

RJH65T04BDPM-A0

650V - 30A - IGBT
Power Switching

R07DS1366EJ0200
Rev.2.00
Oct.05.2022

Features

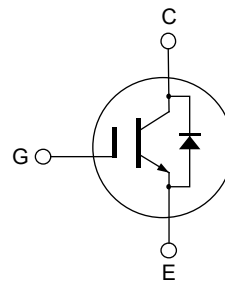
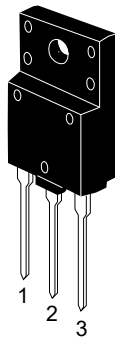
- Trench gate and thin wafer technology
- Built in fast recovery diode in one package
- Low collector to emitter saturation voltage
 $V_{CE(sat)} = 1.5\text{ V typ. (at } I_C = 30\text{ A, } V_{GE} = 15\text{ V, } T_a = 25\text{ °C)}$
- Quality grade: Standard
- High speed switching
 $t_f = 45\text{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

Key Performance

Type	V _{CES}	I _C	V _{CE(sat)} , T _C =25°C	I _F	T _J
RJH65T04BDPM-A0	650 V	30 A	1.5 V	50 A	175 °C

Outline

RENESAS Package code: PRSS0003ZP-A
(Package name: TO-3PFP)



1. Gate
2. Collector
3. Emitter

Absolute Maximum Ratings

(T_c = 25 °C)

Item	Symbol	Ratings	Unit	
Collector to emitter voltage	V _{CES}	650	V	
Gate to emitter voltage	V _{GES}	±30	V	
Collector current	T _c = 25 °C	I _C	60	A
	T _c = 100 °C	I _C	30	A
Collector peak current	I _{C(peak)} ^{Notes1}	120	A	
Clamped inductive load current	I _{CL} ^{Notes2}	120	A	
Diode forward current	T _c = 25 °C	I _F	100	A
	T _c = 100 °C	I _F	50	A
Peak surge forward current	IFSM ^{Notes3}	230	A	
Collector power dissipation	P _C ^{Notes4}	65	W	
Junction temperature	T _j ^{Notes4}	175	°C	
Storage temperature	T _{stg}	-55 to +150	°C	

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

- Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1 %
 2. V_{GE} = 15 V
 3. PW = 3 ms (sine half wave, Non-repetitive, 1 cycle), T_j = 150 degC
 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

Thermal Resistance Characteristics

(T_c = 25 °C)

Item	Symbol	Max. Value ^{Notes5}	Unit
Junction to case thermal resistance (IGBT)	R _{th(j-c)}	2.3	°C/W
Junction to case thermal resistance (Diode)	R _{th(j-c)}	2.35	°C/W

Notes: 5. Designed target value on Renesas measurement condition. (Not tested)

Electrical Characteristics

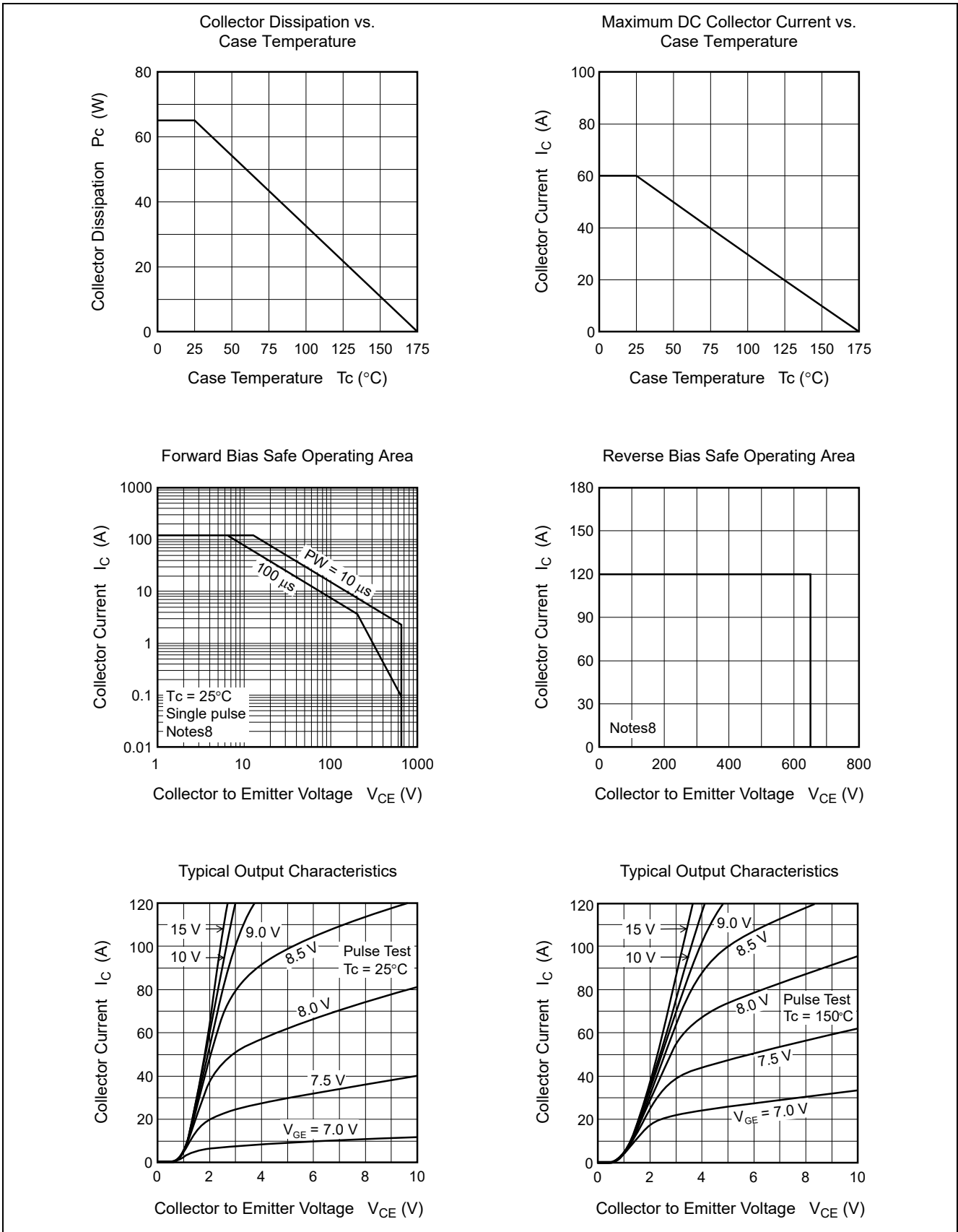
(T_c = 25 °C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Collector to emitter leakage current	I _{CEs}	—	—	100	μA	V _{CE} = 650 V, V _{GE} = 0 V
Gate to emitter leakage current	I _{GES}	—	—	±1	μA	V _{GE} = ±30 V, V _{CE} = 0 V
Gate to emitter threshold voltage	V _{GE(th)}	4.0	—	7.0	V	V _{CE} = 10 V, I _C = 1 mA
Collector to emitter saturation voltage	V _{CE(sat)}	—	1.50	1.95	V	I _C = 30 A, V _{GE} = 15 V ^{Notes6}
Input capacitance	C _{ies}	—	1760	—	pF	V _{CE} = 25 V
Output capacitance	C _{oes}	—	125	—	pF	V _{GE} = 0 V
Reverse transfer capacitance	C _{res}	—	34	—	pF	f = 1 MHz
Total gate charge	Q _g	—	74	—	nC	V _{GE} = 15V
Gate to emitter charge	Q _{ge}	—	13	—	nC	V _{CE} = 400 V
Gate to collector charge	Q _{gc}	—	31	—	nC	I _C = 30 A
Turn-on delay time	t _{d(on)}	—	35	—	ns	V _{CC} = 400 V
Rise time	t _r	—	25	—	ns	V _{GE} = 15 V
Turn-off delay time	t _{d(off)}	—	115	—	ns	I _C = 30 A
Fall time	t _f	—	45	—	ns	R _g = 10 Ω
Turn-on loss energy	E _{on}	—	0.36	—	mJ	Inductive load ^{Notes7}
Turn-off loss 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 V
Rise time	t _r	—	25	—	ns	V _{GE} = 15 V
Turn-off delay time	t _{d(off)}	—	125	—	ns	I _C = 30 A
Fall time	t _f	—	70	—	ns	R _g = 10 Ω
Turn-on loss energy	E _{on}	—	0.60	—	mJ	T _c = 150 °C
Turn-off loss energy	E _{off}	—	0.50	—	mJ	Inductive load ^{Notes7}
Total switching energy	E _{total}	—	1.10	—	mJ	
Diode forward voltage	V _F	—	1.4	1.8	V	I _F = 30 A ^{Notes6}
Diode forward voltage	V _F	—	1.7	2.2	V	I _F = 50 A ^{Notes6}
Diode reverse recovery time	t _{rr}	—	80	—	ns	I _F = 50 A, di _F /dt = 300 A/μs
Diode reverse recovery charge	Q _{rr}	—	0.35	—	μC	
Diode peak reverse recovery current	I _{rr}	—	7.5	—	A	

Notes: 6. Pulse test

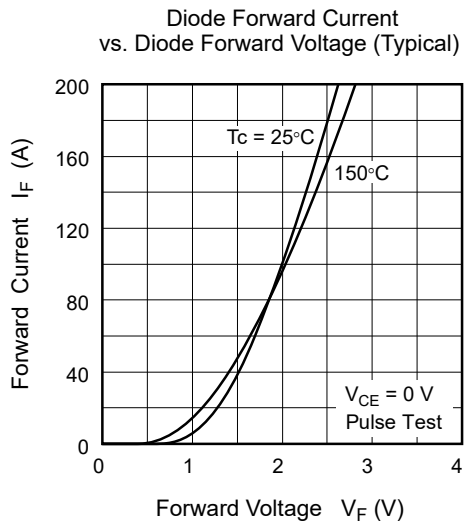
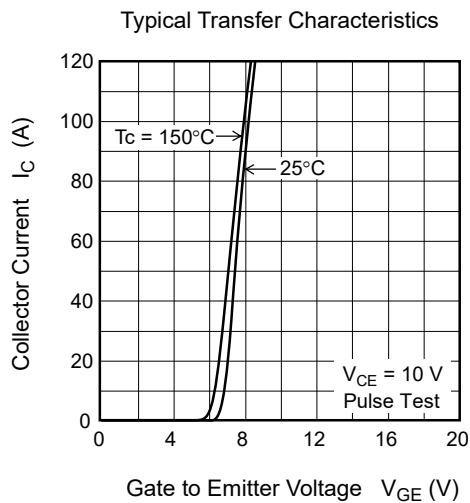
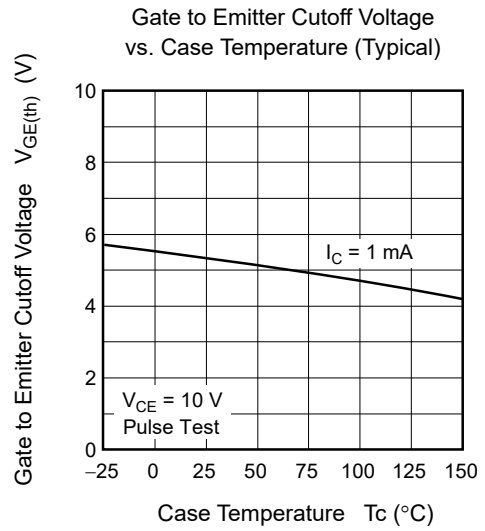
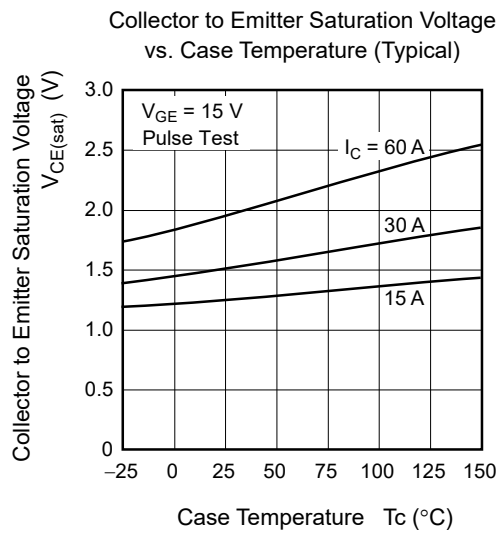
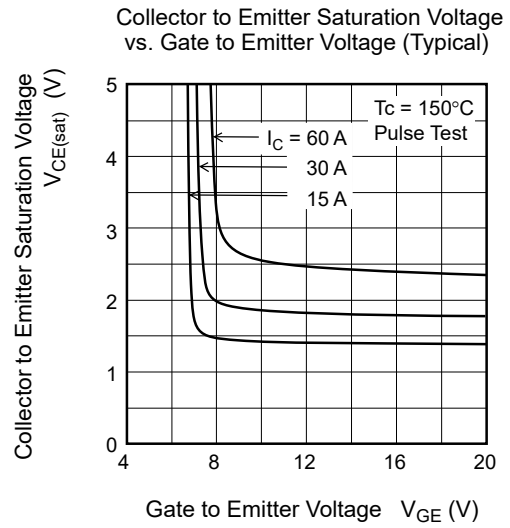
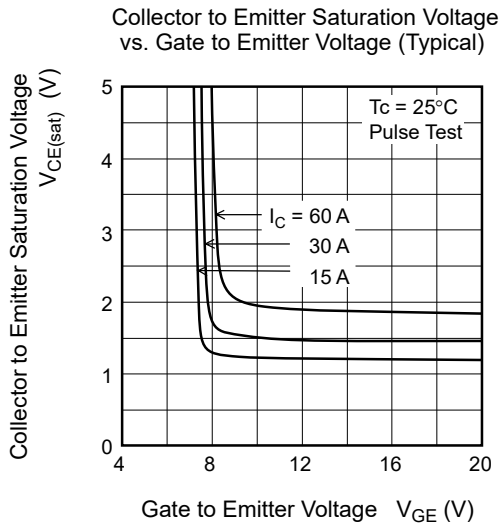
7. Switching time test circuit and waveform are shown below.

Main Characteristics

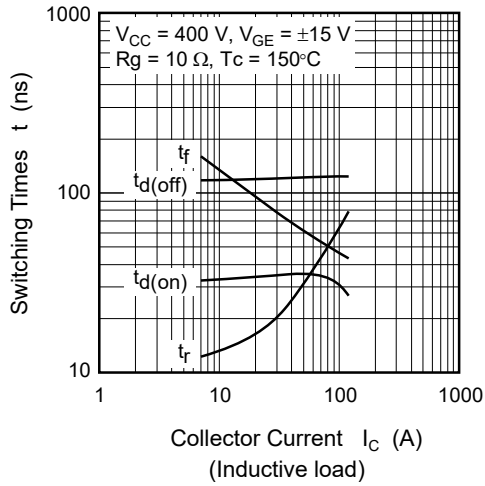


Notes: 8. Designed target value on Renesas measurement condition. (Not tested)

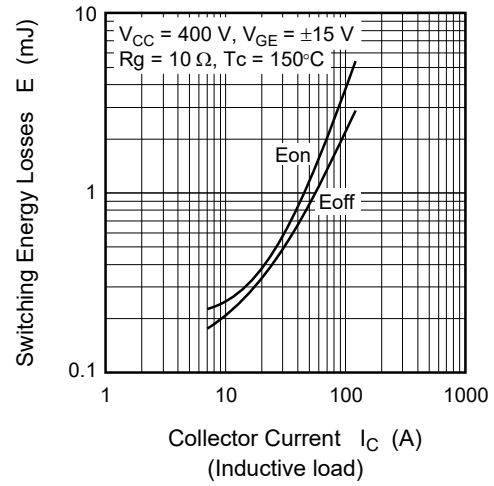
Renesas recommends that operating conditions are designed according to a document "Power MOS FET · IGBT Attention of Handling Semiconductor Devices".



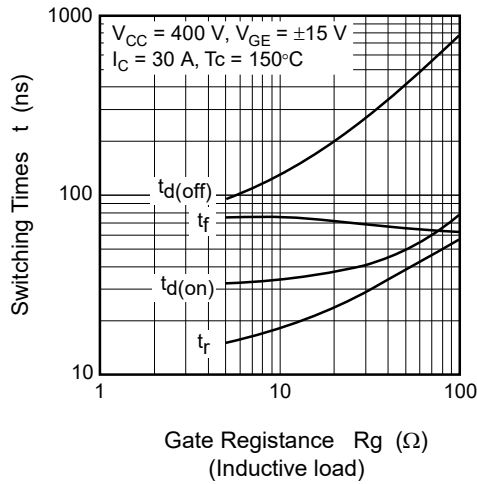
Switching Characteristics (Typical) (1)



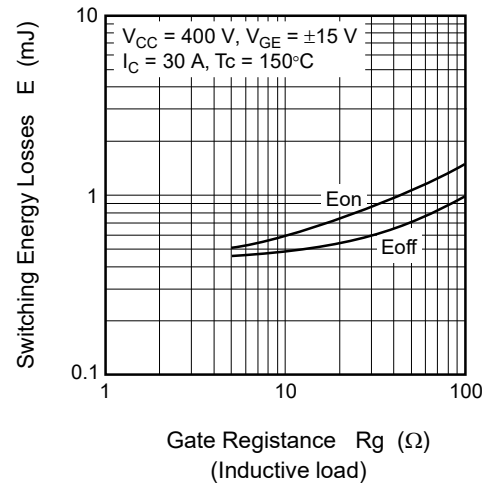
Switching Characteristics (Typical) (2)



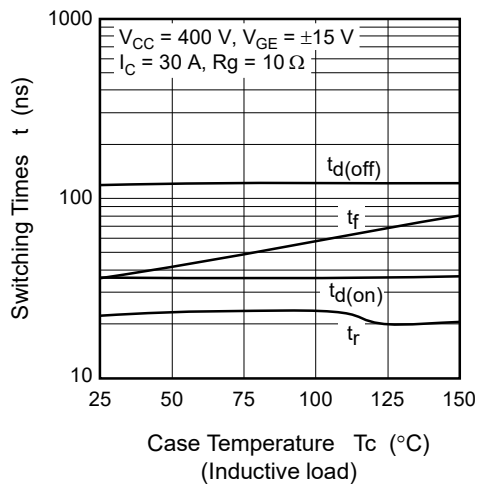
Switching Characteristics (Typical) (3)



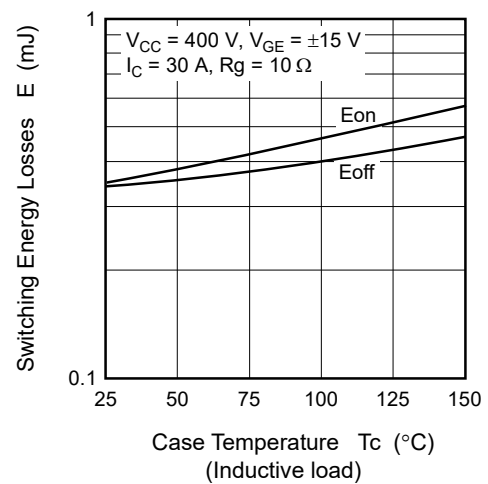
Switching Characteristics (Typical) (4)



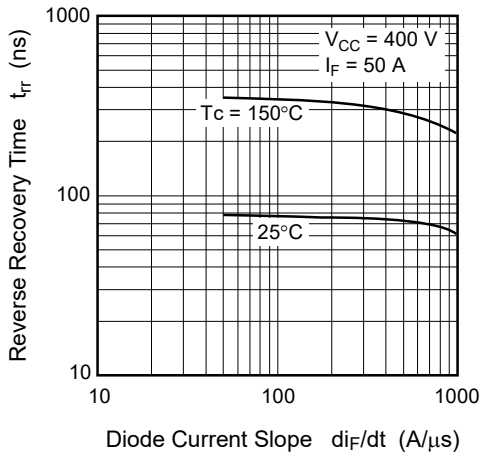
Switching Characteristics (Typical) (5)



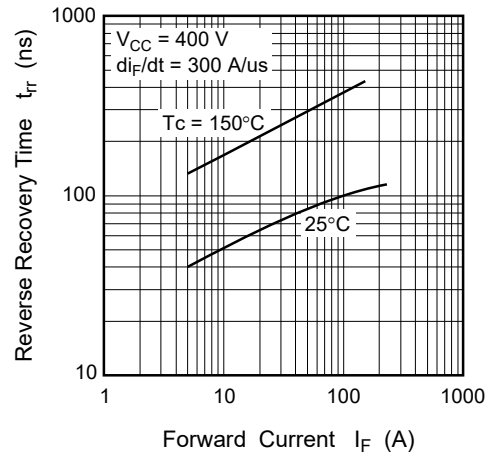
Switching Characteristics (Typical) (6)



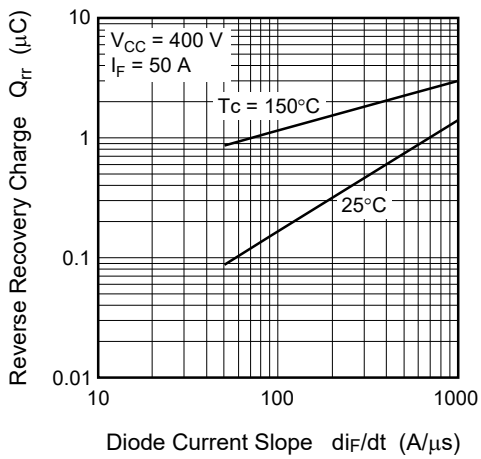
Reverse Recovery Time vs. Diode Current Slope (Typical)



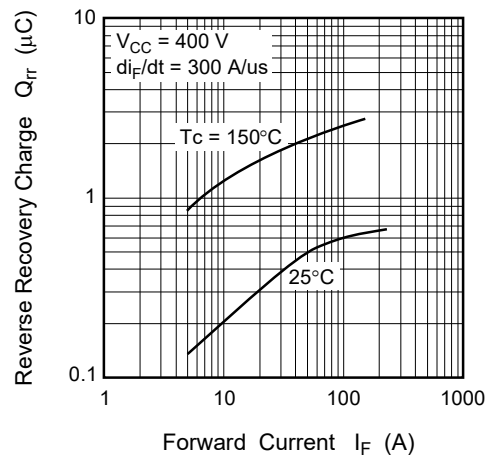
Reverse Recovery Time vs. Forward Current (Typical)



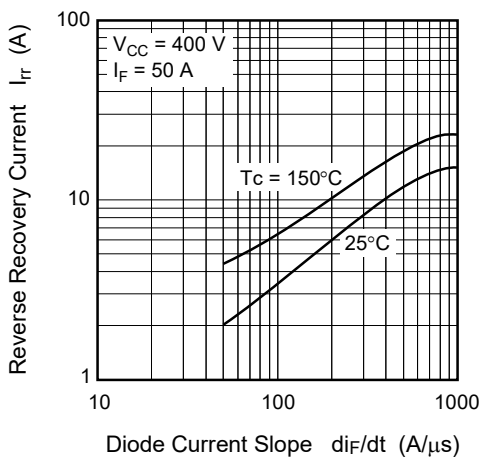
Reverse Recovery Charge vs. Diode Current Slope (Typical)



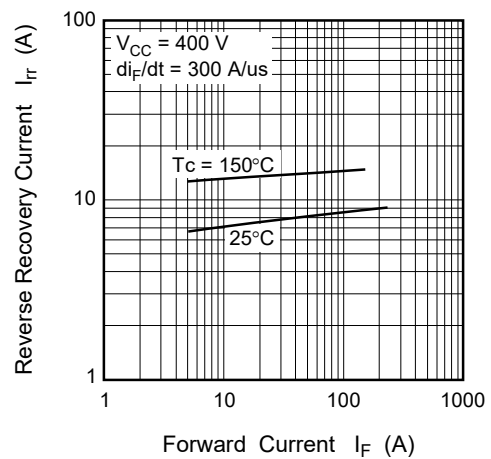
Reverse Recovery Charge vs. Forward Current (Typical)

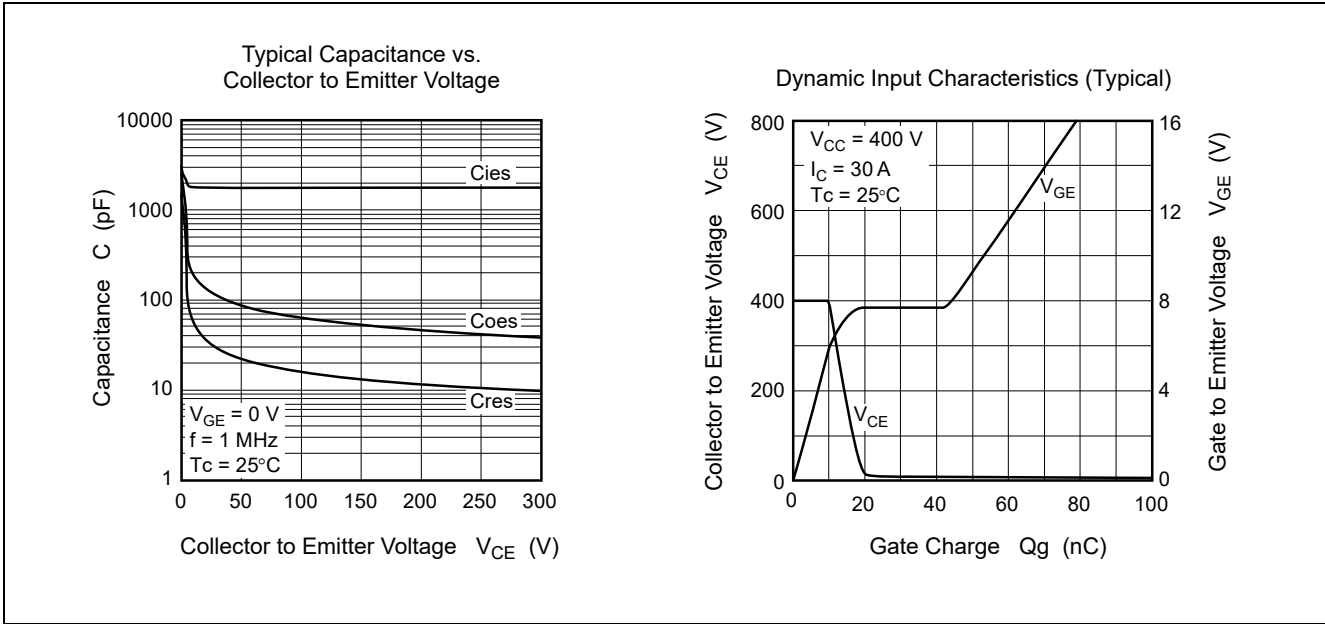


Reverse Recovery Current vs. Diode Current Slope (Typical)

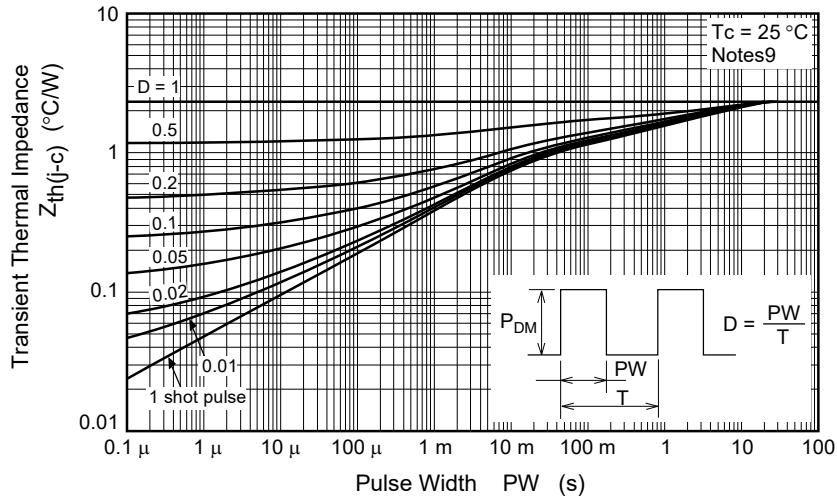


Reverse Recovery Current vs. Forward Current (Typical)

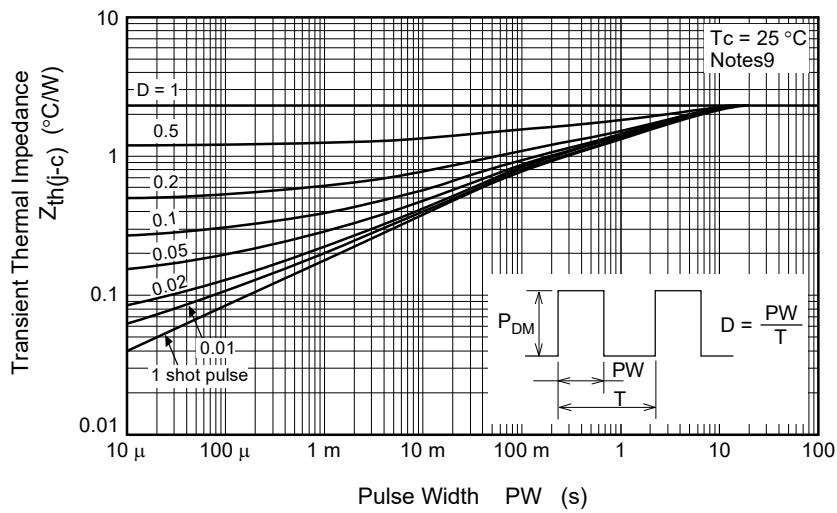




Transient Thermal Impedance vs. Pulse Width (IGBT)

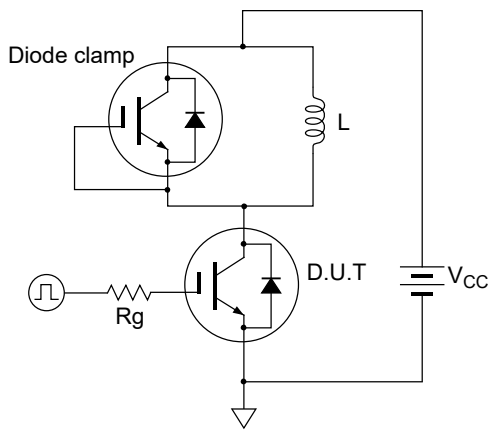


Transient Thermal Impedance vs. Pulse Width (Diode)

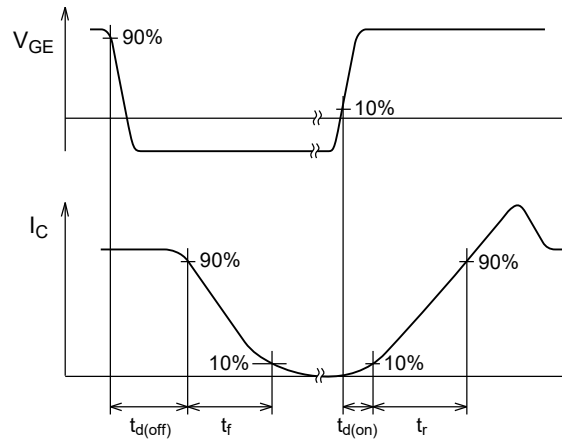


Notes: 9. Designed target value on Renesas measurement condition. (Not tested)

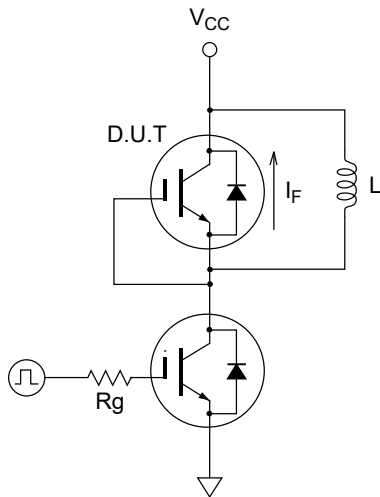
Switching Time Test Circuit



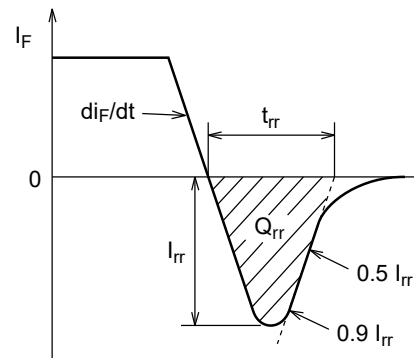
Waveform



Diode Reverse Recovery Time Test Circuit



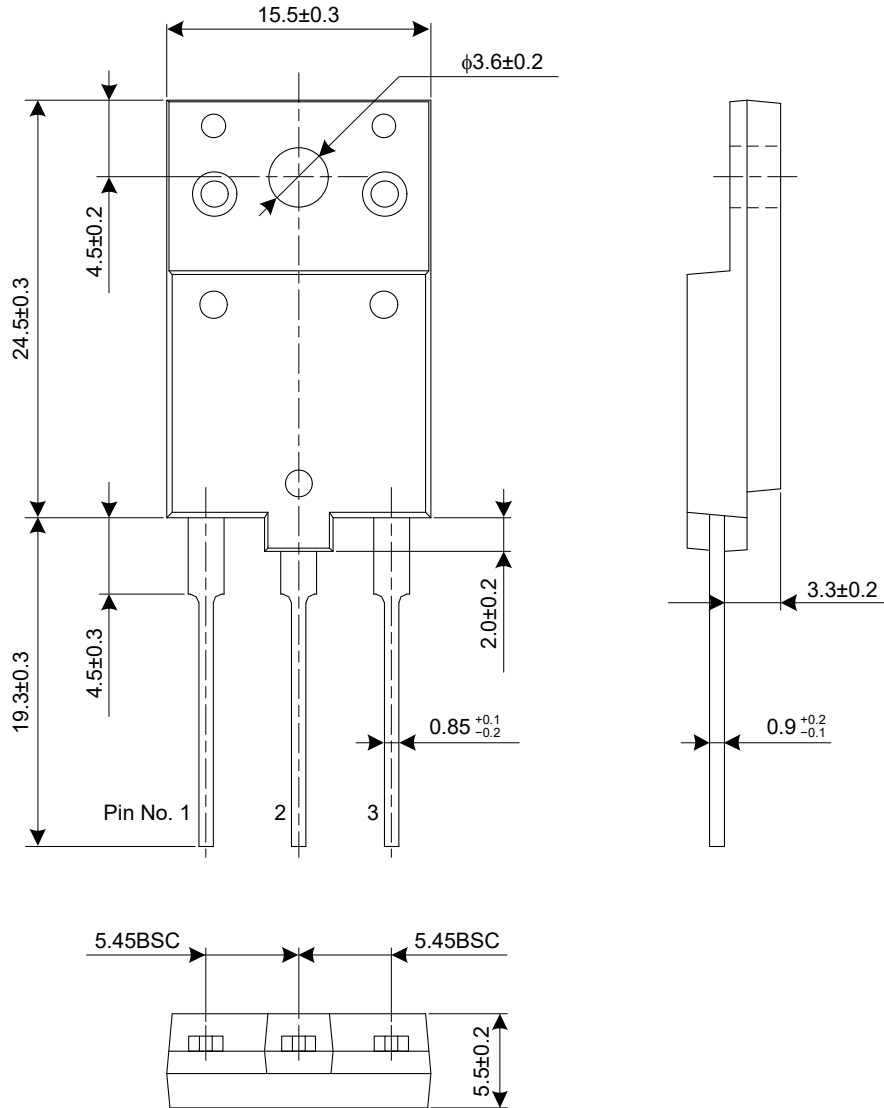
Waveform



Package Dimensions

Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS (Typ) [g]
TO-3PFP	—	PRSS0003ZP-A	TO-3PFP	6.2

Unit: mm



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Ordering Information

Orderable Part Number	Quantity	Shipping Container
RJH65T04BDPM-A0#T2	1000pcs	Box (tube)

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Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
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