

RJH65D27BDPQ-A0

650V - 50A - IGBT
Application: Inverter

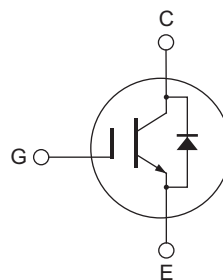
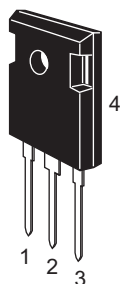
R07DS1328EJ0110
Rev.1.10
Mar 01, 2016

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

RENESAS Package code: PRSS0003ZH-A
(Package name: TO-247A)



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

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}	± 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	$i_{c(peak)}$ ^{Note1}	200	A
Clamped inductive load current	I_{CL} ^{Note2}	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	$I_{DF(peak)}$ ^{Note1}	200	A
Collector dissipation	P_C ^{Note3}	375	W
Junction to case thermal resistance (IGBT)	θ_{j-c} ^{Note3}	0.40	$^\circ\text{C/W}$
Junction to case thermal resistance (Diode)	θ_{j-cd} ^{Note3}	0.50	$^\circ\text{C/W}$
Junction temperature	T_j ^{Note3}	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	μA	$V_{CE} = 650 \text{ V}, V_{GE} = 0$
Gate to emitter leak current	I_{GES}	—	—	± 1	μA	$V_{GE} = \pm 30 \text{ V}, V_{CE} = 0$
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	$I_C = 50 \text{ A}, V_{GE} = 15 \text{ V}$ ^{Note4}
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) ^{Note5}
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) ^{Note5}
Total switching energy	E_{total}	—	3.4	—	mJ	
Short circuit withstand time	t_{sc}	3	—	—	μs	$V_{CC} \leq 360 \text{ V}, V_{GE} = 15 \text{ V}$ $T_C = 150^\circ\text{C}$

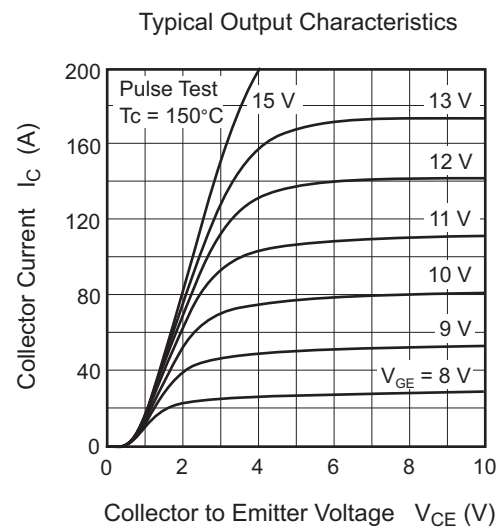
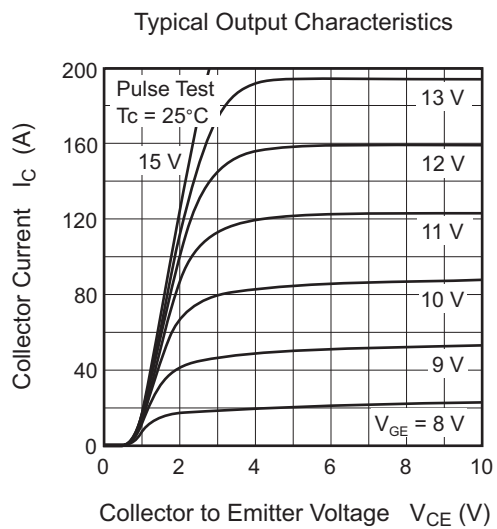
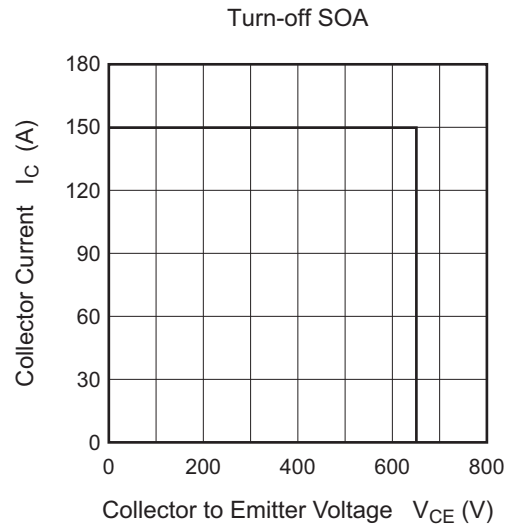
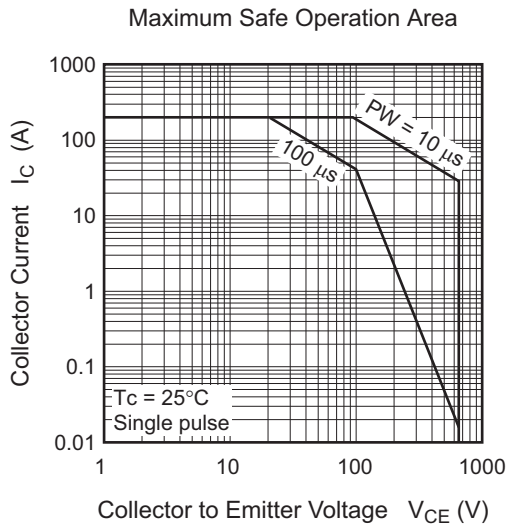
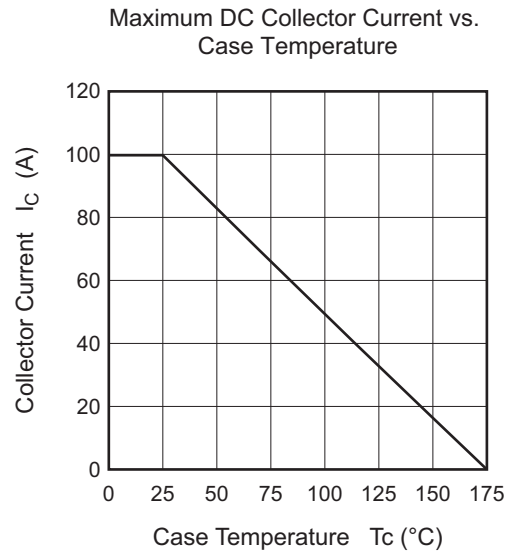
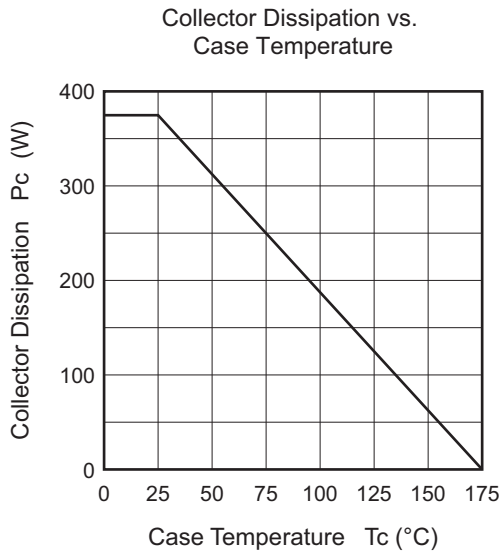
FRD forward voltage	V_F	—	1.7	2.2	V	$I_F = 50 \text{ A}$ ^{Note4}
FRD reverse recovery time	t_{rr}	—	80	—	ns	$I_F = 50 \text{ A}, di_F/dt = 300 \text{ A}/\mu\text{s}$
FRD reverse recovery charge	Q_{rr}	—	0.35	—	μC	
FRD peak reverse recovery current	I_{rr}	—	7.5	—	A	

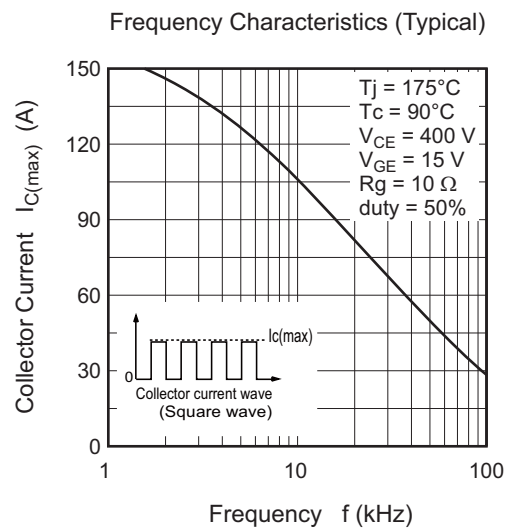
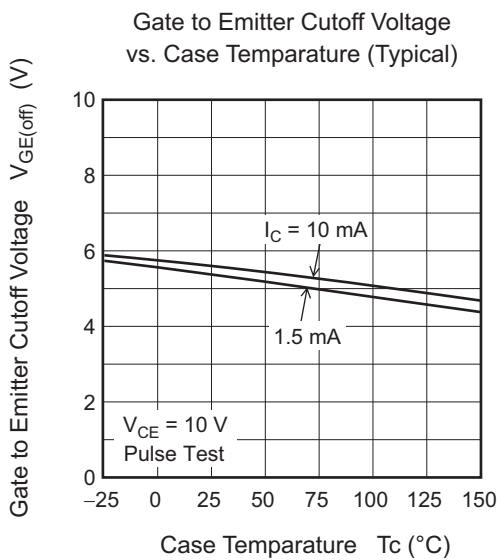
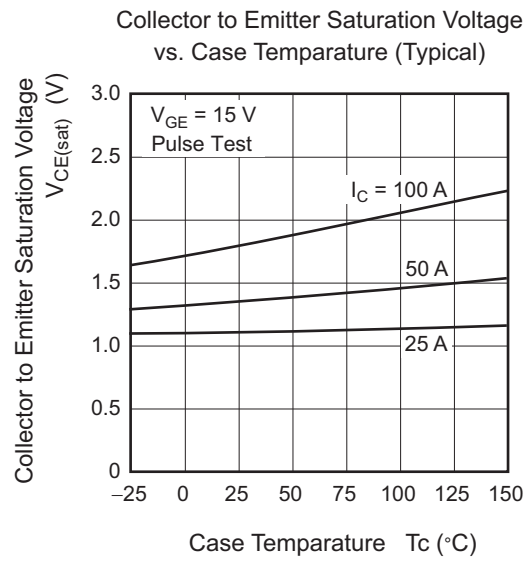
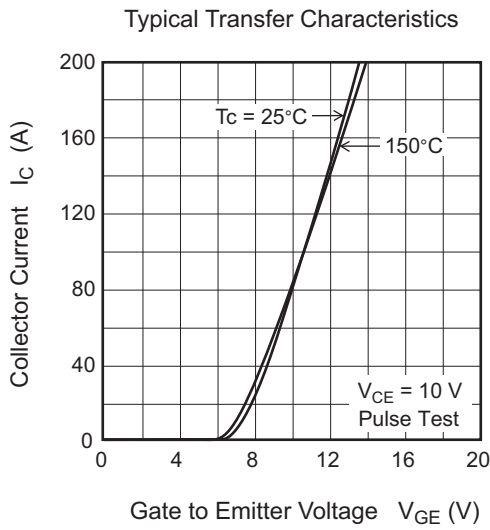
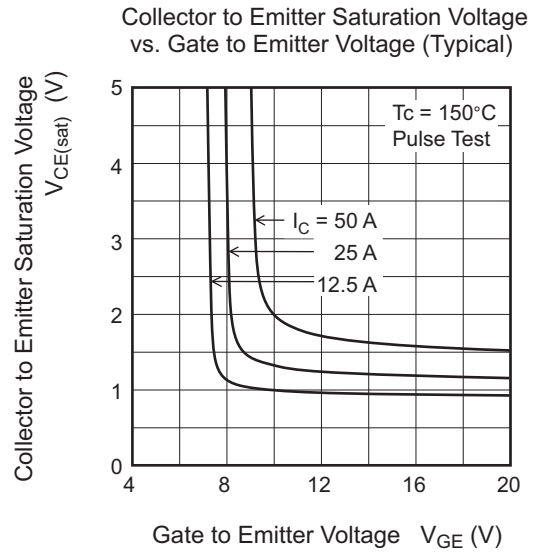
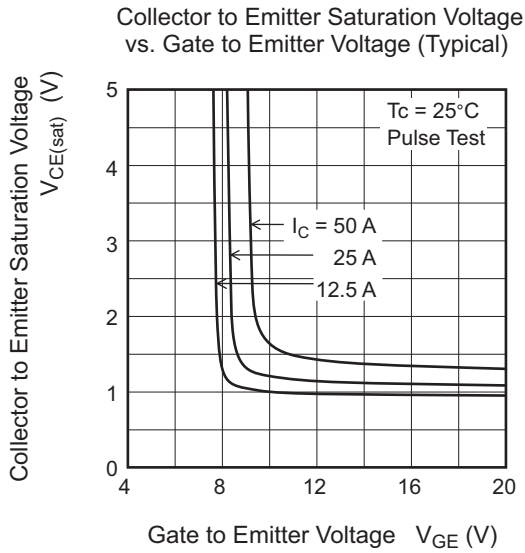
Notes: 1. $PW \leq 10 \mu\text{s}$, duty cycle $\leq 1\%$ 2. $V_{GE} = 15 \text{ V}$ 3. Please use this device in the thermal conditions which the junction temperature does not exceed 175°C
Renesas IGBT Application Note is disclosed about reliability test and application condition up to 175°C

4. Pulse test

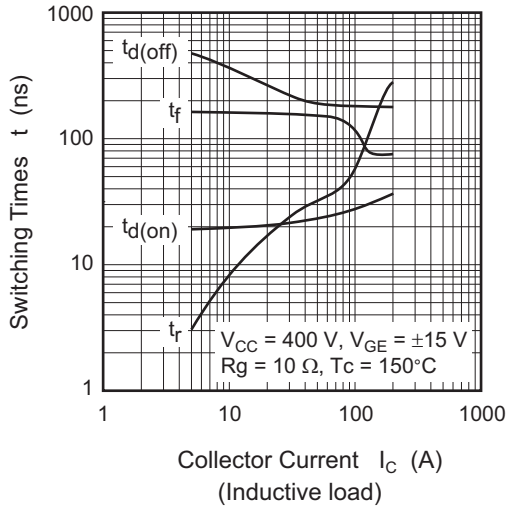
5. Switching time test circuit and waveform are shown below.

Main Characteristics

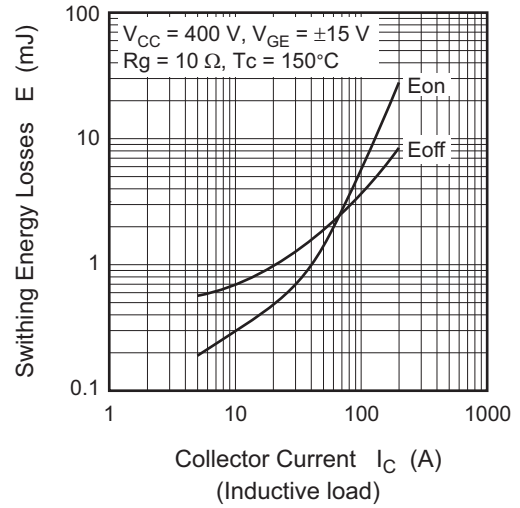




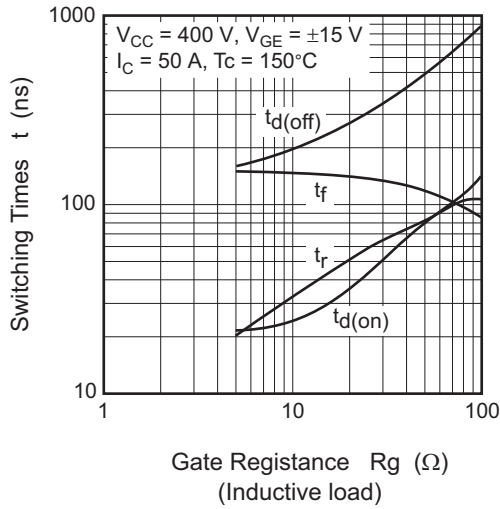
Switching Characteristics (Typical) (1)



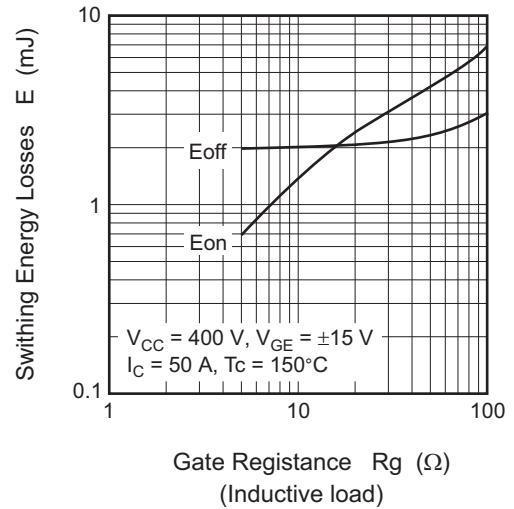
Switching Characteristics (Typical) (2)



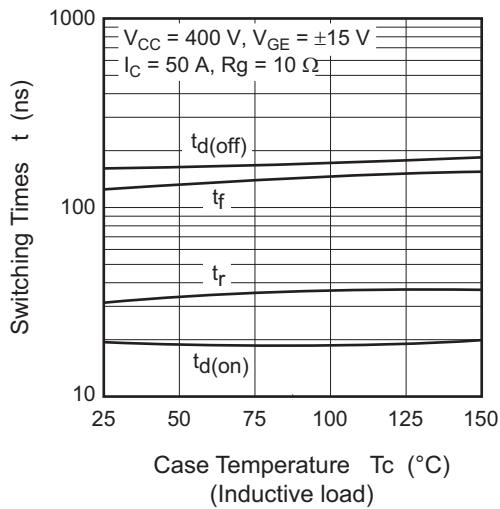
Switching Characteristics (Typical) (3)



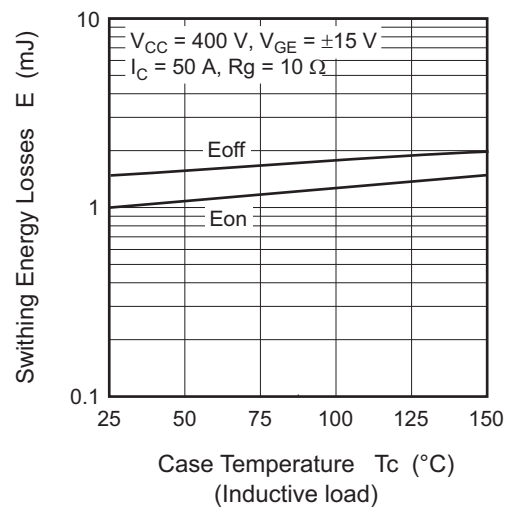
Switching Characteristics (Typical) (4)



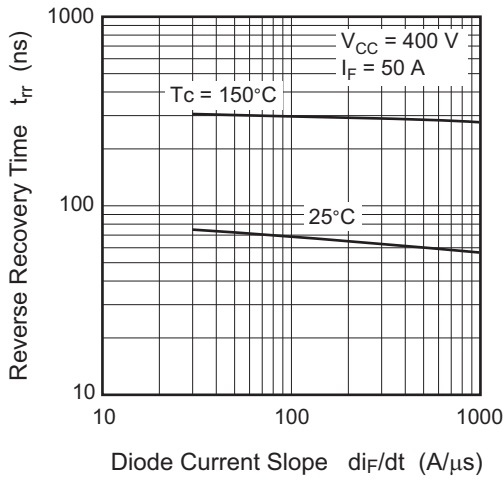
Switching Characteristics (Typical) (5)



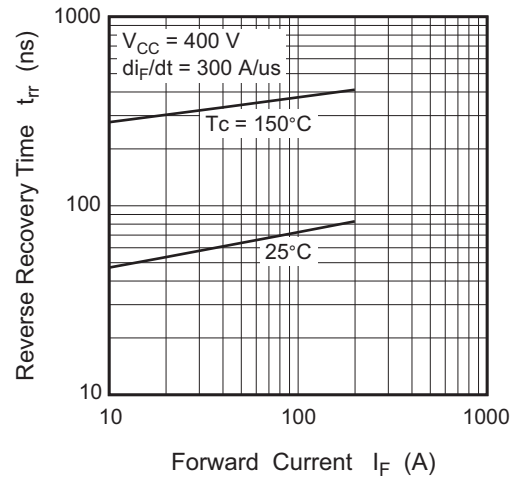
Switching Characteristics (Typical) (6)



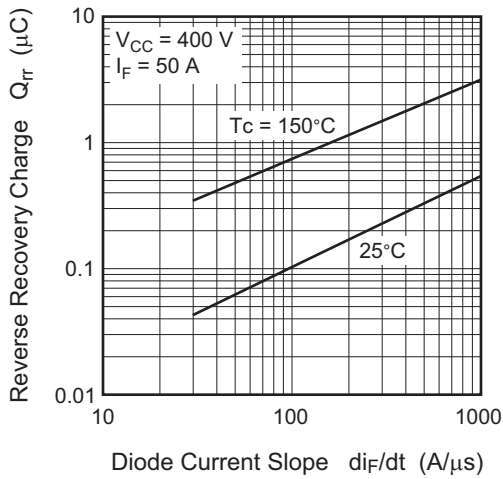
Reverse Recovery Time vs. Diode Current Slope (Typical)



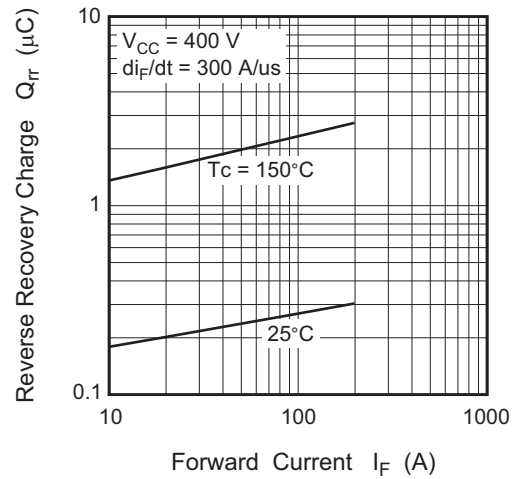
Reverse Recovery Time vs. Forward Current (Typical)



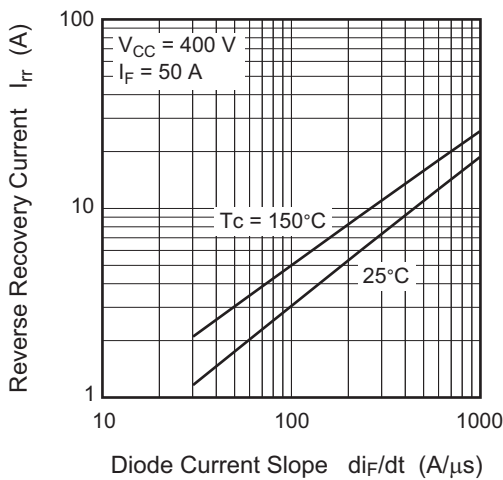
Reverse Recovery Charge vs. Diode Current Slope (Typical)



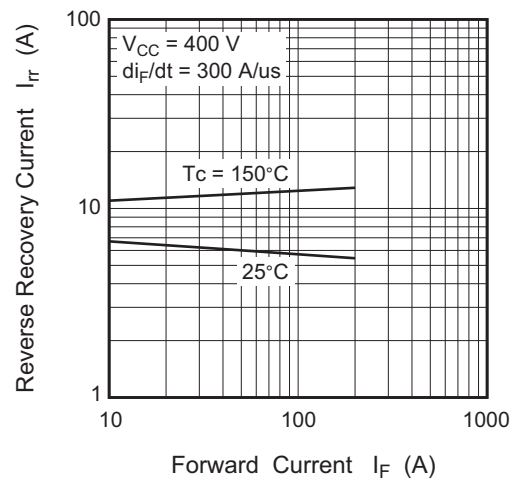
Reverse Recovery Charge vs. Forward Current (Typical)



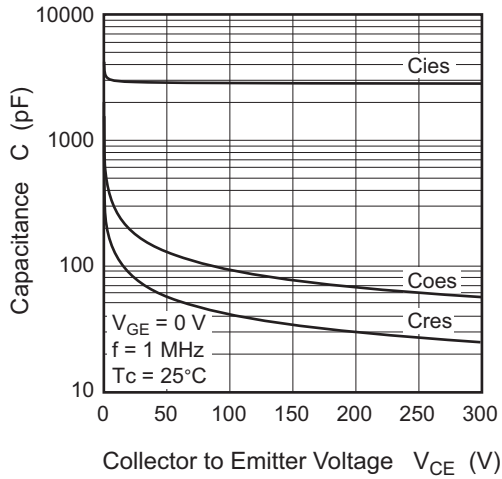
Reverse Recovery Current vs. Diode Current Slope (Typical)



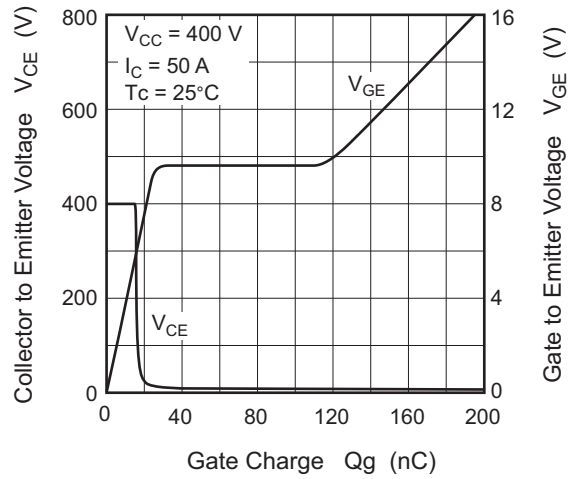
Reverse Recovery Current vs. Forward Current (Typical)



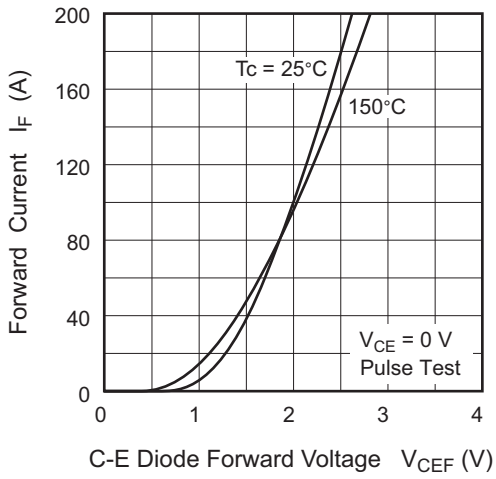
Typical Capacitance vs. Collector to Emitter Voltage

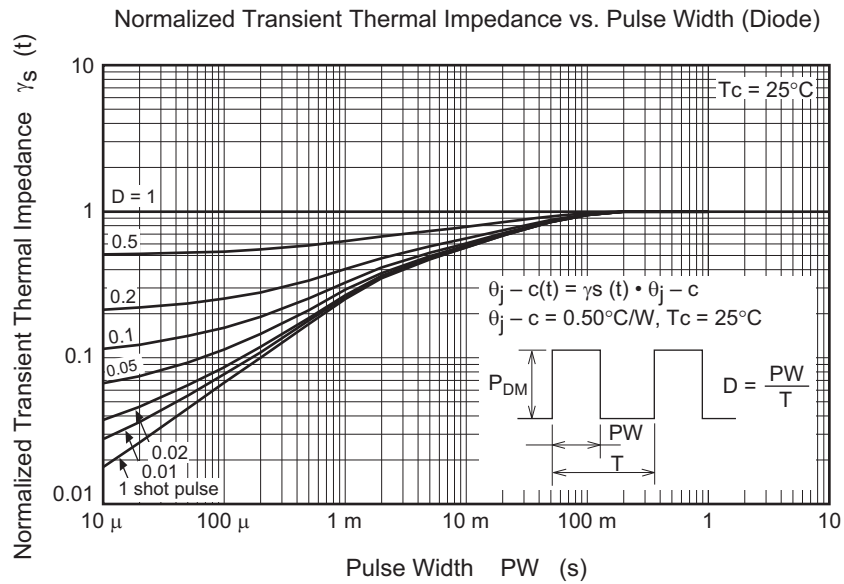
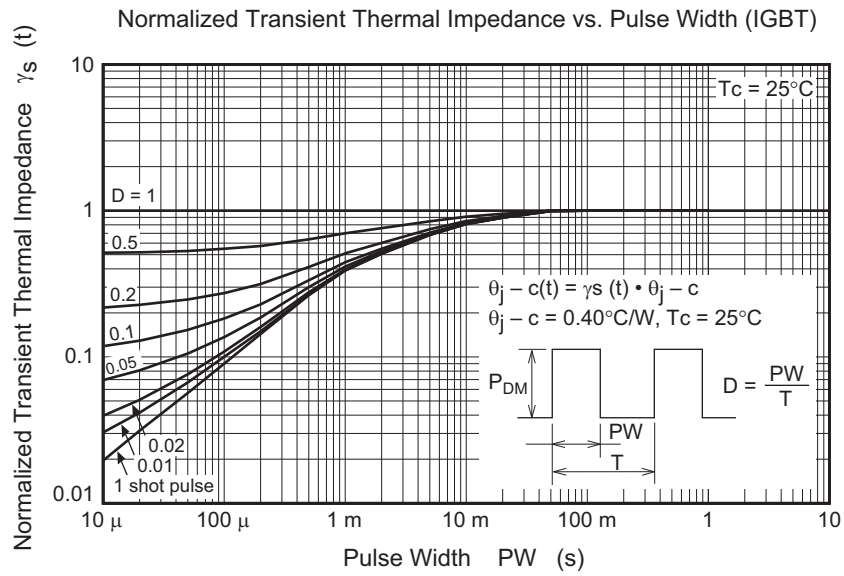


Dynamic Input Characteristics (Typical)

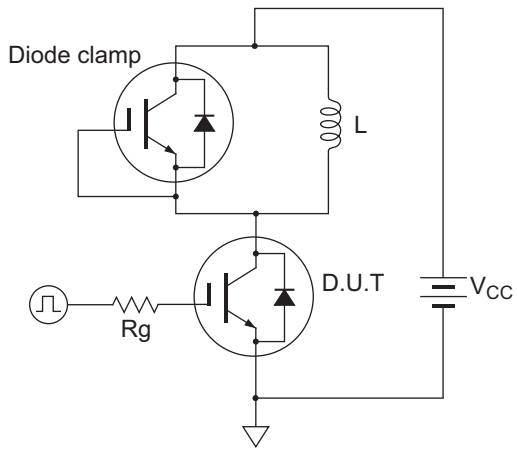


Forward Current vs. Forward Voltage (Typical)

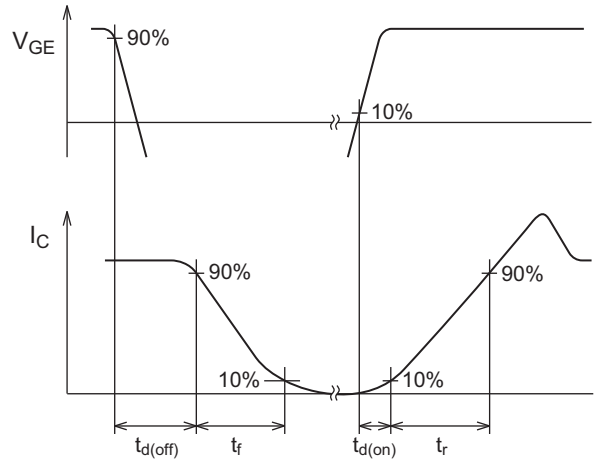




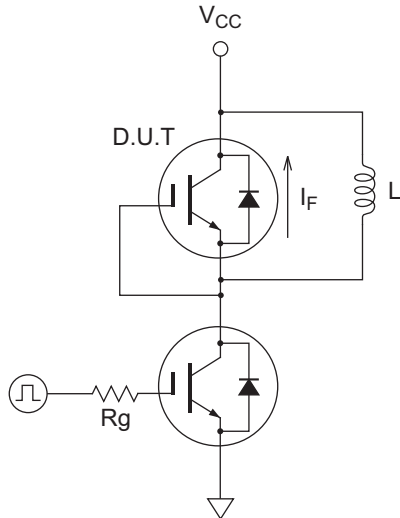
Switching Time Test Circuit



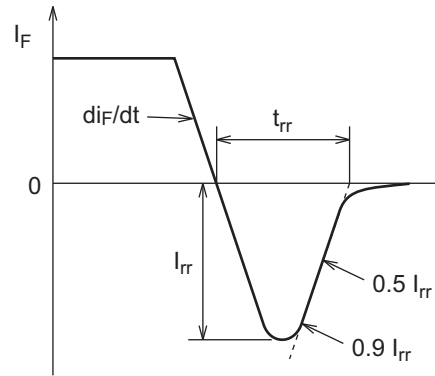
Waveform



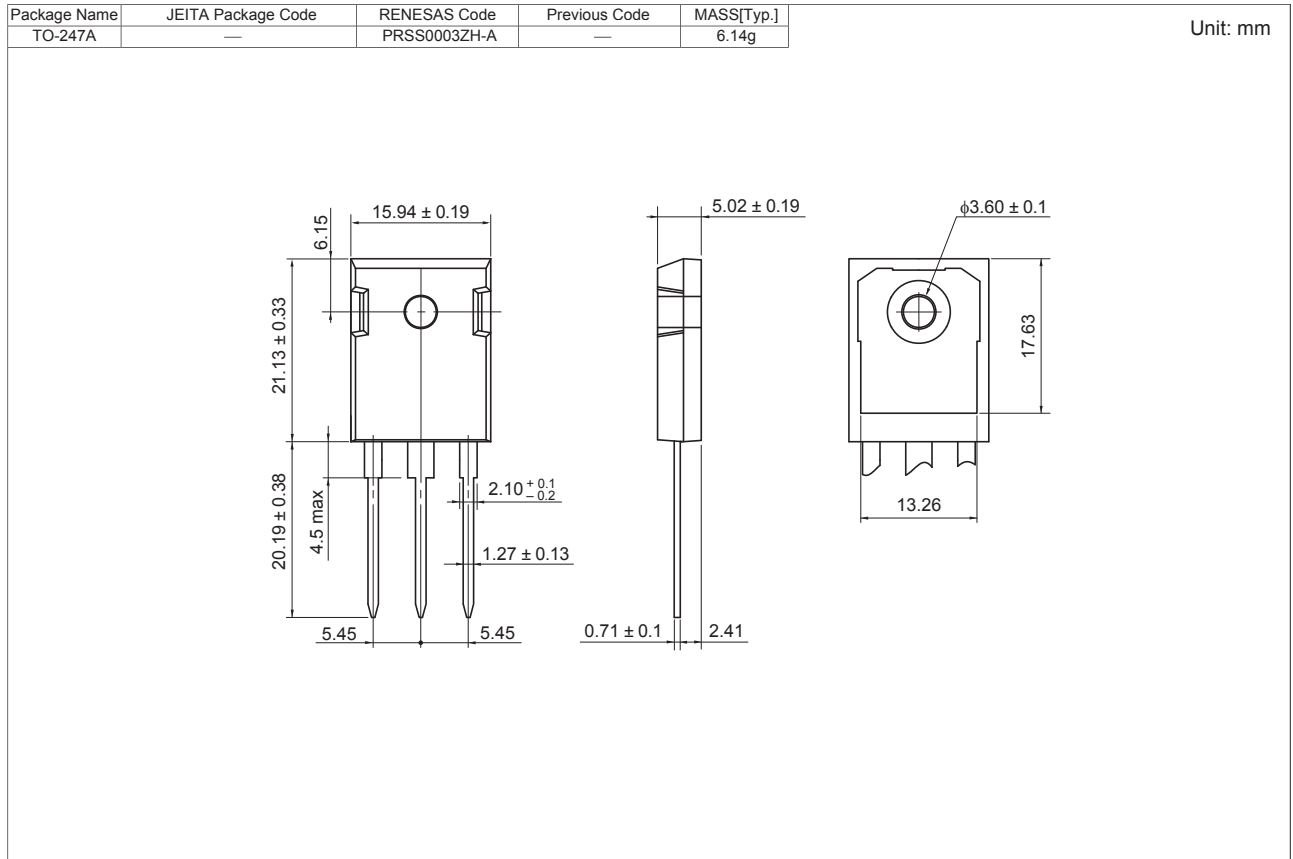
Diode Reverse Recovery Time Test Circuit



Waveform



Package Dimension



Ordering Information

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

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Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited

9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH

Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.

Room 1709, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100191, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.

Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, P. R. China 200333
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited

Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.

13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.

80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.

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Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.

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Tel: +91-80-67208700, Fax: +91-80-67208777

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