RJQ6008BDPM

600V - 6A - IGBT
Power Switching

R07DS1489EJ0200
Rev.2.00
Nov.19.2020

Features

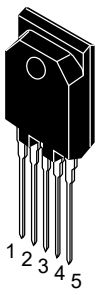
- Built in fast recovery diode in one package
- Low collector to emitter saturation voltage
  $V_{CE(sat)}$ =1.8 V typ. (at I_C = 20 A, V_{GE} = 15V, Tc = 25 °C)
- Quality grade: Standard
- High speed switching
- Applications: PFC

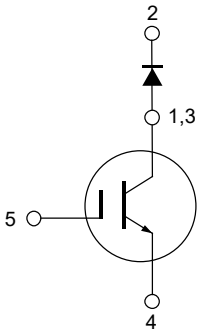
Key Performance

Type	V_{CES}	I_C	$V_{CE(sat)}$, T_C=25°C	I_F	T_j
RJQ6008BDPM	600 V	20 A	1.8 V	20 A	150 °C

Outline

RENESAS Package code: PRSS0005ZB-A
(Package name: TO-3PFM-5)





1. Anode, Collector
2. Cathode
3. Anode, Collector
4. Emitter
5. Gate

Absolute Maximum Ratings

IGBT

(Tc = 25 °C)

Item		Symbol	Ratings	Unit
Collector to emitter voltage		V_{CES}	600	V
Gate to emitter voltage		V_{GES}	±30	V
Collector current	Tc = 25 °C	I_C	13	A
	Tc = 100 °C	I_C	6	A
Collector peak current		$I_{C(peak)}$ Notes1	100	A
Collector power dissipation		P_C Notes2	29	W
Junction temperature		T_j Notes2	150	°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. Pulse width limited by safe operating area.
2. Heat dissipation so that the junction temperature is 150 °C or lower.

Diode

(Tc = 25 °C)

Item		Symbol	Ratings	Unit
Maximum reverse voltage		V_{RM}	600	V
Diode forward current		I_F	20	A
Peak surge forward current	PW = 10 ms Notes3	IFSM	100	A
	PW = 1 ms Notes4	IFSM	190	A
Junction temperature		T_j Notes2	150	°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: 3. 50Hz sine half wave, Non-repetitive 1 cycle value, Tj = 25°C.
4. PW = 1ms sine half wave, Non-repetitive peak value, Tj = 25°C.

Thermal Resistance Characteristics

(Tc = 25 °C)

Item	Symbol	Max. Value Notes5	Unit
Junction to case thermal impedance (IGBT)	$R_{th(j-c)}$	4.2	°C/W
Junction to case thermal resistance (Diode)	$R_{th(j-c)}$	3.0	°C/W

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

Electrical Characteristics

IGBT

(Tc = 25 °C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Collector to emitter leakage current	I_{CES}	—	—	10	μA	V_{CE} = 600 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 = 0.67 mA
Collector to emitter saturation voltage	$V_{CE(sat)}$	—	1.8	2.4	V	I_C = 20 A, V_{GE} = 15V Notes6, 7
Input capacitance	C_{ies}	—	1320	—	pF	V_{CE} = 25 V
Output capacitance	C_{oes}	—	37	—	pF	V_{GE} = 0 V
Reverse transfer capacitance	C_{res}	—	26	—	pF	f = 1 MHz
Total gate charge	Q_g	—	70	—	nC	V_{GE} = 15 V
Gate to emitter charge	Q_{ge}	—	8	—	nC	V_{CE} = 400 V
Gate to collector charge	Q_{gc}	—	31	—	nC	I_C = 13 A
Turn-on delay time	$t_{d(on)}$	—	31	—	ns	V_{CC} = 400 V
Rise time	t_r	—	20	—	ns	V_{GE} = 15 V
Turn-off delay time	$t_{d(off)}$	—	107	—	ns	I_C = 20 A
Fall time	t_f	—	28	—	ns	R_g = 10 Ω
Turn-on loss energy	E_{on}	—	0.51	—	mJ	Tc = 25 °C
Turn-off loss energy	E_{off}	—	0.11	—	mJ	Inductive load Notes8
Total switching energy	E_{total}	—	0.62	—	mJ	
Turn-on delay time	$t_{d(on)}$	—	29	—	ns	V_{CC} = 400 V
Rise time	t_r	—	17	—	ns	V_{GE} = 15 V
Turn-off delay time	$t_{d(off)}$	—	114	—	ns	I_C = 20 A
Fall time	t_f	—	51	—	ns	R_g = 10 Ω
Turn-on loss energy	E_{on}	—	0.67	—	mJ	Tc = 150 °C
Turn-off loss energy	E_{off}	—	0.24	—	mJ	Inductive load Notes8
Total switching energy	E_{total}	—	0.91	—	mJ	

Notes: 6. Pulse test
7. Measured between Pins 3 and 4.
8. Switching time test circuit and waveform are shown below.

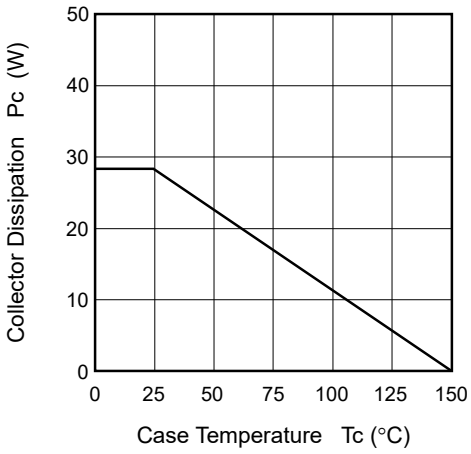
Diode

(Tc = 25 °C)

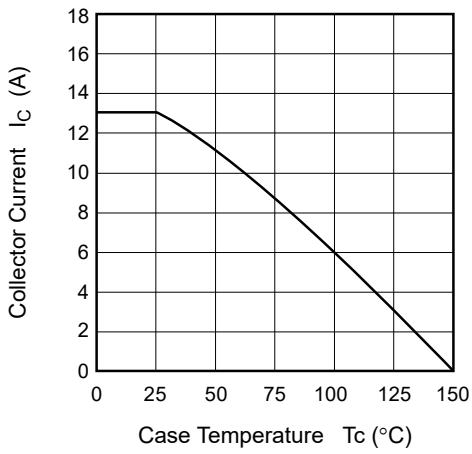
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Forward voltage	V_F	—	1.2	1.8	V	I_F = 20 A Notes6
Reverse recovery time	t_{rr}	—	100	—	ns	I_F = 20 A, d_{iF}/d_t = 100 A/μs
Reverse recovery charge	Q_{rr}	—	0.3	—	μC	
Peak reverse recovery current	I_{rr}	—	5.3	—	A	

Main Characteristics

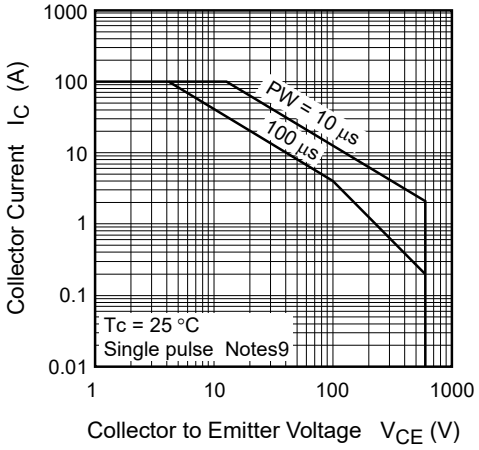
Collector Dissipation vs. Case Temperature



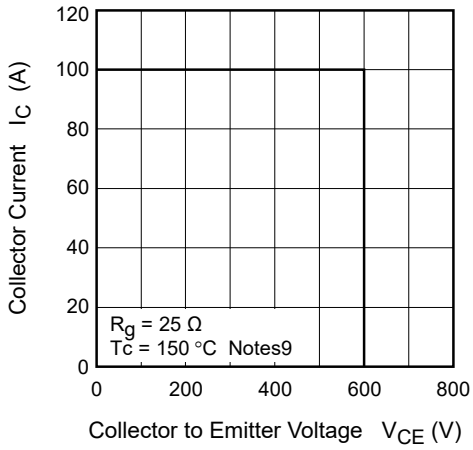
Maximum DC Collector Current vs. Case Temperature



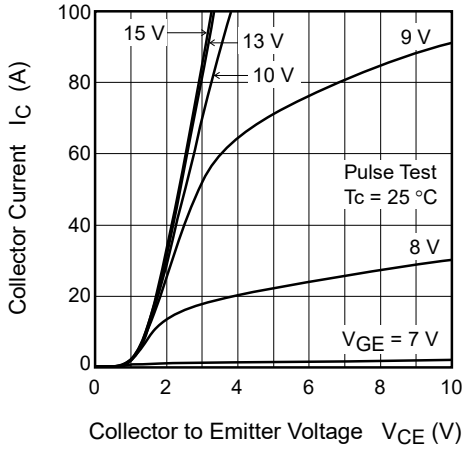
Forward Bias Safe Operating Area



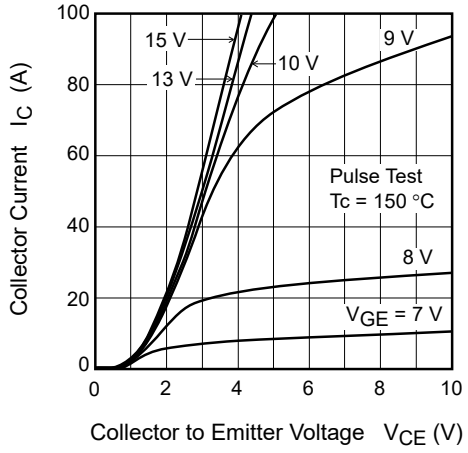
Reverse Bias Safe Operating Area



Typical Output Characteristics

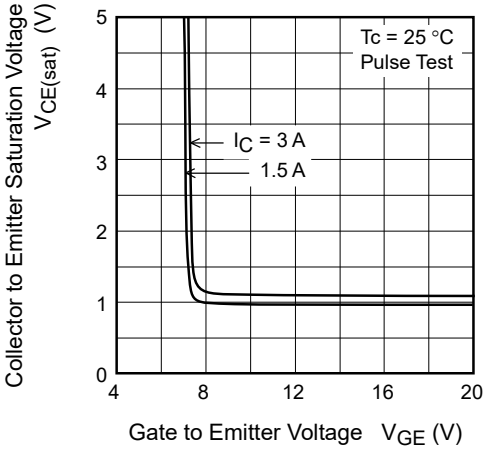


Typical Output Characteristics

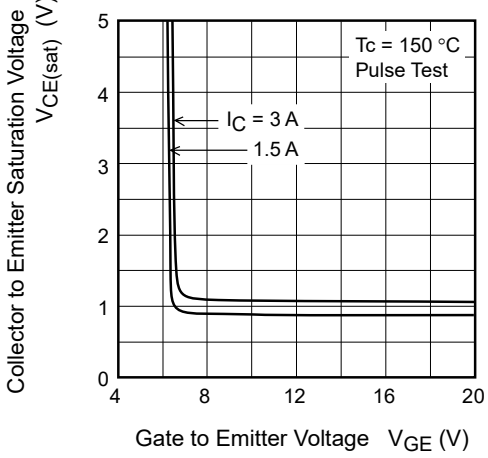


Notes: 9. Designed target value on Renesas measurement condition. (Not tested)
Renesas recommends that operating conditions are designed according to a document “Power MOS FET・IGBT Attention of Handling Semiconductor Devices”.

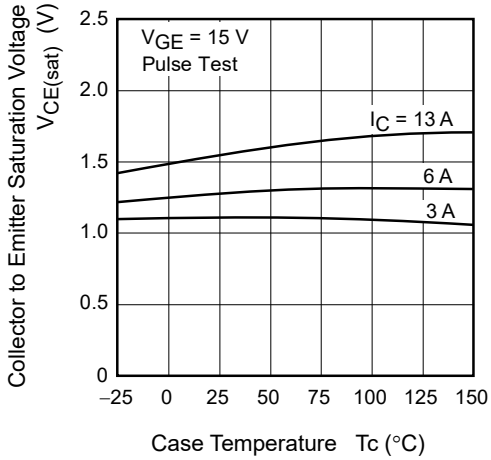
Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage (Typical)



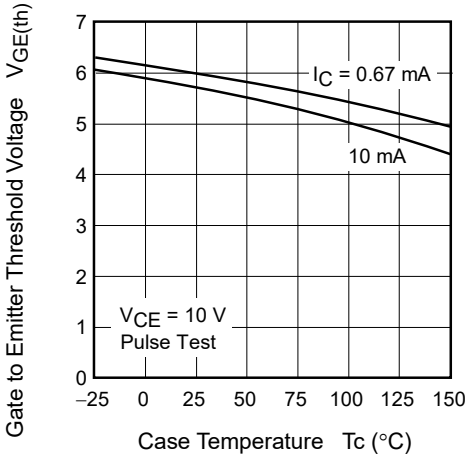
Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage (Typical)



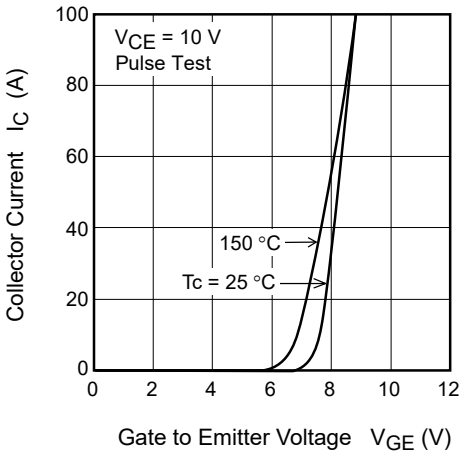
Collector to Emitter Saturation Voltage vs. Case Temperature (Typical)



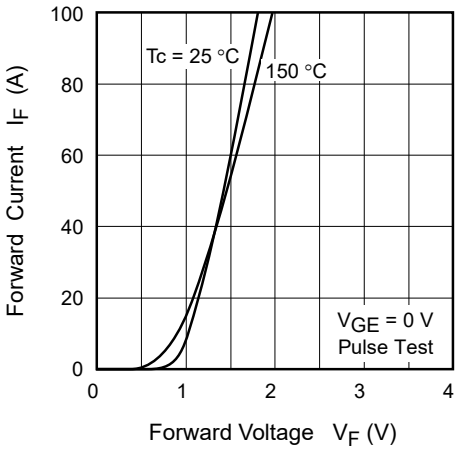
Gate to Emitter Threshold Voltage vs. Case Temperature (Typical)



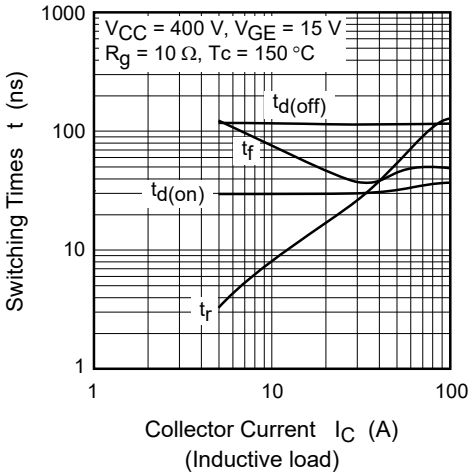
Typical Transfer Characteristics



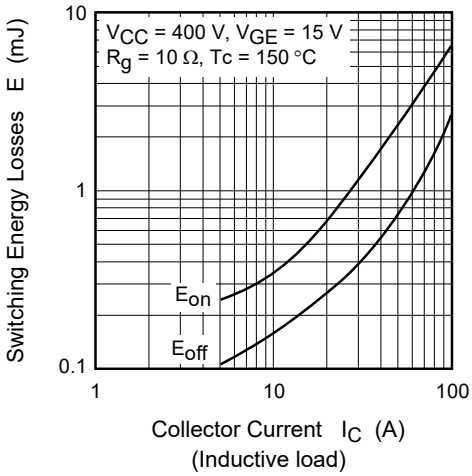
Diode Forward Current vs. Diode Forward Voltage (Typical)



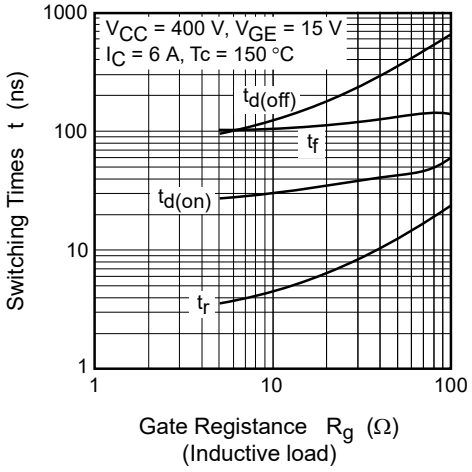
Switching Characteristics (Typical) (1)



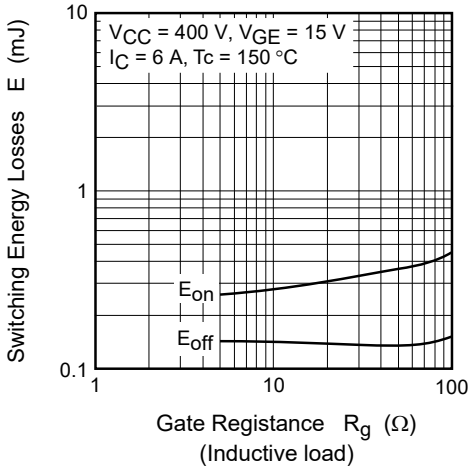
Switching Characteristics (Typical) (2)



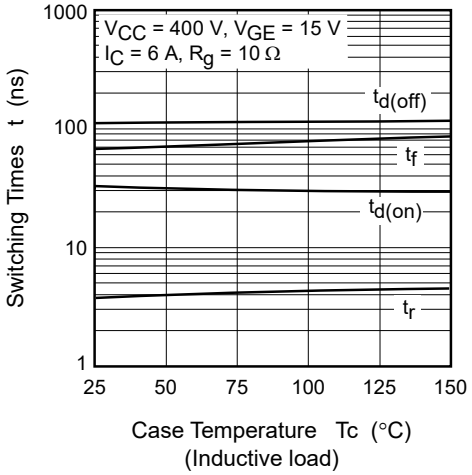
Switching Characteristics (Typical) (3)



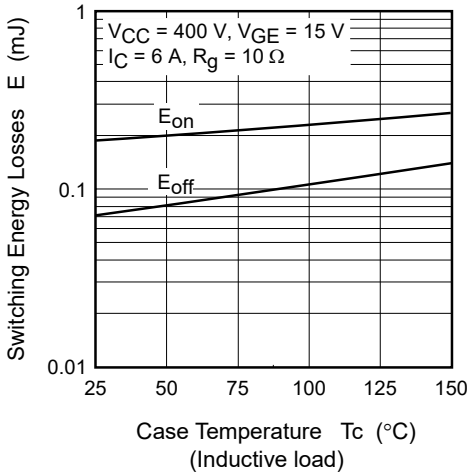
Switching Characteristics (Typical) (4)



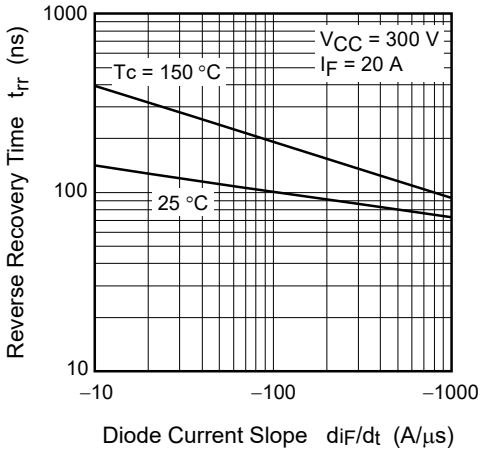
Switching Characteristics (Typical) (5)



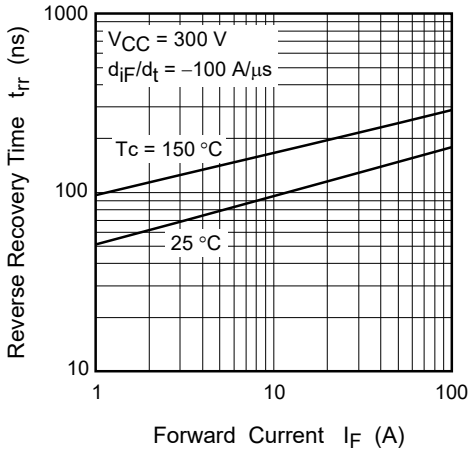
Switching Characteristics (Typical) (6)



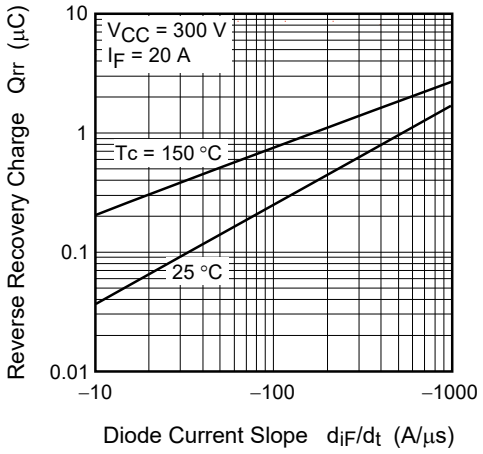
Reverse Recovery Time vs.
Diode Current Slope (Typical)



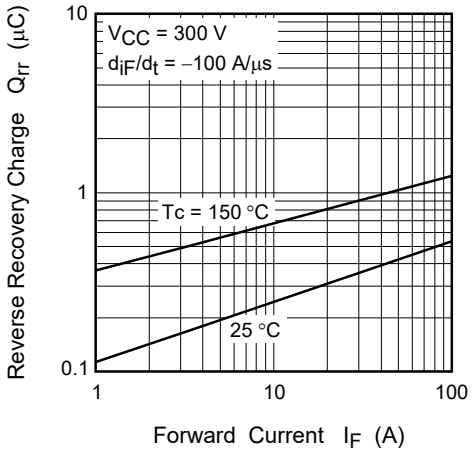
Reverse Recovery Time vs.
Forward Current (Typical)



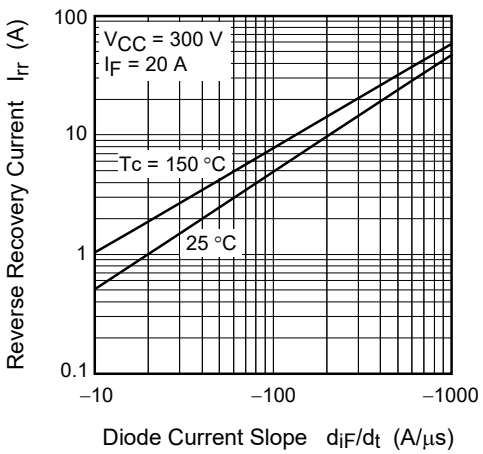
Reverse Recovery Charge vs.
Diode Current Slope (Typical)



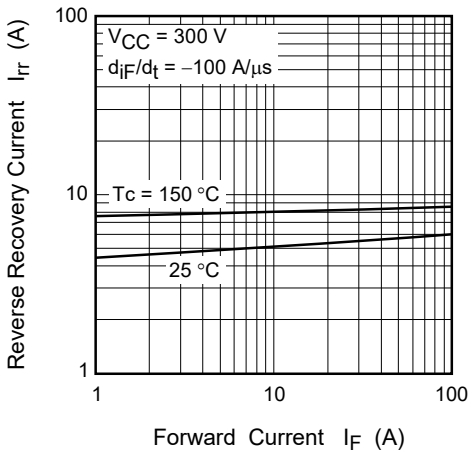
Reverse Recovery Charge vs.
Forward Current (Typical)



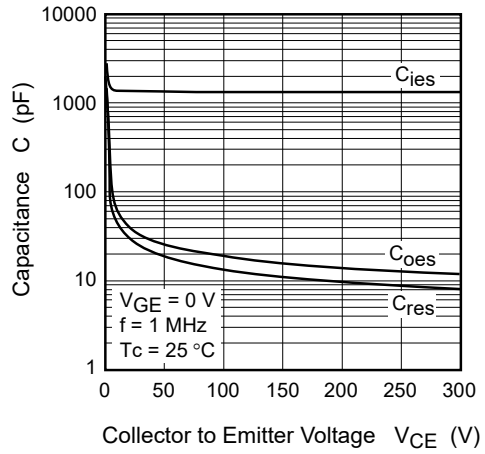
Reverse Recovery Current vs.
Diode Current Slope (Typical)



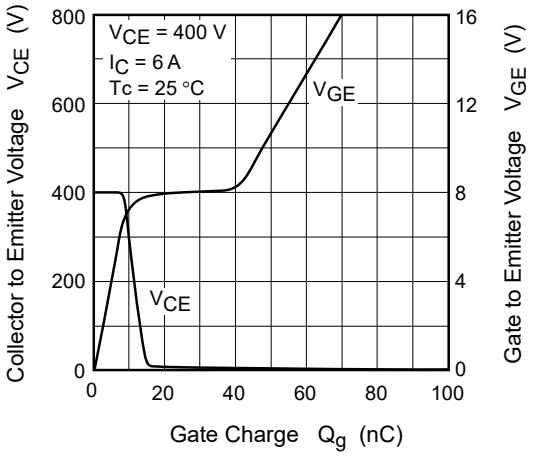
Reverse Recovery Current vs.
Forward Current (Typical)

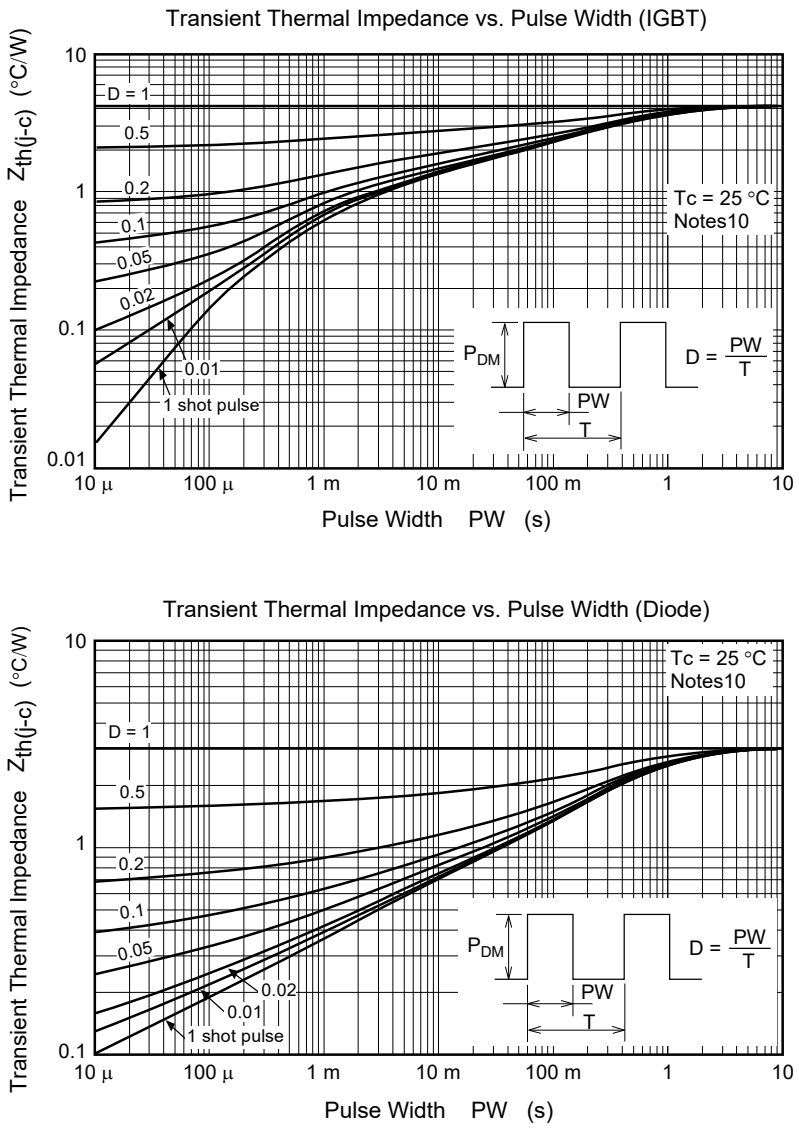


Typical Capacitance vs.
Collector to Emitter Voltage



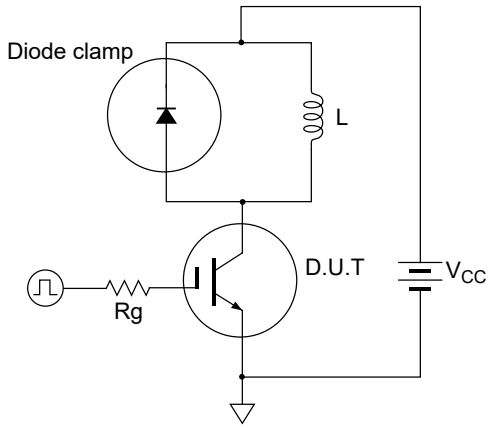
Dynamic Input Characteristics (Typical)



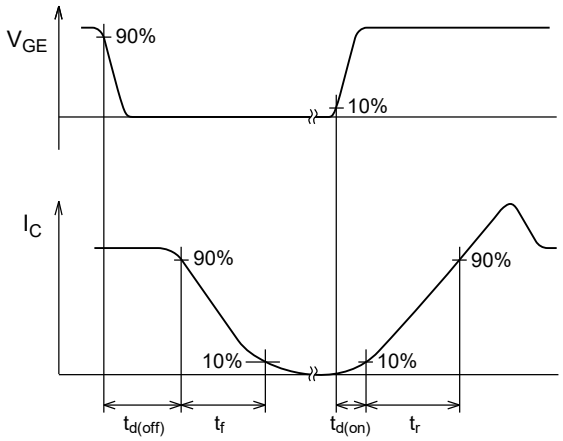


Notes: 10. Designed target value on Renesas measurement condition. (Not tested)

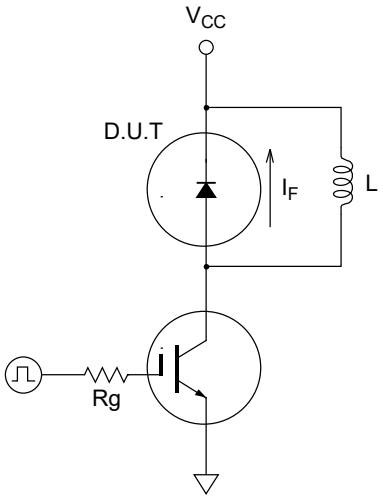
Switching Time Test Circuit



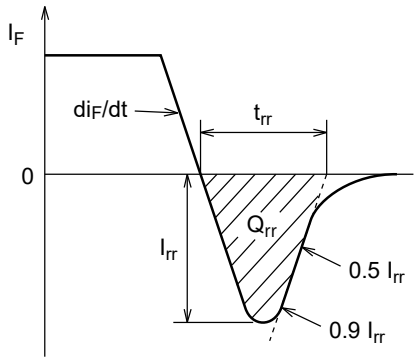
Waveform



Diode Reverse Recovery Time Test Circuit



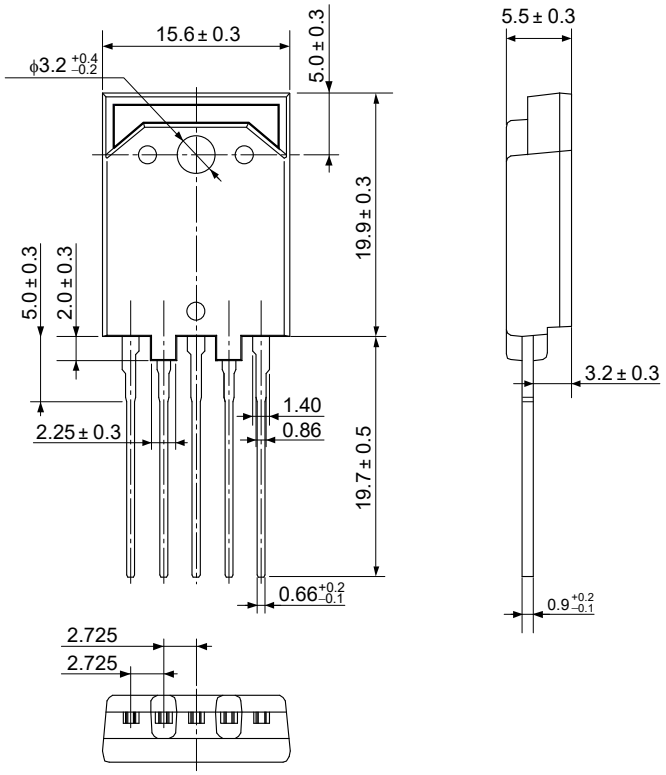
Waveform



Package Dimensions

Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
TO-3PFM-5	SC-93	PRSS0005ZB-A	TO-3PFM-5	5.3g

Unit: mm



Ordering Information

Orderable Part No.	Quantity	Shipping Container
RJQ6008BDPM-00#T0	360 pcs	Box (Tube)

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(Rev.4.0-1 November 2017)

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www.renesas.com

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