

RJH65T04BDPM-A0

650V - 30A - IGBT

Application: Power Factor Correction circuit

R07DS1366EJ0100

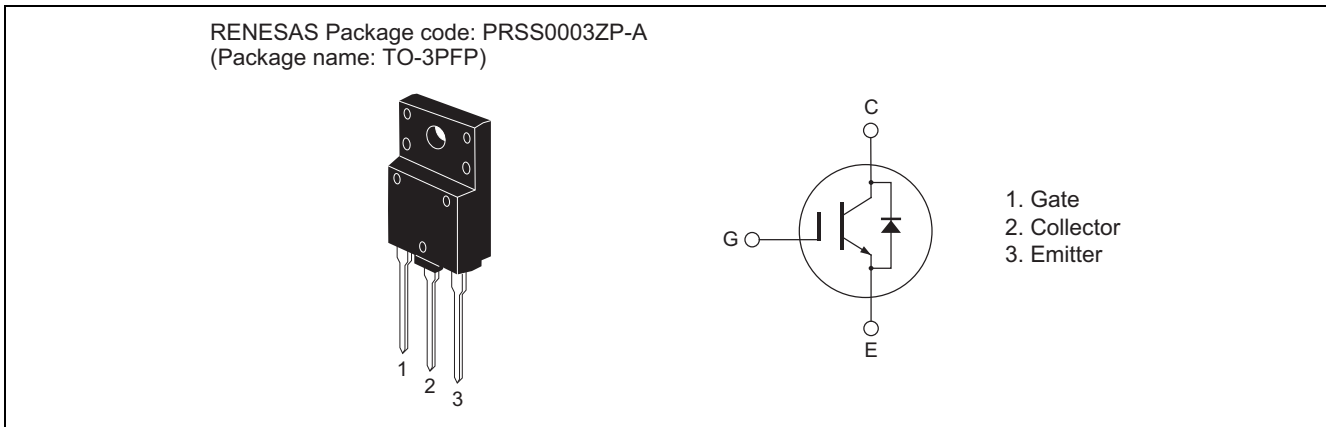
Rev.1.00

Jul 14, 2016

Features

- Low collector to emitter saturation voltage
 $V_{CE(sat)} = 1.5 \text{ V typ. (at } I_C = 30 \text{ A, } V_{GE} = 15 \text{ V, } T_a = 25^\circ\text{C)}$
- Built in fast recovery diode in one package
- Trench gate and thin wafer technology
- High speed switching
 $t_f = 45 \text{ ns typ. (at } V_{CC} = 400 \text{ V, } V_{GE} = 15 \text{ V, } I_C = 30 \text{ A, } R_g = 10 \Omega, T_a = 25^\circ\text{C, inductive load)}$
- Operation frequency ($20\text{kHz} \leq f < 40\text{kHz}$)

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}	± 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}	120	A
Clamped inductive load current	I_{CL} ^{Note2}	120	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
Peak surge forward current	I_{FSM} ^{Note3}	230	A
Collector dissipation	P_C ^{Note4}	65	W
Junction to case thermal resistance (IGBT)	θ_{j-c} ^{Note4}	2.3	$^\circ\text{C} / \text{W}$
Junction to case thermal resistance (Diode)	θ_{j-cd} ^{Note4}	2.35	$^\circ\text{C} / \text{W}$
Junction temperature	T_j ^{Note4}	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	$V_{GE(off)}$	4.0	—	7.0	V	$V_{CE} = 10 \text{ V}, I_C = 1 \text{ mA}$
Collector to emitter saturation voltage	$V_{CE(sat)}$	—	1.50	1.95	V	$I_C = 30 \text{ A}, V_{GE} = 15 \text{ V}$ ^{Note5}
Input capacitance	C_{ies}	—	1760	—	pF	$V_{CE} = 25 \text{ V}$
Output capacitance	C_{oes}	—	125	—	pF	$V_{GE} = 0$
Reverse transfer capacitance	C_{res}	—	34	—	pF	$f = 1 \text{ MHz}$
Total gate charge	Q_g	—	74	—	nC	$V_{GE} = 15 \text{ V}$
Gate to emitter charge	Q_{ge}	—	13	—	nC	$V_{CE} = 400 \text{ V}$
Gate to collector charge	Q_{gc}	—	31	—	nC	$I_C = 30 \text{ A}$
Turn-on delay time	$t_{d(on)}$	—	35	—	ns	$V_{CC} = 400 \text{ V}$
Rise time	t_r	—	25	—	ns	$V_{GE} = 15 \text{ V}$
Turn-off delay time	$t_{d(off)}$	—	115	—	ns	$I_C = 30 \text{ A}$
Fall time	t_f	—	45	—	ns	$R_g = 10 \Omega$
Turn-on energy	E_{on}	—	0.36	—	mJ	(Inductive load) ^{Note6}
Turn-off energy	E_{off}	—	0.35	—	mJ	
Total switching energy	E_{total}	—	0.71	—	mJ	
Turn-on delay time	$t_{d(on)}$	—	35	—	ns	$V_{CC} = 400 \text{ V}$
Rise time	t_r	—	25	—	ns	$V_{GE} = 15 \text{ V}$
Turn-off delay time	$t_{d(off)}$	—	125	—	ns	$I_C = 30 \text{ A}$
Fall time	t_f	—	70	—	ns	$R_g = 10 \Omega$
Turn-on energy	E_{on}	—	0.60	—	mJ	$T_C = 150^\circ\text{C}$
Turn-off energy	E_{off}	—	0.50	—	mJ	(Inductive load) ^{Note6}
Total switching energy	E_{total}	—	1.10	—	mJ	

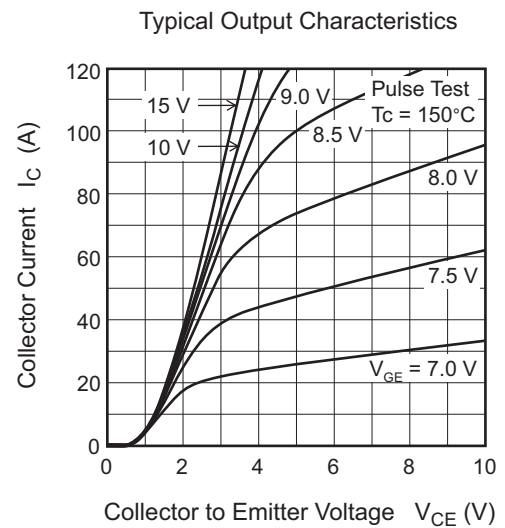
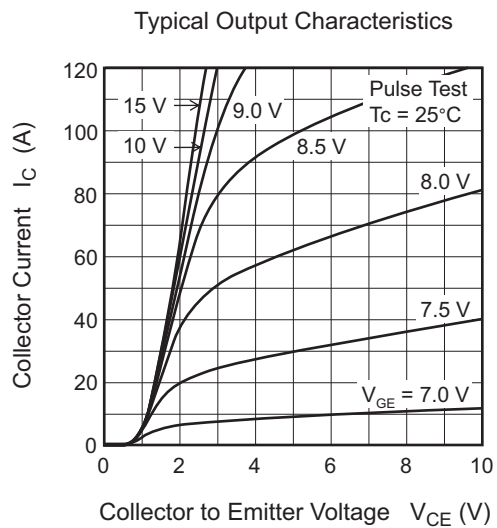
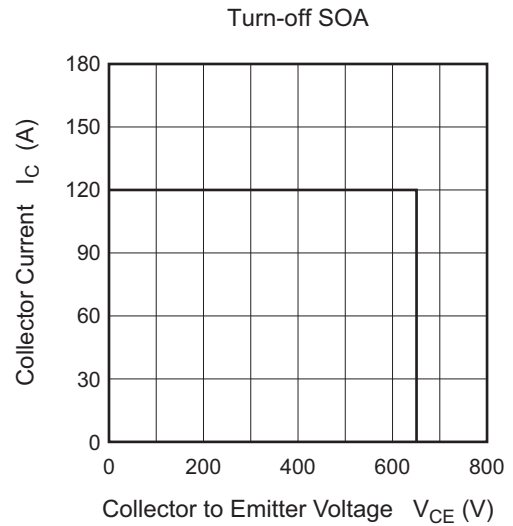
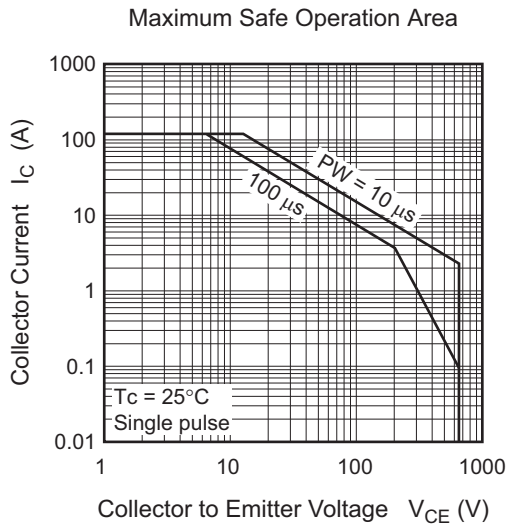
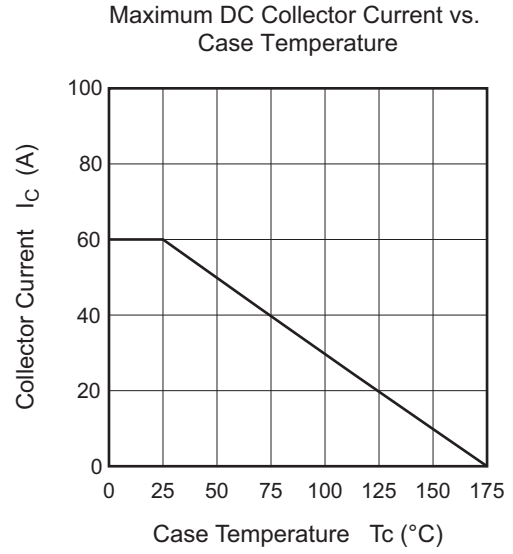
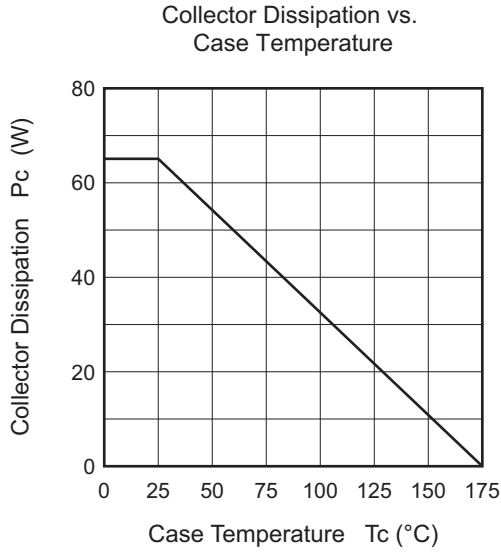
FRD forward voltage	V_F	—	1.4	1.8	V	$I_F = 30 \text{ A}$ ^{Note5}
FRD forward voltage	V_F	—	1.7	2.2	V	$I_F = 50 \text{ A}$ ^{Note5}
FRD reverse recovery time	t_{rr}	—	80	—	ns	$I_F = 50 \text{ A}, di_F/dt = 300 \text{ A}/\mu\text{s}$
FRD reverse recovery charge	Q_{rr}	—	0.35	—	μC	
FRD peak reverse recovery current	I_{rr}	—	7.5	—	A	

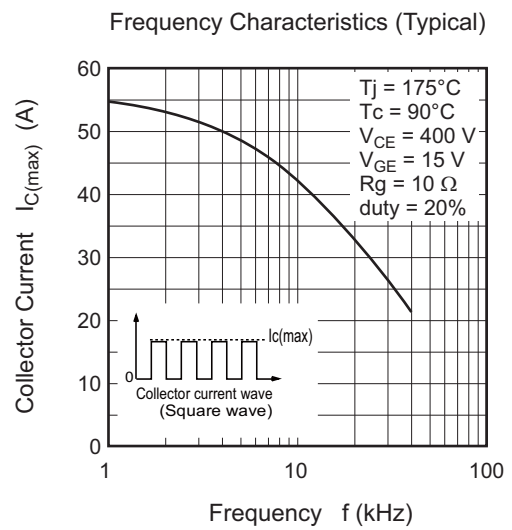
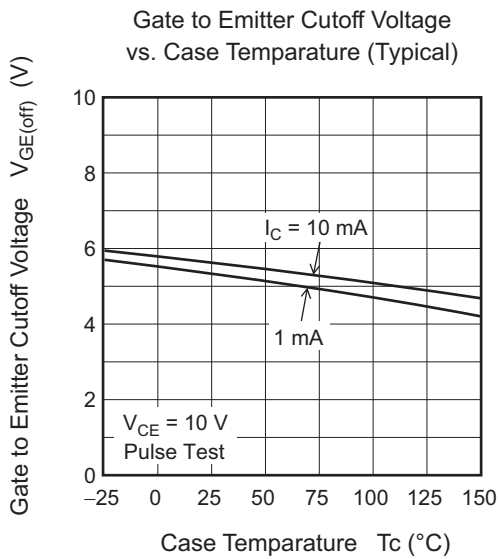
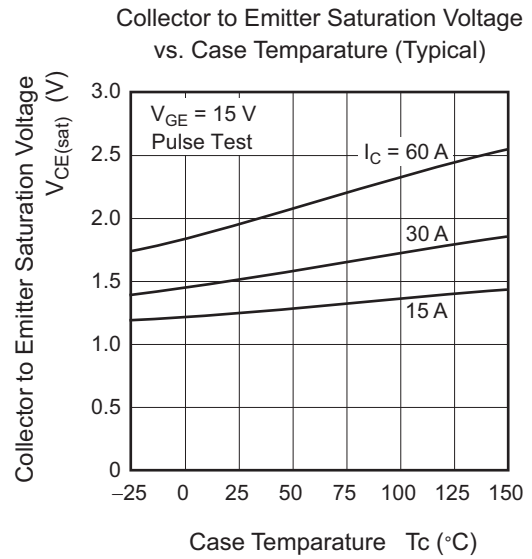
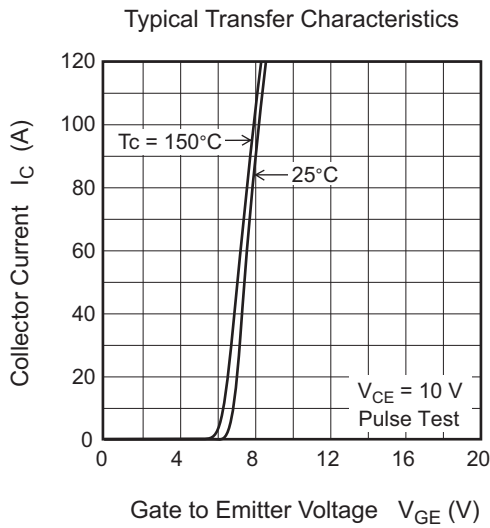
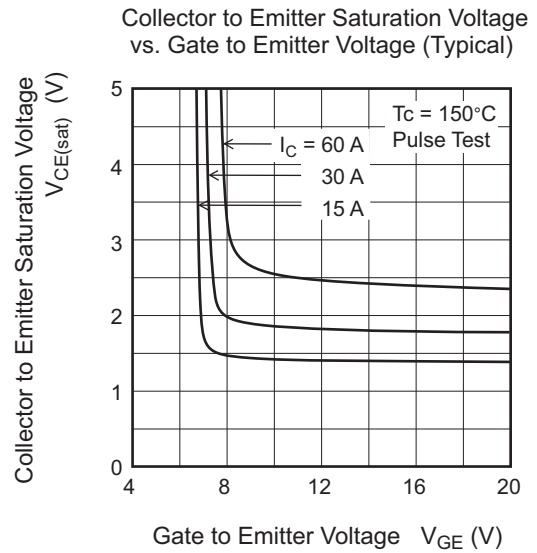
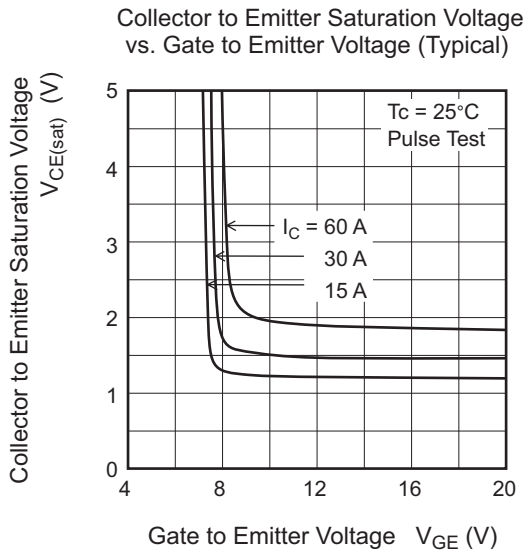
Notes: 1. $PW \leq 10 \mu\text{s}$, duty cycle $\leq 1\%$ 2. $V_{GE} = 15 \text{ V}$ 3. $PW = 3 \text{ ms}$ (sine half wave, Non-repetitive, 1 cycle), $T_j = 150^\circ\text{C}$ 4. Please use this device in the thermal conditions which the junction temperature does not exceed 175°C
Renesas IGBT Application Note is disclosed about reliability test and condition up to 175°C

5. Pulse test

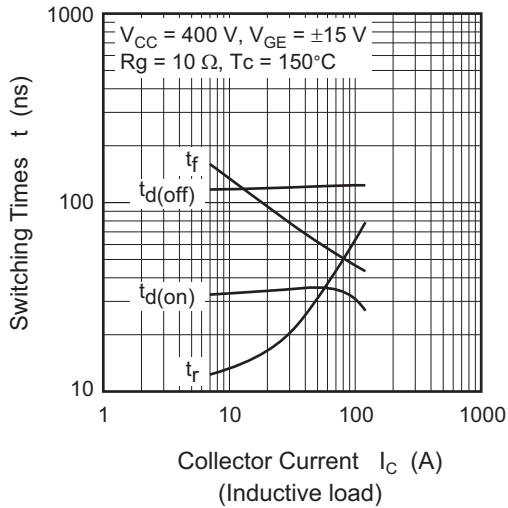
6. Switching time test circuit and waveform are shown below.

Main Characteristics

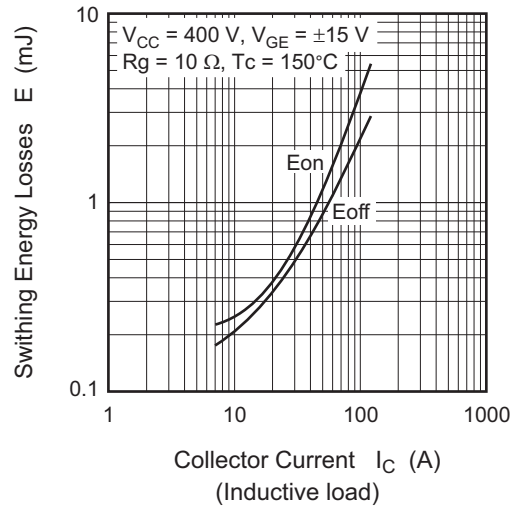




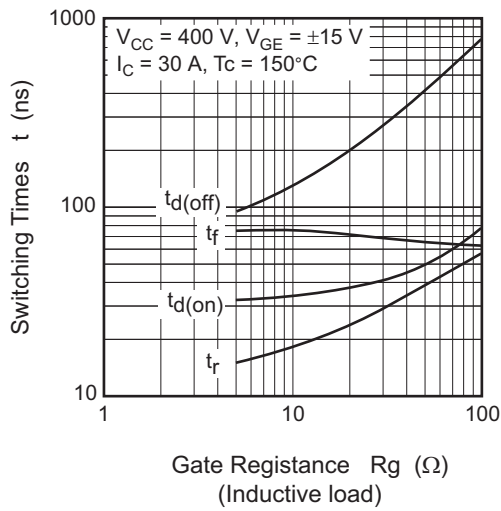
Switching Characteristics (Typical) (1)



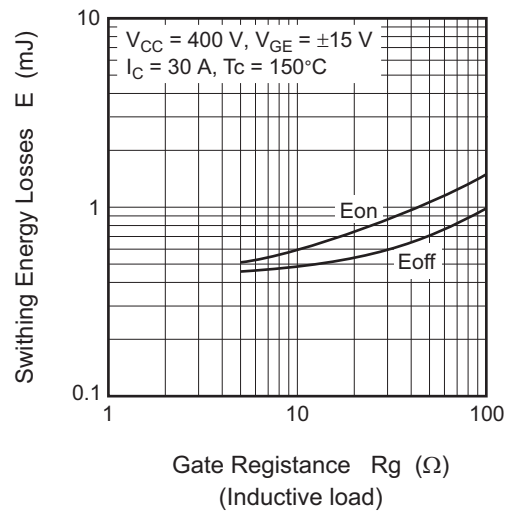
Switching Characteristics (Typical) (2)



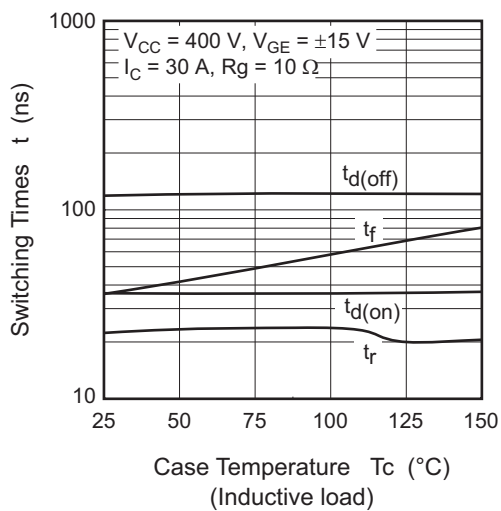
Switching Characteristics (Typical) (3)



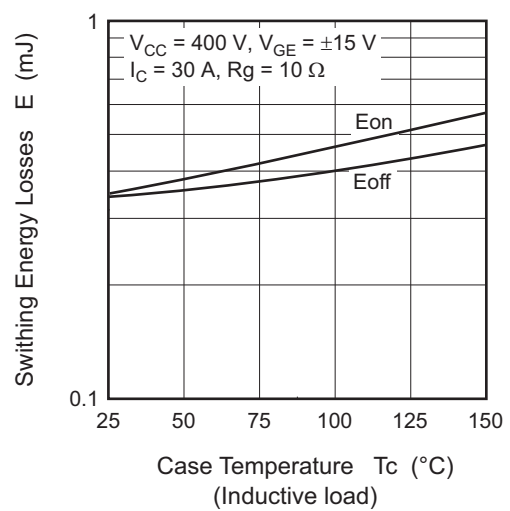
Switching Characteristics (Typical) (4)

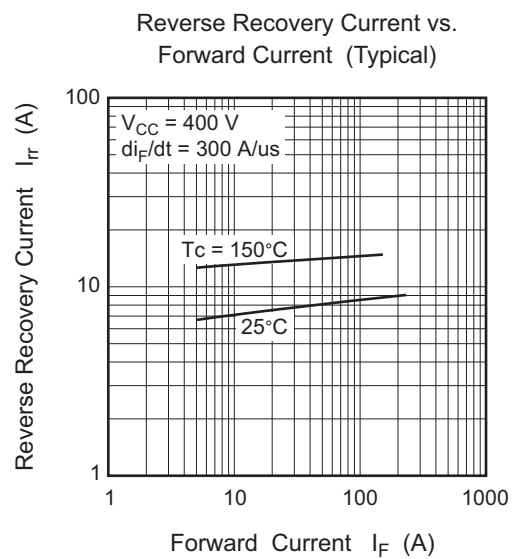
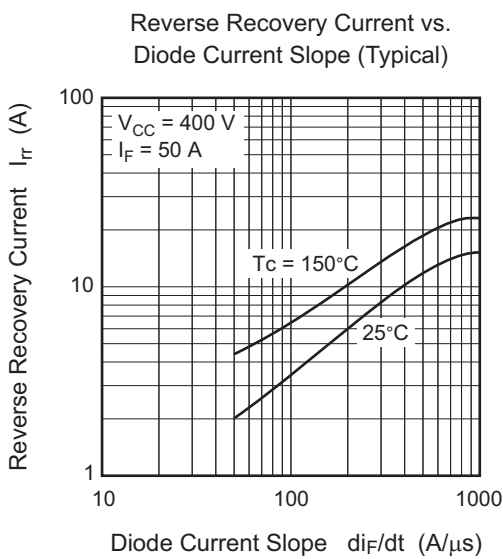
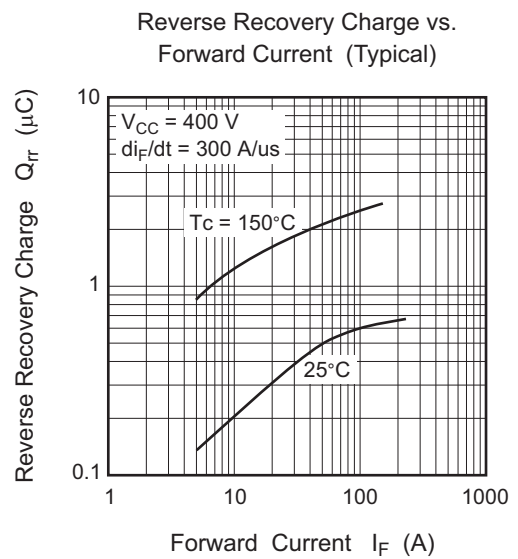
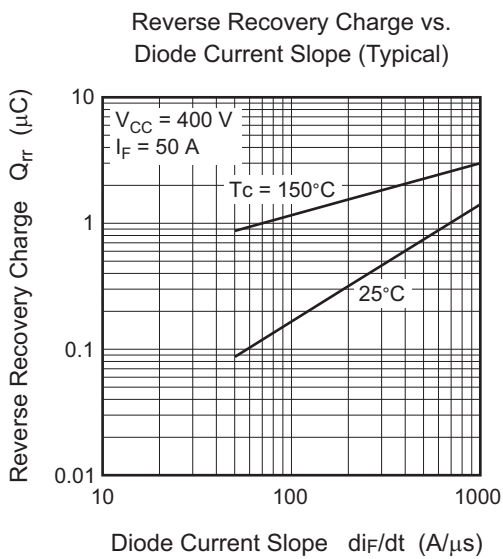
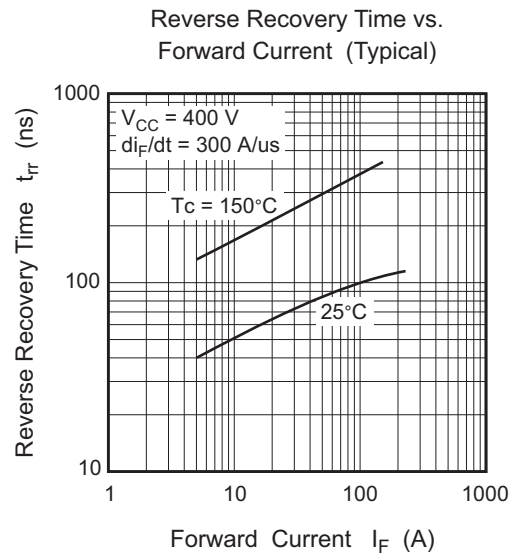
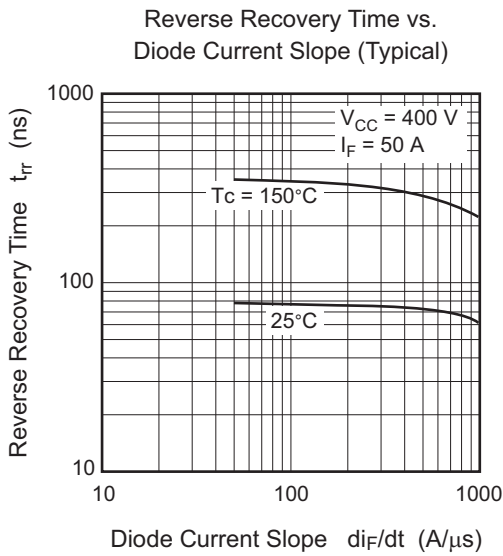


Switching Characteristics (Typical) (5)

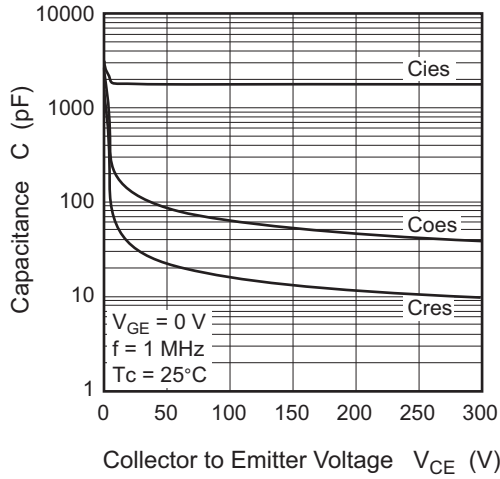


Switching Characteristics (Typical) (6)

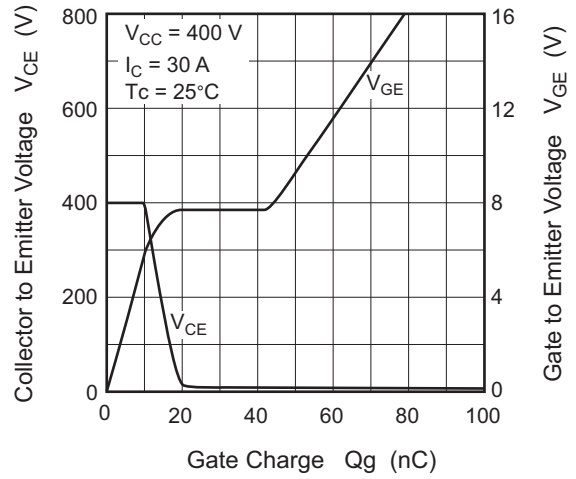




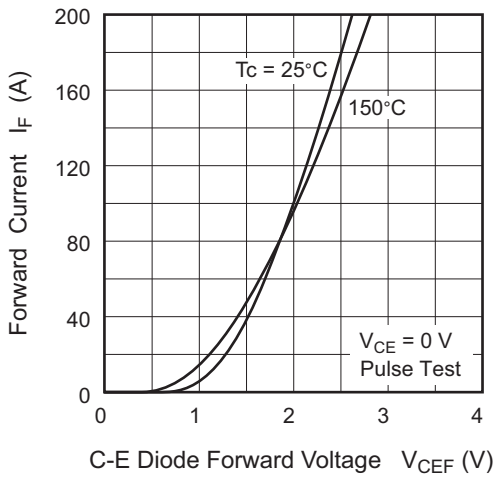
Typical Capacitance vs. Collector to Emitter Voltage

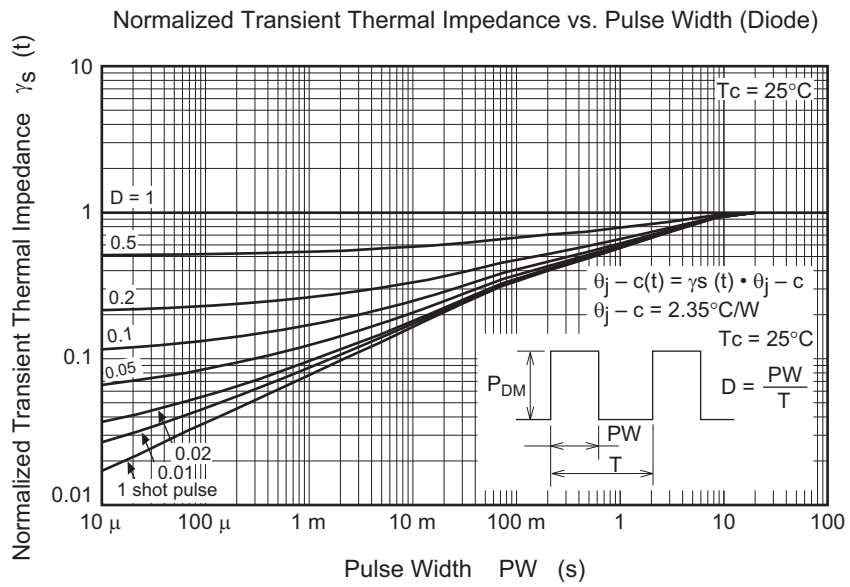
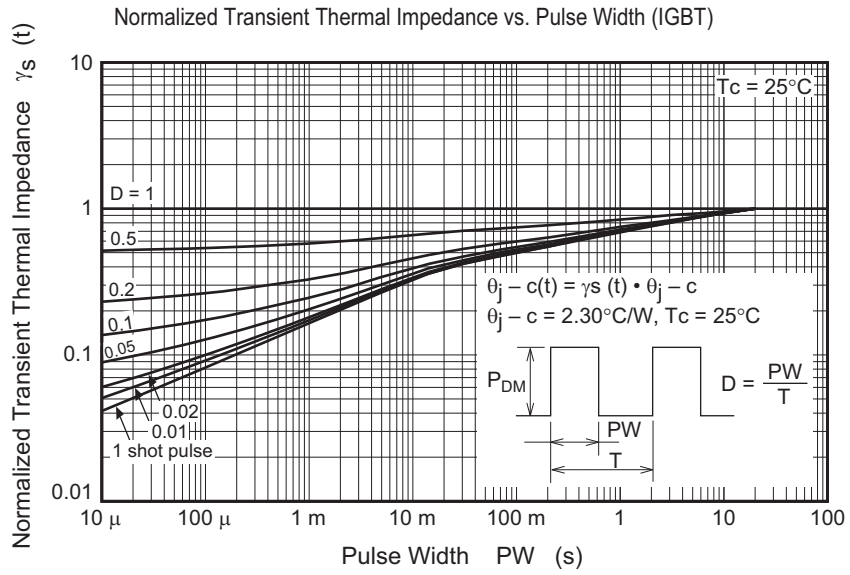


Dynamic Input Characteristics (Typical)

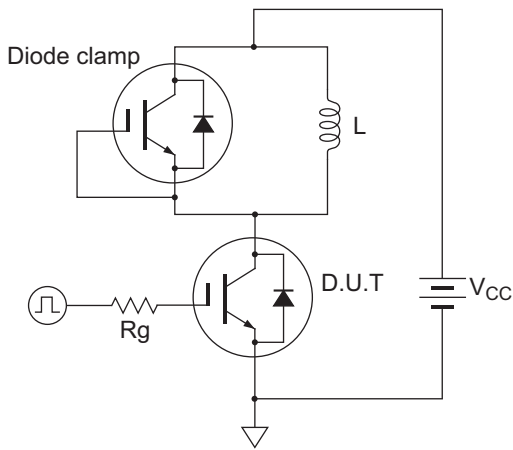


Forward Current vs. Forward Voltage (Typical)

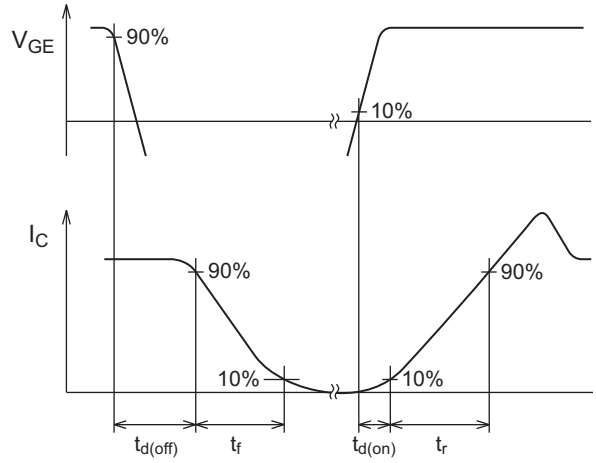




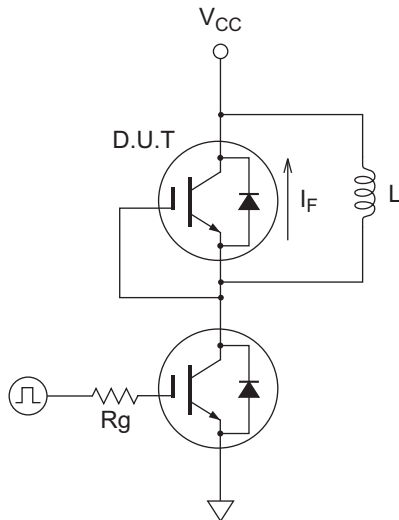
Switching Time Test Circuit



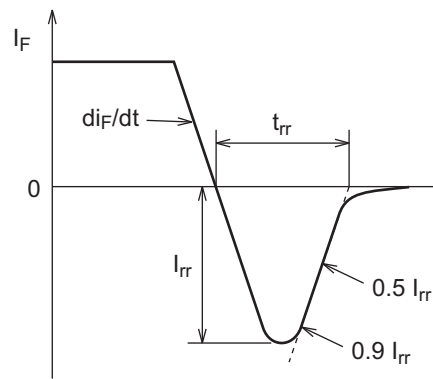
Waveform



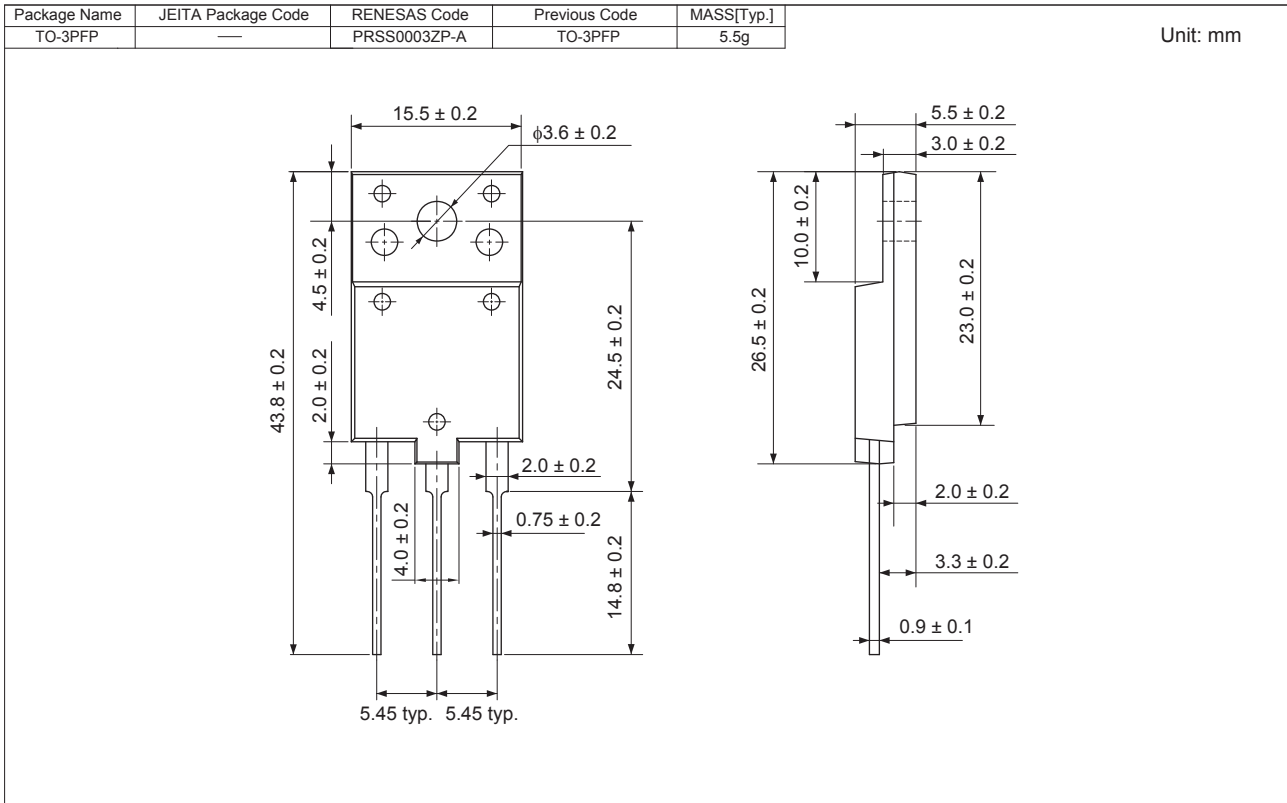
Diode Reverse Recovery Time Test Circuit



Waveform



Package Dimensions



Ordering Information

Orderable Part No.	Quantity	Shipping Container
RJH65T04BDPM-A0#T2	1000pcs	Box(tube)

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