RJH65T04BDPM-A0

650V - 30A - IGBT
Power Switching

R07DS1366EJ0200
Rev.2.00
Oct.05.2022

Features

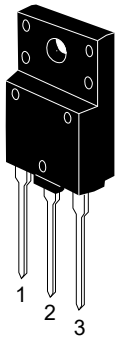
- Trench gate and thin wafer technology
- Built in fast recovery diode in one package
- Low collector to emitter saturation voltage $V_{CE(sat)}$ = 1.5 V typ. (at I_C = 30 A, V_{GE} = 15 V, Ta = 25 °C)
- Quality grade: Standard
- High speed switching t_f = 45 ns typ. (at V_{CC} = 400 V, V_{GE} = 15 V,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

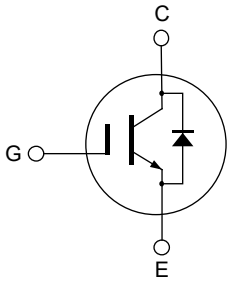
Key Performance

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

(Tc = 25 °C)

Item		Symbol	Ratings	Unit
Collector to emitter voltage		V_{CES}	650	V
Gate to emitter voltage		V_{GES}	±30	V
Collector current	Tc = 25 °C	I_C	60	A
	Tc = 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	Tc = 25 °C	I_F	100	A
	Tc = 100 °C	I_F	50	A
Peak surge forward current		IFSM Notes3	230	A
Collector power dissipation		P_C Notes4	65	W
Junction temperature		Tj Notes4	175	°C
Storage temperature		Tstg	–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), Tj = 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

(Tc = 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

(Tc = 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	Cies	—	1760	—	pF	V_{CE} = 25 V V_{GE} = 0 V f = 1 MHz
Output capacitance	Coes	—	125	—	pF	
Reverse transfer capacitance	Cres	—	34	—	pF	
Total gate charge	Qg	—	74	—	nC	V_{GE} = 15V V_{CE} = 400 V I_C = 30 A
Gate to emitter charge	Qge	—	13	—	nC	
Gate to collector charge	Qgc	—	31	—	nC	
Turn-on delay time	$t_{d(on)}$	—	35	—	ns	V_{CC} = 400 V V_{GE} = 15 V I_C = 30 A Rg = 10 Ω Inductive load Notes7
Rise time	t_r	—	25	—	ns	
Turn-off delay time	$t_{d(off)}$	—	115	—	ns	
Fall time	t_f	—	45	—	ns	
Turn-on loss energy	E_{on}	—	0.36	—	mJ	
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 V_{GE} = 15 V I_C = 30 A Rg = 10 Ω Tc = 150 °C Inductive load Notes7
Rise time	t_r	—	25	—	ns	
Turn-off delay time	$t_{d(off)}$	—	125	—	ns	
Fall time	t_f	—	70	—	ns	
Turn-on loss energy	E_{on}	—	0.60	—	mJ	
Turn-off loss energy	E_{off}	—	0.50	—	mJ	
Total switching energy	E_{total}	—	1.10	—	mJ	

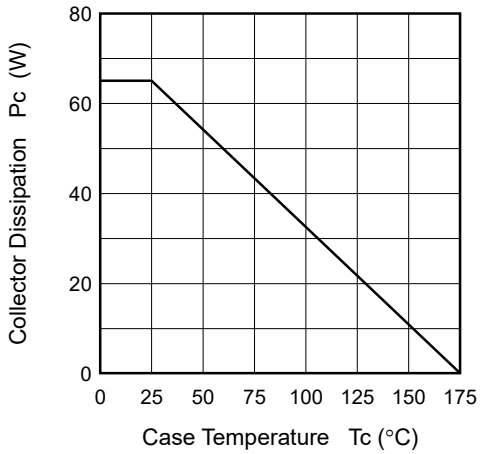
Diode forward voltage	V_F	—	1.4	1.8	V	I_F = 30 A Notes6
Diode forward voltage	V_F	—	1.7	2.2	V	I_F = 50 A Notes6
Diode reverse recovery time	t_{rr}	—	80	—	ns	I_F = 50 A, di_F/dt = 300 A/μs
Diode reverse recovery charge	Q_{rr}	—	0.35	—	μC	
Diode peak reverse recovery current	I_{rr}	—	7.5	—	A	

Notes: 6. Pulse test

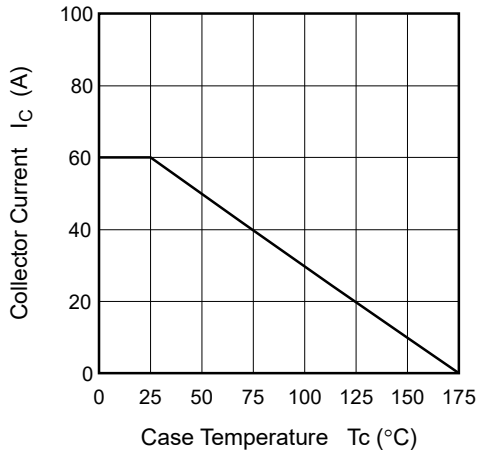
7. Switching time test circuit and waveform are shown below.

Main Characteristics

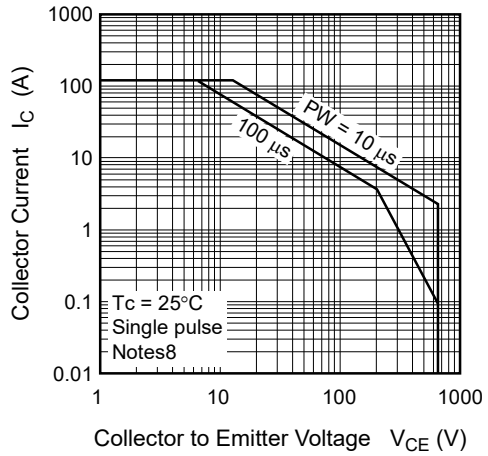
Collector Dissipation vs. Case Temperature



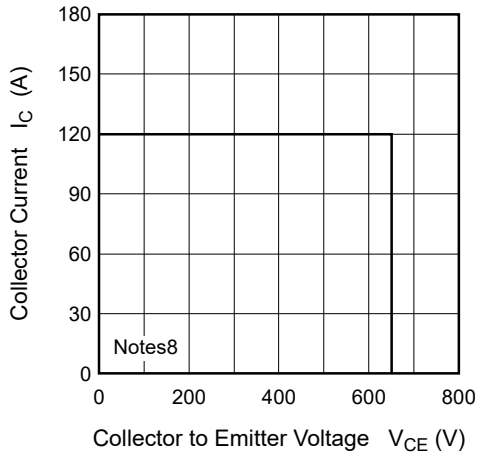
Maximum DC Collector Current vs. Case Temperature



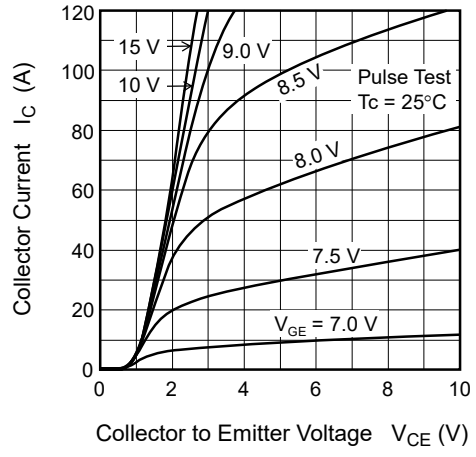
Forward Bias Safe Operating Area



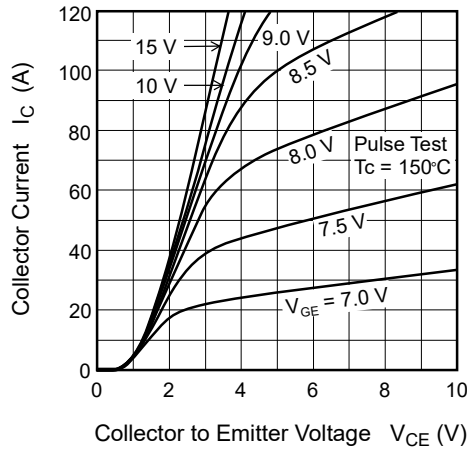
Reverse Bias Safe Operating Area



Typical Output Characteristics

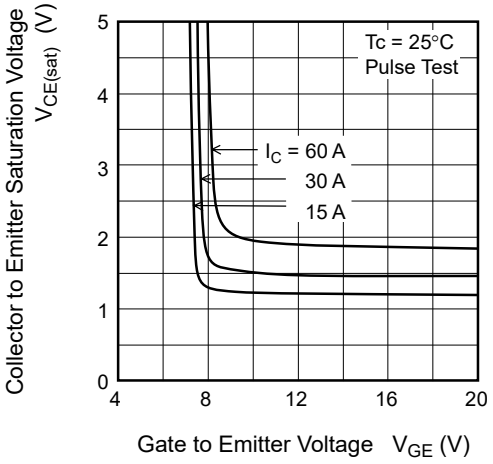


Typical Output Characteristics

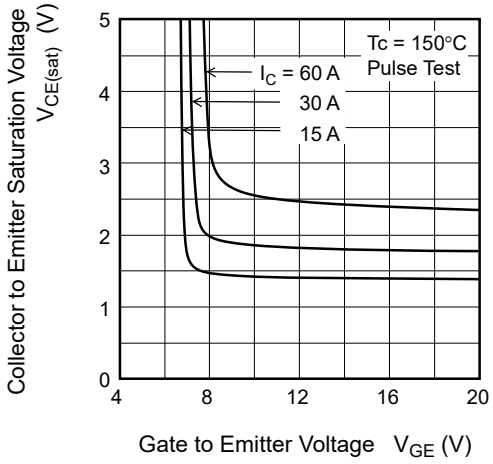


Notes: 8. Designed target value on Renesas measurement condition. (Not tested)
Renesas recommends that operating conditions are designed according to a document “Power MOS FET・IGBT Attention of Handling Semiconductor Devices”.

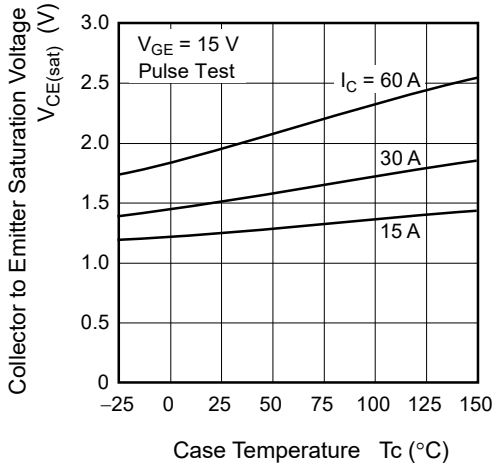
Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage (Typical)



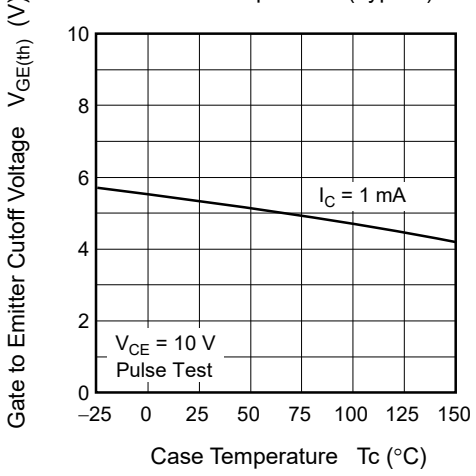
Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage (Typical)



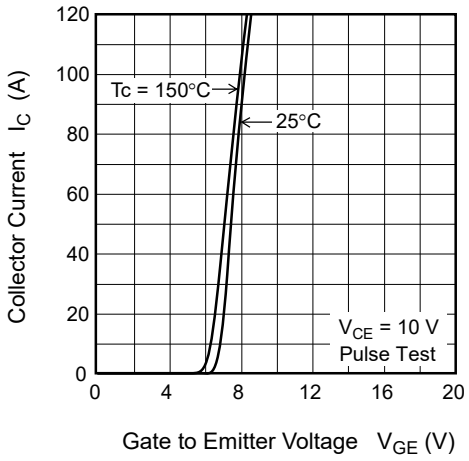
Collector to Emitter Saturation Voltage vs. Case Temperature (Typical)



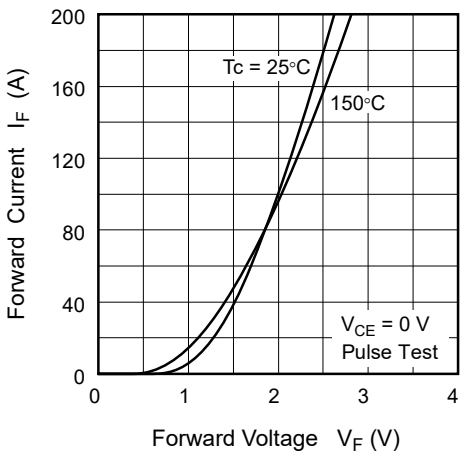
Gate to Emitter Cutoff Voltage vs. Case Temperature (Typical)



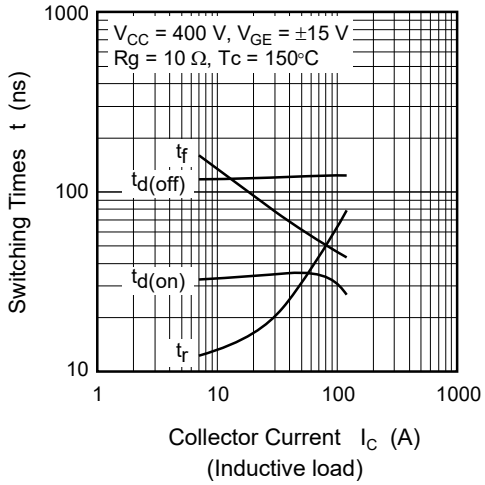
Typical Transfer Characteristics



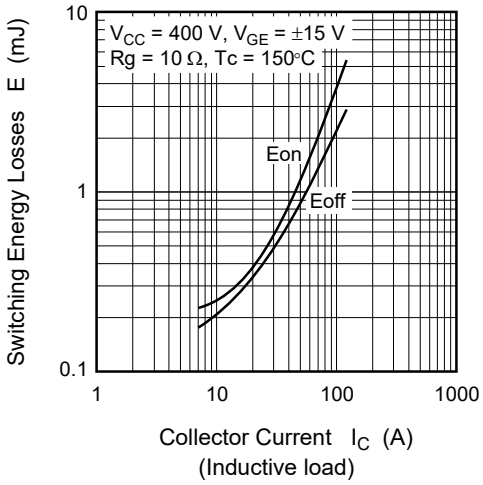
Diode Forward Current vs. Diode Forward Voltage (Typical)



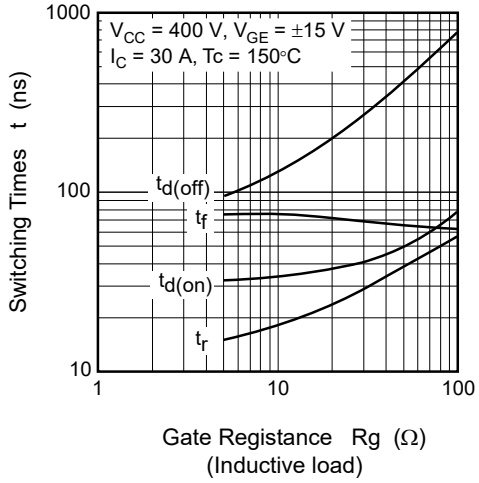
Switching Characteristics (Typical) (1)



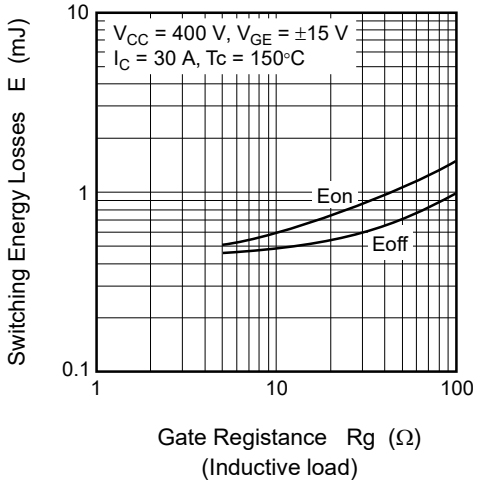
Switching Characteristics (Typical) (2)



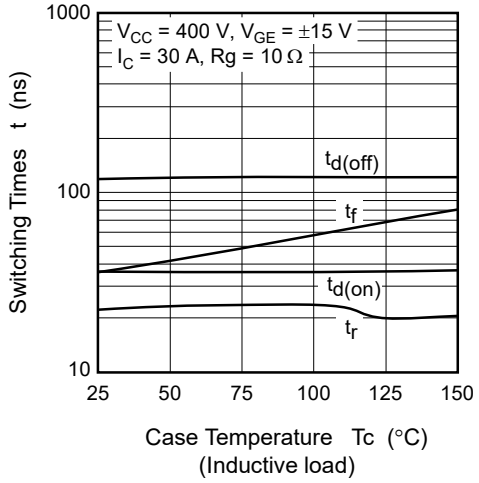
Switching Characteristics (Typical) (3)



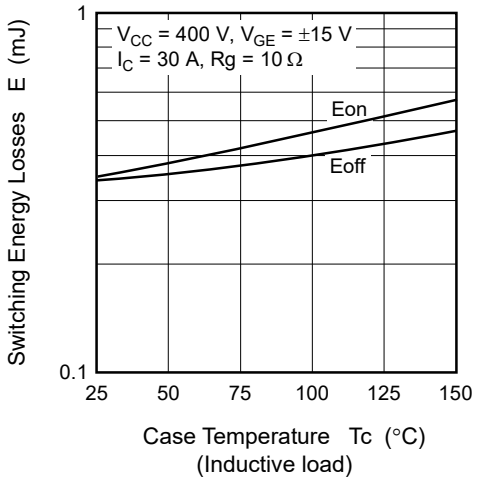
Switching Characteristics (Typical) (4)



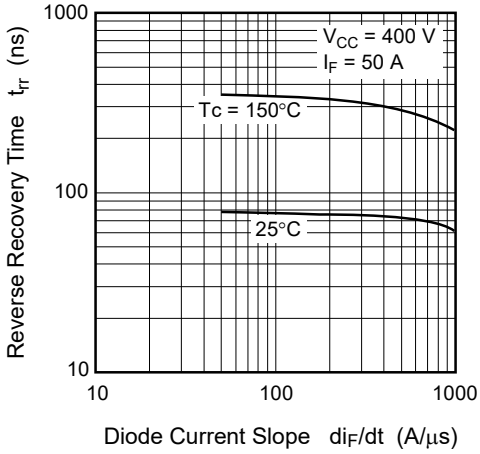
Switching Characteristics (Typical) (5)



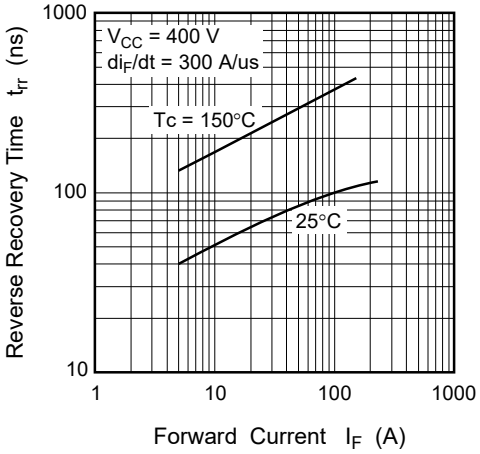
Switching Characteristics (Typical) (6)



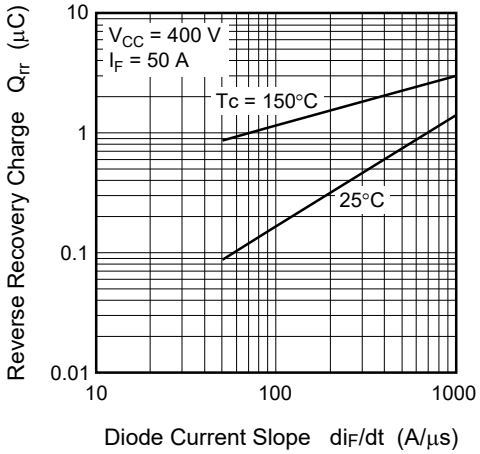
Reverse Recovery Time vs.
Diode Current Slope (Typical)



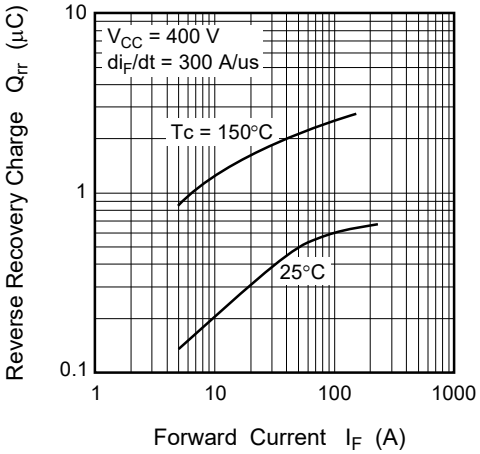
Reverse Recovery Time vs.
Forward Current (Typical)



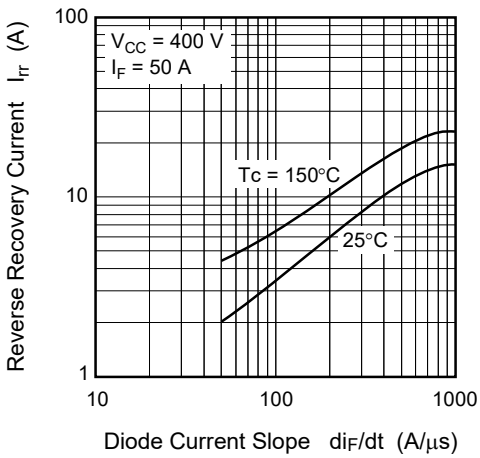
Reverse Recovery Charge vs.
Diode Current Slope (Typical)



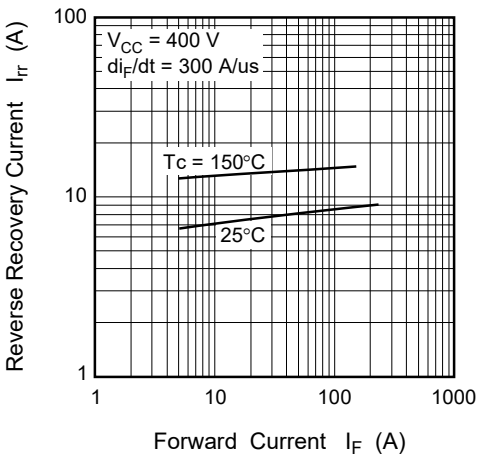
Reverse Recovery Charge vs.
Forward Current (Typical)



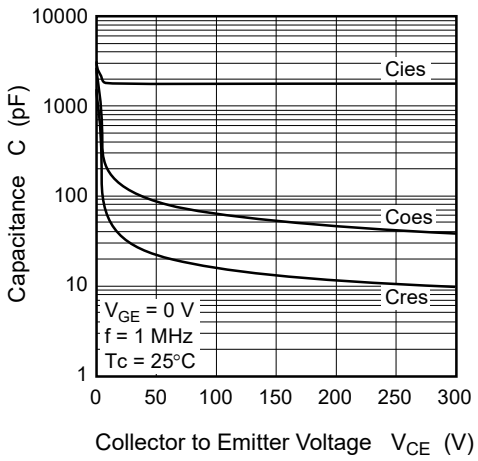
Reverse Recovery Current vs.
Diode Current Slope (Typical)



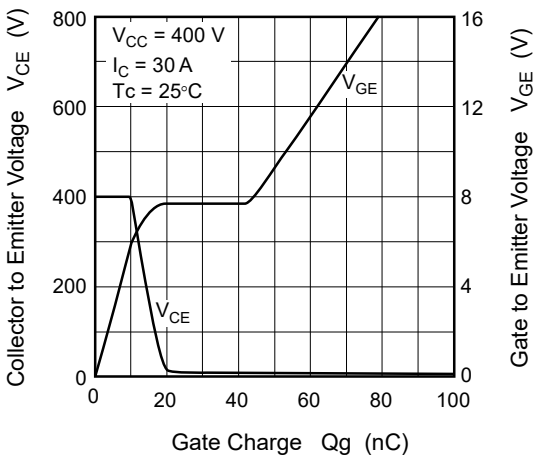
Reverse Recovery Current vs.
Forward Current (Typical)

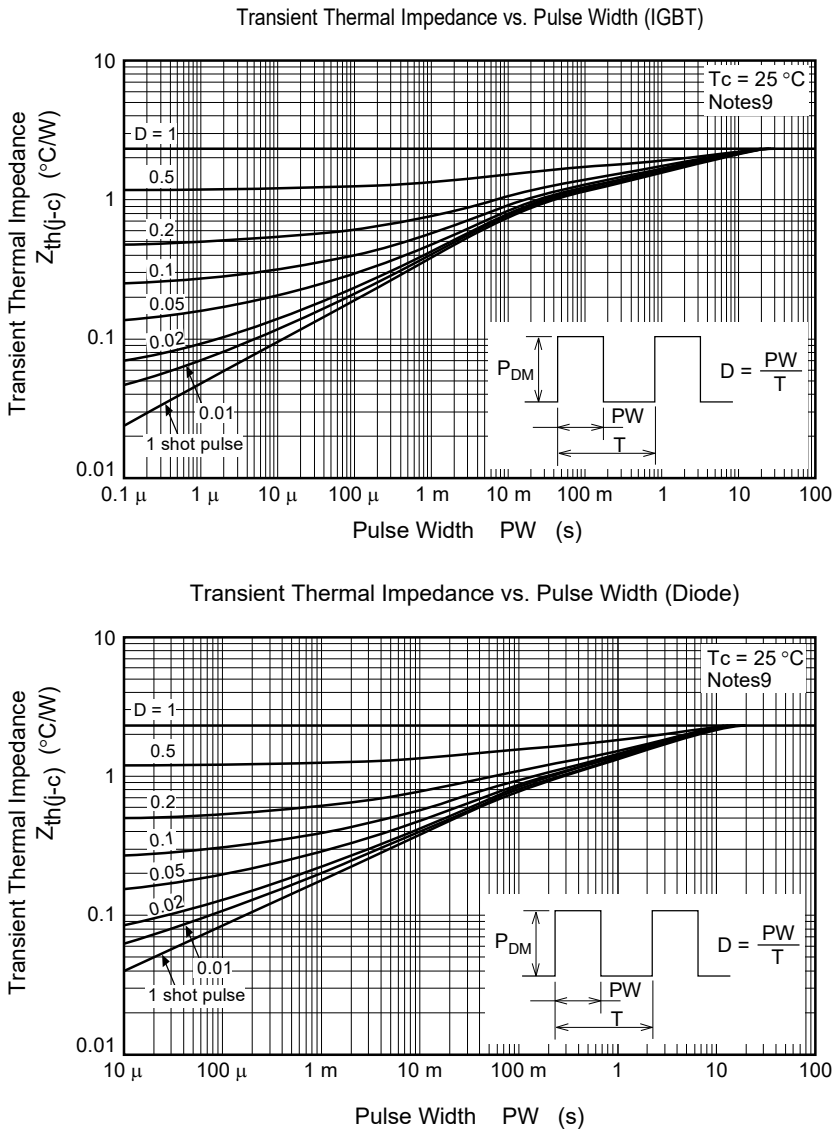


Typical Capacitance vs.
Collector to Emitter Voltage



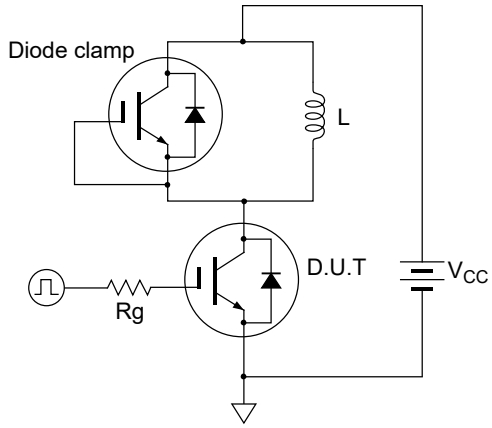
Dynamic Input Characteristics (Typical)



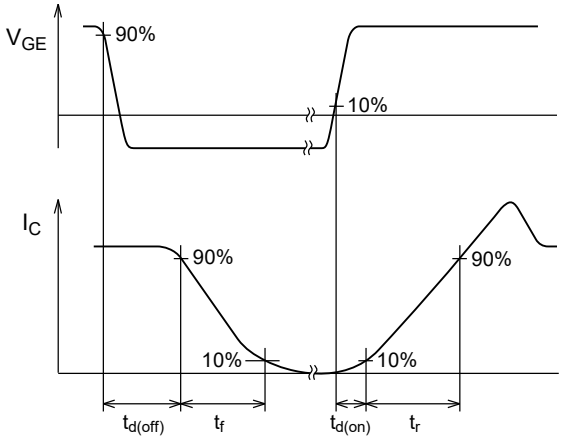


Notes: 9. Designed target value on Renesas measurement condition. (Not tested)

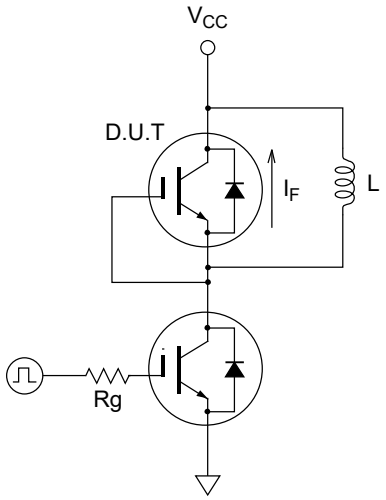
Switching Time Test Circuit



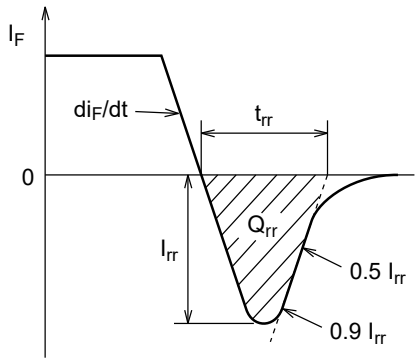
Waveform



Diode Reverse Recovery Time Test Circuit



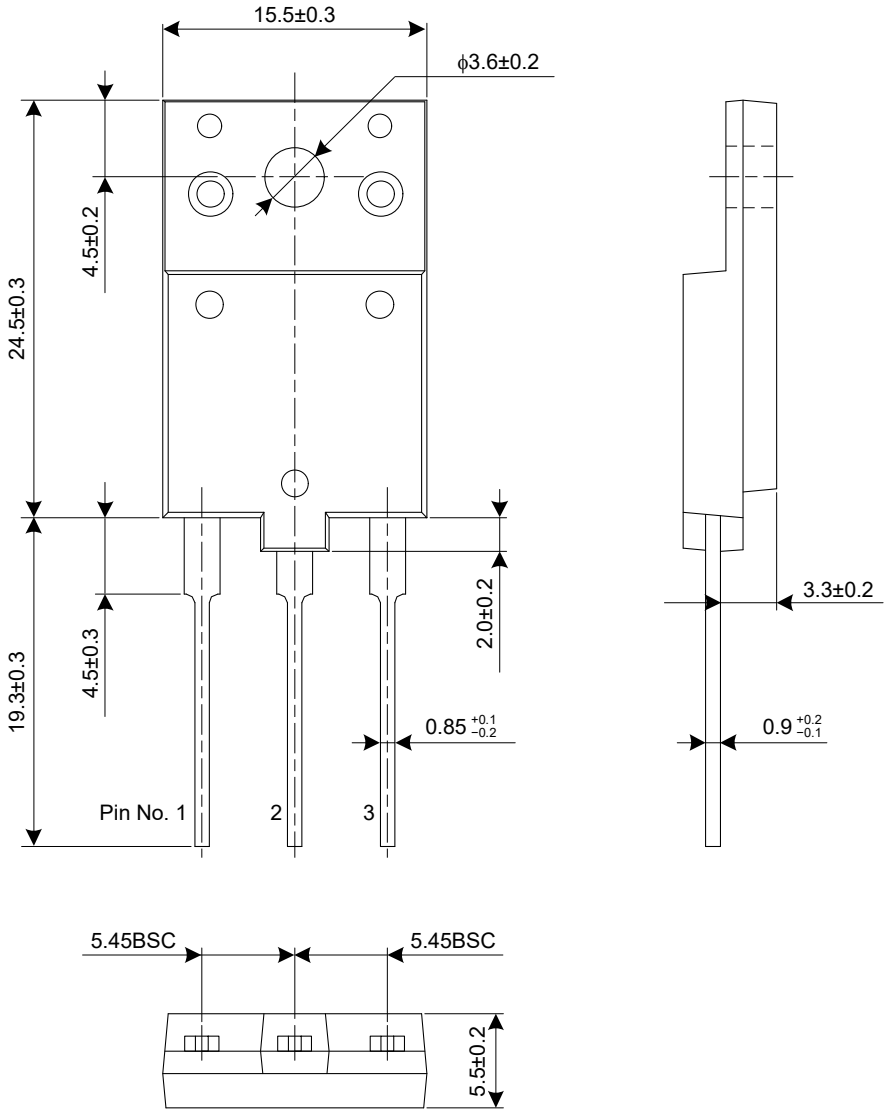
Waveform



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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