RJH65T46DPQ-A0

650V - 40A - IGBT
Application: Power Factor Correction circuit

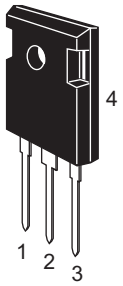
R07DS1259EJ0100
Rev.1.00
May 18, 2015

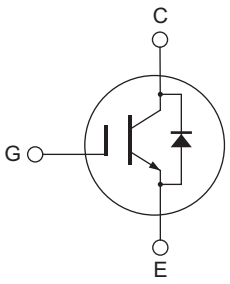
Features

- Low collector to emitter saturation voltage
  $V_{CE(sat)}$ = 1.8 V typ. (at I_C = 40 A, V_{GE} = 15 V, Ta = 25°C)
- Built in fast recovery diode in one package
- Trench gate and thin wafer technology (G7H series)
- High speed switching
  t_f = 45 ns typ. (at V_{CC} = 400 V, V_{GE} = 15 V , I_C = 40 A, Rg = 10 Ω, Ta = 25°C, Inductive load)
- Operation frequency (20kHz ≤ f < 100kHz)
- Not guarantee short circuit withstand time

Outline

RENESAS Package code: PRSS0003ZH-A
(Package name: TO-247A)





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

Absolute Maximum Ratings

(Tc = 25°C)

Item		Symbol	Ratings	Unit
Collector to emitter voltage / diode reverse voltage		V_{CES} / V_R	650	V
Gate to emitter voltage		V_{GES}	±30	V
Collector current	Tc = 25 °C	I_C	80	A
	Tc = 100 °C	I_C	40	A
Collector peak current		i_C(peak) Note1	300	A
Collector to emitter diode Forward current	Tc = 25 °C	I_{DF}	30	A
	Tc = 100 °C	I_{DF}	15	A
Collector to emitter diode forward peak current		i_{DF}(peak) Note1	100	A
Collector dissipation		P_C	340.9	W
Junction to case thermal impedance (IGBT)		θj-c	0.44	°C/W
Junction to case thermal resistance (Diode)		θj-cd	1.33	°C/ W
Junction temperature		Tj Note2	175	°C
Storage temperature		Tstg	–55 to +150	°C

Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1%
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.

Electrical Characteristics

(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Zero gate voltage collector current / Diode reverse current	I_{CES} / I_R	—	—	100	μA	V_{CE} = 650 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	—	7.0	V	V_{CE} = 10V, I_C = 1.33 mA
Collector to emitter saturation voltage	$V_{CE(sat)}$	—	1.8	2.4	V	I_C = 40 A, V_{GE} = 15V Note3
Input capacitance	Cies	—	3000	—	pF	V_{CE} = 25 V V_{GE} = 0 f = 1 MHz
Output capacitance	Coes	—	92	—	pF	
Reveres transfer capacitance	Cres	—	55	—	pF	
Total gate charge	Qg	—	138	—	nC	VGE = 15 V VCE = 400 V IC = 40 A
Gate to emitter charge	Qge	—	22	—	nC	
Gate to collector charge	Qgc	—	57	—	nC	
Turn-on delay time	$t_{d(on)}$	—	45	—	ns	V_{CC} = 400 V V_{GE} = 15 V I_C = 40 A Rg = 10 Ω T_C = 25 °C Inductive load Note4
Rise time	t_r	—	30	—	ns	
Turn-off delay time	$t_{d(off)}$	—	170	—	ns	
Fall time	t_f	—	45	—	ns	
Turn-on loss energy	E_{on}	—	0.45	—	mJ	
Turn-off loss energy	E_{off}	—	0.55	—	mJ	
Total switching energy	E_{total}	—	1.00	—	mJ	
Turn-on delay time	$t_{d(on)}$	—	45	—	ns	V_{CC} = 400 V V_{GE} = 15 V I_C = 40 A Rg = 10 Ω T_C = 150 °C Inductive load Note4
Rise time	t_r	—	30	—	ns	
Turn-off delay time	$t_{d(off)}$	—	185	—	ns	
Fall time	t_f	—	50	—	ns	
Turn-on loss energy	E_{on}	—	0.57	—	mJ	
Turn-off loss energy	E_{off}	—	0.63	—	mJ	
Total switching energy	E_{total}	—	1.20	—	mJ	

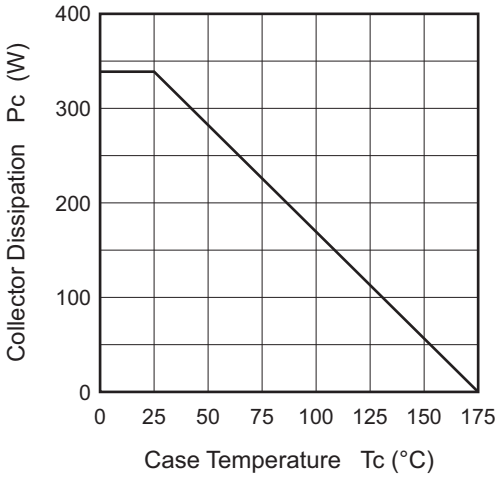
FRD forward voltage	V_F	—	1.7	2.2	V	I_F = 15 A Note3
FRD reverse recovery time	t_{rr}	—	100	—	ns	I_F = 15 A, di_F/dt = 300 A/μs

Notes: 3. Pulse test

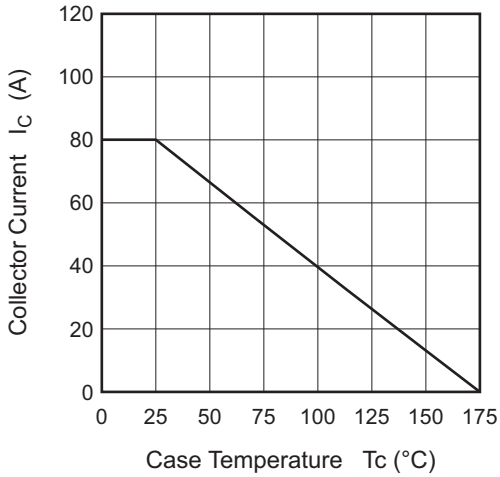
4. Switching time test circuit and waveform are shown below.

Main Characteristics

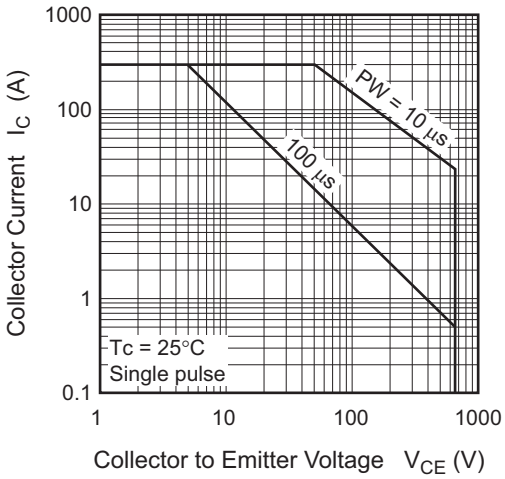
Collector Dissipation vs. Case Temperature



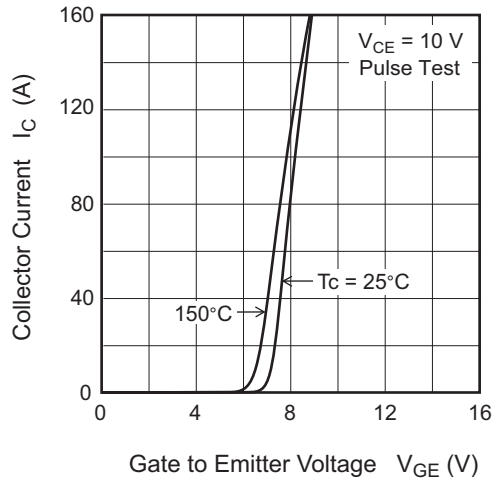
Maximum DC Collector Current vs. Case Temperature



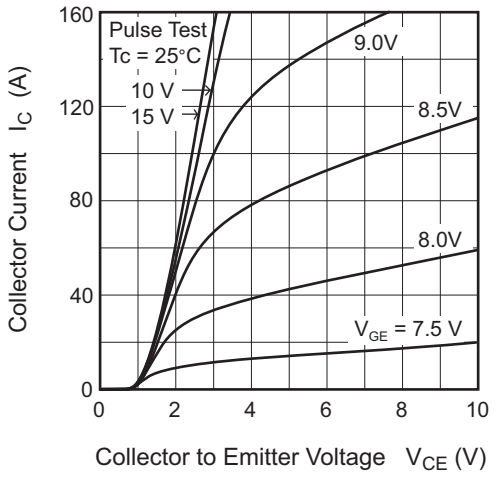
Maximum Safe Operation Area



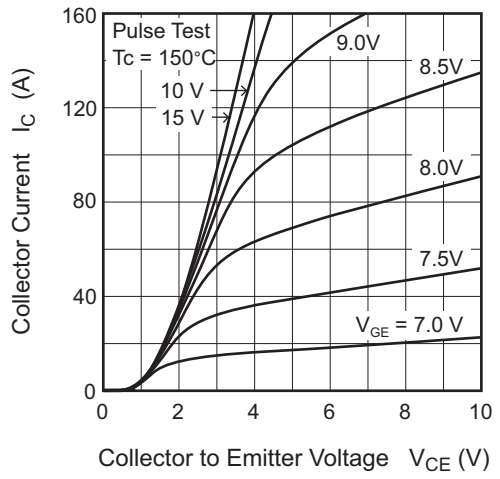
Typical Transfer Characteristics



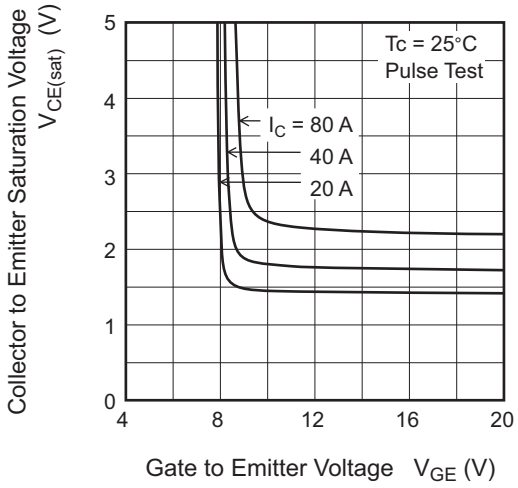
Typical Output Characteristics



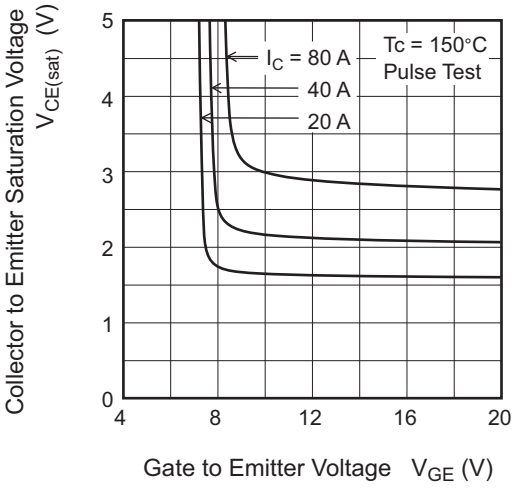
Typical Output Characteristics



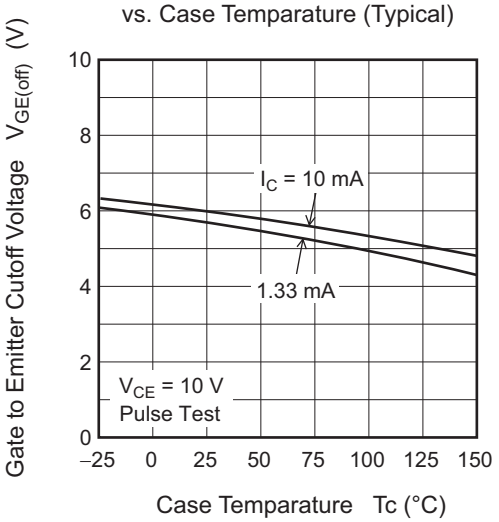
Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage (Typical)



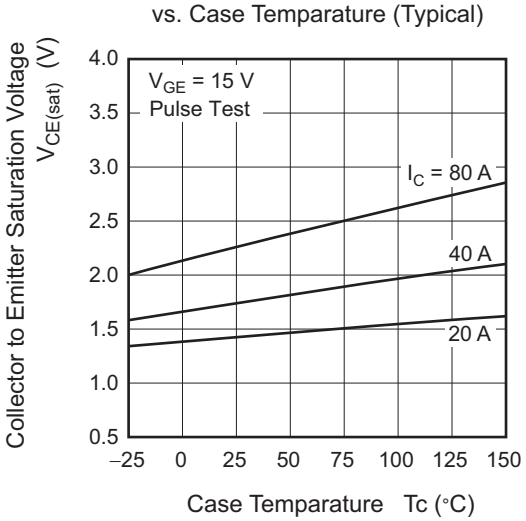
Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage (Typical)



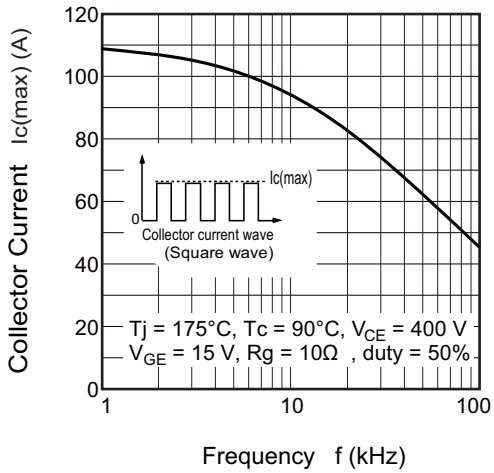
Gate to Emitter Cutoff Voltage vs. Case Temparature (Typical)



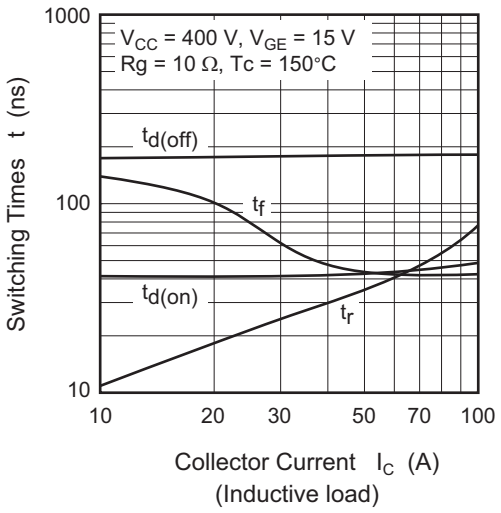
Collector to Emitter Saturation Voltage vs. Case Temparature (Typical)



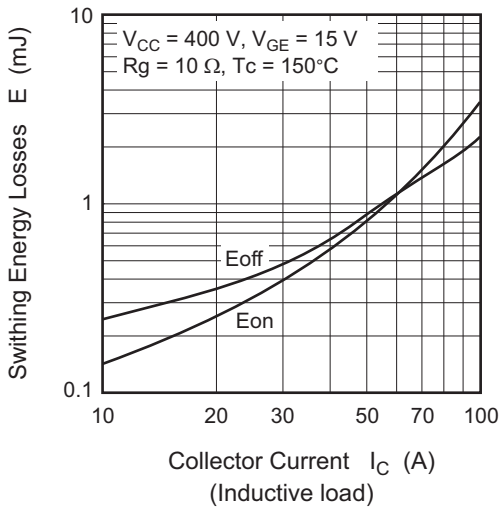
Frequency Characteristics (Typical)



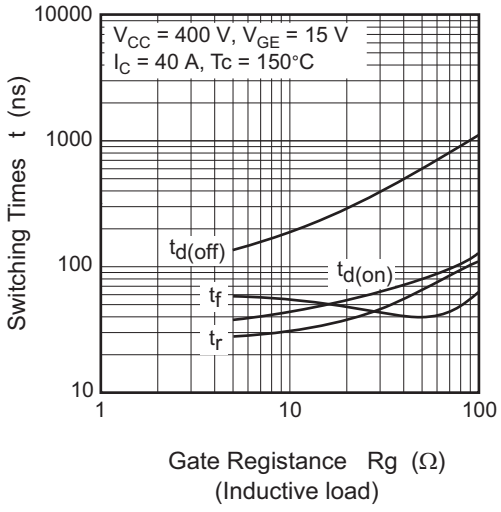
Switching Characteristics (Typical) (1)



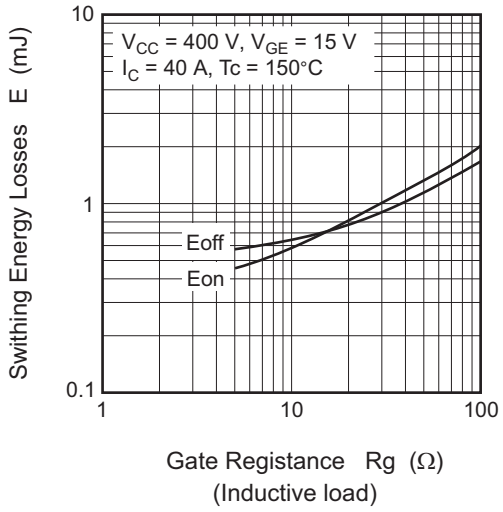
Switching Characteristics (Typical) (2)



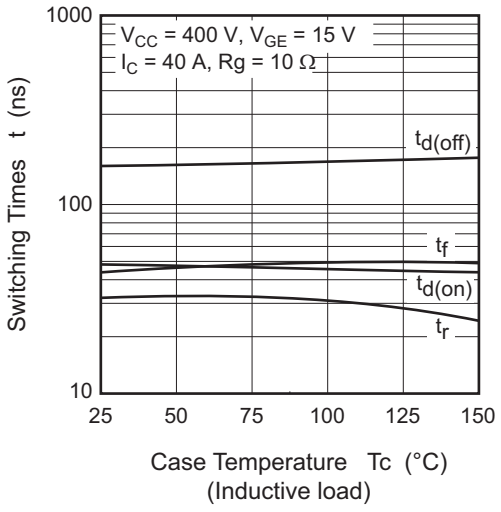
Switching Characteristics (Typical) (3)



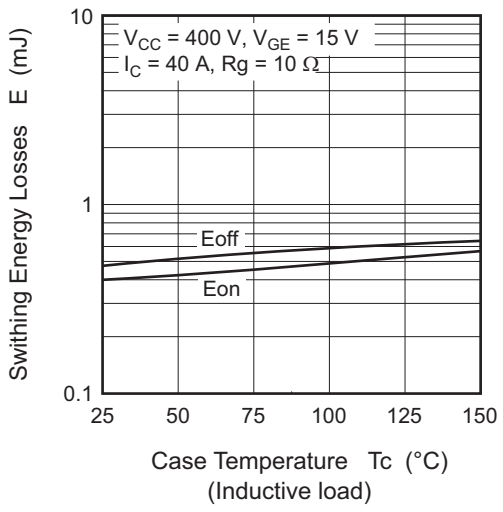
Switching Characteristics (Typical) (4)



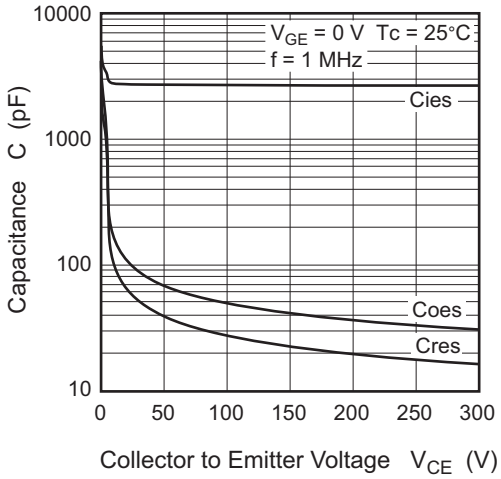
Switching Characteristics (Typical) (5)



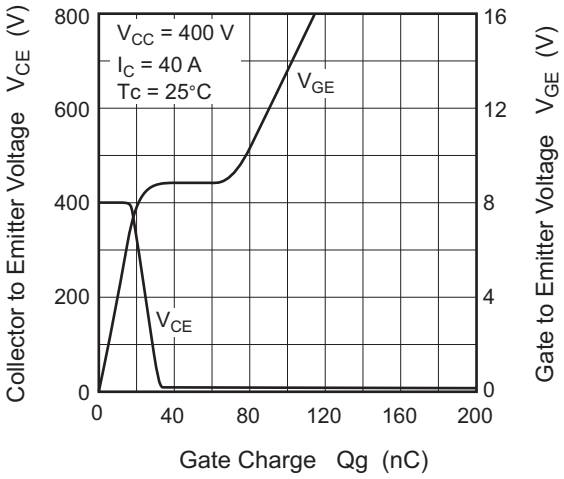
Switching Characteristics (Typical) (6)



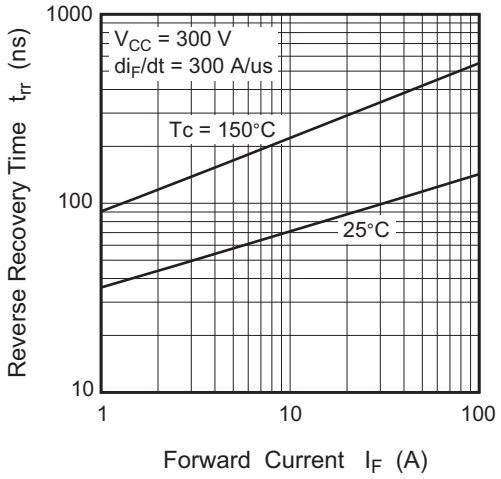
Typical Capacitance vs.
Collector to Emitter Voltage



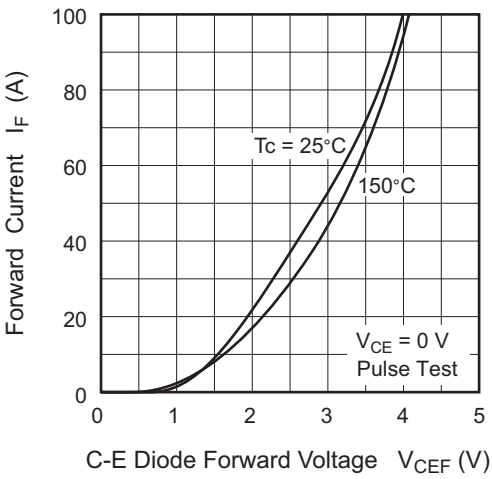
Dynamic Input Characteristics (Typical)

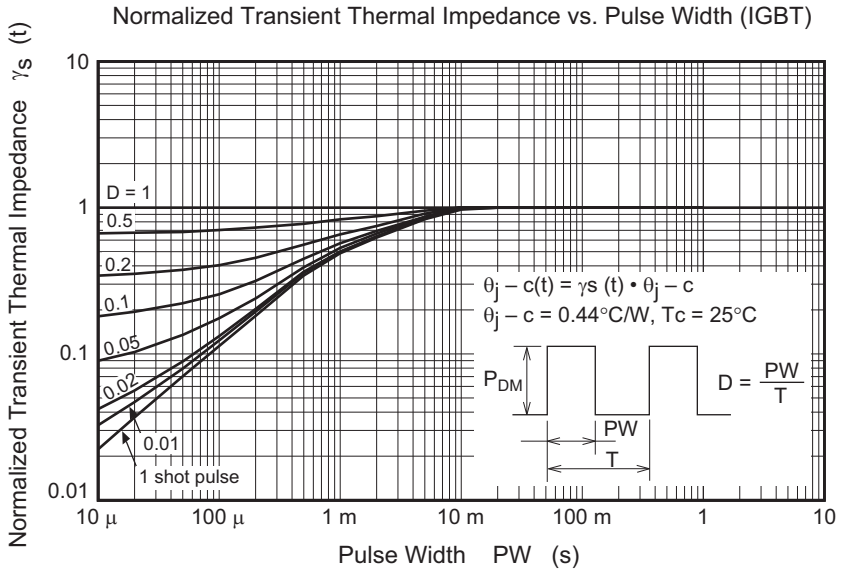


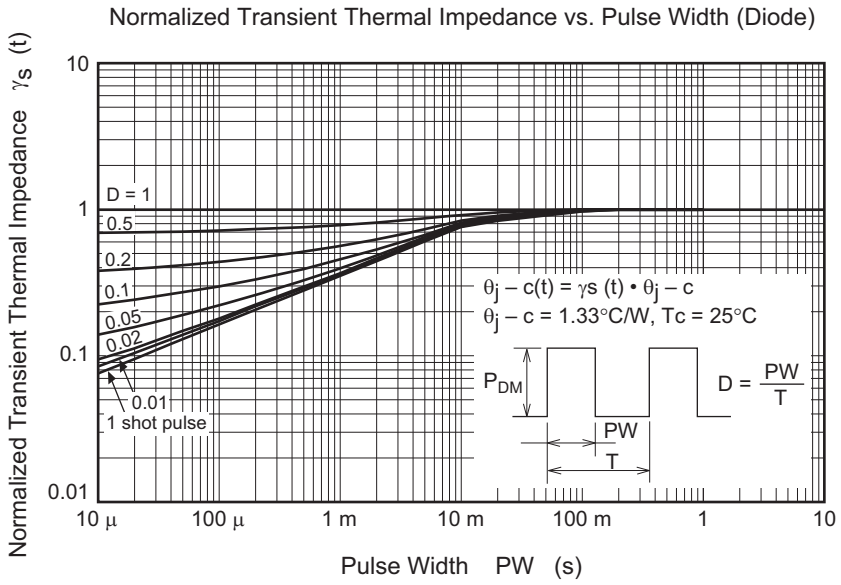
Reverse Recovery Time vs.
Forward Current (Typical)



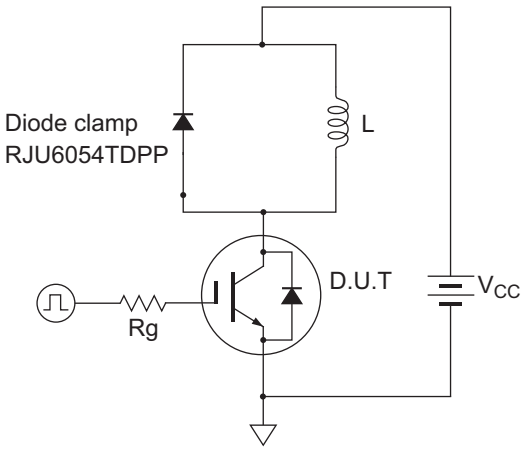
Forward Current vs. Forward Voltage (Typical)



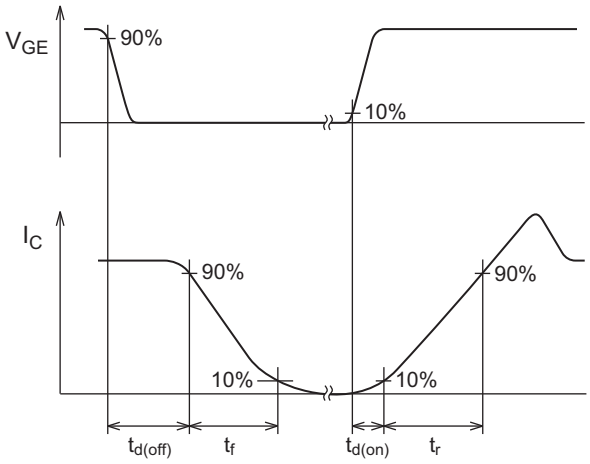

Normalized Transient Thermal Impedance vs. Pulse Width (IGBT)
Normalized Transient Thermal Impedance γs (t)
10
1
0.1
0.01
D = 1
0.5
0.2
0.1
0.05
0.02
0.01
1 shot pulse
θj – c(t) = γs (t) • θj – c
θj – c = 0.44°C/W, Tc = 25°C
PDM
D = PW / T
PW
T
10 μ
100 μ
1 m
10 m
100 m
1
10
Pulse Width PW (s)


Normalized Transient Thermal Impedance vs. Pulse Width (Diode)
Normalized Transient Thermal Impedance γs (t)
10
1
0.1
0.01
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 = 1.33°C/W, Tc = 25°C
PDM
D = PW / T
PW
T
10 μ
100 μ
1 m
10 m
100 m
1
10
Pulse Width PW (s)

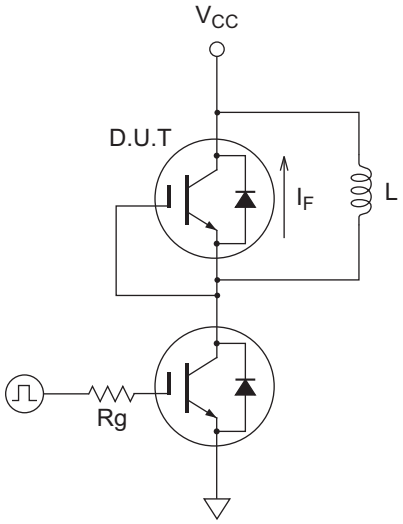
Switching Time Test Circuit



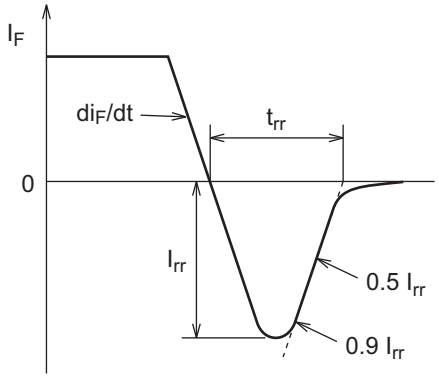
Waveform



Diode Reverse Recovery Time Test Circuit



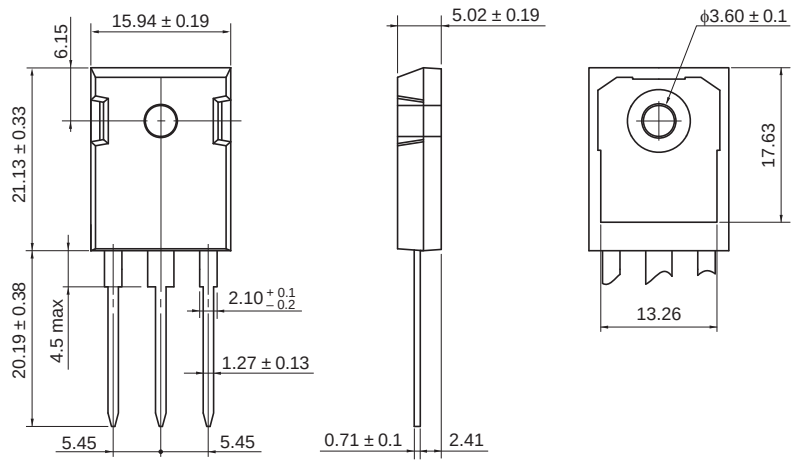
Waveform



Package Dimensions

Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
TO-247A	—	PRSS0003ZH-A	—	6.14g

Unit: mm



Ordering Information

Orderable Part Number	Quantity	Shipping Container
RJH65T46DPQ-A0#T0	240 pcs	Box (Tube)

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