

# RJH60M3DPE

600V - 17A - IGBT

Application: Inverter

R07DS0533EJ0300

Rev.3.00

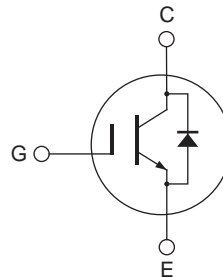
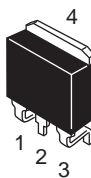
May 25, 2012

## Features

- Short circuit withstand time (8  $\mu$ s typ.)
- Low collector to emitter saturation voltage  
 $V_{CE(sat)} = 1.8$  V typ. (at  $I_C = 17$  A,  $V_{GE} = 15$  V,  $T_a = 25^\circ\text{C}$ )
- Built in fast recovery diode (90 ns typ.) in one package
- Trench gate and thin wafer technology
- High speed switching  
 $t_f = 70$  ns typ. (at  $V_{CC} = 300$  V,  $V_{GE} = 15$  V,  $I_C = 17$  A,  $R_g = 5 \Omega$ ,  $T_a = 25^\circ\text{C}$ )

## Outline

RENESAS Package code: PRSS0004AE-B  
 (Package name: LDPAK (S)-(1) )



1. Gate
2. Collector
3. Emitter
4. Collector

## Absolute Maximum Ratings

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

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	$T_c = 25^\circ\text{C}$	$I_C$	35	A
	$T_c = 100^\circ\text{C}$	$I_C$	17	A
Collector peak current	$i_{c(peak)}$ <sup>Note1</sup>	50	A	
Collector to emitter diode forward current	$i_{DF}$	17	A	
Collector to emitter diode forward peak current	$i_{DF(peak)}$ <sup>Note1</sup>	50	A	
Collector dissipation	$P_C$ <sup>Note2</sup>	113	W	
Junction to case thermal resistance (IGBT)	$\theta_{j-c}$ <sup>Note2</sup>	1.11	$^\circ\text{C}/\text{W}$	
Junction to case thermal resistance (Diode)	$\theta_{j-cd}$ <sup>Note2</sup>	2.8	$^\circ\text{C}/\text{W}$	
Junction temperature	$T_j$	150	$^\circ\text{C}$	
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$	

Notes: 1.  $PW \leq 10 \mu\text{s}$ , duty cycle  $\leq 1\%$

2. Value at  $T_c = 25^\circ\text{C}$

## Electrical Characteristics

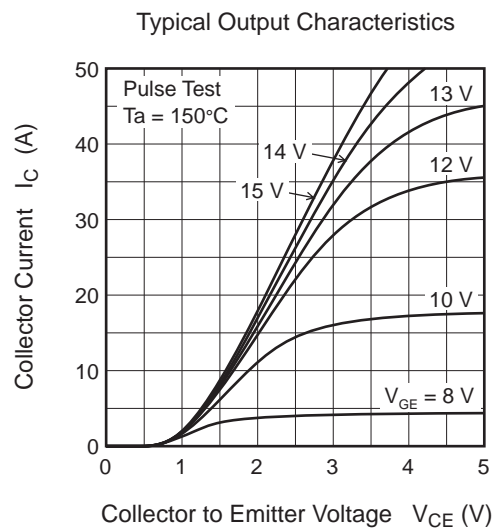
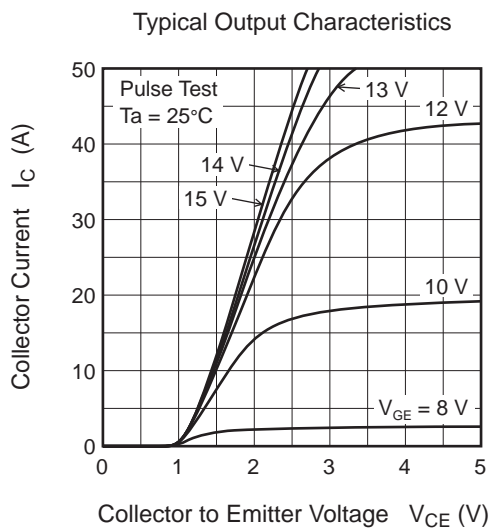
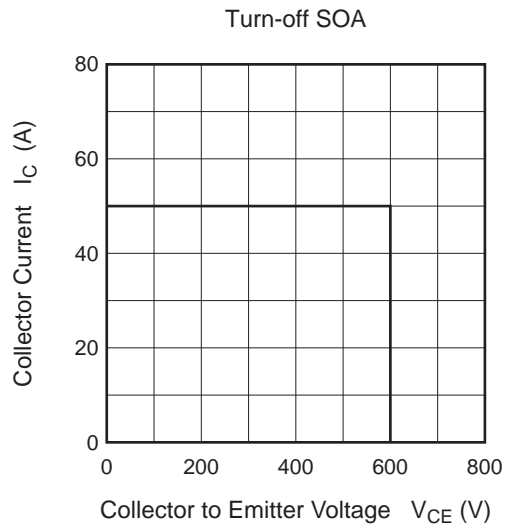
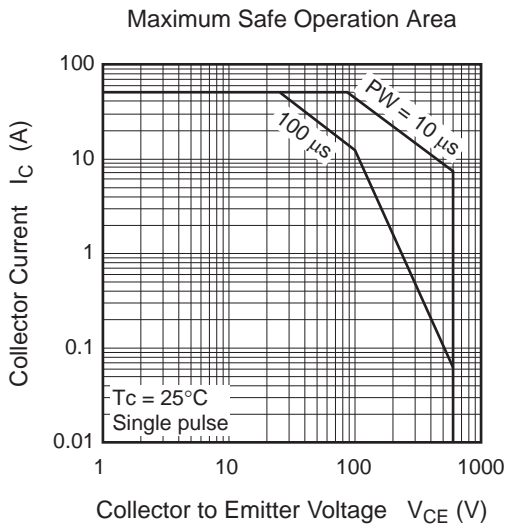
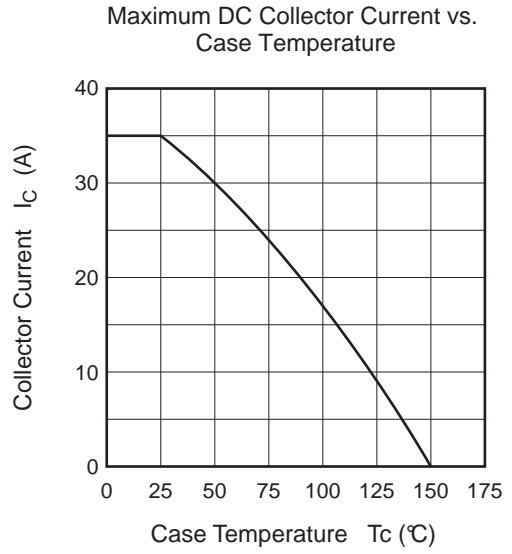
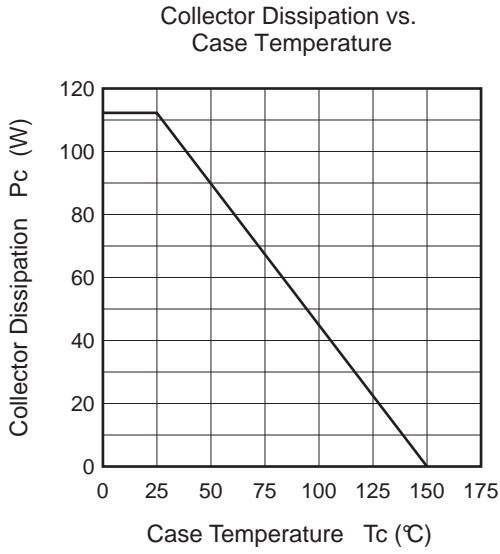
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Collector to emitter breakdown voltage	$V_{(BR)CES}$	600	—	—	V	$I_y = 10 \mu A, V_{GE} = 0$
Zero gate voltage collector current / Diode reverse current	$I_{CES} / I_R$	—	—	5	$\mu A$	$V_{CE} = 600 V, V_{GE} = 0$
Gate to emitter leak current	$I_{GES}$	—	—	$\pm 1$	$\mu A$	$V_{GE} = \pm 30 V, V_{CE} = 0$
Gate to emitter cutoff voltage	$V_{GE(off)}$	5	—	7	V	$V_{CE} = 10 V, I_C = 1 mA$
Collector to emitter saturation voltage	$V_{CE(sat)}$	—	1.8	2.3	V	$I_C = 17 A, V_{GE} = 15 V$ <sup>Note3</sup>
	$V_{CE(sat)}$	—	2.2	—	V	$I_C = 35 A, V_{GE} = 15 V$ <sup>Note3</sup>
Input capacitance	$C_{ies}$	—	900	—	pF	$V_{CE} = 25 V$
Output capacitance	$C_{oes}$	—	60	—	pF	$V_{GE} = 0$
Reverse transfer capacitance	$C_{res}$	—	30	—	pF	$f = 1 MHz$
Total gate charge	$Q_g$	—	60	—	nC	$V_{GE} = 15 V$
Gate to emitter charge	$Q_{ge}$	—	9	—	nC	$V_{CE} = 300 V$
Gate to collector charge	$Q_{gc}$	—	35	—	nC	$I_C = 17 A$
Turn-on delay time	$t_{d(on)}$	—	38	—	ns	$V_{CC} = 300 V$
Rise time	$t_r$	—	20	—	ns	$V_{GE} = 15 V$
Turn-off delay time	$t_{d(off)}$	—	90	—	ns	$I_C = 17 A$
Fall time	$t_f$	—	70	—	ns	$R_g = 5 \Omega$
Turn-on energy	$E_{on}$	—	0.29	—	mJ	Inductive load
Turn-off energy	$E_{off}$	—	0.29	—	mJ	
Total switching energy	$E_{total}$	—	0.58	—	mJ	
Short circuit withstand time	$t_{sc}$	6	8	—	$\mu s$	$T_C = 100 ^\circ C$ $V_{CC} \leq 360 V, V_{GE} = 15 V$

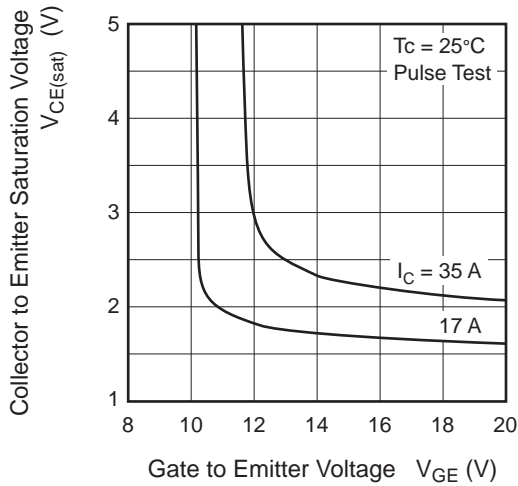
FRD Forward voltage	$V_F$	—	1.3	1.7	V	$I_F = 17 A$ <sup>Note3</sup>
FRD reverse recovery time	$t_{rr}$	—	90	—	ns	$I_F = 17 A$
FRD reverse recovery charge	$Q_{rr}$	—	0.15	—	$\mu C$	$di_F/dt = 100 A/\mu s$
FRD peak reverse recovery current	$I_{rr}$	—	4.5	—	A	

Notes: 3. Pulse test.

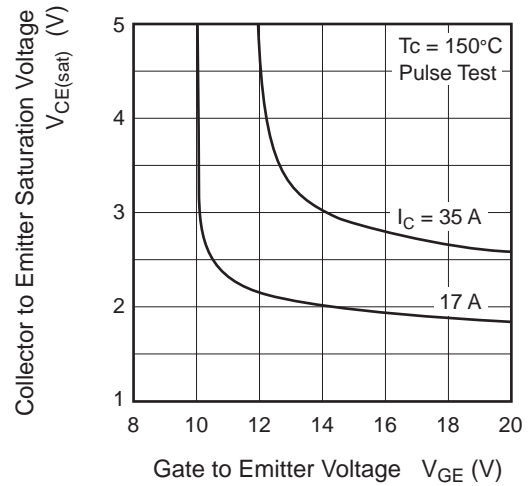
Main Characteristics



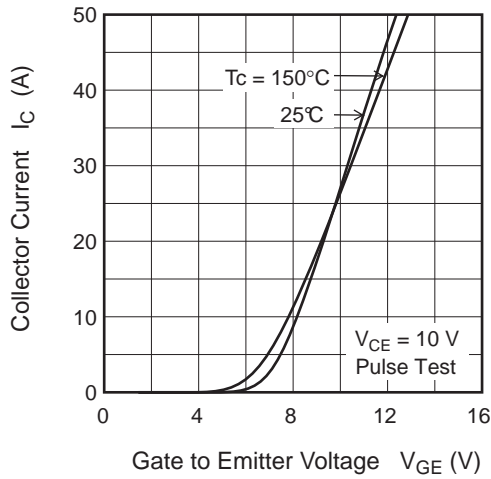
Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage (Typical)



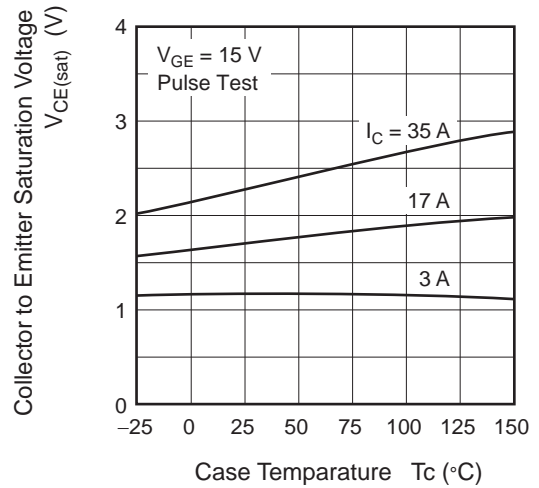
Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage (Typical)



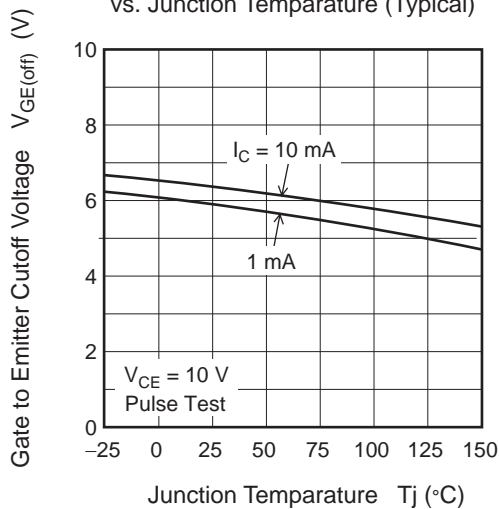
Typical Transfer Characteristics



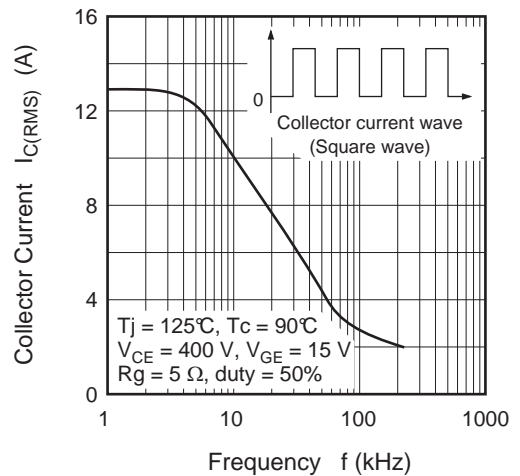
Collector to Emitter Saturation Voltage vs. Junction Temperature (Typical)



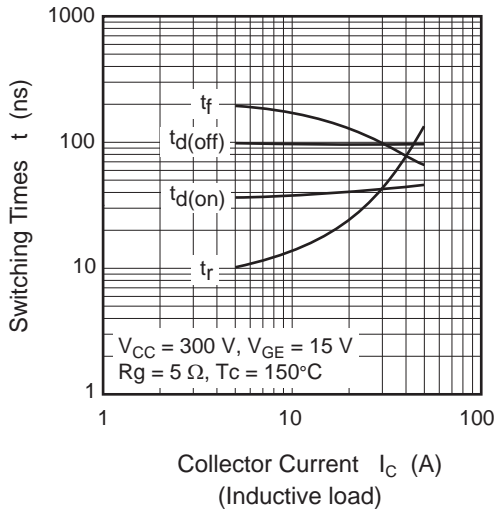
Gate to Emitter Cutoff Voltage vs. Junction Temperature (Typical)



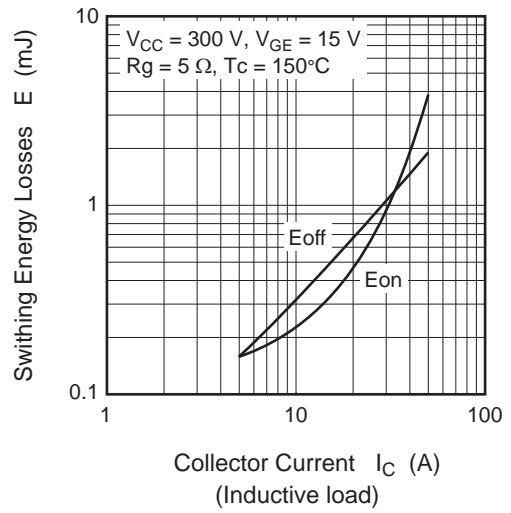
Frequency Characteristics (Typical)



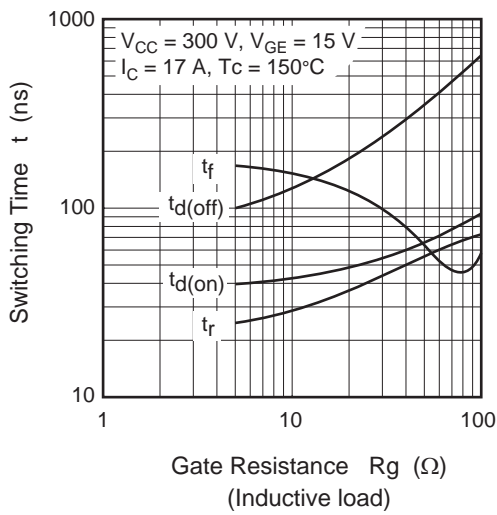
Switching Characteristics (Typical) (1)



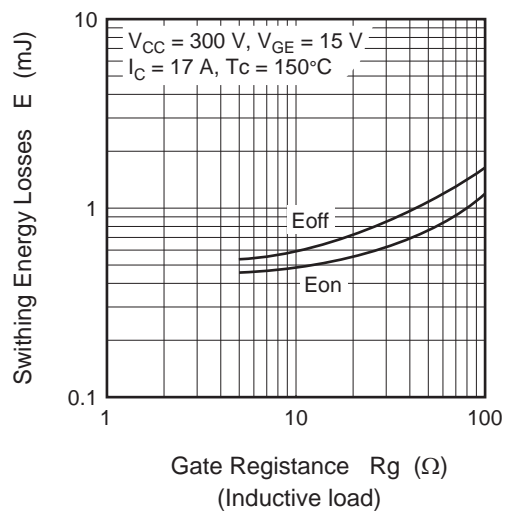
Switching Characteristics (Typical) (2)



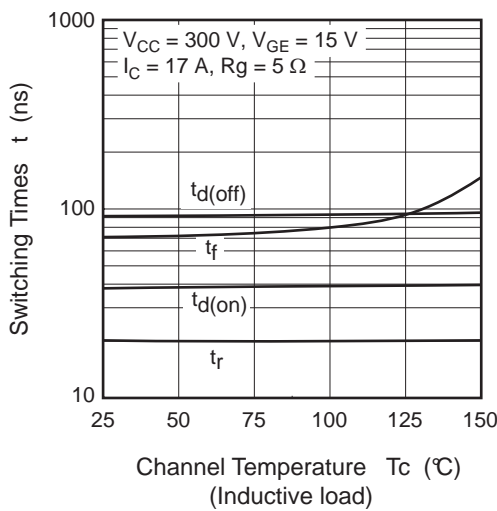
Switching Characteristics (Typical) (3)



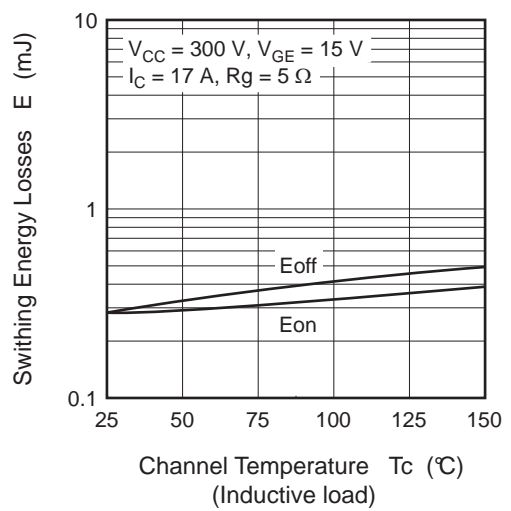
Switching Characteristics (Typical) (4)



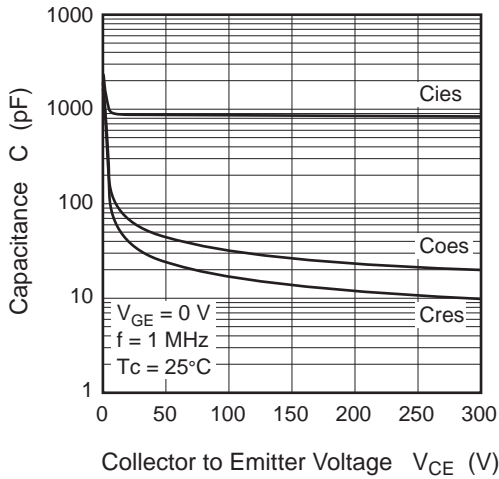
Switching Characteristics (Typical) (5)



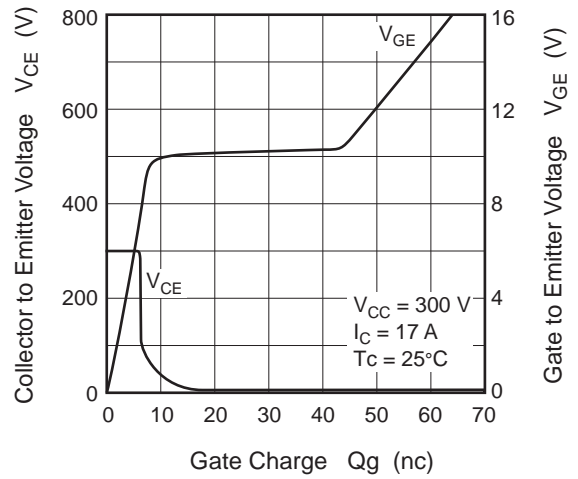
Switching Characteristics (Typical) (6)



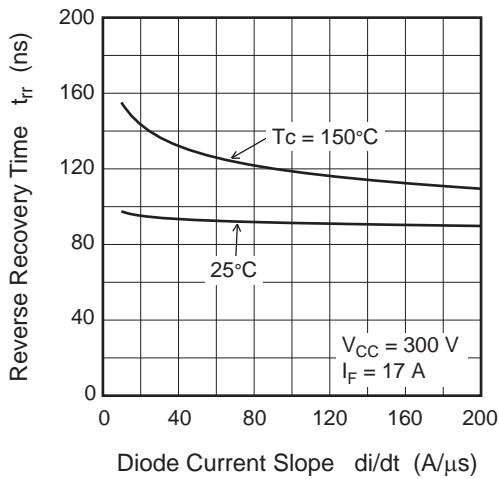
Typical Capacitance vs. Collector to Emitter Voltage



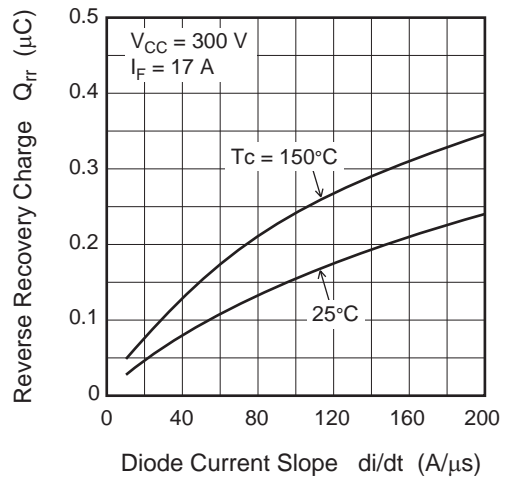
Dynamic Input Characteristics (Typical)



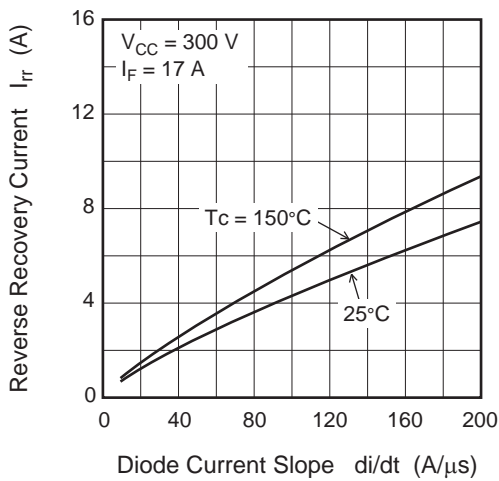
Reverse Recovery Time vs. Diode Current Slope (Typical)



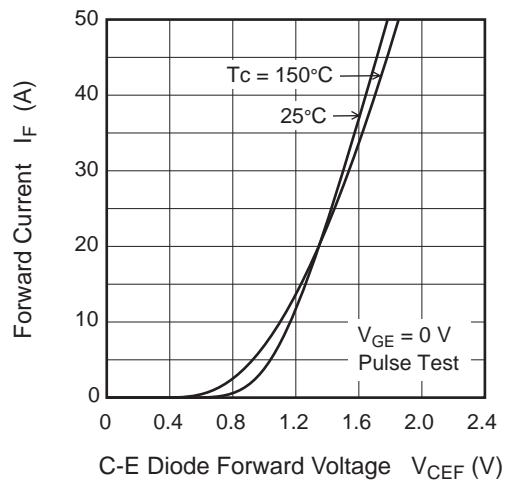
Reverse Recovery Charge vs. Diode Current Slope (Typical)

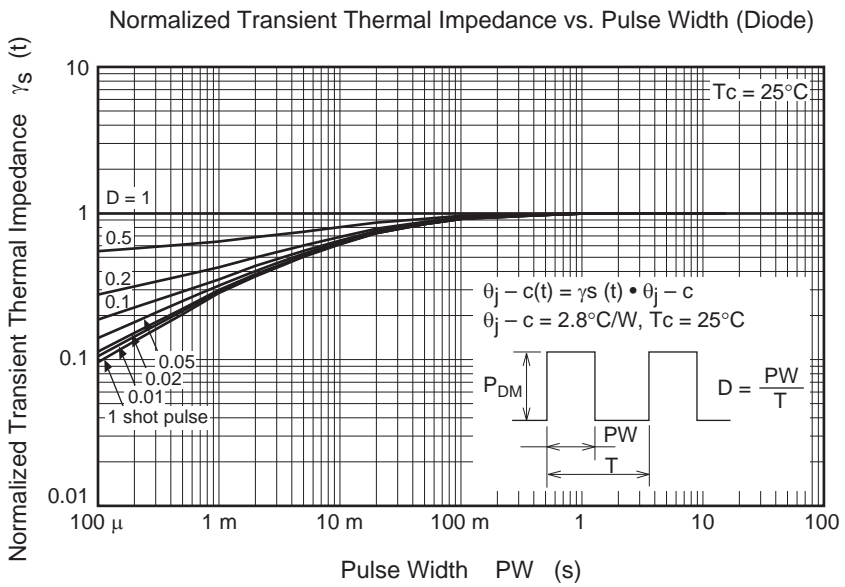
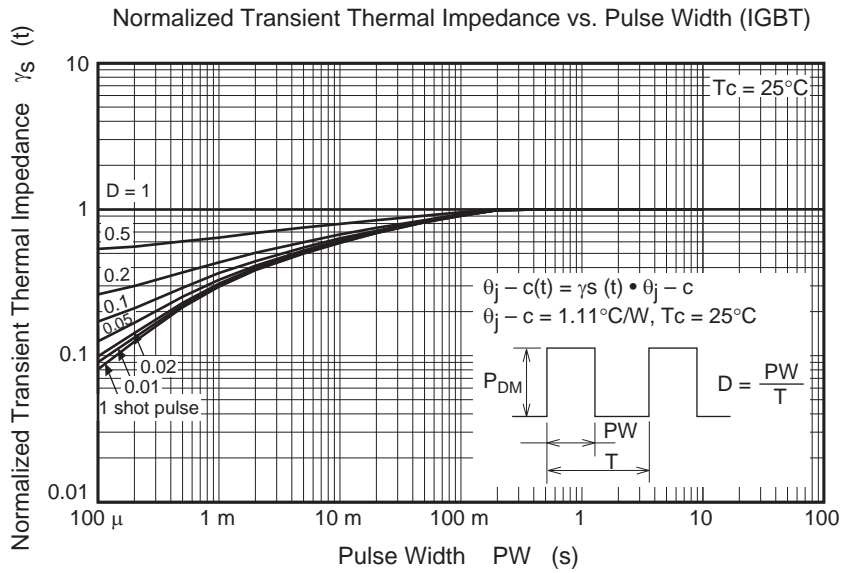


Reverse Recovery Current vs. Diode Current Slope (Typical)

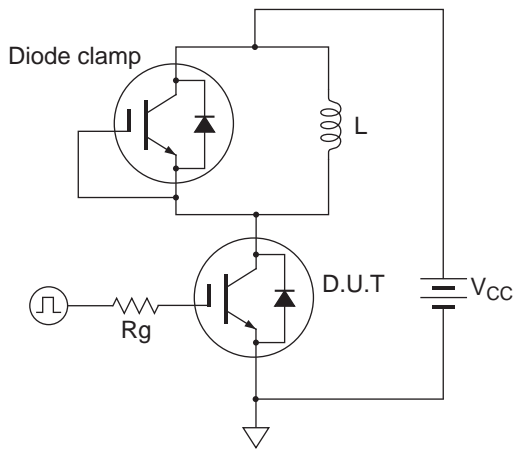


Forward Current vs. Forward Voltage (Typical)

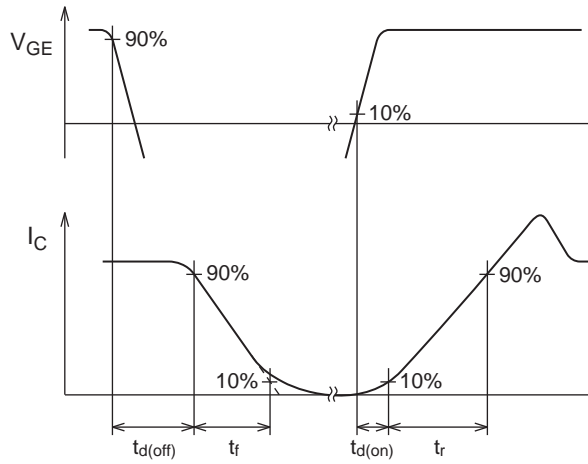




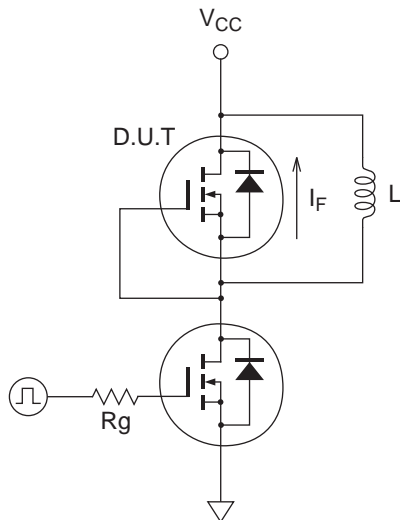
Switching Time Test Circuit



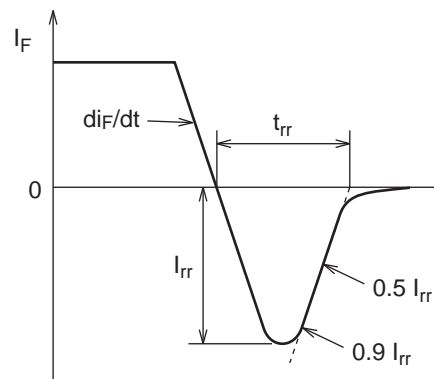
Waveform



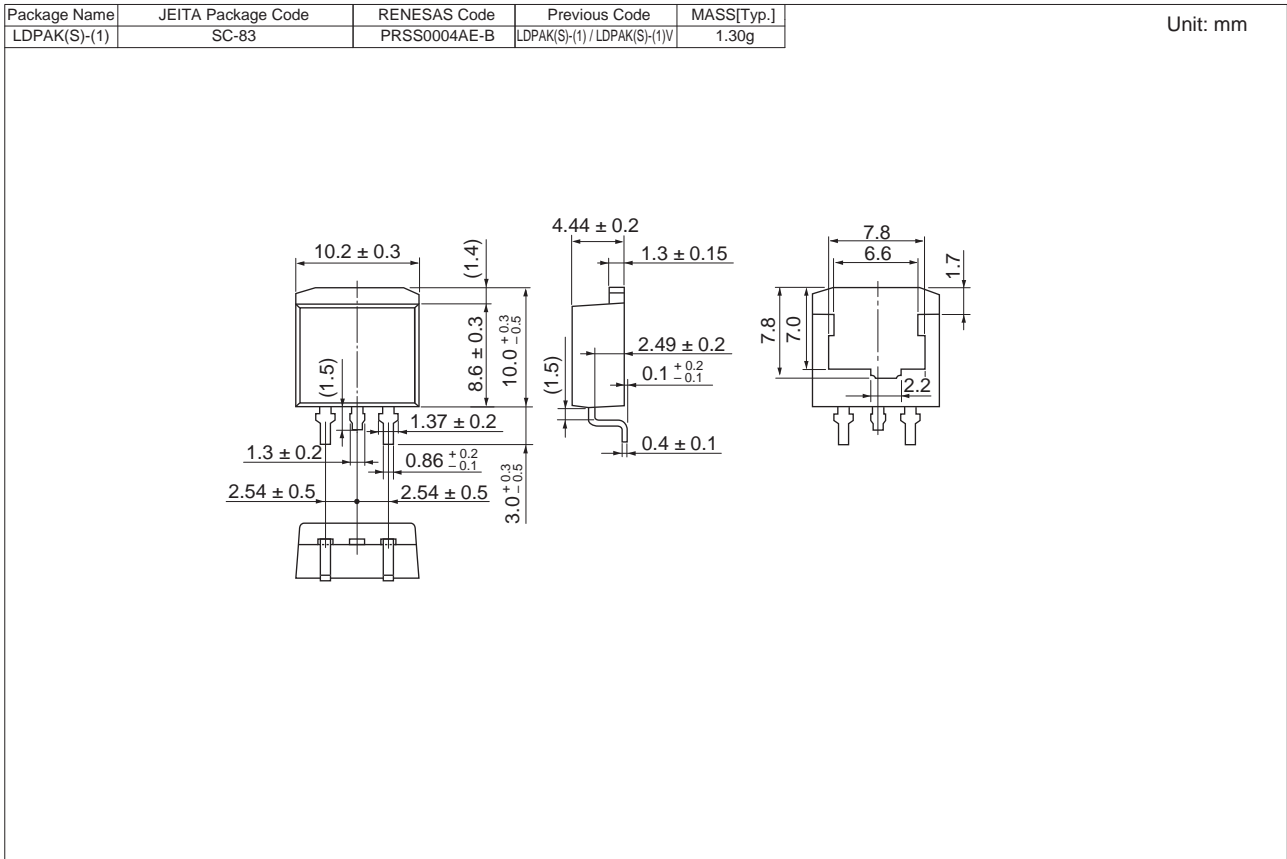
Diode Reverse Recovery Time Test Circuit



Waveform



### Package Dimension



### Ordering Information

Orderable Part Number	Quantity	Shipping Container
RJH60M3DPE-00#J3	1000 pcs	Taping

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