

# RJQ6003DPM

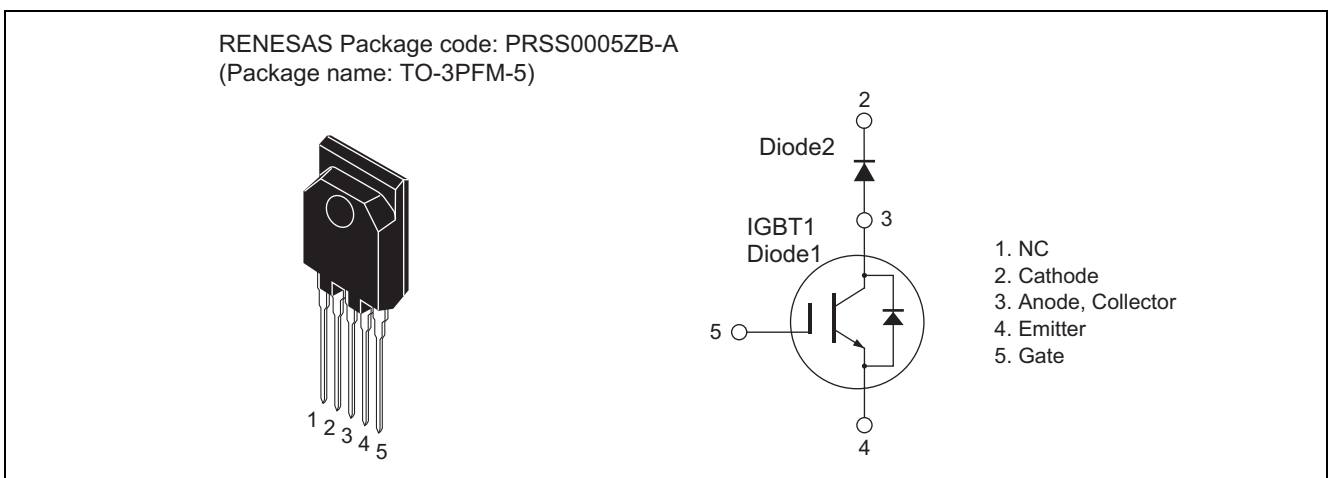
600V - 20A - IGBT and Diode  
High Speed Power Switching

R07DS0846EJ0100  
Rev.1.00  
Aug 03, 2012

## Features

- Low collector to emitter saturation voltage  
 $V_{CE(sat)} = 1.37$  V typ. ( $I_C = 40$  A,  $V_{GE} = 15$  V,  $T_a = 25^\circ\text{C}$ )
- Built in fast recovery diode in one package
- Trench gate and thin wafer technology
- High speed switching  
 $t_r = 85$  ns typ. (at  $I_C = 30$  A,  $V_{CE} = 400$  V,  $V_{GE} = 15$  V,  $R_g = 5$   $\Omega$ ,  $T_a = 25^\circ\text{C}$ , inductive load)

## Outline



## Absolute Maximum Ratings

### IGBT1, Diode1

( $T_a = 25^\circ\text{C}$ )

Item	Symbol	Ratings	Unit	
Collector to emitter voltage/diode reverse voltage	$V_{CES}/V_R$	600	V	
Gate to emitter voltage	$V_{GES}$	$\pm 30$	V	
Collector current	$T_c = 25^\circ\text{C}$	$I_C$ <sup>Note1</sup>	40	A
	$T_c = 100^\circ\text{C}$	$I_C$ <sup>Note1</sup>	20	A
Collector peak current	$I_{C(peak)}$ <sup>Note3</sup>	160	A	
Collector to emitter diode forward current	$I_{DF}$ <sup>Note1</sup>	20	A	
Collector to emitter diode forward peak current	$I_{DF(peak)}$ <sup>Note3</sup>	100	A	
Collector dissipation	$P_C$ <sup>Note2</sup>	50	W	
Junction to case thermal impedance (IGBT)	$\theta_{j-c}$	2.5	$^\circ\text{C}/\text{W}$	
Junction to case thermal impedance (Diode)	$\theta_{j-cd}$	4.5	$^\circ\text{C}/\text{W}$	
Junction temperature	$T_j$	150	$^\circ\text{C}$	
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$	

- Notes: 1. Limited by  $T_j$  max.  
2. Value at  $T_c = 25^\circ\text{C}$   
3. Pulse width limited by maximum safe operating area.

## Diode2

(Ta = 25°C)

Item	Symbol	Ratings	Unit
Maximum reverse voltage	$V_{RM}$	600	V
Continuous forward current	$I_F$ <sup>Note1</sup>	20	A
Peak surge forward current	$I_{FSM}$ <sup>Note4</sup>	80	A
Junction to case thermal impedance	$\theta_{j-c}$	4.5	°C/W
Junction temperature	$T_j$	150	°C
Storage temperature	$T_{stg}$	-55 to +150	°C

Notes: 4. 50 Hz sine half wave, Non-repetitive 1 cycle value,  $T_j = 25^\circ\text{C}$ .

## Electrical Characteristics

## IGBT

(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Zero gate voltage collector current	$I_{CES}$	—	—	100	$\mu\text{A}$	$V_{CE} = 600\text{V}, V_{GE} = 0$
Gate to emitter leak current	$I_{GES}$	—	—	$\pm 1$	$\mu\text{A}$	$V_{GE} = \pm 30\text{V}, V_{CE} = 0$
Gate to emitter cutoff voltage	$V_{GE(off)}$	4	—	8	V	$V_{CE} = 10\text{V}, I_C = 1\text{mA}$
Collector to emitter saturation voltage	$V_{CE(sat)}$	—	1.37	1.8	V	$I_C = 40\text{A}, V_{GE} = 15\text{V}$ <sup>Note5</sup>
	$V_{CE(sat)}$	—	1.7	—	V	$I_C = 80\text{A}, V_{GE} = 15\text{V}$ <sup>Note5</sup>
Input capacitance	$C_{ies}$	—	2780	—	pF	$V_{CE} = 25\text{V}$
Output capacitance	$C_{oes}$	—	122	—	pF	$V_{GE} = 0\text{V}$
Reverse transfer capacitance	$C_{res}$	—	43	—	pF	$f = 1\text{MHz}$
Switching time	$t_{d(on)}$	—	53	—	ns	$I_C = 30\text{A},$ $V_{CE} = 400\text{V}, V_{GE} = 15\text{V}$ $R_g = 5\ \Omega$ <sup>Note5</sup> Inductive load
	$t_r$	—	145	—	ns	
	$t_{d(off)}$	—	105	—	ns	
	$t_f$	—	85	—	ns	

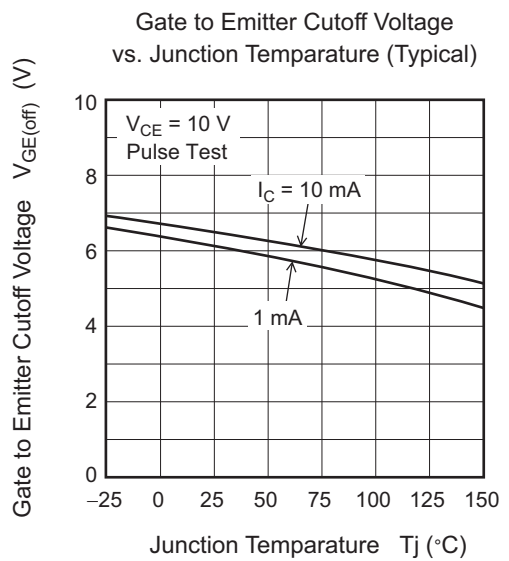
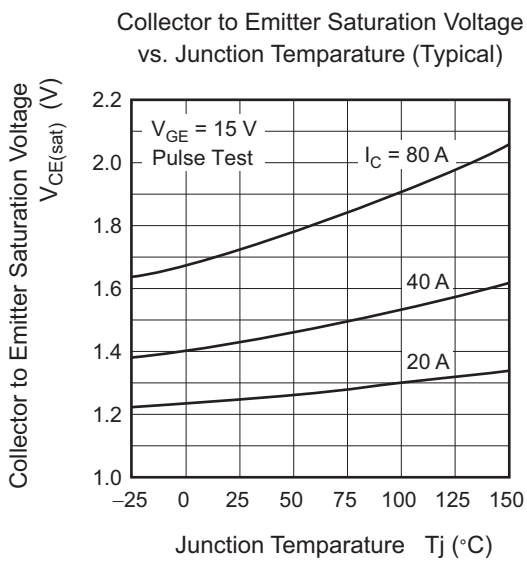
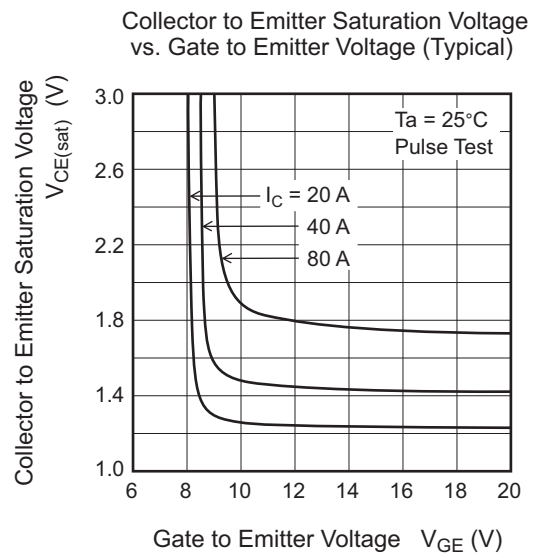
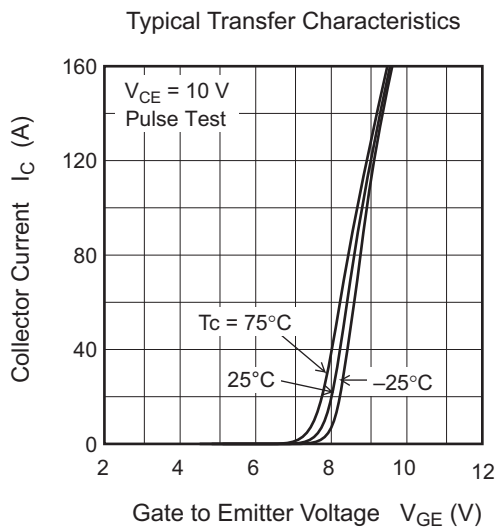
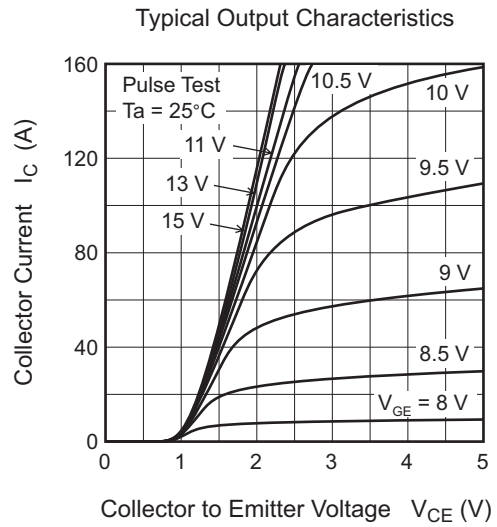
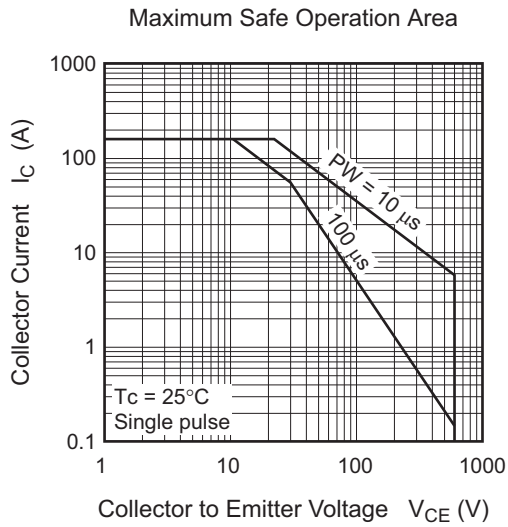
Notes: 5. Pulse test

## Diode1, Diode2

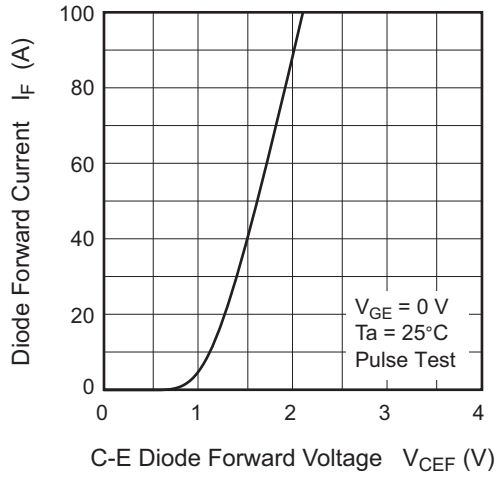
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test conditions
Forward voltage	$V_F$	—	1.4	1.9	V	$I_F = 30\text{A}$
Reverse current	$I_R$	—	—	1	$\mu\text{A}$	$V_R = 600\text{V}$
Reverse recovery Time	$t_{rr}$	—	100	—	ns	$I_F = 30\text{A}$ $di/dt = 100\text{A}/\mu\text{s}$
FRD reverse recovery charge	$Q_{rr}$	—	0.18	—	$\mu\text{C}$	
FRD peak reverse recovery current	$I_{rr}$	—	4.2	—	A	

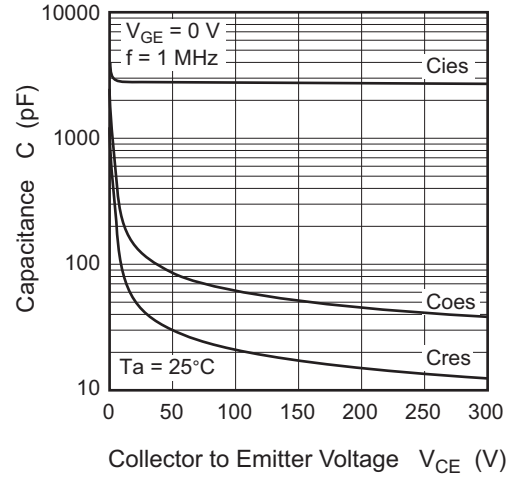
Main Characteristics



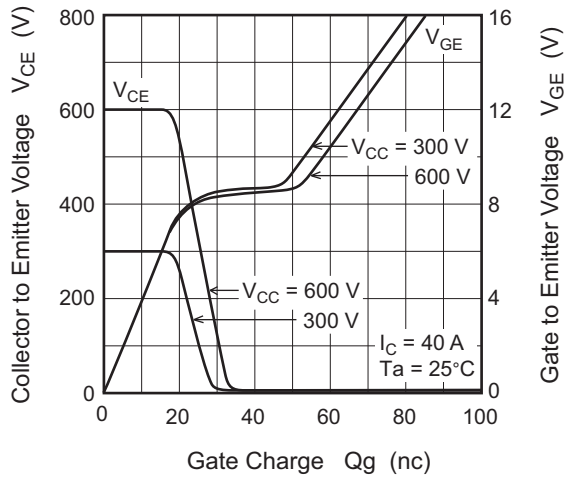
Forward Current vs. Forward Voltage (Typical)



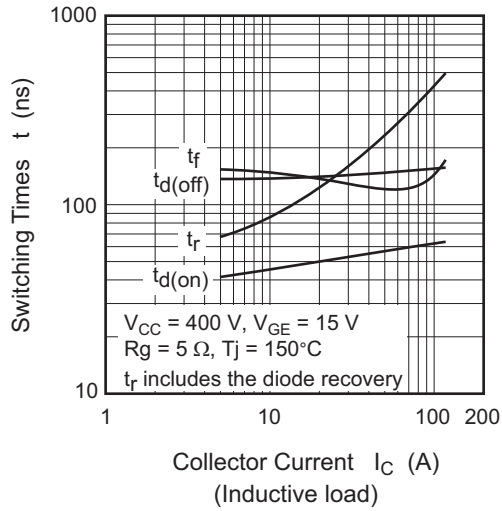
Typical Capacitance vs. Collector to Emitter Voltage



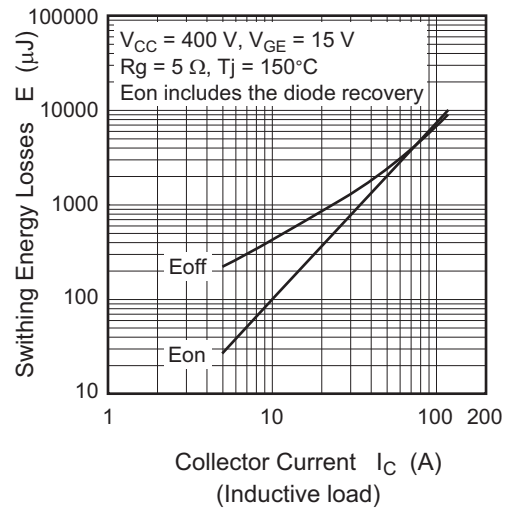
Dynamic Input Characteristics (Typical)



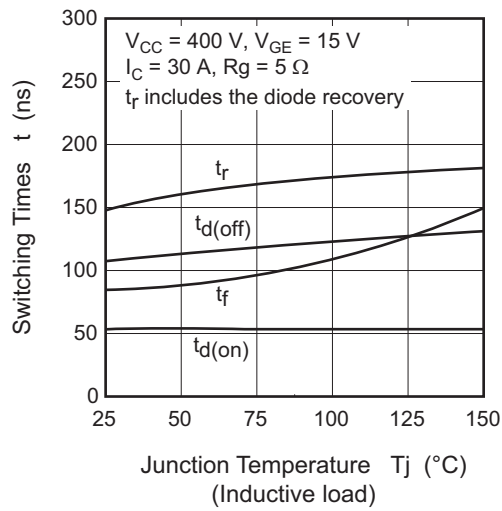
Switching Characteristics (Typical) (1)



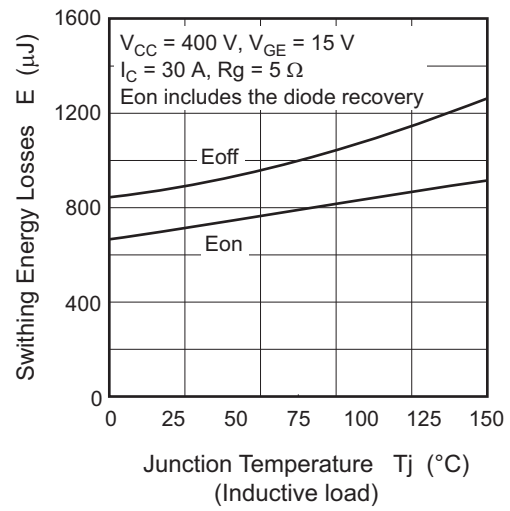
Switching Characteristics (Typical) (2)

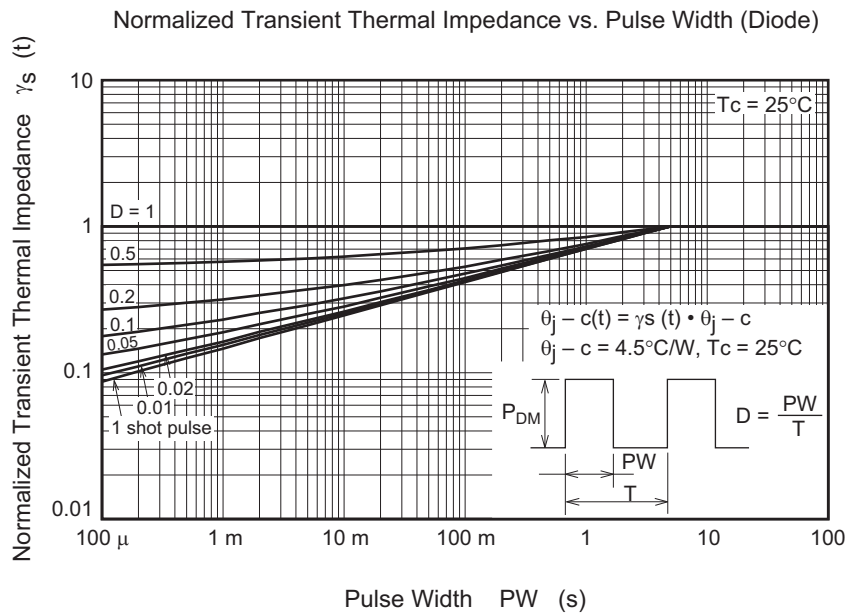
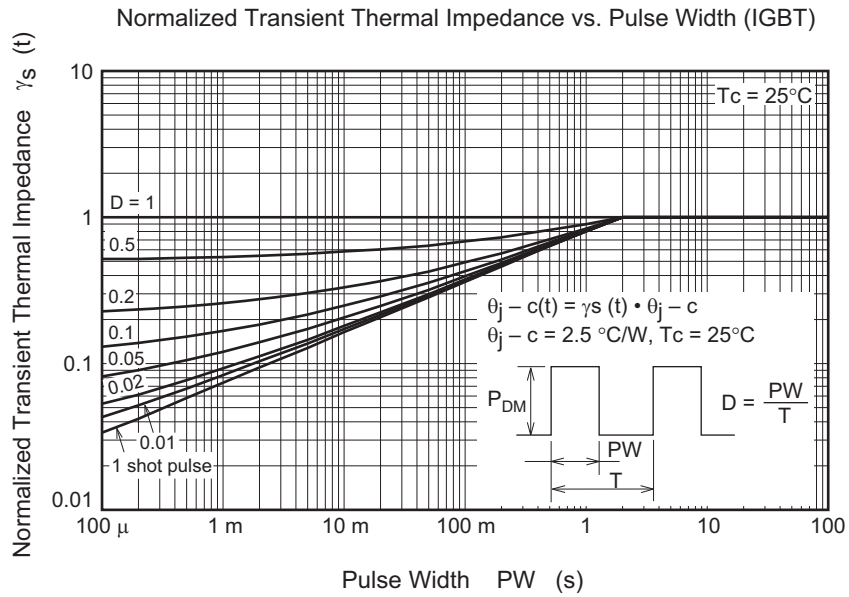


Switching Characteristics (Typical) (3)

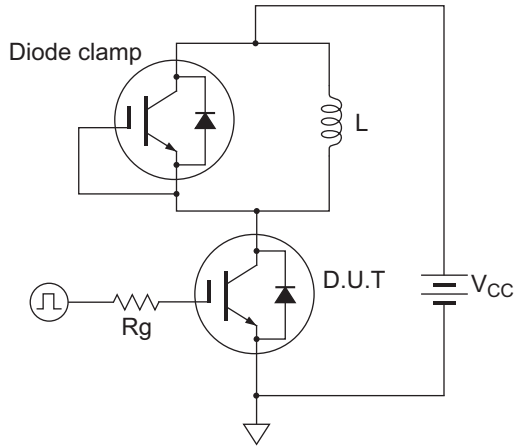


Switching Characteristics (Typical) (4)

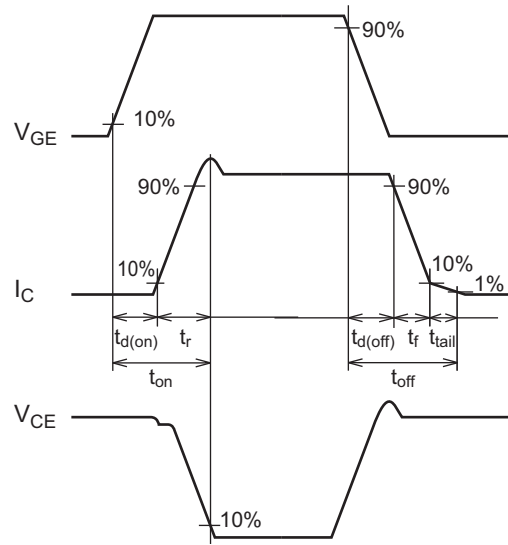




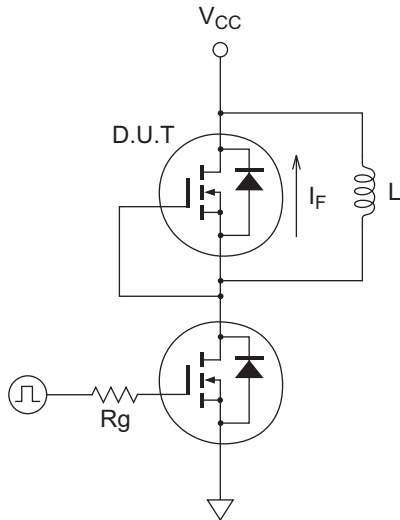
Switching Time Test Circuit



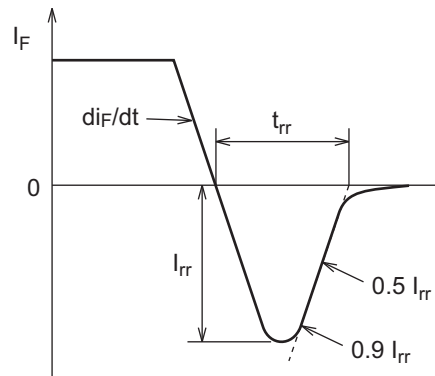
Waveform



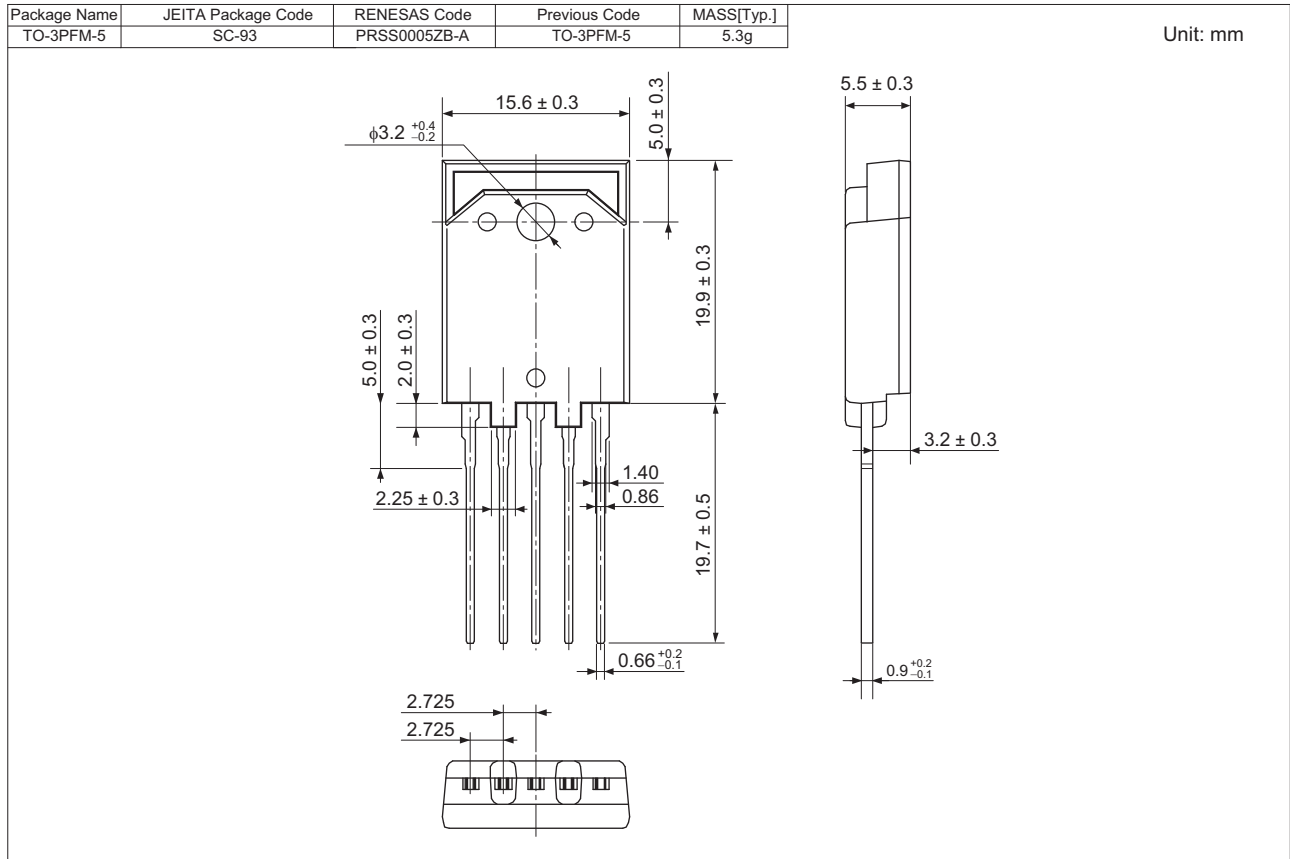
Diode Reverse Recovery Time Test Circuit



Waveform



### Package Dimensions



### Ordering Information

Orderable Part Number	Quantity	Shipping Container
RJQ6003DPM-00#T0	360 pcs	Box (tube)



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