RJH60D3DPP-M0

600V - 17A - IGBT
Application: Inverter

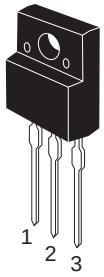
R07DS0162EJ0400
Rev.4.00
Apr 19, 2012

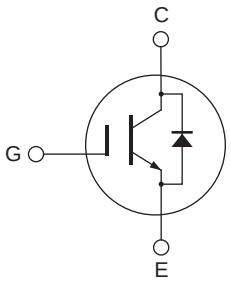
Features

- Short circuit withstand time (5 μs typ.)
- Low collector to emitter saturation voltage
  $V_{CE(sat)}$ = 1.6 V typ. (at I_C = 17 A, V_{GE} = 15 V, Ta = 25°C)
- Built in fast recovery diode (100 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, Rg = 5 Ω, Ta = 25°C)

Outline

RENESAS Package code: PRSS0003AF-A
(Package name: TO-220FL)





1. Gate
2. Collector
3. Emitter

Absolute Maximum Ratings

(Ta = 25°C)

Item		Symbol	Ratings	Unit
Collector to emitter voltage / diode reverse voltage		V_{CES} / V_R	600	V
Gate to emitter voltage		V_{GES}	±30	V
Collector current	Tc = 25°C	I_C	35	A
	Tc = 100°C	I_C	17	A
Collector peak current		ic(peak) Note1	70	A
Collector to emitter diode forward current		i_{DF}	17	A
Collector to emitter diode forward peak current		i_{DF}(peak) Note1	70	A
Collector dissipation		P_C Note2	40	W
Junction to case thermal resistance (IGBT)		θj-c Note2	3.15	°C/ W
Junction to case thermal resistance (Diode)		θj-cd Note2	4.9	°C/ W
Junction temperature		Tj	150	°C
Storage temperature		Tstg	–55 to +150	°C

Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1%
2. Value at Tc = 25°C

Electrical Characteristics

(Ta = 25°C)

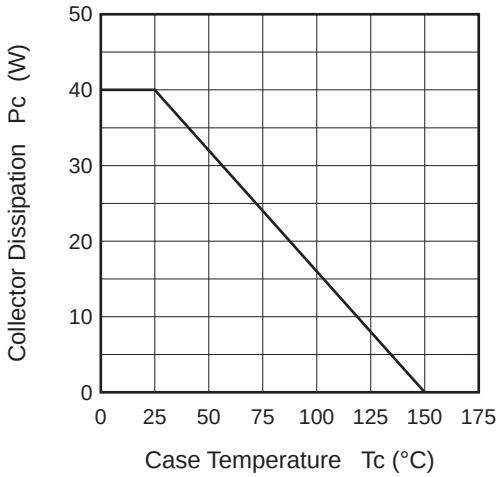
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Collector to emitter breakdown voltage	$V_{BR(CES)}$	600	—	—	V	I_C =10 μA, V_{GE} = 0
Zero gate voltage collector current / Diode reverse current	I_{CES} / I_R	—	—	5	μA	V_{CE} = 600 V, V_{GE} = 0
Gate to emitter leak current	I_{GES}	—	—	±1	μA	V_{GE} = ±30 V, V_{CE} = 0
Gate to emitter cutoff voltage	$V_{GE(off)}$	4.0	—	6.0	V	V_{CE} = 10 V, I_C = 1 mA
Collector to emitter saturation voltage	$V_{CE(sat)}$	—	1.6	2.2	V	I_C = 17 A, V_{GE} = 15 V Note3
	$V_{CE(sat)}$	—	2.0	—	V	I_C = 35 A, V_{GE} = 15 V Note3
Input capacitance	Cies	—	900	—	pF	V_{CE} = 25 V V_{GE} = 0 f = 1 MHz
Output capacitance	Coes	—	60	—	pF	
Reveres transfer capacitance	Cres	—	25	—	pF	
Total gate charge	Qg	—	37	—	nC	V_{GE} = 15 V V_{CE} = 300 V I_C = 17 A
Gate to emitter charge	Qge	—	6.5	—	nC	
Gate to collector charge	Qgc	—	15	—	nC	
Turn-on delay time	$t_{d(on)}$	—	35	—	ns	V_{CC} = 300 V V_{GE} = 15 V I_C = 17 A Rg = 5 Ω Inductive load
Rise time	t_r	—	16	—	ns	
Turn-off delay time	$t_{d(off)}$	—	80	—	ns	
Fall time	t_f	—	70	—	ns	
Turn-on energy	E_{on}	—	0.20	—	mJ	
Turn-off energy	E_{off}	—	0.21	—	mJ	
Total switching energy	E_{total}	—	0.41	—	mJ	
Short circuit withstand time	t_{sc}	3.0	5.0	—	μs	V_{CC} ≤ 360 V, V_{GE} = 15 V

FRD Forward voltage	V_F	—	1.3	1.7	V	I_F = 17 A Note3
FRD reverse recovery time	t_{rr}	—	100	—	ns	I_F = 17 A di_F/dt = 100 A/μs
FRD reverse recovery charge	Q_{rr}	—	0.15	—	μC	
FRD peak reverse recovery current	I_{rr}	—	4.2	—	A	

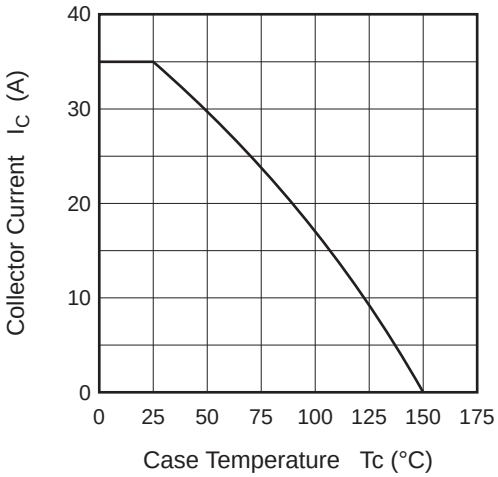
Notes: 3. Pulse test.

Main Characteristics

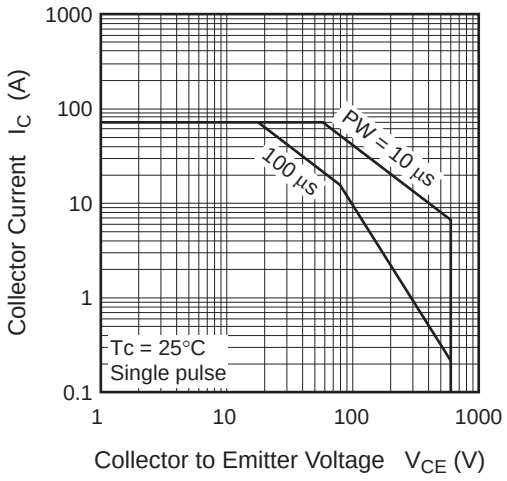
Power Dissipation vs. Case Temperature



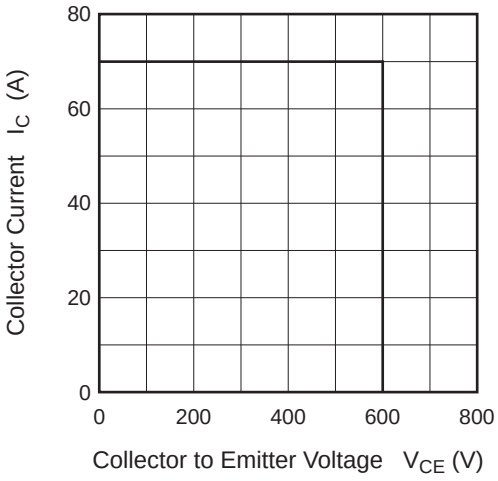
Maximum DC Collector Current vs. Case Temperature



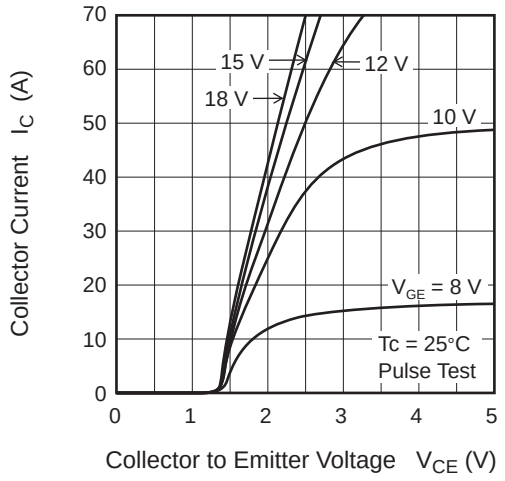
Maximum Safe Operation Area



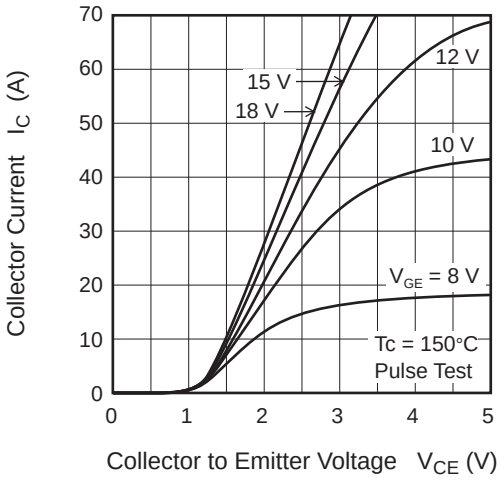
Turn-off SOA



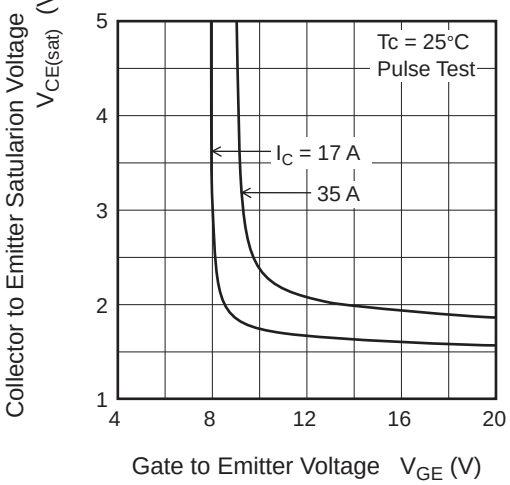
IGBT Output Characteristics (Typical)



IGBT Output Characteristics (Typical)



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



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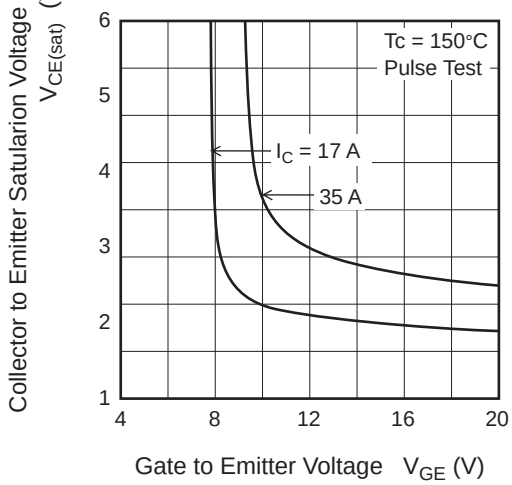
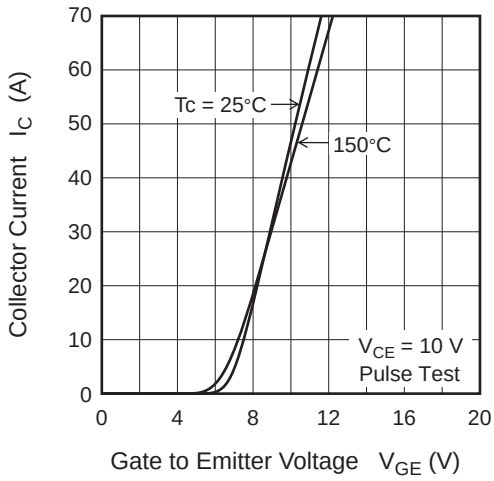
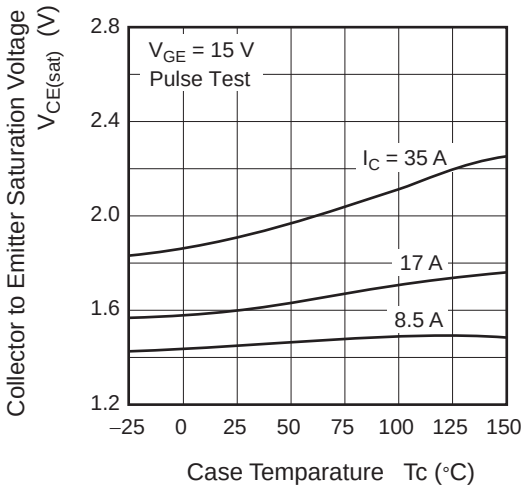


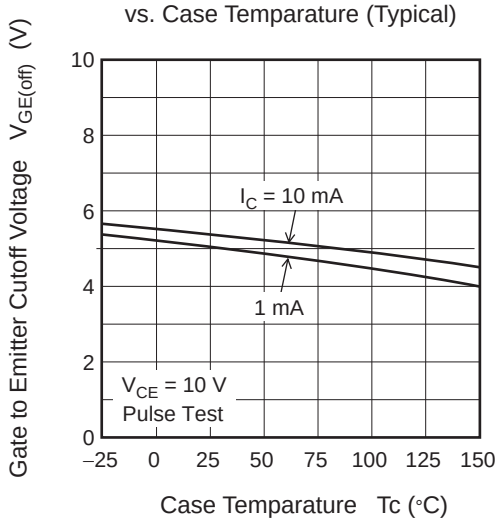
Transfer Characteristics (Typical)



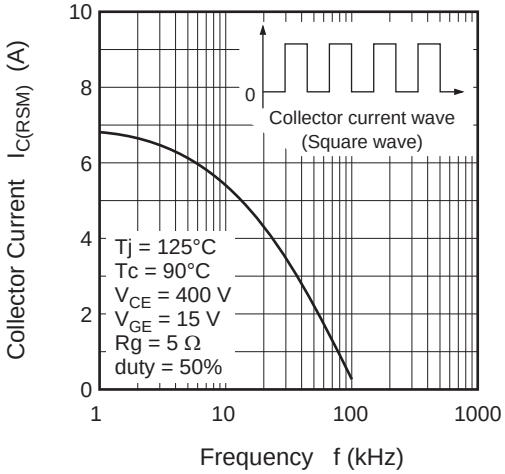
Collector to Emitter Saturation Voltage
vs. Case Temparature (Typical)



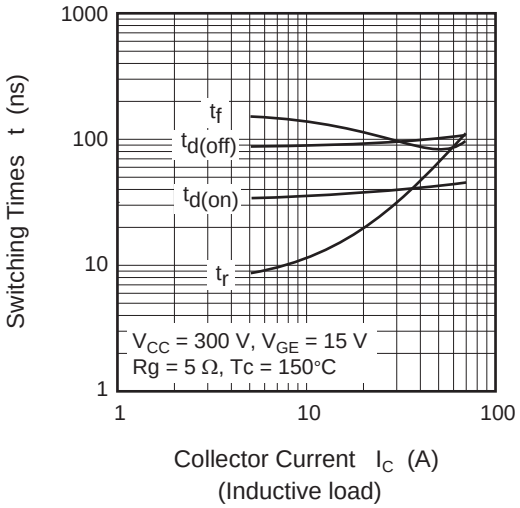
Gate to Emitter Cutoff Voltage
vs. Case Temparature (Typical)



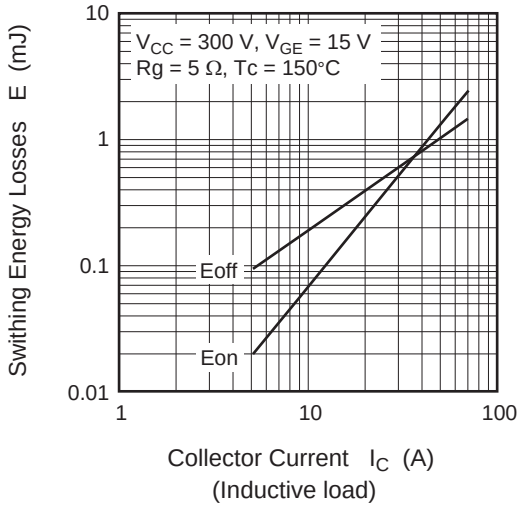
Frequency Characteristics (Typical)



Switching Characteristics (Typical) (1)



Switching Characteristics (Typical) (2)



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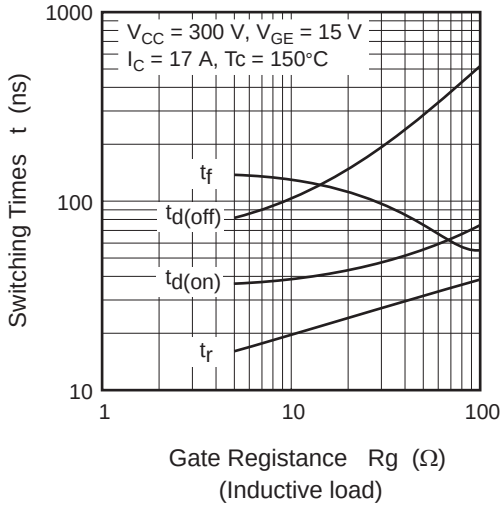

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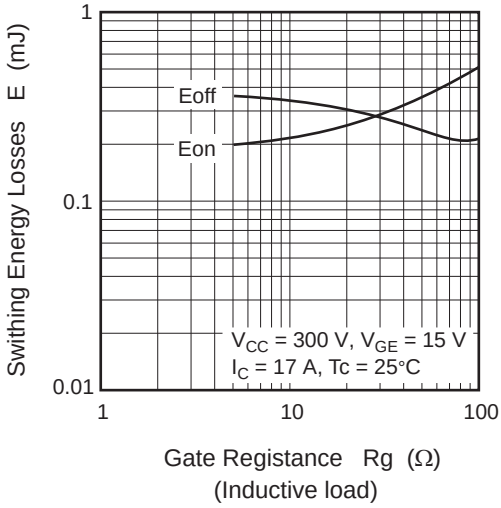
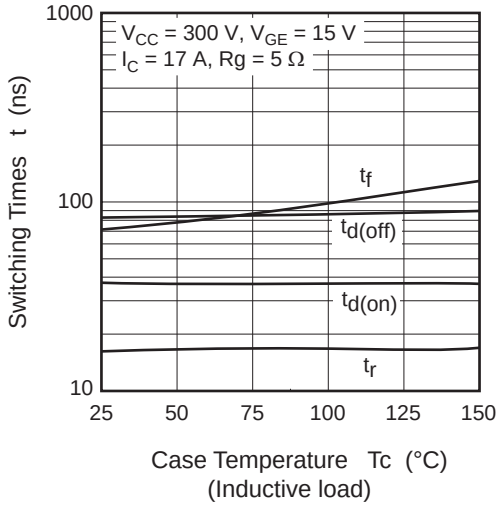
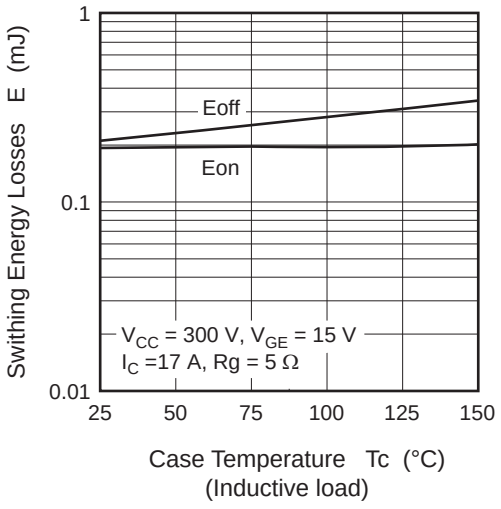


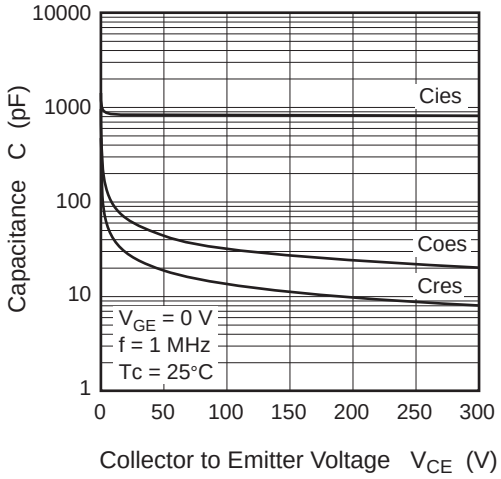
Switching Characteristics (Typical) (5)



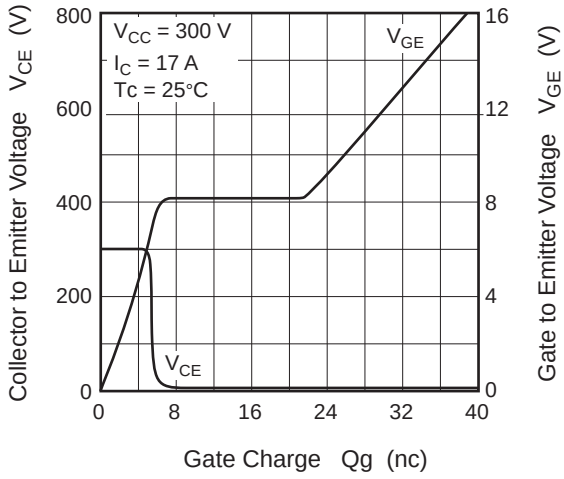
Switching Characteristics (Typical) (6)



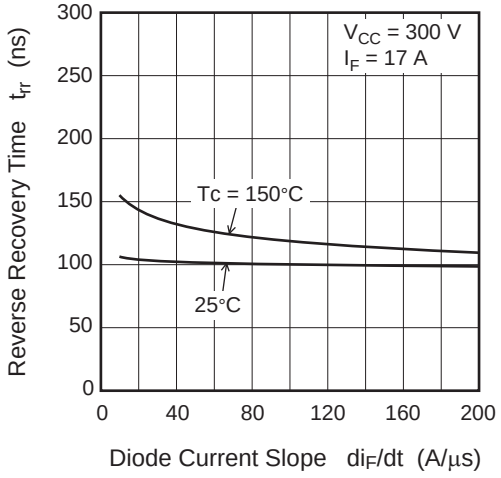
Typical Capacitance vs.
Collector to Emitter Voltage



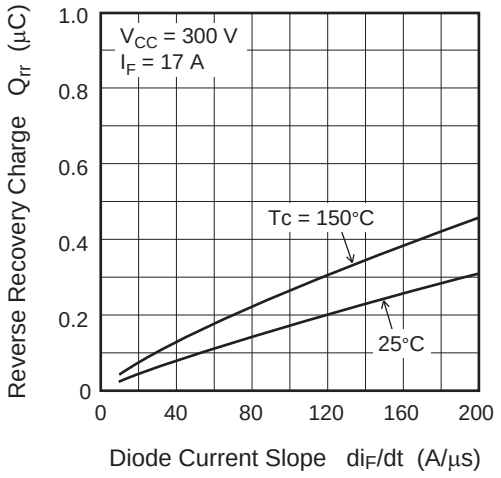
Dynamic Input Characteristics (Typical)



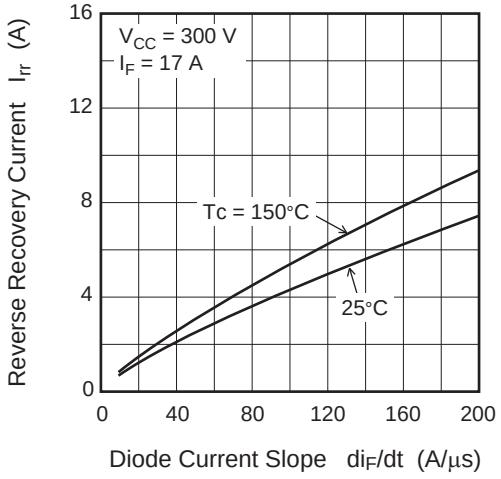
Reverse Recovery Time vs.
Diode Current Slope (Typical)



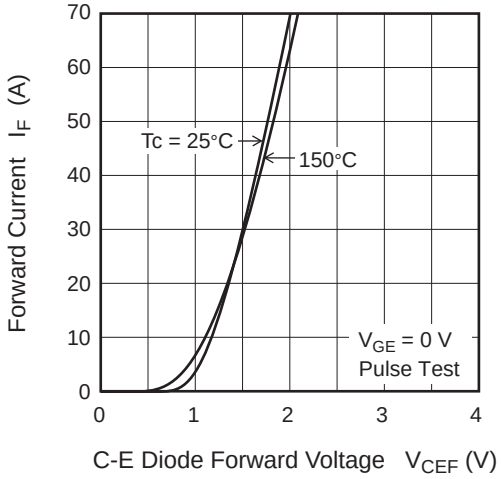
Reverse Recovery Charge vs.
Diode Current Slope (Typical)

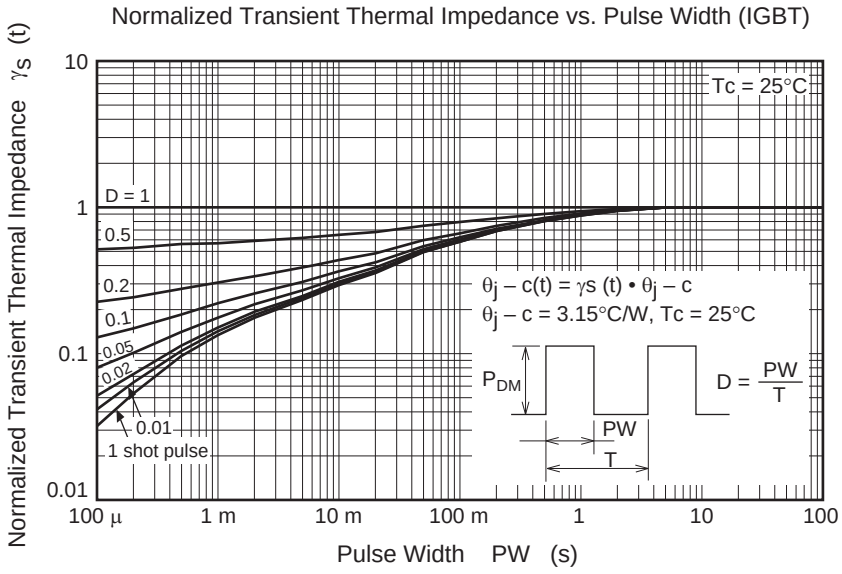


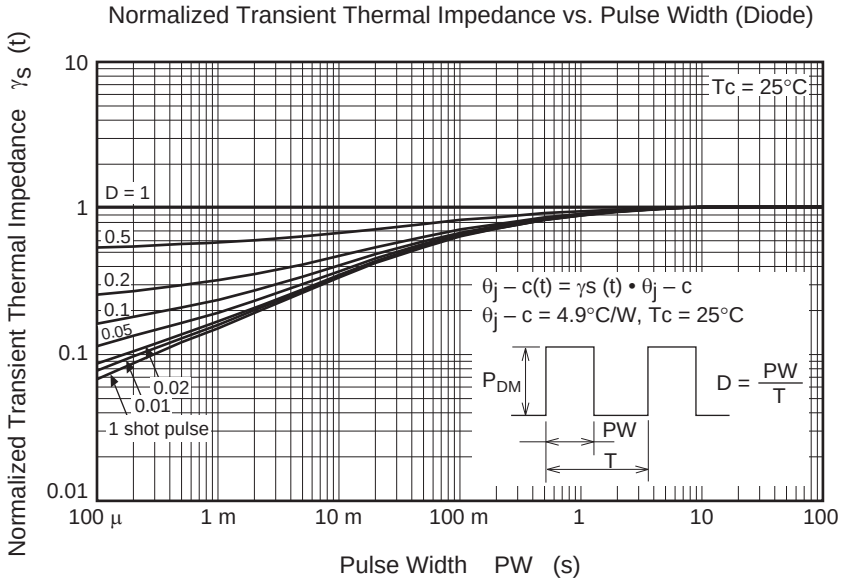
Reverse Recovery Current vs.
Diode Current Slope (Typical)



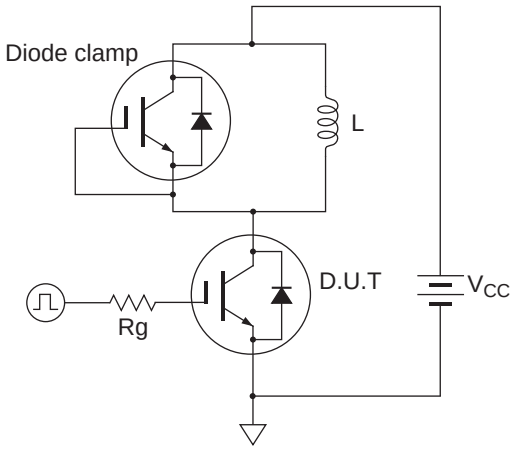
Forward Current vs. Forward Voltage (Typical)



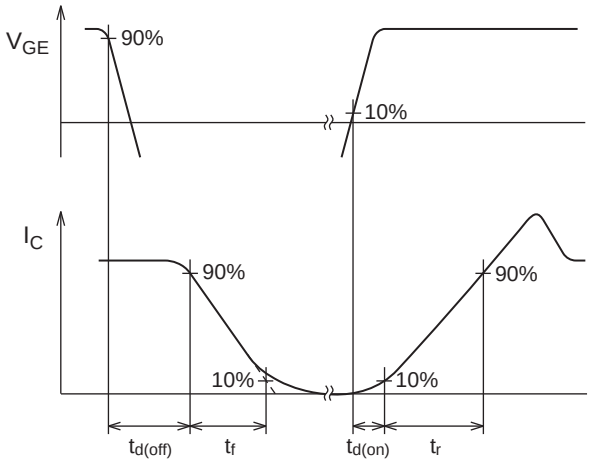

Normalized Transient Thermal Impedance vs. Pulse Width (IGBT)
Normalized Transient Thermal Impedance γs (t)
10
1
0.1
0.01
Tc = 25°C
D = 1
0.5
0.2
0.1
0.05
0.02
0.01
1 shot pulse
θj – c(t) = γs (t) • θj – c
θj – c = 3.15°C/W, Tc = 25°C
PDM
D = PW / T
PW
T
100 μ
1 m
10 m
100 m
1
10
100
Pulse Width PW (s)


Normalized Transient Thermal Impedance vs. Pulse Width (Diode)
Normalized Transient Thermal Impedance γs (t)
10
1
0.1
0.01
Tc = 25°C
D = 1
0.5
0.2
0.1
0.05
0.02
0.01
1 shot pulse
θj – c(t) = γs (t) • θj – c
θj – c = 4.9°C/W, Tc = 25°C
PDM
D = PW / T
PW
T
100 μ
1 m
10 m
100 m
1
10
100
Pulse Width PW (s)

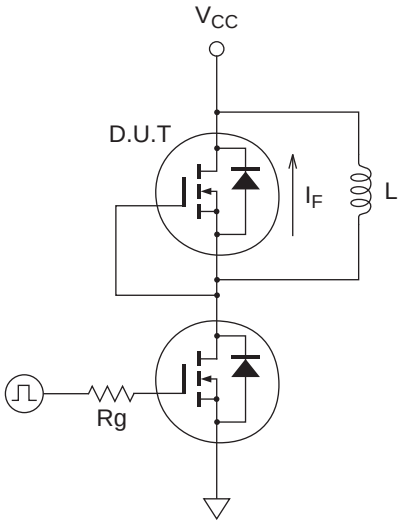
Switching Time Test Circuit



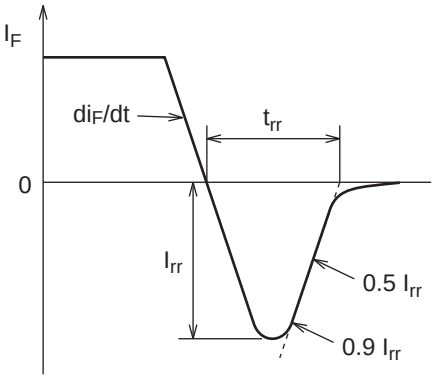
Waveform



Diode Reverse Recovery Time Test Circuit



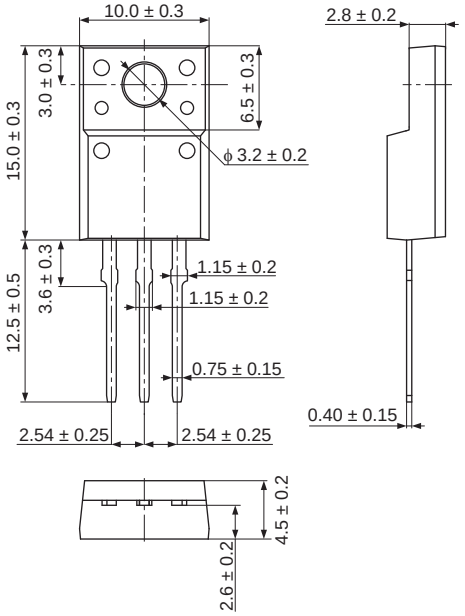
Waveform



Package Dimension

Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
TO-220FL	—	PRSS0003AF-A	TO-220FL	1.5g

Unit: mm



Ordering Information

Orderable Part No.	Quantity	Shipping Container
RJH60D3DPP-M0#T2	600 pcs	Box (Tube)

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Renesas Electronics America Inc.
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
1 harbourFront Avenue, #06-10, keppel Bay Tower, Singapore 098632
Tel: +65-6213-0200, Fax: +65-6278-8001

Renesas Electronics Malaysia Sdn.Bhd.
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics Korea Co., Ltd.
11F., Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

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