

# RJH60D1DPP-A0

600V - 10A - IGBT  
Power Switching

R07DS1458EJ0110  
Rev.1.10  
Mar.01.20

## Features

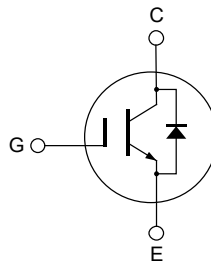
- Trench gate and thin wafer technology
- Built in fast recovery diode (100 ns typ.) in one package
- Low collector to emitter saturation voltage  
 $V_{CE(sat)} = 1.9\text{ V typ. (at } I_c = 10\text{ A, } V_{GE} = 15\text{ V, } T_c = 25^\circ\text{C)}$
- High speed switching  
 $t_f = 75\text{ ns typ. (at } V_{CC} = 300\text{ V, } V_{GE} = 15\text{ V, } I_c = 10\text{ A, } R_g = 5\ \Omega, \text{ inductive load)}$
- Short circuit withstand time (5  $\mu\text{s typ.}$ )
- Applications: Inverter
- Quality grade: Standard

## Key Performance

Type	$V_{CES}$	$I_c$	$V_{CE(sat), T_C=25^\circ\text{C}}$	$T_j$
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

(T<sub>c</sub> = 25 °C)

Item	Symbol	Ratings	Unit
Collector to emitter voltage	V <sub>CES</sub>	600	V
Gate to emitter voltage	V <sub>GES</sub>	±30	V
Collector current	T <sub>c</sub> = 25 °C	I <sub>C</sub>	A
	T <sub>c</sub> = 100 °C	I <sub>C</sub>	A
Collector peak current	I <sub>C(peak)</sub> <sup>Note1</sup>	40	A
Diode forward current	I <sub>F</sub>	10	A
Diode forward peak current	I <sub>F(peak)</sub> <sup>Note1</sup>	40	A
Collector power dissipation	P <sub>C</sub>	30	W
Junction temperature	T <sub>j</sub>	150	°C
Storage temperature	T <sub>stg</sub>	-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

(T<sub>c</sub> = 25 °C)

Item	Symbol	Max. Value <sup>Notes2</sup>	Unit
Junction to case thermal resistance (IGBT)	R <sub>th(j-c)</sub>	4.1	°C/W
Junction to case thermal resistance (Diode)	R <sub>th(j-c)</sub>	7.2	°C/W

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

## Electrical Characteristics

(T<sub>c</sub> = 25 °C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Collector to emitter leakage current	I <sub>CES</sub>	—	—	5	μA	V <sub>CE</sub> = 600 V, V <sub>GE</sub> = 0 V
Gate to emitter leakage current	I <sub>GES</sub>	—	—	±1	μA	V <sub>GE</sub> = ±30 V, V <sub>CE</sub> = 0 V
Gate to emitter threshold voltage	V <sub>GE(th)</sub>	4.0	—	6.0	V	V <sub>CE</sub> = 10 V, I <sub>C</sub> = 1 mA
Collector to emitter saturation voltage	V <sub>CE(sat)</sub>	—	1.9	2.5	V	I <sub>C</sub> = 10 A, V <sub>GE</sub> = 15 V <sup>Notes3</sup>
	V <sub>CE(sat)</sub>	—	2.6	—	V	I <sub>C</sub> = 20 A, V <sub>GE</sub> = 15 V <sup>Notes3</sup>
Input capacitance	C <sub>ies</sub>	—	275	—	pF	V <sub>CE</sub> = 25 V
Output capacitance	C <sub>oes</sub>	—	25	—	pF	V <sub>GE</sub> = 0 V
Reverse transfer capacitance	C <sub>res</sub>	—	8	—	pF	f = 1 MHz
Total gate charge	Q <sub>g</sub>	—	13	—	nC	V <sub>GE</sub> = 15 V
Gate to emitter charge	Q <sub>ge</sub>	—	3	—	nC	V <sub>CE</sub> = 300 V
Gate to collector charge	Q <sub>gc</sub>	—	5	—	nC	I <sub>C</sub> = 10 A
Turn-on delay time	t <sub>d(on)</sub>	—	30	—	ns	V <sub>CC</sub> = 300 V
Rise time	t <sub>r</sub>	—	13	—	ns	V <sub>GE</sub> = +15 V/-5 V
Turn-off delay time	t <sub>d(off)</sub>	—	42	—	ns	I <sub>C</sub> = 10 A
Fall time	t <sub>f</sub>	—	75	—	ns	R <sub>g</sub> = 5 Ω
Turn-on loss energy	E <sub>on</sub>	—	0.10	—	mJ	Inductive load <sup>Notes4</sup>
Turn-off loss energy	E <sub>off</sub>	—	0.13	—	mJ	
Total switching energy	E <sub>total</sub>	—	0.23	—	mJ	
Short circuit withstand time	t <sub>sc</sub>	3.0	5.0	—	μs	V <sub>GE</sub> = 15 V, V <sub>CC</sub> ≤ 360 V <sup>Notes5</sup>

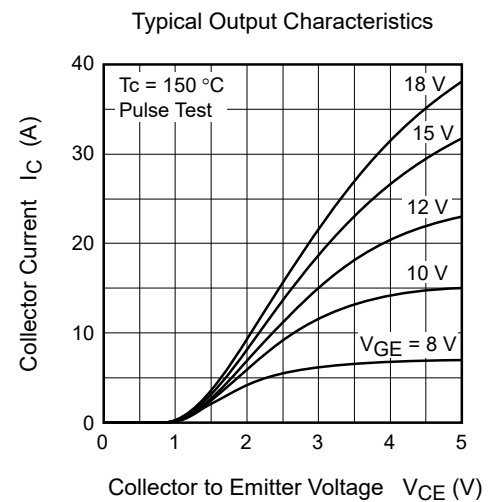
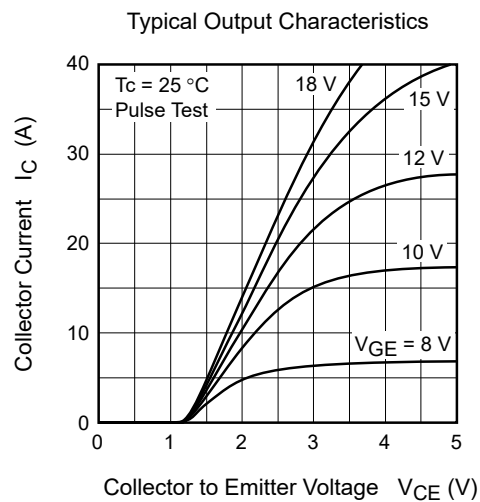
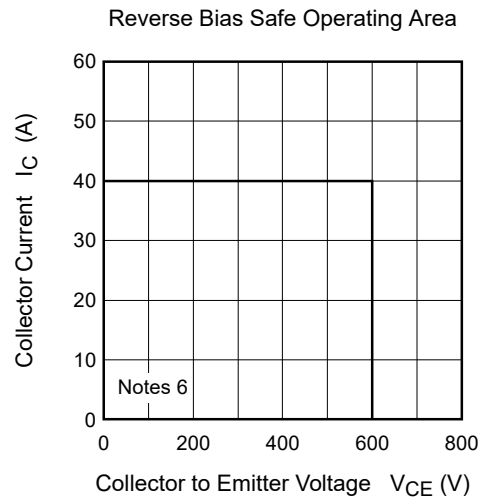
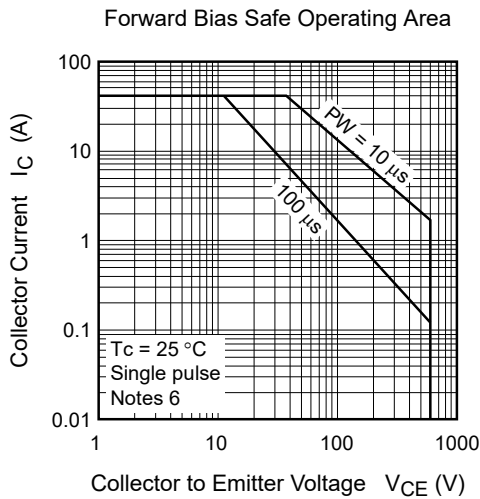
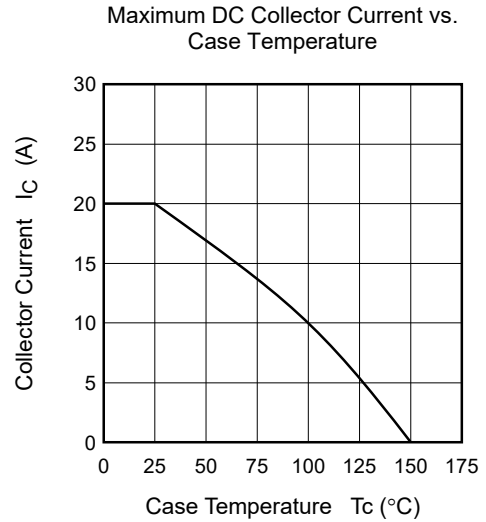
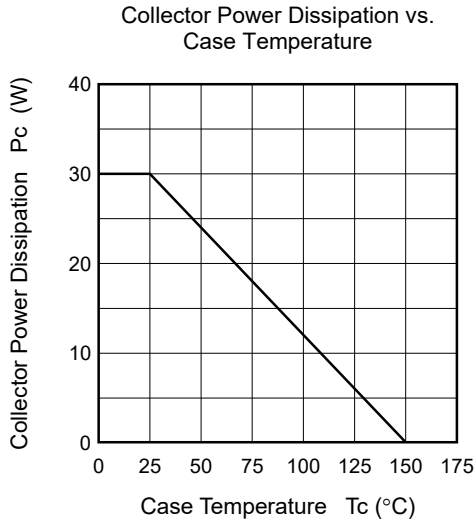
Diode forward voltage	V <sub>F</sub>	—	1.4	1.9	V	I <sub>F</sub> = 10 A <sup>Notes3</sup>
Diode reverse recovery time	t <sub>rr</sub>	—	70	—	ns	I <sub>F</sub> = 10 A, di <sub>F</sub> /dt = 100 A/μs
Diode reverse recovery charge	Q <sub>rr</sub>	—	0.11	—	μC	
Diode peak reverse recovery current	I <sub>rr</sub>	—	3.5	—	A	

Notes: 3. Pulse test

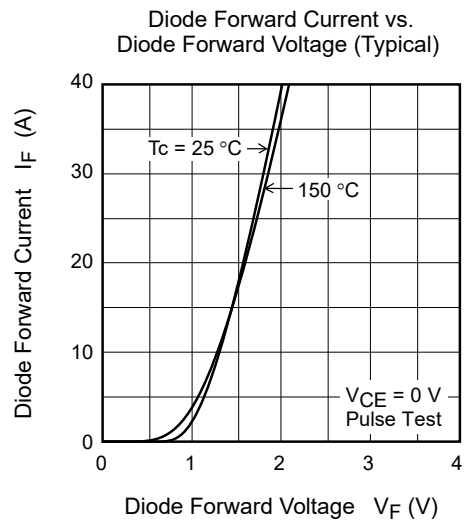
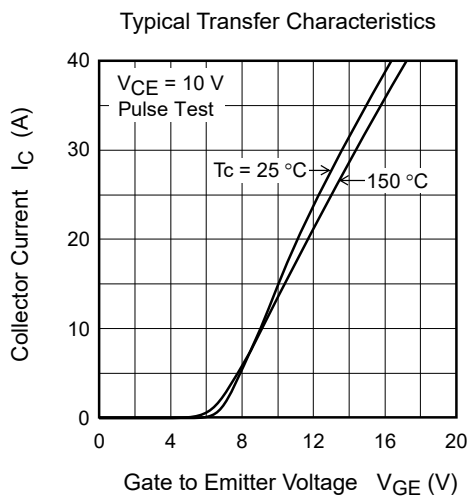
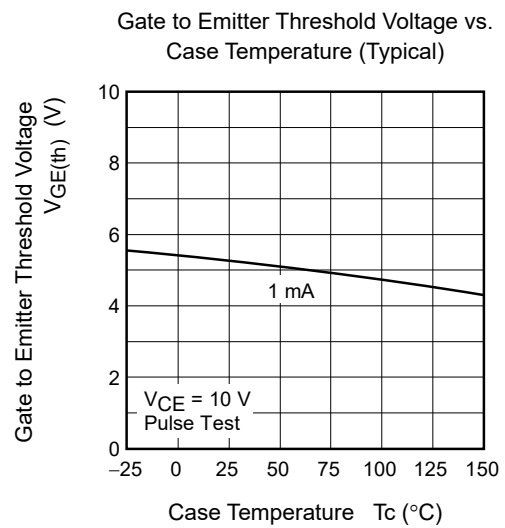
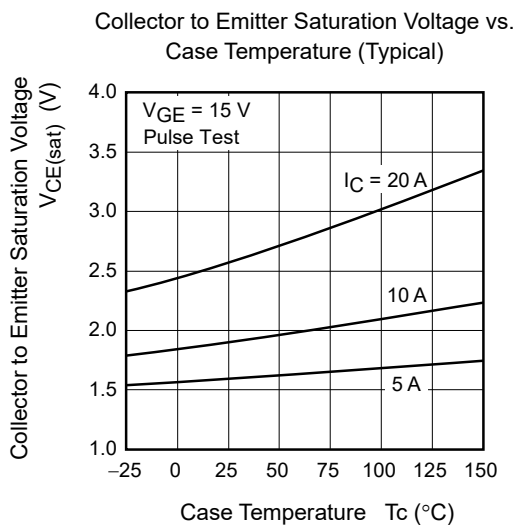
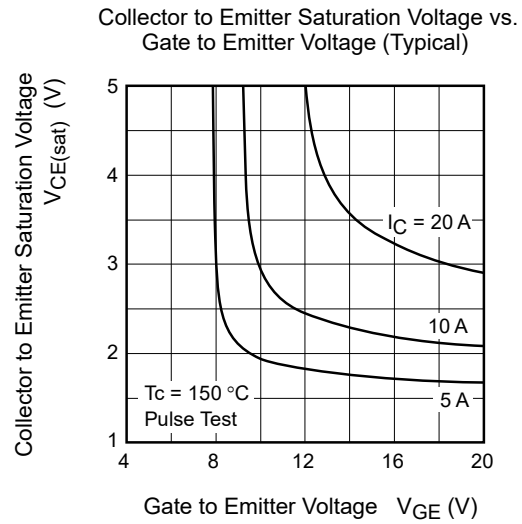
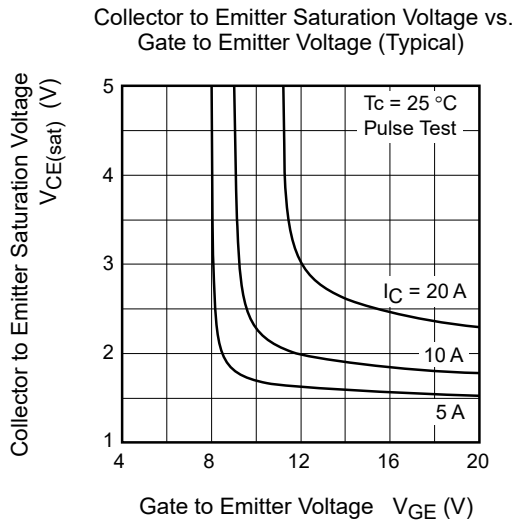
4. Switching time test circuit and waveform are shown below.

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

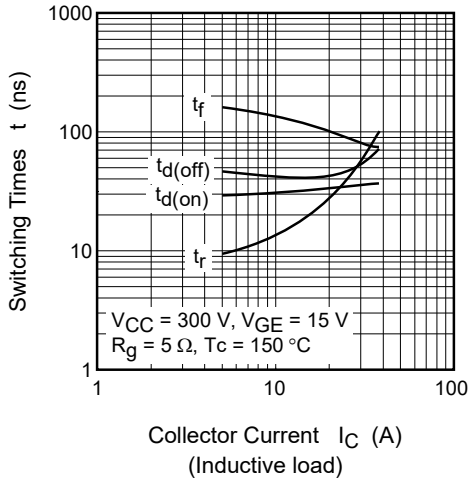
## Main Characteristics



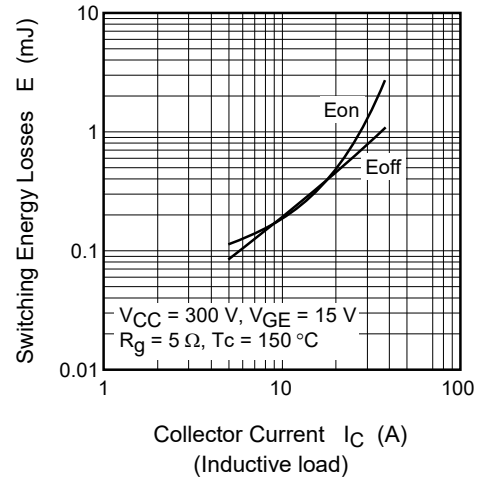
Notes: 6 Designed target value on Renesas measurement condition. (Not tested)  
 Renesas recommends that operating conditions are designed according to a document "Power MOS FET · IGBT Attention of Handling Semiconductor Devices".



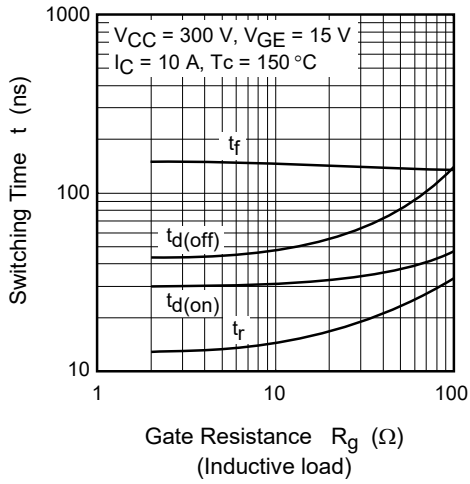
Switching Characteristics (Typical) (1)



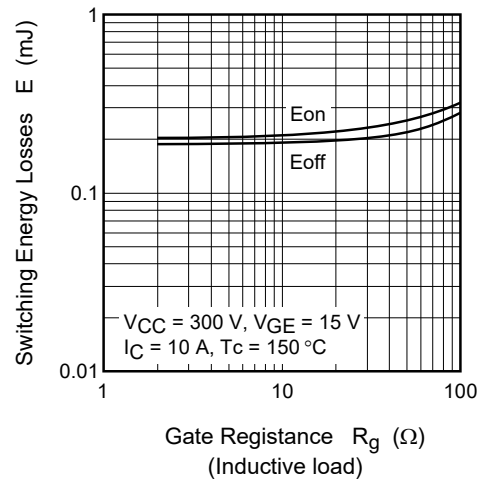
Switching Characteristics (Typical) (2)



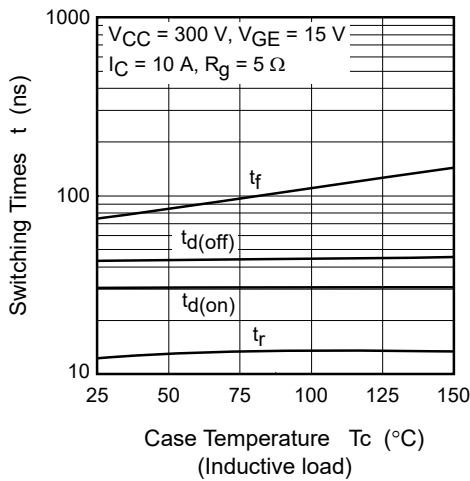
Switching Characteristics (Typical) (3)



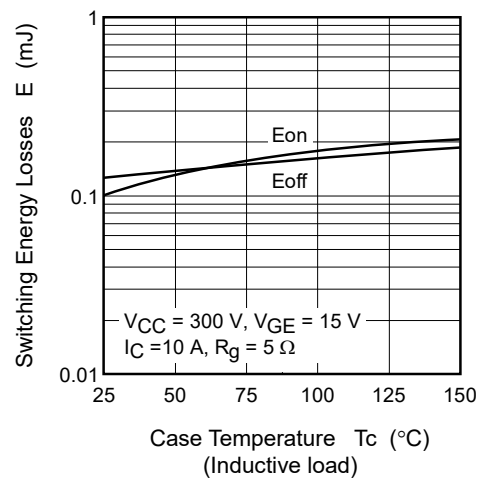
Switching Characteristics (Typical) (4)

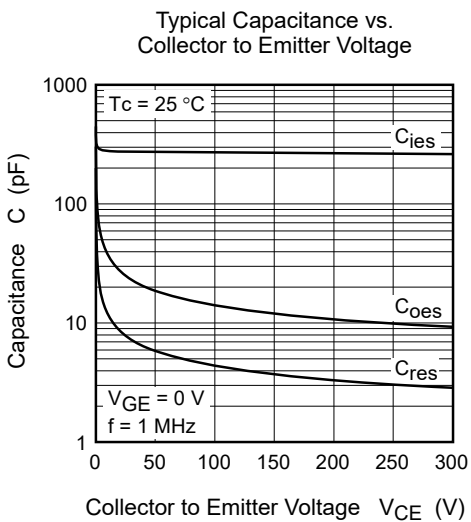
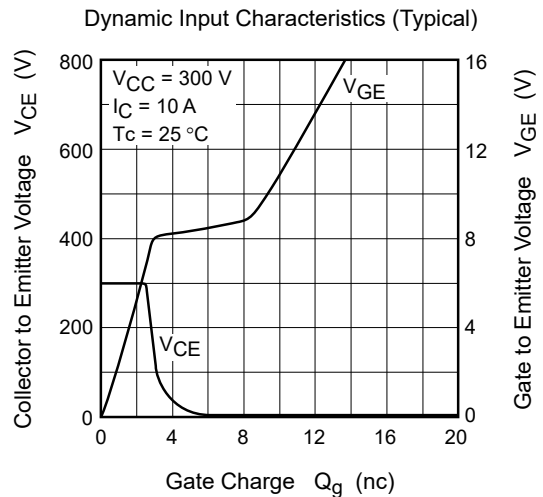
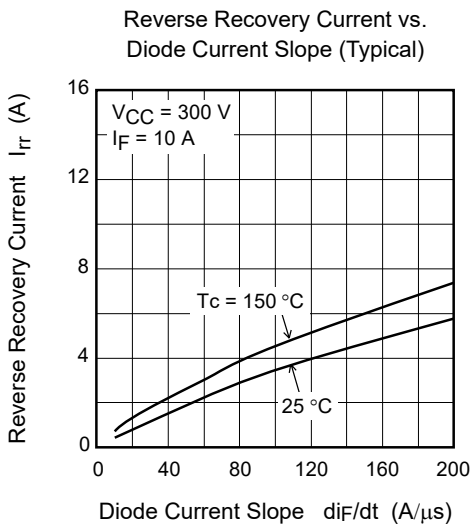
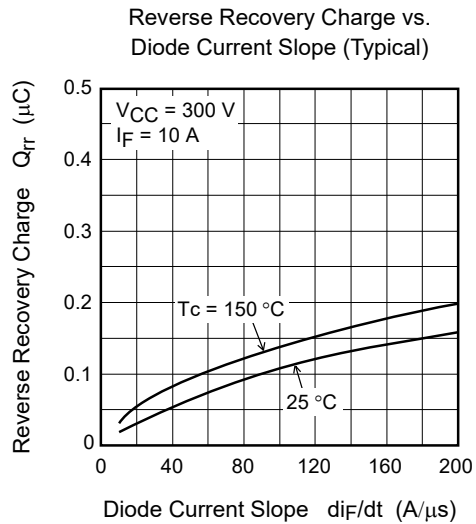
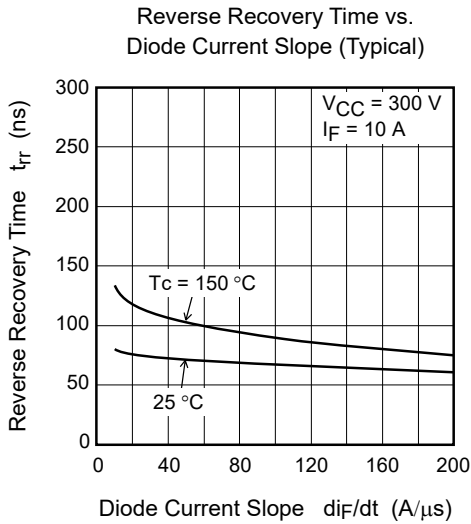


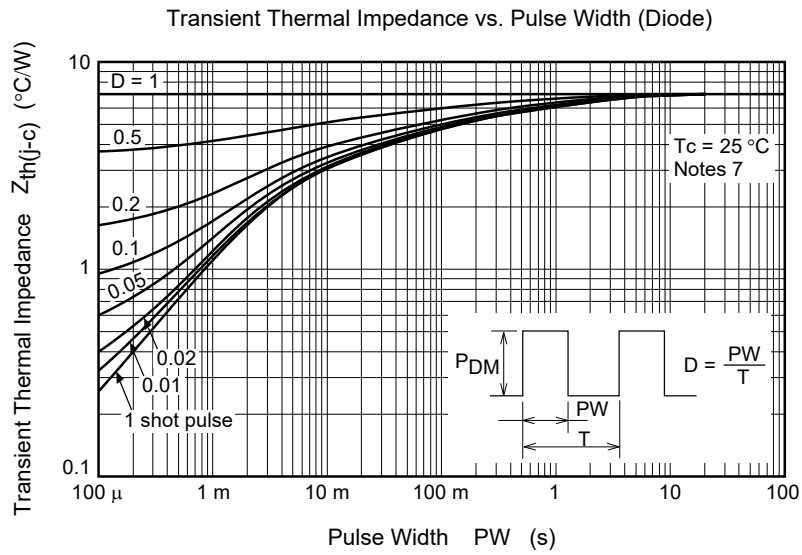
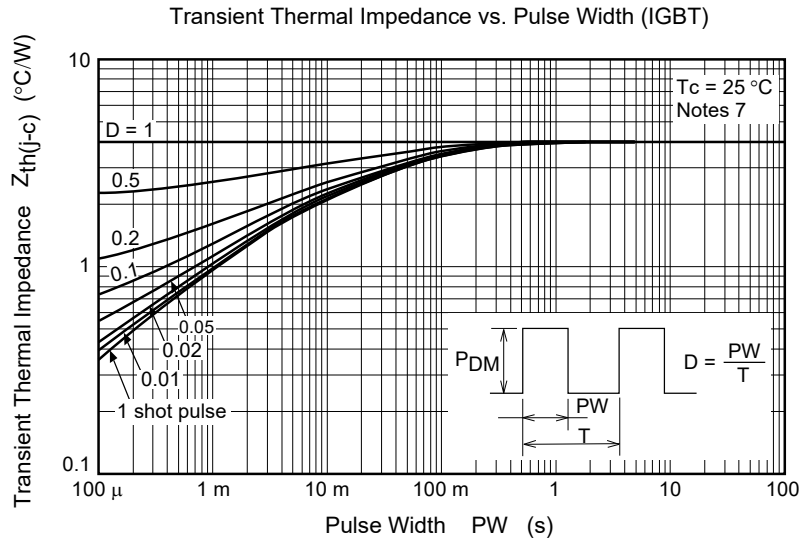
Switching Characteristics (Typical) (5)



Switching Characteristics (Typical) (6)



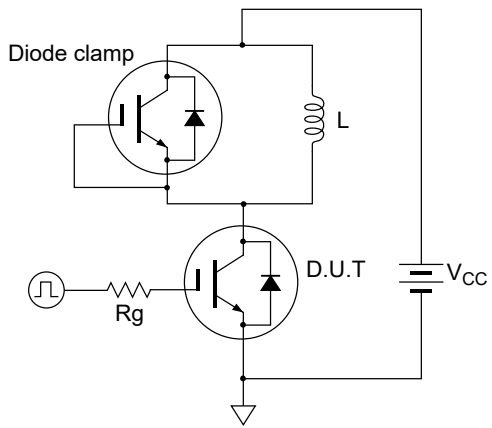




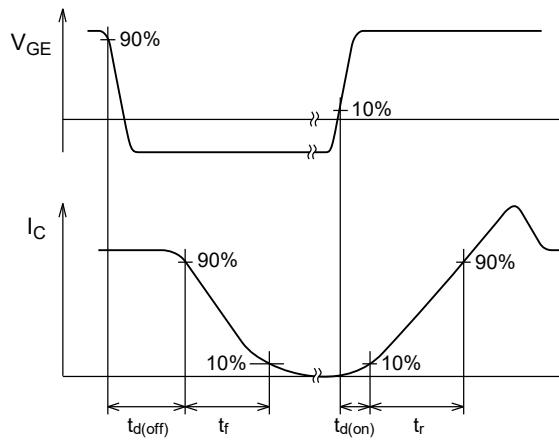
Notes: 7. Designed target value on Renesas measurement condition. (Not tested)



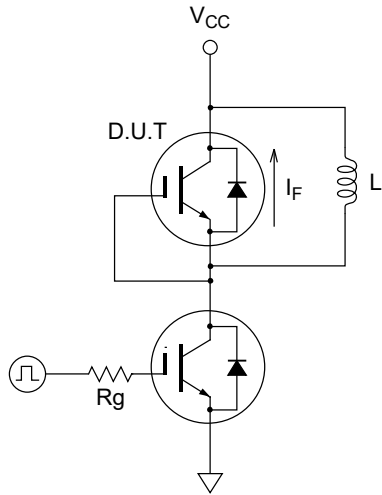
Switching Time Test Circuit



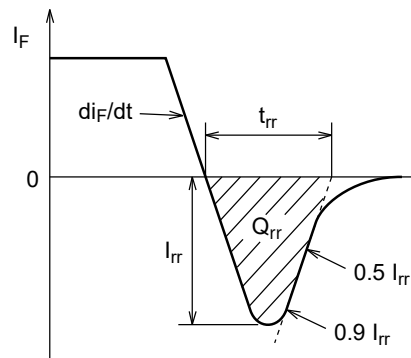
Waveform



Diode Reverse Recovery Time Test Circuit



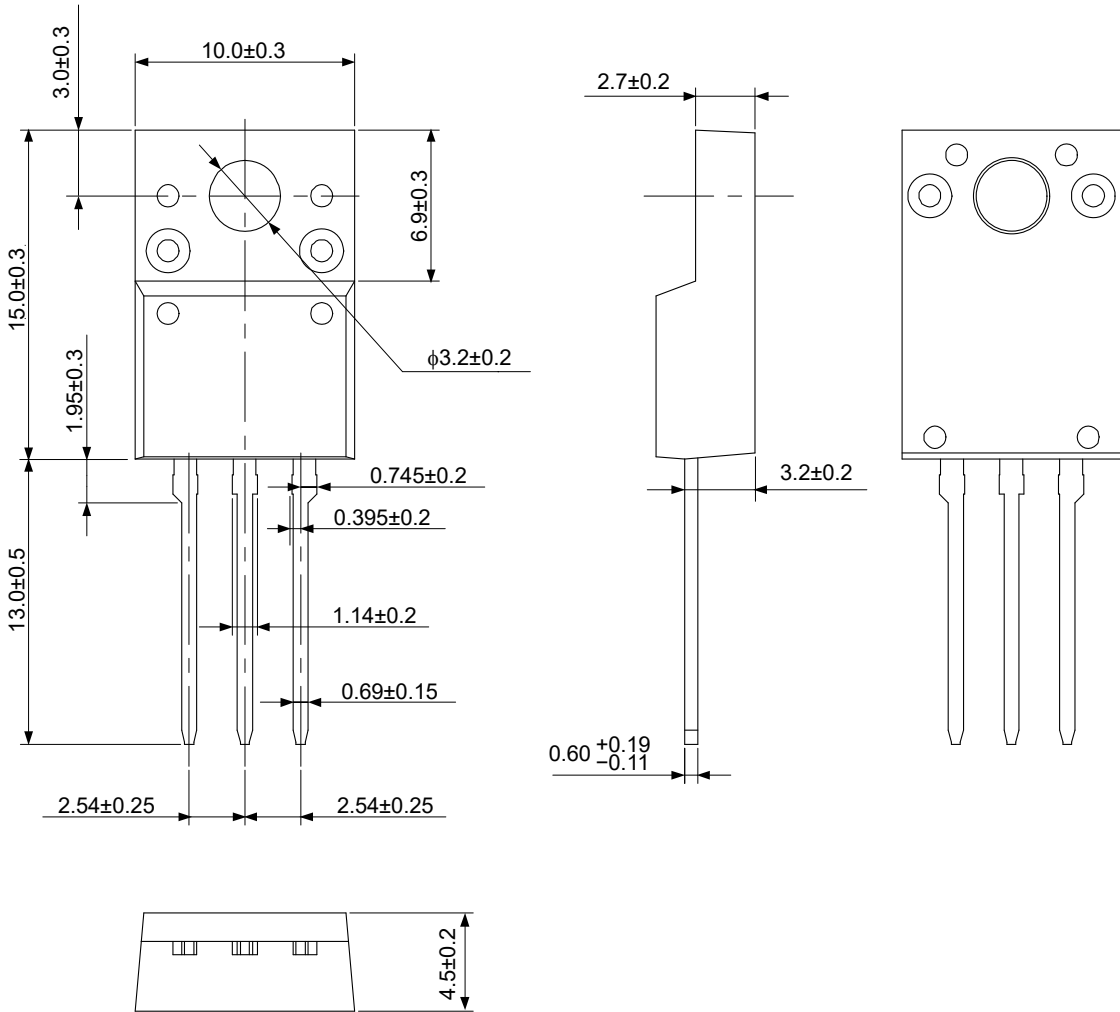
Waveform



### Package Dimensions

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

Unit: mm



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### Ordering Information

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

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