RJH60D1DPP-A0

600V - 10A - IGBT
Power Switching

R07DS1458EJ0110
Rev.1.10
Mar.01.20

Features

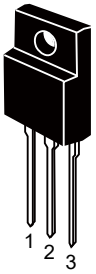
- Trench gate and thin wafer technology
- Built in fast recovery diode (100 ns typ.) in one package
- Low collector to emitter saturation voltage
  $V_{CE(sat)}$ = 1.9 V typ. (at I_C = 10 A, V_{GE} = 15 V, Tc = 25°C)
- High speed switching
  t_f = 75 ns typ. (at V_{CC} = 300 V, V_{GE} = 15 V, I_C = 10 A, Rg = 5 Ω, inductive load)
- Short circuit withstand time (5 μs typ.)
- Applications: Inverter
- Quality grade: Standard

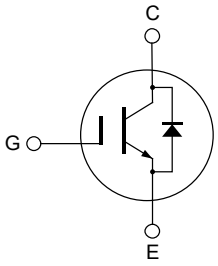
Key Performance

Type	V_{CES}	I_C	$V_{CE(sat)}$, T_C=25°C	T_j
RJH60D1DPP-A0	600 V	10 A	1.9 V	150 °C

Outline

RENESAS Package code: PRSS0003AP-A
(Package name: TO-220FPA)





1. Gate
2. Collector
3. Emitter

Absolute Maximum Ratings

(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	20	A
	Tc = 100 °C	I_C	10	A
Collector peak current		$I_{C(peak)}$ Note1	40	A
Diode forward current		I_F	10	A
Diode forward peak current		$I_{F(peak)}$ Note1	40	A
Collector power dissipation		P_C	30	W
Junction temperature		T_j	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. PW ≤ 10 μs, duty cycle ≤ 1 %

Thermal Resistance Characteristics

(Tc = 25 °C)

Item	Symbol	Max. Value Notes2	Unit
Junction to case thermal resistance (IGBT)	$R_{th(j-c)}$	4.1	°C/W
Junction to case thermal resistance (Diode)	$R_{th(j-c)}$	7.2	°C/W

Notes: 2. Designed target value on Renesas measurement condition. (Not tested)

Electrical Characteristics

(Tc = 25 °C)

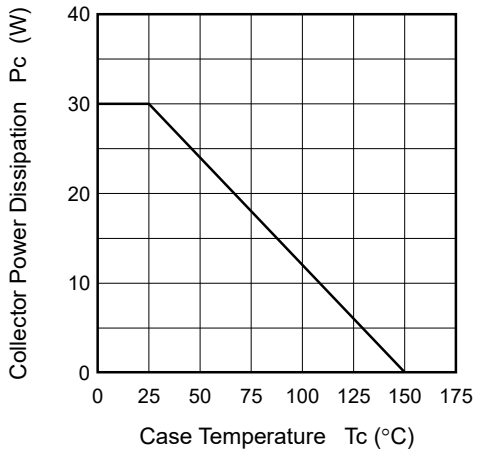
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Collector to emitter leakage current	I_{CES}	—	—	5	μA	V_{CE} = 600 V, V_{GE} = 0 V
Gate to emitter leakage current	I_{GES}	—	—	±1	μA	V_{GE} = ±30 V, V_{CE} = 0 V
Gate to emitter threshold voltage	$V_{GE(th)}$	4.0	—	6.0	V	V_{CE} = 10 V, I_C = 1 mA
Collector to emitter saturation voltage	$V_{CE(sat)}$	—	1.9	2.5	V	I_C = 10 A, V_{GE} = 15 V Notes3
	$V_{CE(sat)}$	—	2.6	—	V	I_C = 20 A, V_{GE} = 15 V Notes3
Input capacitance	C_{ies}	—	275	—	pF	V_{CE} = 25 V V_{GE} = 0 V f = 1 MHz
Output capacitance	C_{oes}	—	25	—	pF	
Reverse transfer capacitance	C_{res}	—	8	—	pF	
Total gate charge	Q_g	—	13	—	nC	V_{GE} = 15 V V_{CE} = 300 V I_C = 10 A
Gate to emitter charge	Q_{ge}	—	3	—	nC	
Gate to collector charge	Q_{gc}	—	5	—	nC	
Turn-on delay time	$t_{d(on)}$	—	30	—	Ns	V_{CC} = 300 V V_{GE} = +15 V/–5 V I_C = 10 A R_g = 5 Ω Inductive load Notes4
Rise time	t_r	—	13	—	ns	
Turn-off delay time	$t_{d(off)}$	—	42	—	ns	
Fall time	t_f	—	75	—	ns	
Turn-on loss energy	E_{on}	—	0.10	—	mJ	
Turn-off loss energy	E_{off}	—	0.13	—	mJ	
Total switching energy	E_{total}	—	0.23	—	mJ	
Short circuit withstand time	t_{sc}	3.0	5.0	—	μs	V_{GE} = 15 V, V_{CC} ≤ 360 V Notes5

Diode forward voltage	V_F	—	1.4	1.9	V	I_F = 10 A Notes3
Diode reverse recovery time	t_{rr}	—	70	—	ns	I_F = 10 A, d_{iF}/d_t = 100 A/μs
Diode reverse recovery charge	Q_{rr}	—	0.11	—	μC	
Diode peak reverse recovery current	I_{rr}	—	3.5	—	A	

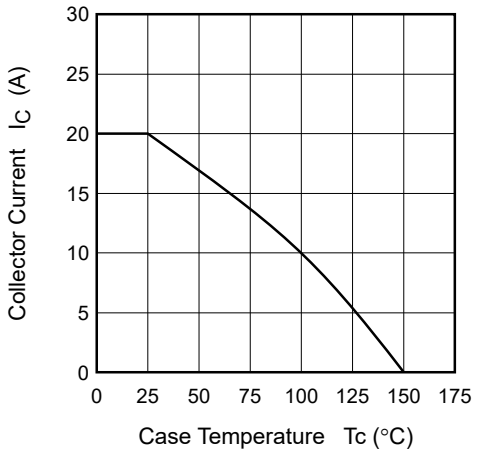
Notes: 3. Pulse test
4. Switching time test circuit and waveform are shown below.
5. Designed target value on Renesas measurement condition. (Not tested)

Main Characteristics

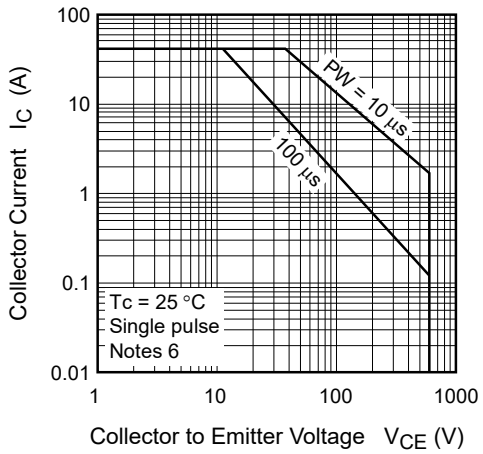
Collector Power Dissipation vs. Case Temperature



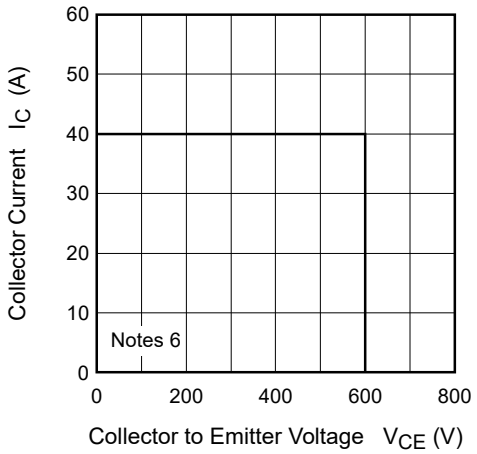
Maximum DC Collector Current vs. Case Temperature



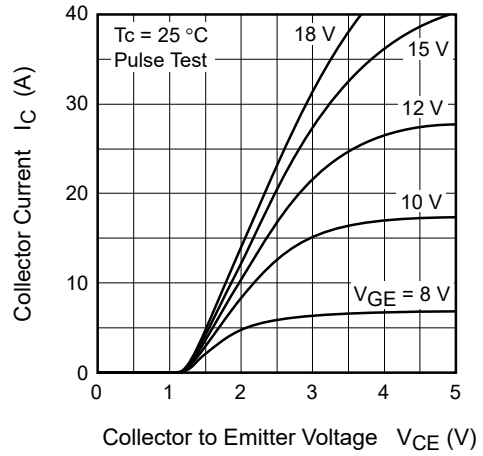
Forward Bias Safe Operating Area



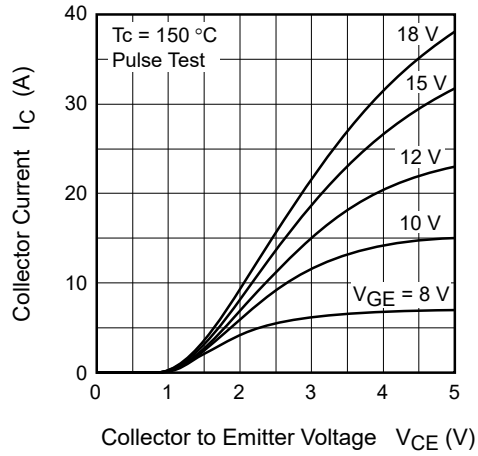
Reverse Bias Safe Operating Area



Typical Output Characteristics

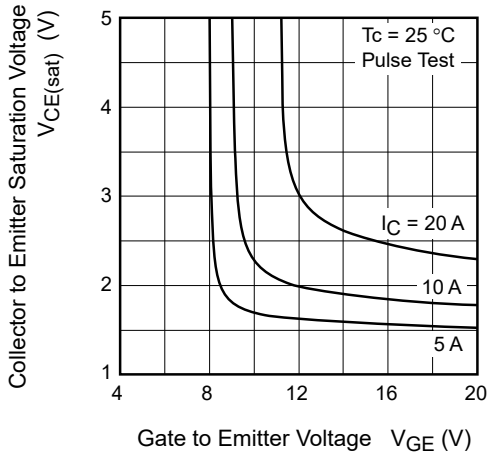


Typical Output Characteristics

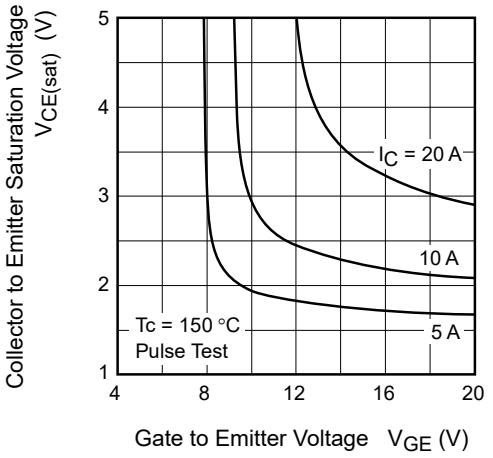


Notes: 6 Designed target value on Renesas measurement condition. (Not tested)
Renesas recommends that operating conditions are designed according to a document “Power MOS FET・IGBT Attention of Handling Semiconductor Devices”.

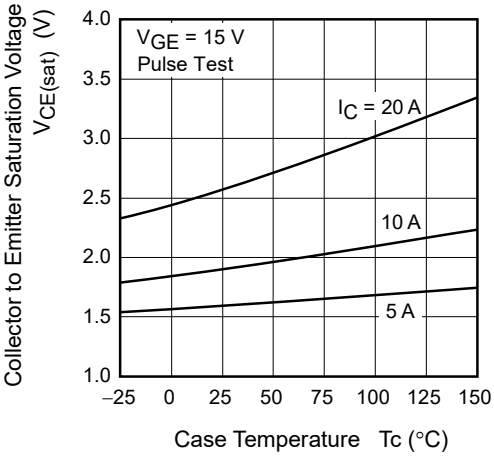
Collector to Emitter Saturation Voltage vs.
Gate to Emitter Voltage (Typical)



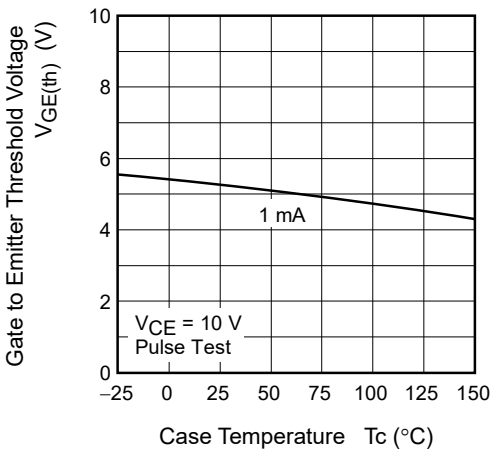
Collector to Emitter Saturation Voltage vs.
Gate to Emitter Voltage (Typical)



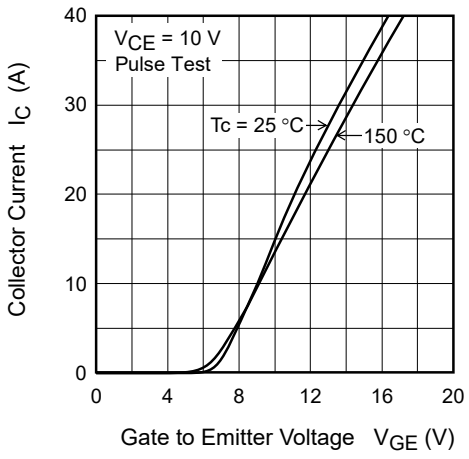
Collector to Emitter Saturation Voltage vs.
Case Temperature (Typical)



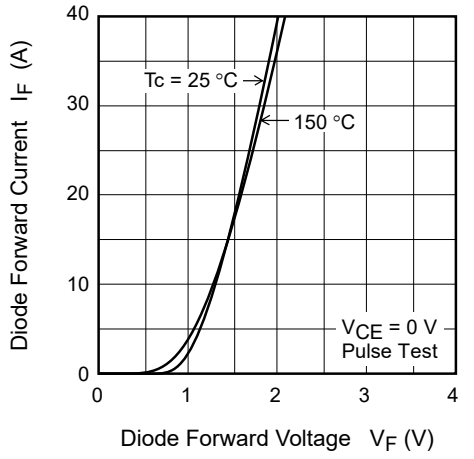
Gate to Emitter Threshold Voltage vs.
Case Temperature (Typical)



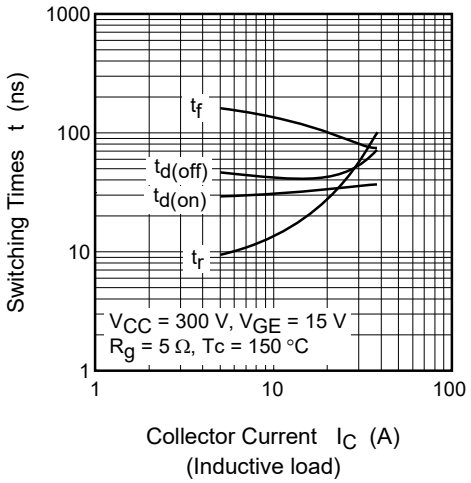
Typical Transfer Characteristics



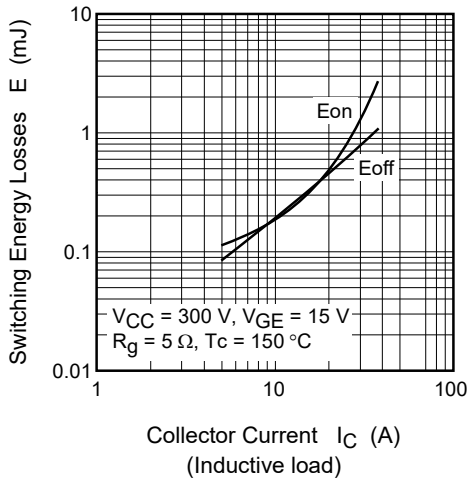
Diode Forward Current vs.
Diode Forward Voltage (Typical)



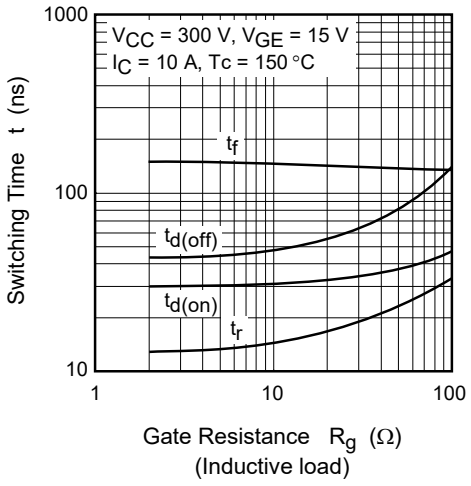
Switching Characteristics (Typical) (1)



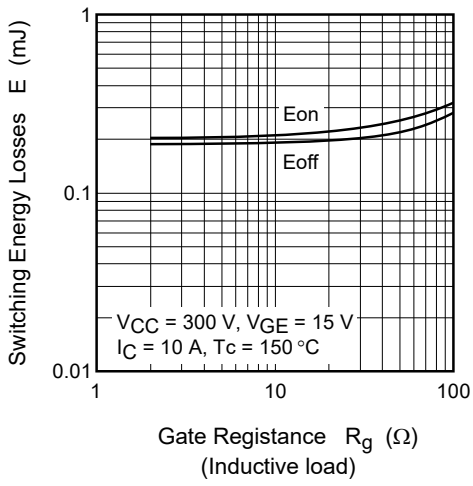
Switching Characteristics (Typical) (2)



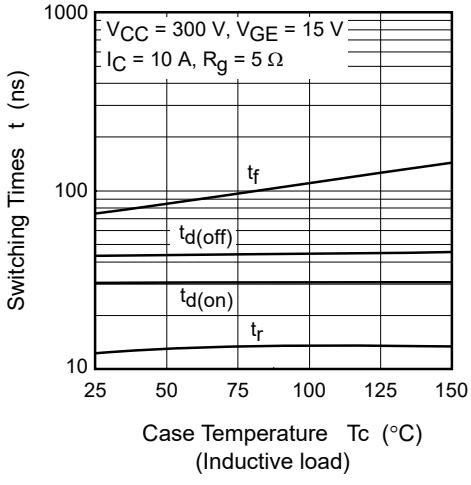
Switching Characteristics (Typical) (3)



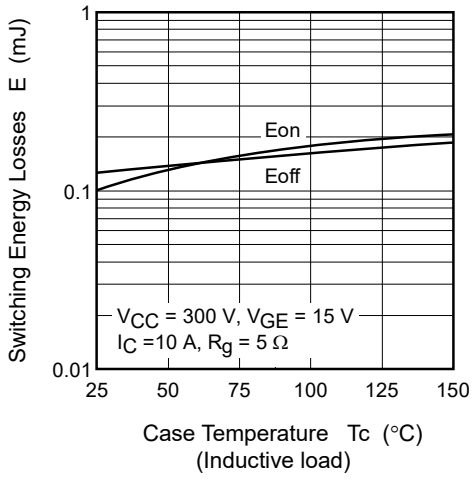
Switching Characteristics (Typical) (4)



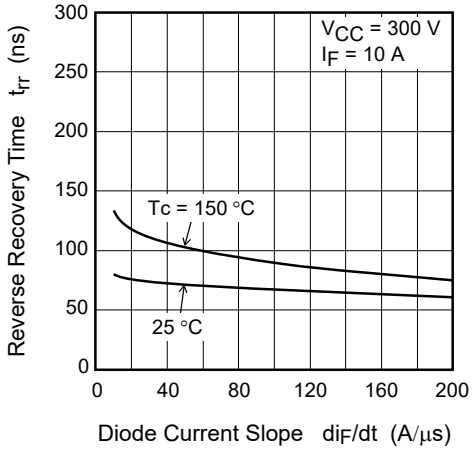
Switching Characteristics (Typical) (5)



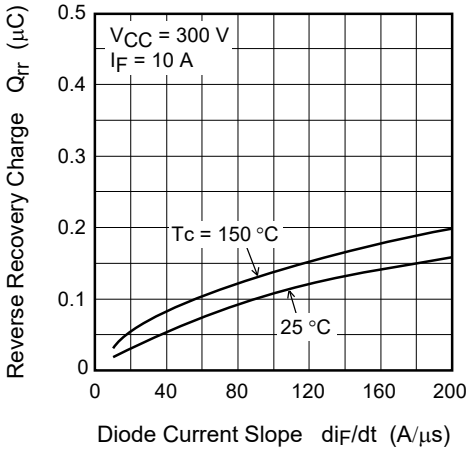
Switching Characteristics (Typical) (6)



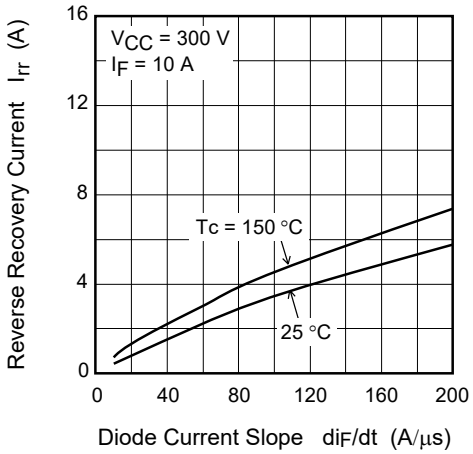
Reverse Recovery Time vs.
Diode Current Slope (Typical)



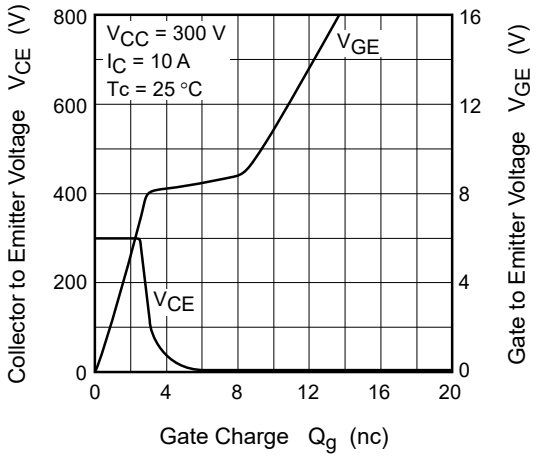
Reverse Recovery Charge vs.
Diode Current Slope (Typical)



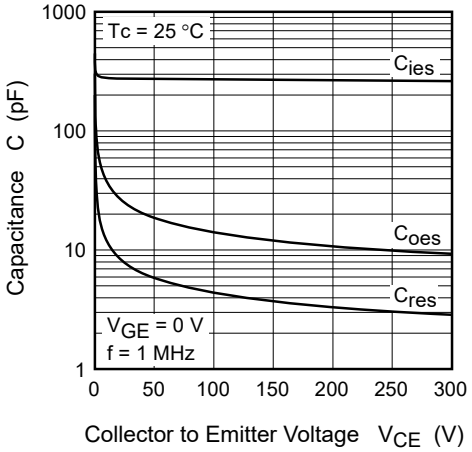
Reverse Recovery Current vs.
Diode Current Slope (Typical)



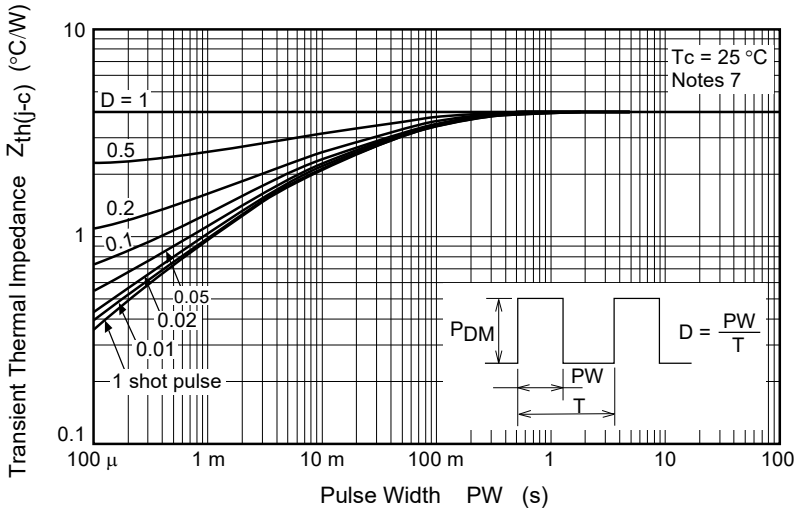
Dynamic Input Characteristics (Typical)



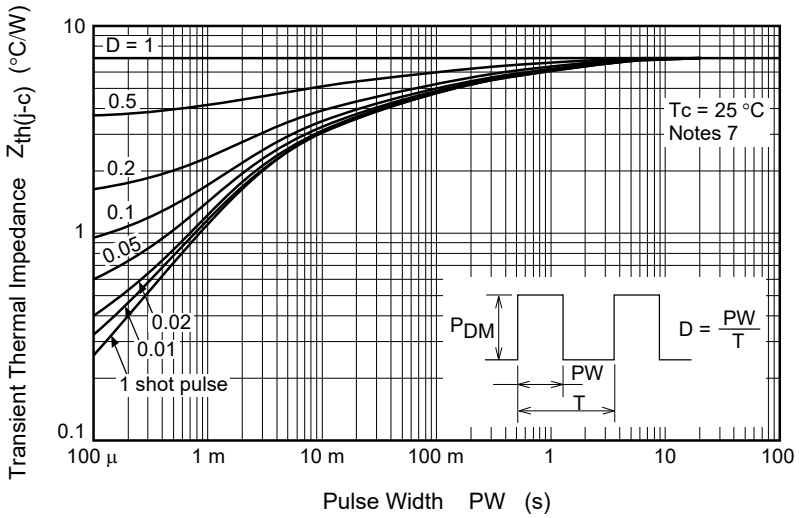
Typical Capacitance vs.
Collector to Emitter Voltage



Transient Thermal Impedance vs. Pulse Width (IGBT)

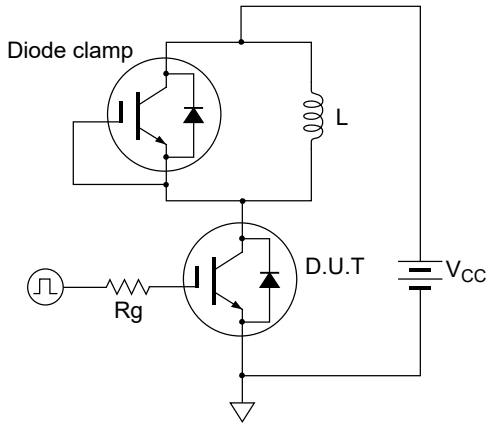


Transient Thermal Impedance vs. Pulse Width (Diode)

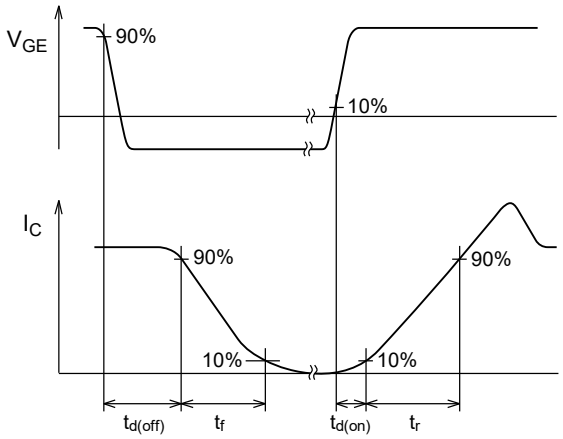


Notes: 7. Designed target value on Renesas measurement condition. (Not tested)

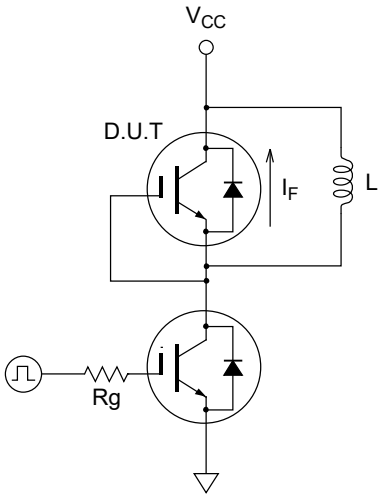
Switching Time Test Circuit



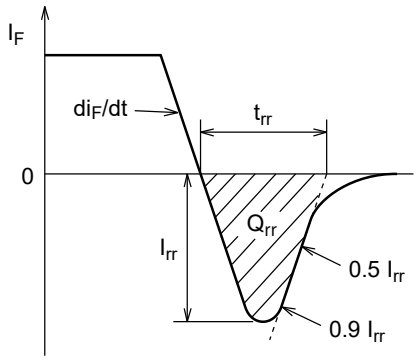
Waveform



Diode Reverse Recovery Time Test Circuit



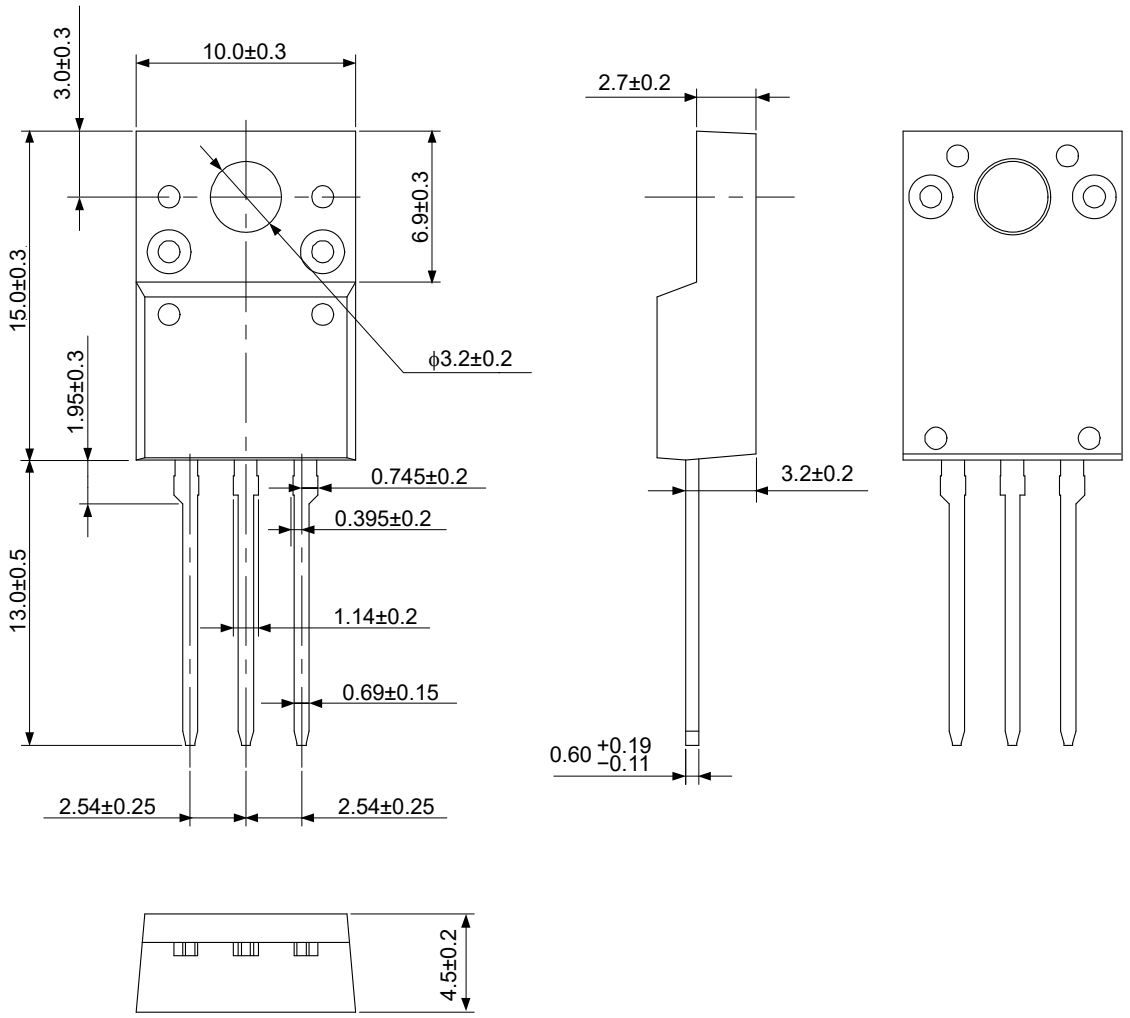
Waveform



Package Dimensions

Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS (Typ) [g]
TO-220FPA	—	PRSS0003AP-A	TO-220FPA	1.65

Unit: mm



Ordering Information

Orderable Part No.	Quantity	Shipping Container
RJH60D1DPP-A0#T2	2500 pcs	Box (Tube)

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