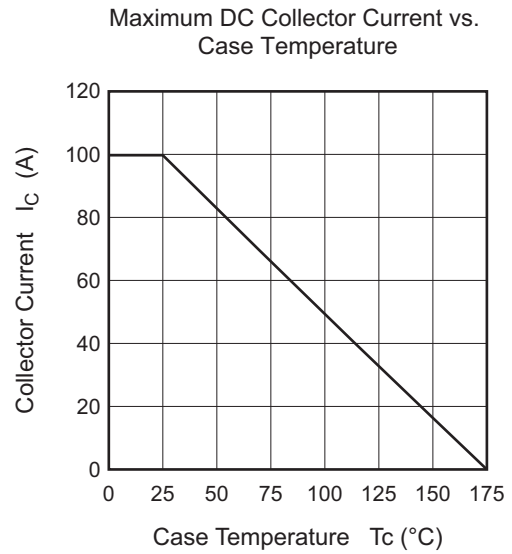
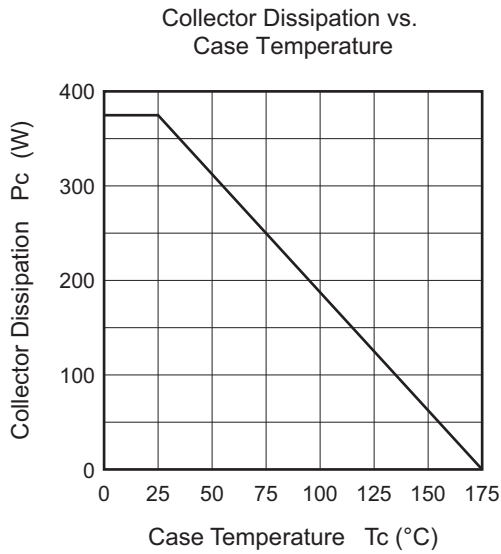
FRD forward voltage	$V_F$	—	1.7	2.2	V	$I_F = 50 \text{ A}$ <sup>Note4</sup>
FRD reverse recovery time	$t_{rr}$	—	80	—	ns	$I_F = 50 \text{ A}, di_F/dt = 300 \text{ A}/\mu\text{s}$
FRD reverse recovery charge	$Q_{rr}$	—	0.35	—	$\mu\text{C}$	
FRD peak reverse recovery current	$I_{rr}$	—	7.5	—	A	

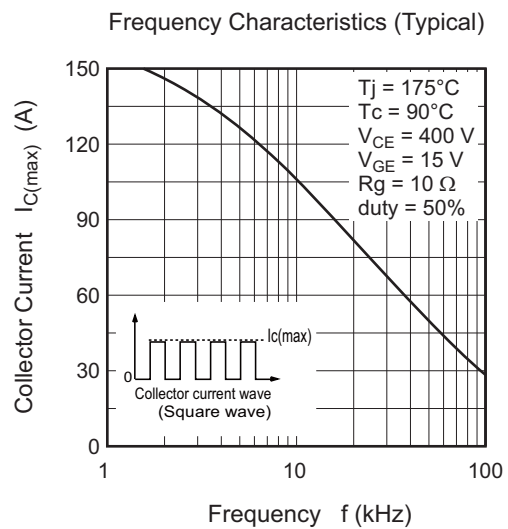
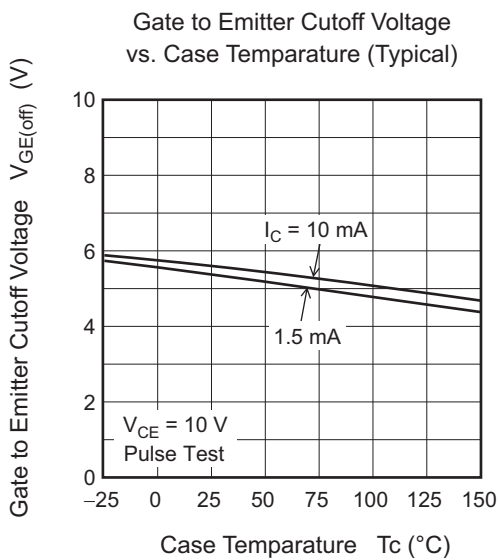
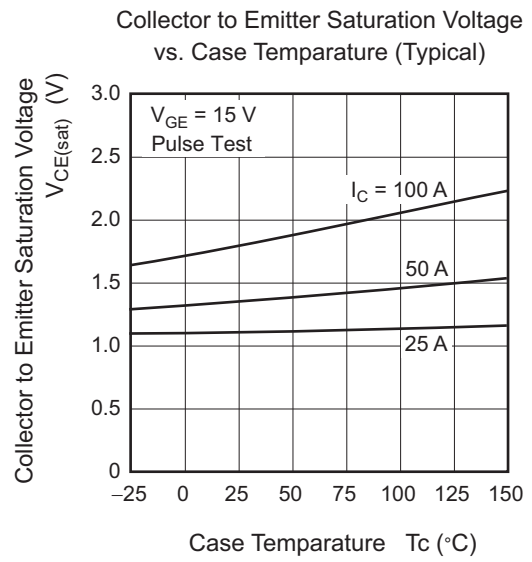
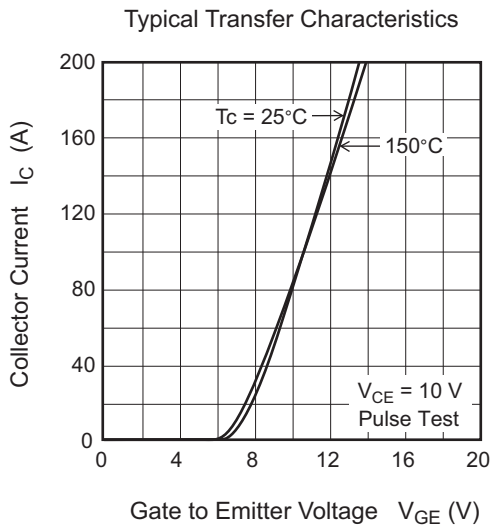
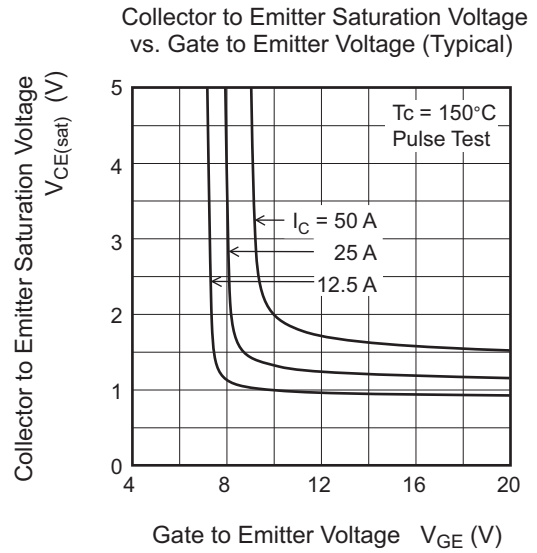
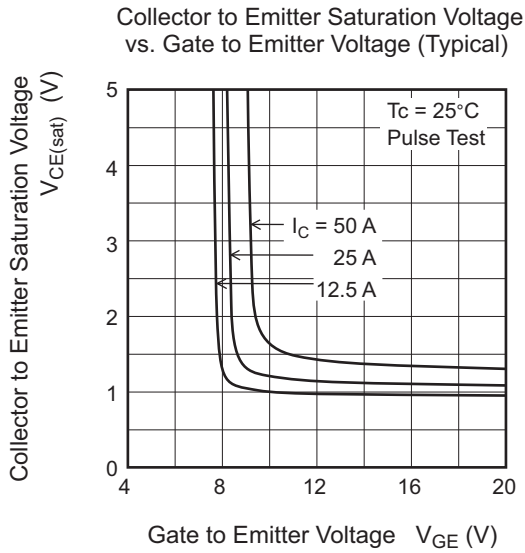
Notes: 1.  $PW \leq 10 \mu\text{s}$ , duty cycle  $\leq 1\%$ 2.  $V_{GE} = 15 \text{ V}$ 3. Please use this device in the thermal conditions which the junction temperature does not exceed 175°C  
Renesas IGBT Application Note is disclosed about reliability test and application condition up to 175°C

4. Pulse test

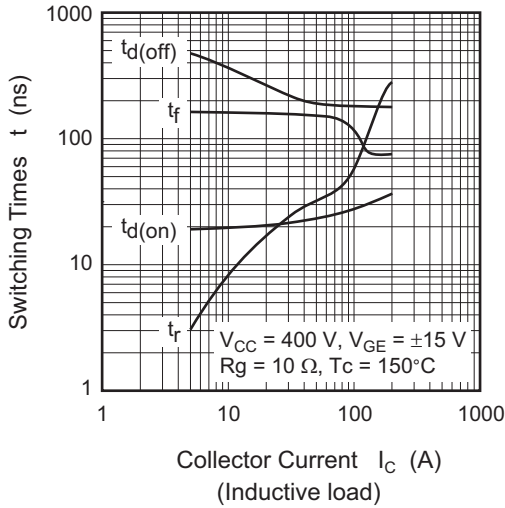
5. Switching time test circuit and waveform are shown below.

Main Characteristics

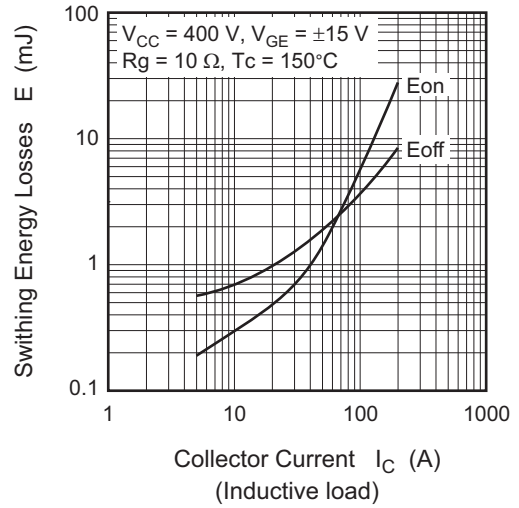




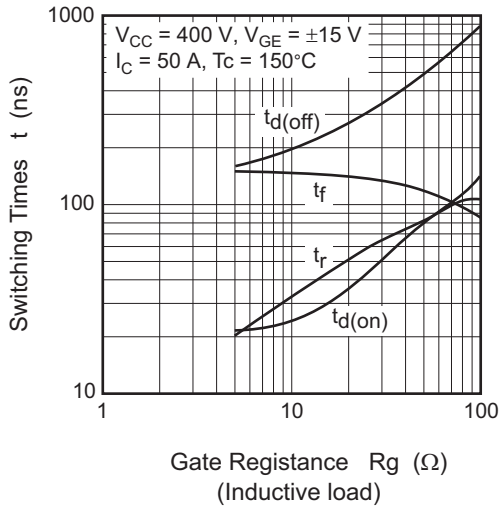
Switching Characteristics (Typical) (1)



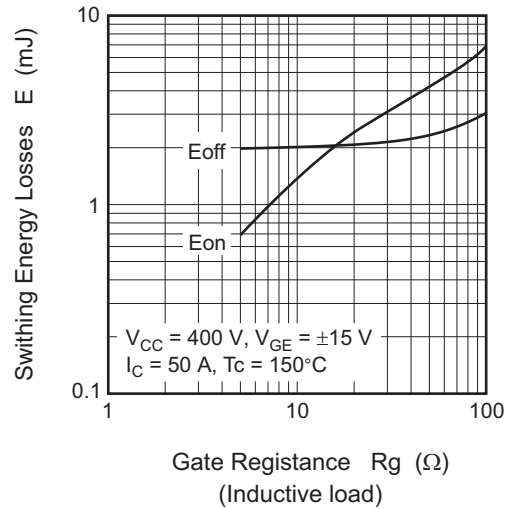
Switching Characteristics (Typical) (2)



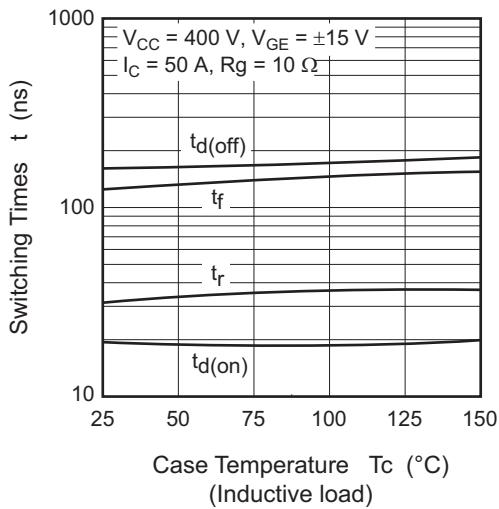
Switching Characteristics (Typical) (3)



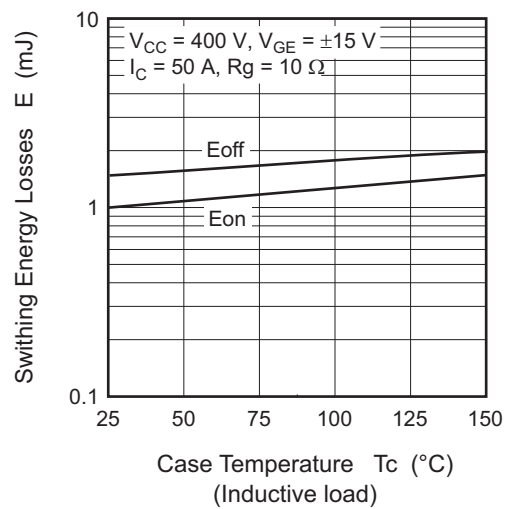
Switching Characteristics (Typical) (4)

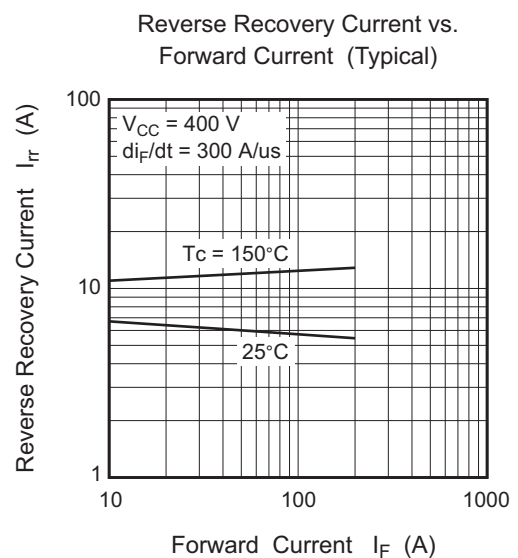
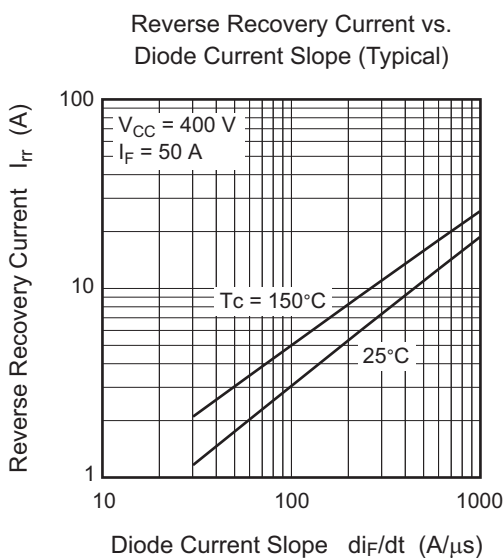
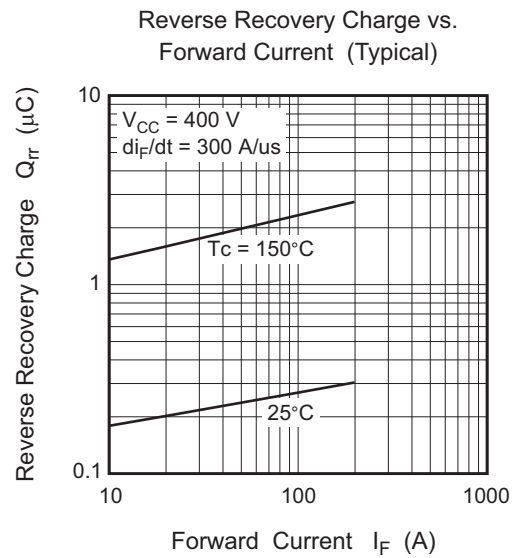
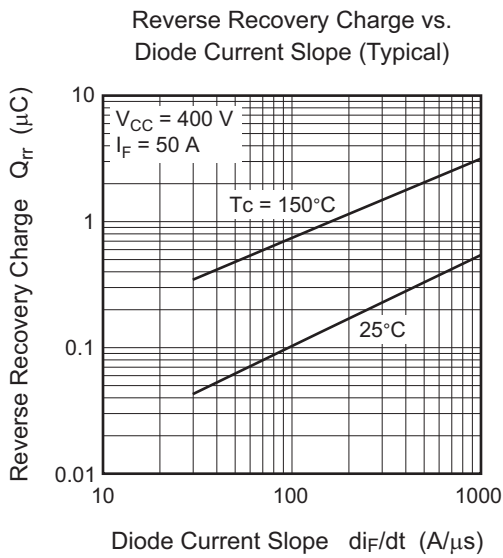
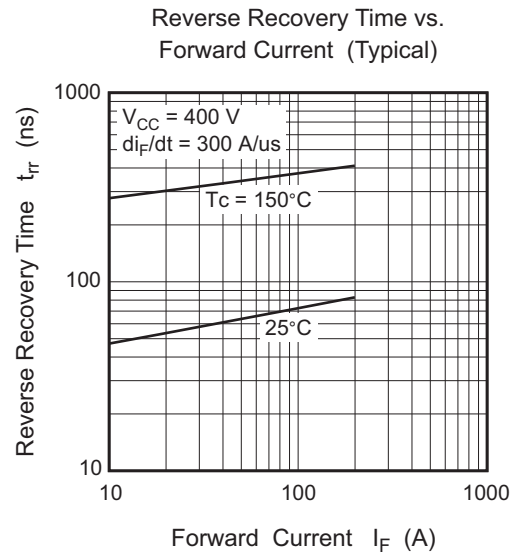
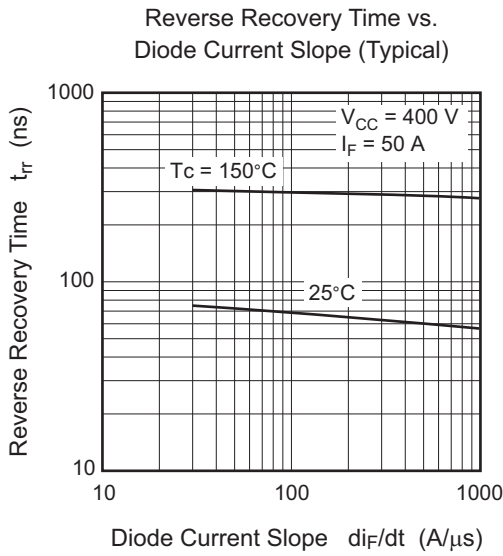


Switching Characteristics (Typical) (5)

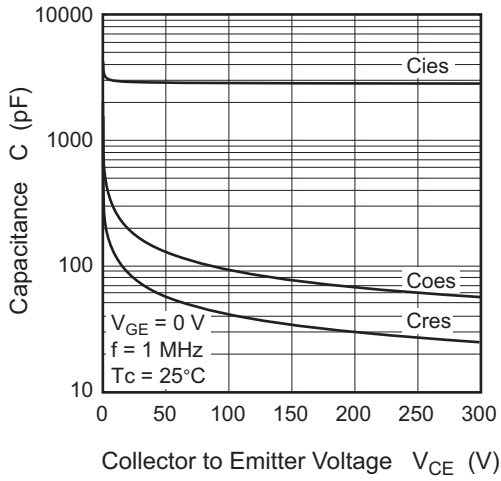


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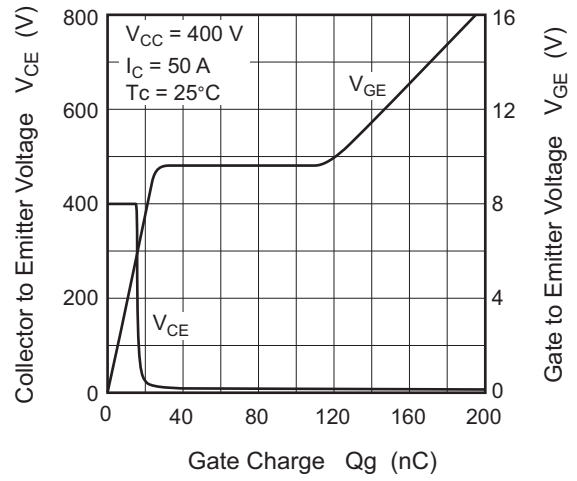




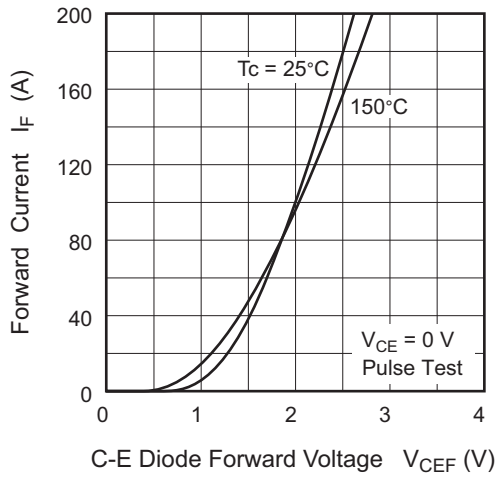
Typical Capacitance vs. Collector to Emitter Voltage

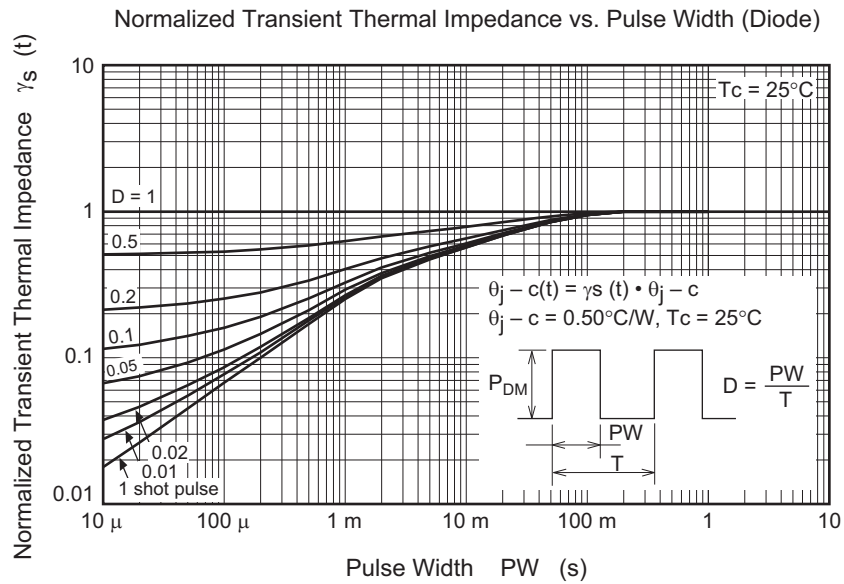
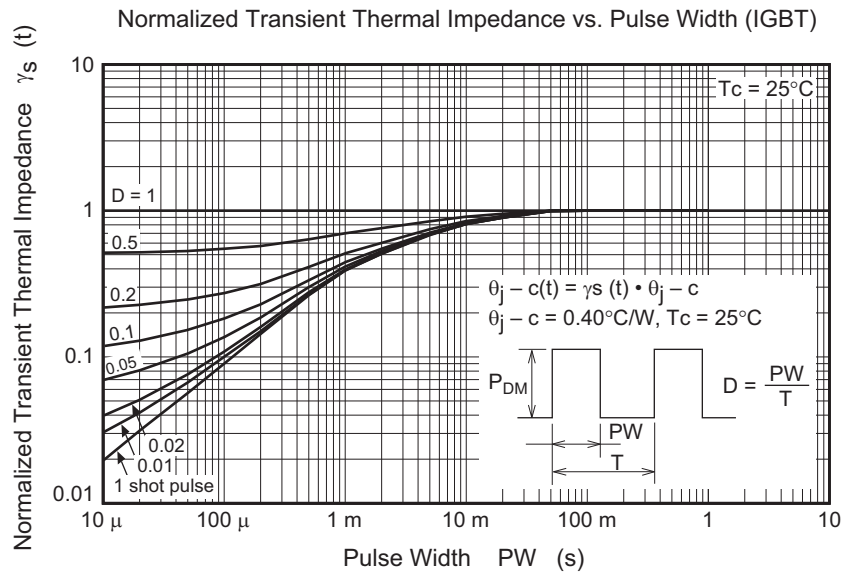


Dynamic Input Characteristics (Typical)



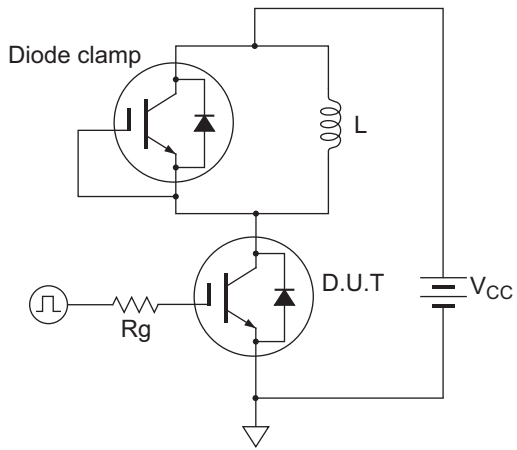
Forward Current vs. Forward Voltage (Typical)



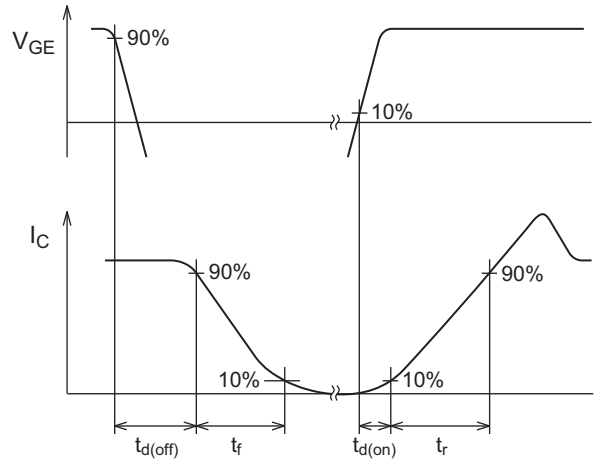




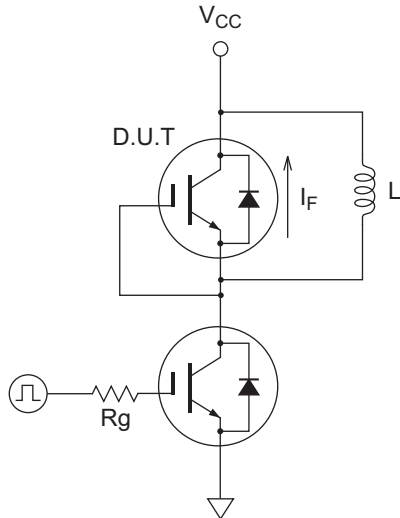
Switching Time Test Circuit



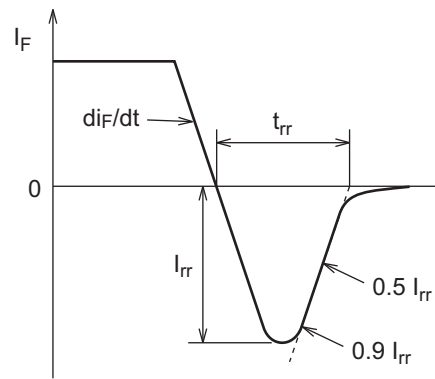
Waveform



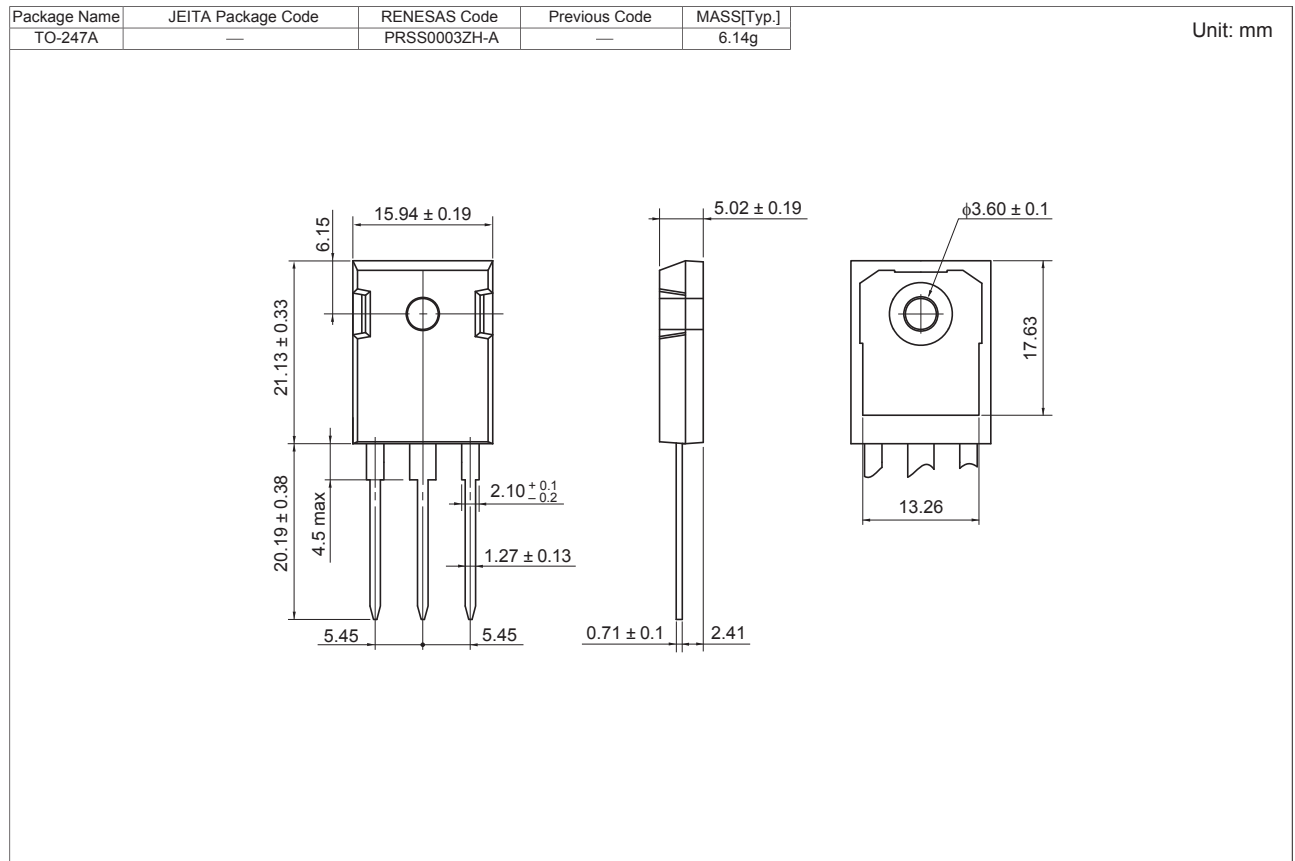
Diode Reverse Recovery Time Test Circuit



Waveform



### Package Dimension



### Ordering Information

Orderable Part No.	Quantity	Shipping Container
RJH65D27BDPQ-A0#T2	240 pcs	Box (Tube)

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