

# RJP65T43DPM

650V - 20A - IGBT  
High Speed Switching

R07DS1201EJ0200  
Rev.2.00  
Dec.01.2020

## Features

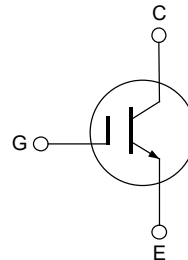
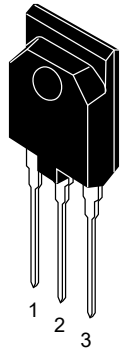
- Trench gate and thin wafer technology (G7H series)
- Isolated package
- Low collector to emitter saturation voltage  
 $V_{CE(sat)} = 1.8 \text{ V typ. (at } I_C = 20 \text{ A, } V_{GE} = 15 \text{ V, } T_a = 25 \text{ }^\circ\text{C)}$
- High speed switching  
 $t_f = 28 \text{ ns typ. (at } V_{CC} = 400 \text{ V, } V_{GE} = 15 \text{ V, } I_C = 20 \text{ A, } R_g = 10 \text{ } \Omega, T_a = 25 \text{ }^\circ\text{C)}$
- Operation frequency ( $20 \text{ kHz} \leq f \leq 100\text{kHz}$ )
- Not guarantee short circuit withstand time
- Applications: PFC
- Quality grade: Standard

## Key Performance

Type	$V_{CES}$	$I_C$	$V_{CE(sat)}, T_c=25^\circ\text{C}$	$T_j$
RJP65T43DPM	650 V	20 A	1.8 V	175 °C

## Outline

RENESAS Package code: PRSS0003ZA-A  
(Package name: TO-3PFM)



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>	650	V	
Gate to emitter voltage	V <sub>GES</sub>	±30	V	
Collector current	T <sub>c</sub> = 25 °C	I <sub>C</sub> <sup>Notes1</sup>	40	A
	T <sub>c</sub> = 100 °C	I <sub>C</sub> <sup>Notes1</sup>	20	A
Collector peak current	i <sub>c(peak)</sub> <sup>Notes1</sup>	150	A	
Collector dissipation	P <sub>C</sub>	68.8	W	
Junction temperature	T <sub>J</sub> <sup>Notes2</sup>	175	°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. Pulse width limited by safe operating area.  
 2. 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 application condition up to 175 °C.

## Thermal Resistance Characteristics

(T<sub>c</sub> = 25 °C)

Item	Symbol	Max. Value <sup>Notes3</sup>	Unit
Junction to case thermal resistance	R <sub>th(j-c)</sub>	2.18	°C/W

Notes: 3. Designed target value on Renesas measurement condition. (Not tested)

## Electrical Characteristics

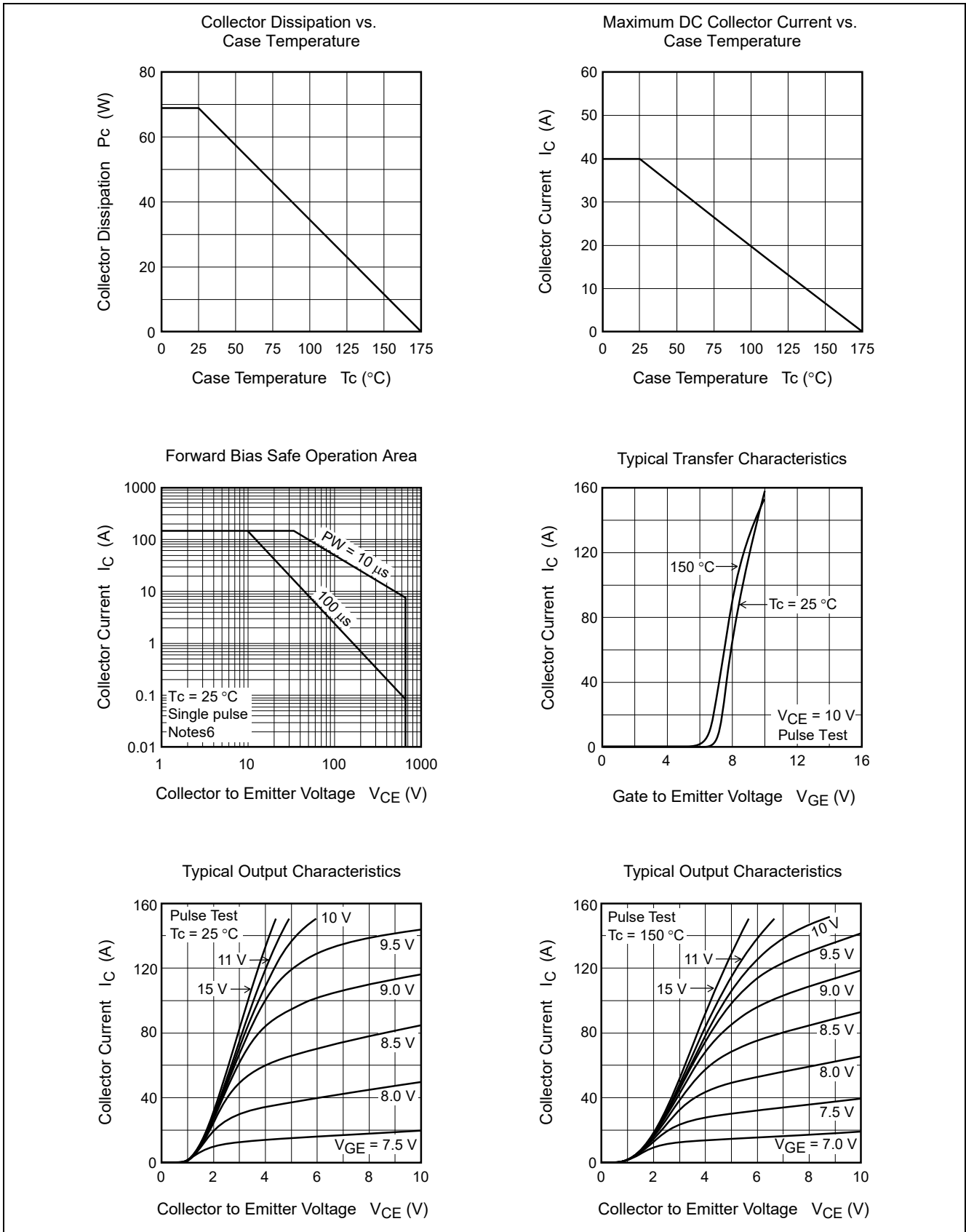
(T<sub>c</sub> = 25 °C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Collector to emitter leakage current	I <sub>CES</sub>	—	—	1	μA	V <sub>CE</sub> = 650 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	—	7.0	V	V <sub>CE</sub> = 10V, I <sub>C</sub> = 0.67 mA
Collector to emitter saturation voltage	V <sub>CE(sat)</sub>	—	1.8	2.4	V	I <sub>C</sub> = 20 A, V <sub>GE</sub> = 15V <sup>Notes4</sup>
Input capacitance	C <sub>ies</sub>	—	1320	—	pF	V <sub>CE</sub> = 25 V V <sub>GE</sub> = 0 V f = 1 MHz
Output capacitance	C <sub>oes</sub>	—	37	—	pF	
Reveres transfer capacitance	C <sub>res</sub>	—	26	—	pF	
Total gate charge	Q <sub>g</sub>	—	70	—	nC	V <sub>GE</sub> = 15 V
Gate to emitter charge	Q <sub>ge</sub>	—	8	—	nC	V <sub>CE</sub> = 400 V
Gate to collector charge	Q <sub>gc</sub>	—	31	—	nC	I <sub>C</sub> = 20 A
Turn-on delay time	t <sub>d(on)</sub>	—	30	—	Ns	V <sub>CC</sub> = 400 V V <sub>GE</sub> = 15 V I <sub>C</sub> = 20 A R <sub>g</sub> = 10 Ω T <sub>C</sub> = 25 °C Inductive load <sup>Notes5</sup>
Rise time	t <sub>r</sub>	—	20	—	ns	
Turn-off delay time	t <sub>d(off)</sub>	—	107	—	ns	
Fall time	t <sub>f</sub>	—	28	—	ns	
Turn-on loss energy	E <sub>on</sub>	—	0.17	—	mJ	
Turn-off loss energy	E <sub>off</sub>	—	0.11	—	mJ	
Total switching energy	E <sub>total</sub>	—	0.28	—	mJ	
Turn-on delay time	t <sub>d(on)</sub>	—	31	—	Ns	
Rise time	t <sub>r</sub>	—	20	—	ns	
Turn-off delay time	t <sub>d(off)</sub>	—	114	—	ns	
Fall time	t <sub>f</sub>	—	51	—	ns	
Turn-on loss energy	E <sub>on</sub>	—	0.25	—	mJ	V <sub>CC</sub> = 400 V V <sub>GE</sub> = 15 V I <sub>C</sub> = 20 A R <sub>g</sub> = 10 Ω T <sub>C</sub> = 150 °C Inductive load <sup>Notes5</sup>
Turn-off loss energy	E <sub>off</sub>	—	0.24	—	mJ	
Total switching energy	E <sub>total</sub>	—	0.49	—	mJ	

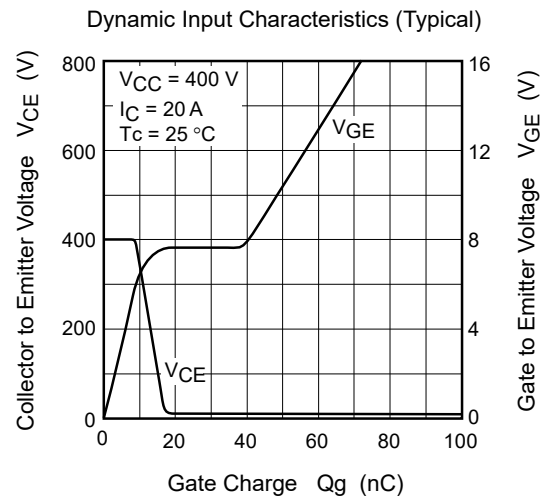
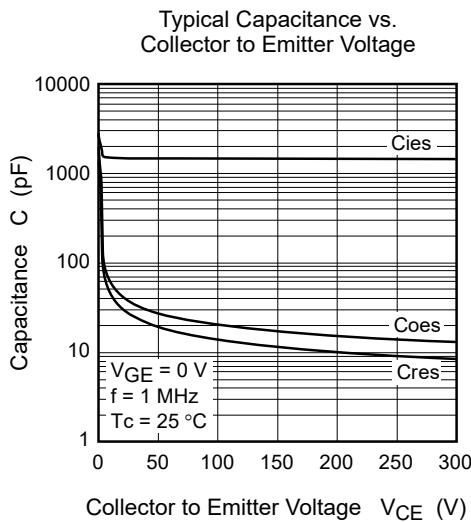
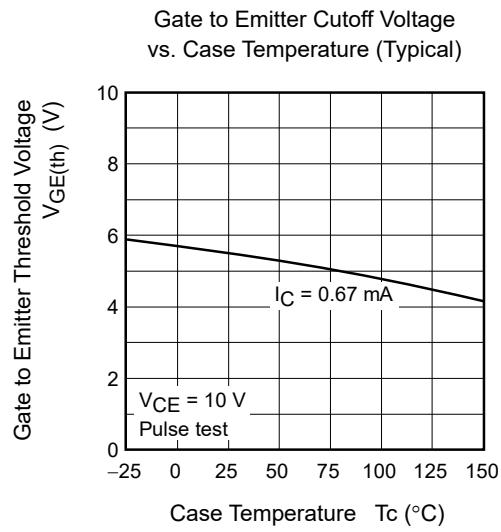
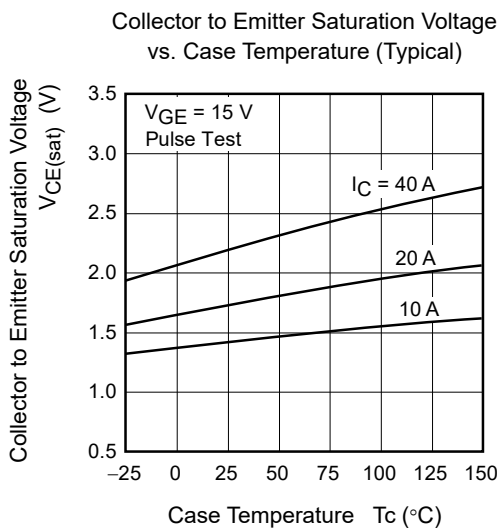
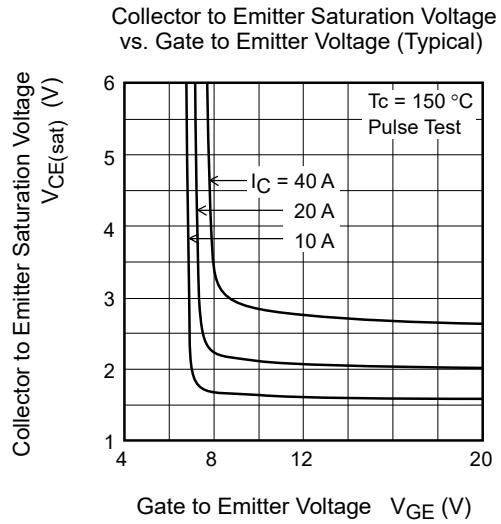
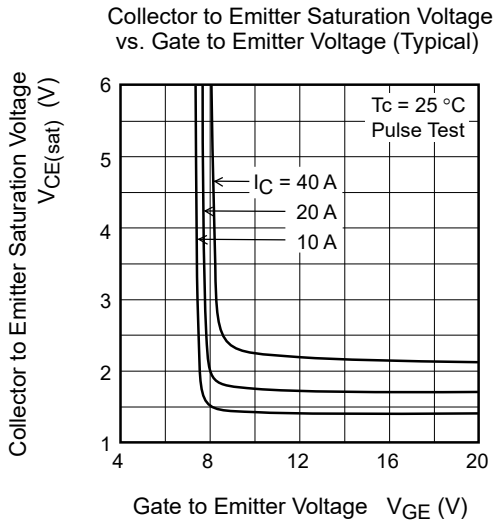
Notes: 4. Pulse test

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

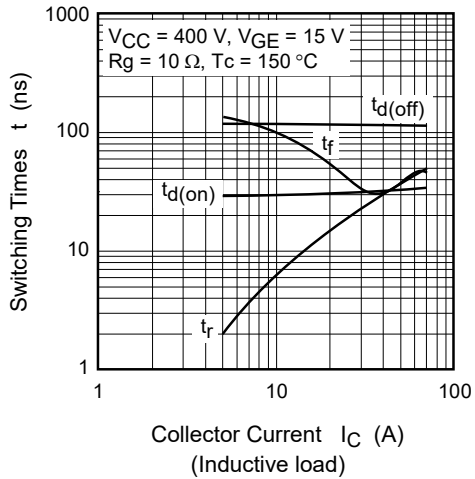
## Main Characteristics



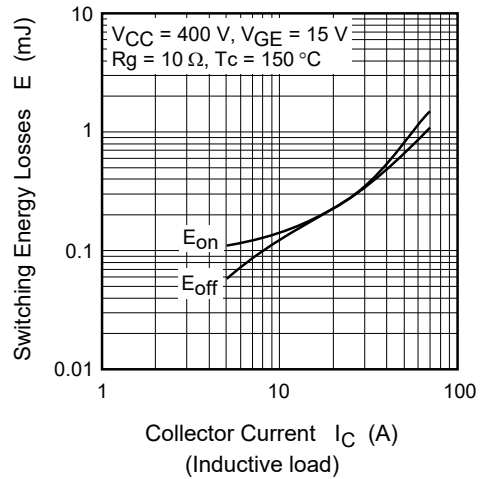
Notes: 6. Designed target value on Renesas measurement condition. (Not tested)  
 Renesas recommends that operating conditions are designed according to a document "Power MOS FET · IGBT Attention of Handling Semiconductor Devices".



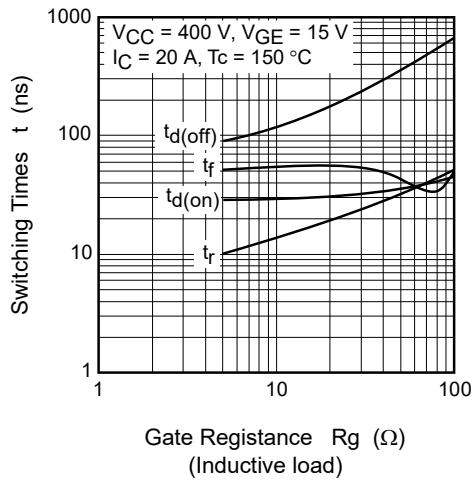
Switching Characteristics (Typical) (1)



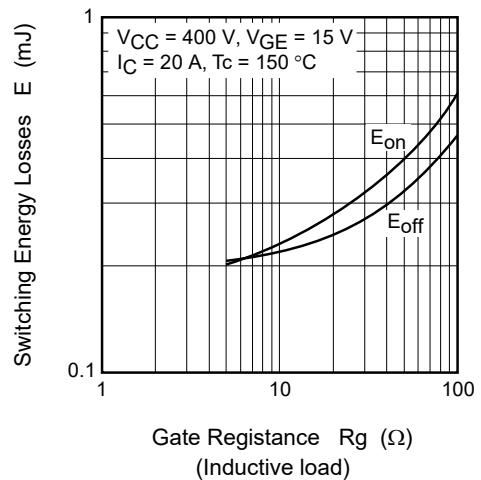
Switching Characteristics (Typical) (2)



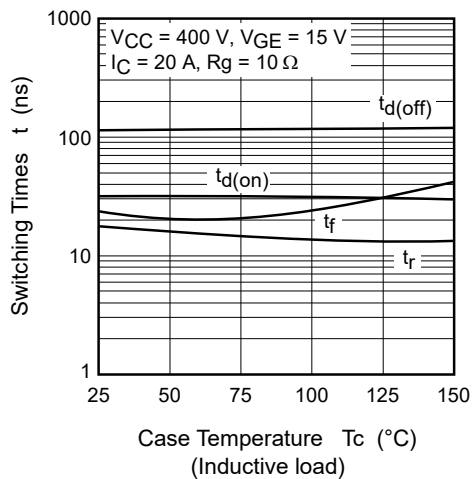
Switching Characteristics (Typical) (3)



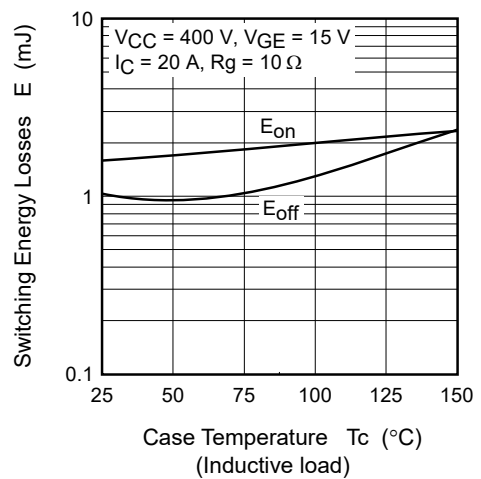
Switching Characteristics (Typical) (4)



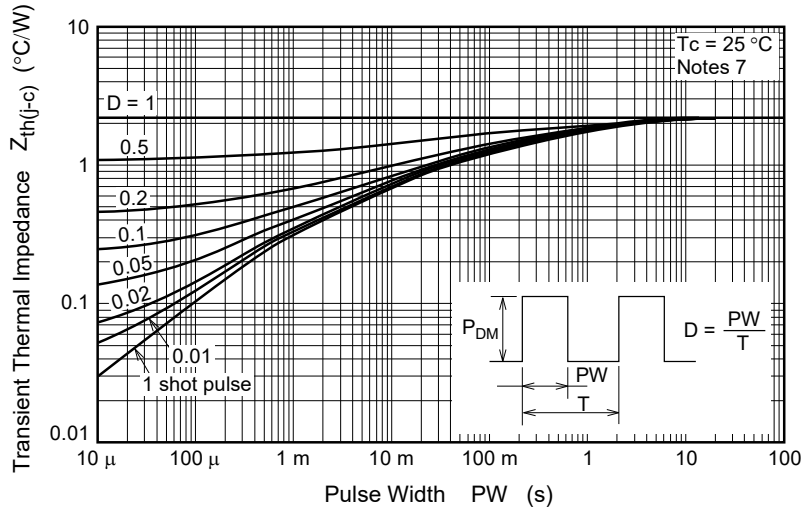
Switching Characteristics (Typical) (5)



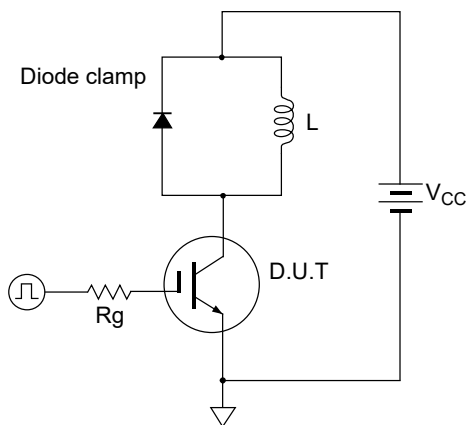
Switching Characteristics (Typical) (6)



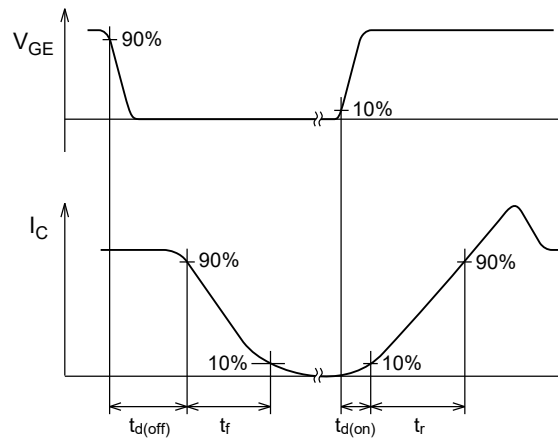
Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit



Waveform



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





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