RJH65T14DPQ-A0

650V - 50A - IGBT
Application: Induction Heating
Microwave Oven

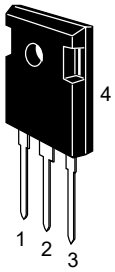
R07DS1256EJ0110
Rev.1.10
Aug 31, 2018

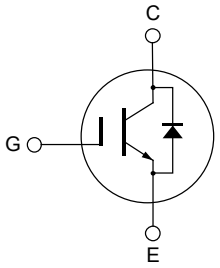
Features

- Optimized for current resonance application
- Low collector to emitter saturation voltage
  $V_{CE(sat)}$ = 1.45 V typ. (at I_C = 50 A, V_{GE} = 15 V, Ta = 25 °C)
- Built in fast recovery diode in one package
- Trench gate and thin wafer technology

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		V_{CES}	650	V
Gate to emitter voltage		V_{GES}	±30	V
Collector current	Tc = 25 °C	I_C Note1	100	A
	Tc = 100 °C	I_C Note1	50	A
Collector peak current		i_C(peak) Note1	180	A
Collector to emitter diode Forward current	Tc = 25 °C	I_{DF}	40	A
	Tc = 100 °C	I_{DF}	20	A
Collector to emitter diode forward peak current		i_{DF}(peak) Note2	100	A
Collector dissipation		P_C	250	W
Junction to case thermal impedance (IGBT)		θj-c Note3	0.6	°C/W
Junction to case thermal impedance (Diode)		θj-cd Note3	1.33	°C/W
Junction temperature		Tj Note4	175	°C
Storage temperature		Tstg	–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 are 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.

Electrical Characteristics

(Tc = 25 °C)

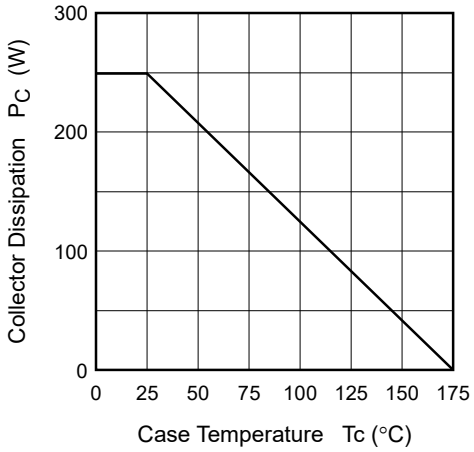
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Zero gate voltage collector current	I_{CES}	—	—	100	μA	V_{CE} = 650 V, V_{GE} = 0 V
Gate to emitter leak current	I_{GES}	—	—	±1	μA	V_{GE} = ±30 V, V_{CE} = 0 V
Gate to emitter cutoff voltage	$V_{GE(off)}$	4	—	7	V	V_{CE} = 10 V, I_C = 1 mA
Collector to emitter saturation voltage	$V_{CE(sat)}$	—	1.45	1.75	V	I_C = 50 A, V_{GE} = 15 V Note5
Input capacitance	Cies	—	1750	—	pF	V_{CE} = 25 V V_{GE} = 0 V f = 1 MHz
Output capacitance	Coes	—	69	—	pF	
Reveres transfer capacitance	Cres	—	34	—	pF	
Total gate charge	Qg	—	80	—	nC	V_{GE} = 15 V V_{CE} = 300 V I_C = 50 A
Gate to emitter charge	Qge	—	15	—	nC	
Gate to collector charge	Qgc	—	35	—	nC	
Turn-on delay time	$t_{d(on)}$	—	38	—	ns	V_{CC} = 400 V V_{GE} = 15 V I_C = 50 A Rg = 10 Ω T_C = 25 °C Inductive load
Rise time	t_r	—	30	—	ns	
Turn-off delay time	$t_{d(off)}$	—	125	—	ns	
Fall time	t_f	—	115	—	ns	
Turn-on loss energy	E_{on}	—	1.3	—	mJ	
Turn-off loss energy	E_{off}	—	1.2	—	mJ	
Total switching energy	E_{total}	—	2.5	—	mJ	
Turn-on delay time	$t_{d(on)}$	—	38	—	ns	V_{CC} = 400 V V_{GE} = 15 V I_C = 50 A Rg = 10 Ω T_C = 150 °C Inductive load
Rise time	t_r	—	30	—	ns	
Turn-off delay time	$t_{d(off)}$	—	130	—	ns	
Fall time	t_f	—	135	—	ns	
Turn-on loss energy	E_{on}	—	1.45	—	mJ	
Turn-off loss energy	E_{off}	—	1.45	—	mJ	
Total switching energy	E_{total}	—	2.90	—	mJ	
Tail loss	E_{tail}	—	560	—	μJ	V_{CC} = 300 V, V_{GE} = 20 V I_C = 50 A, Rg = 15 Ω Tc = 125 °C Current resonance circuit

C-E diode forward voltage	V_{ECF}	—	1.2	1.6	V	I_F = 20 A Note5
C-E diode reverse recovery time	t_{rr}	—	250	—	ns	I_F = 20 A di_F/dt = –300 A/μs

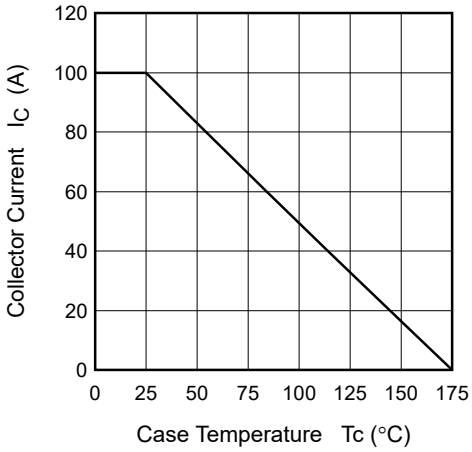
Notes: 1. Pulse width limited by safe operating area.
2. PW ≤ 5 μs, duty cycle ≤ 1%
3. Value at Tc = 25 °C
4. Please use this device in the thermal conditions which the junction temperature does not exceed 175 °C. Renesas IGBT Application Note is disclosed about reliability test and application condition up to 175 °C.
5. Pulse test

Main Characteristics

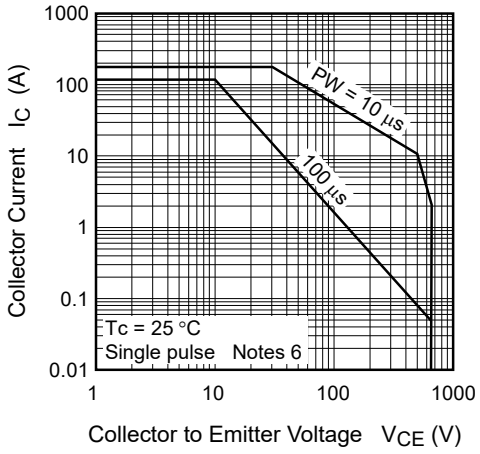
Collector Dissipation vs. Case Temperature



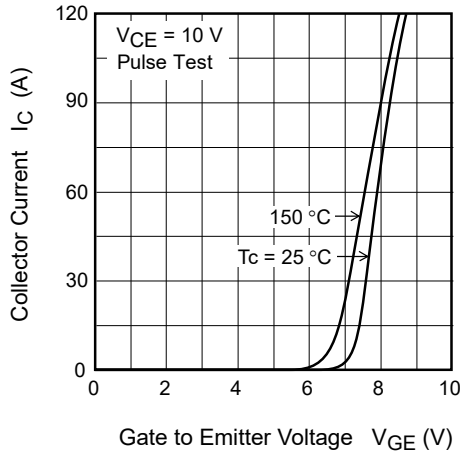
Maximum DC Collector Current vs. Case Temperature



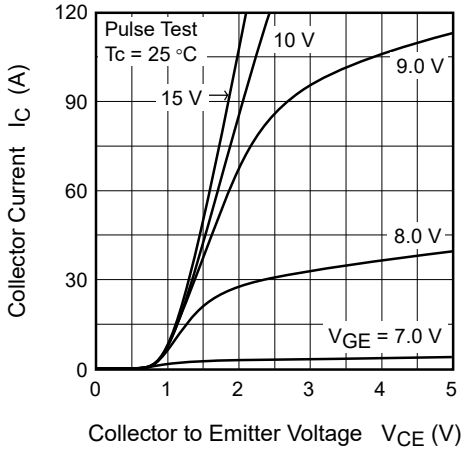
Maximum Safe Operation Area



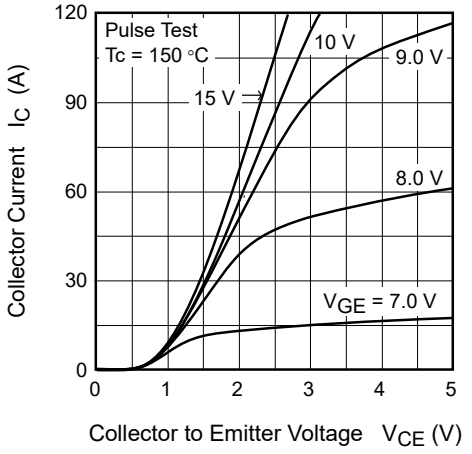
Typical Transfer Characteristics



Typical Output Characteristics

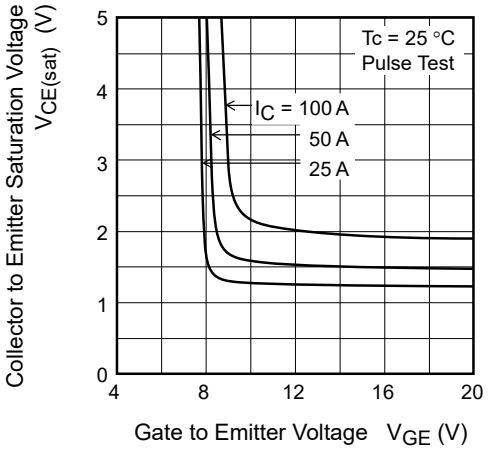


Typical Output Characteristics

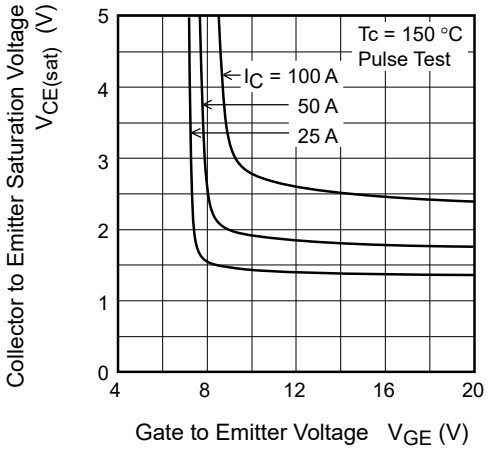


Notes: 6. This data is the designed value on Renesas's measurement condition, Renesas recommends that operating conditions are designed according to a document "Power MOSFET/IGBT Attention of Handling Semiconductor Devices (R07ZZ0010)".

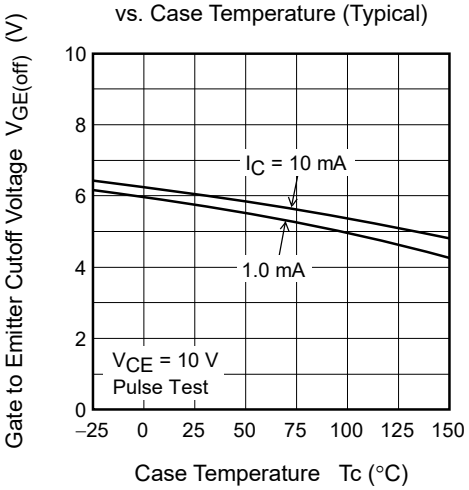
Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage (Typical)



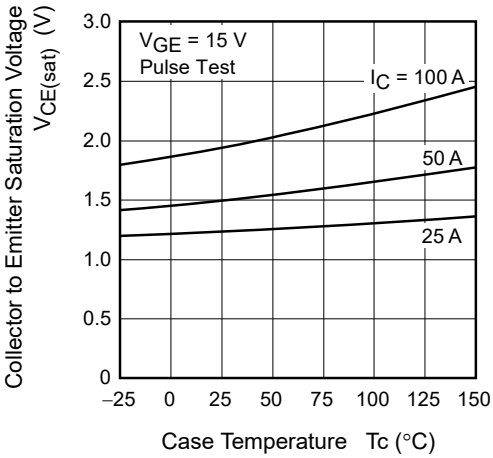
Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage (Typical)



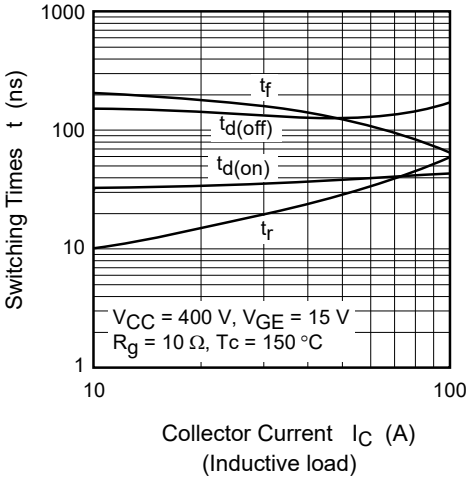
Gate to Emitter Cutoff Voltage vs. Case Temperature (Typical)



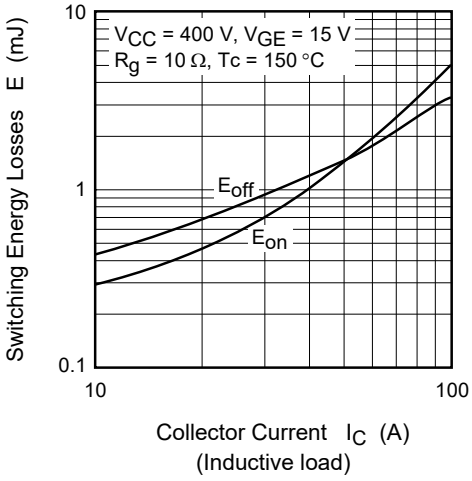
Collector to Emitter Saturation Voltage vs. Case Temperature (Typical)



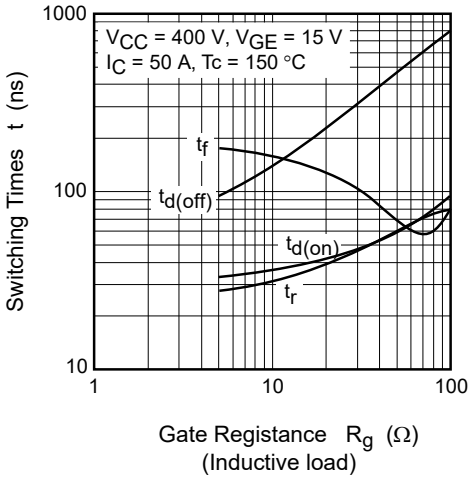
Switching Characteristics (Typical) (1)



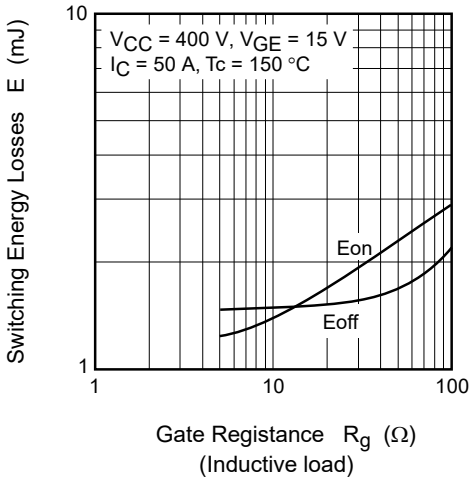
Switching Characteristics (Typical) (2)



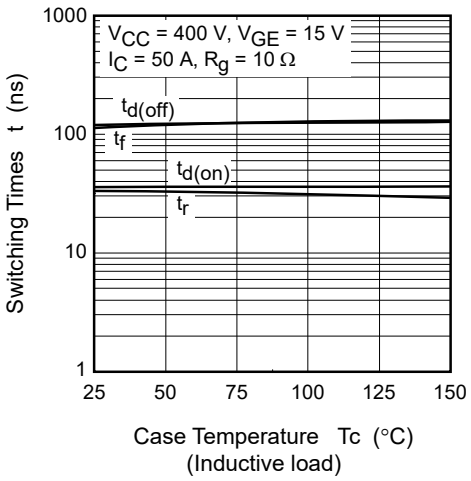
Switching Characteristics (Typical) (3)



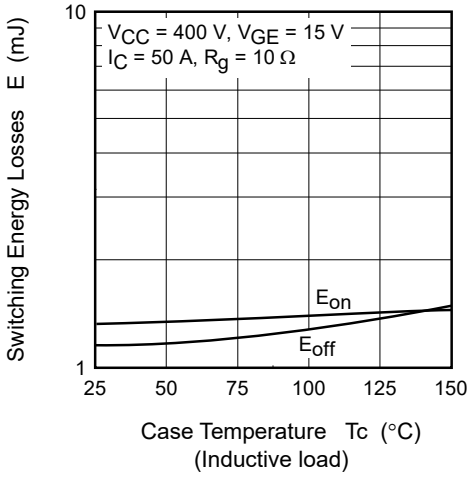
Switching Characteristics (Typical) (4)



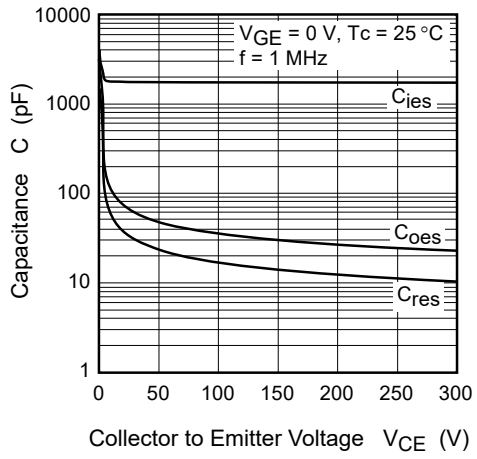
Switching Characteristics (Typical) (5)



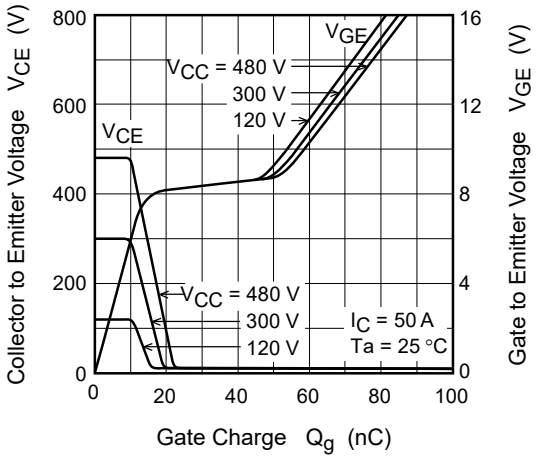
Switching Characteristics (Typical) (6)



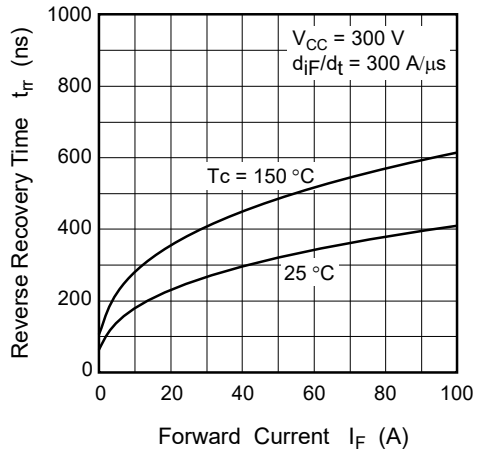
Typical Capacitance vs.
Collector to Emitter Voltage



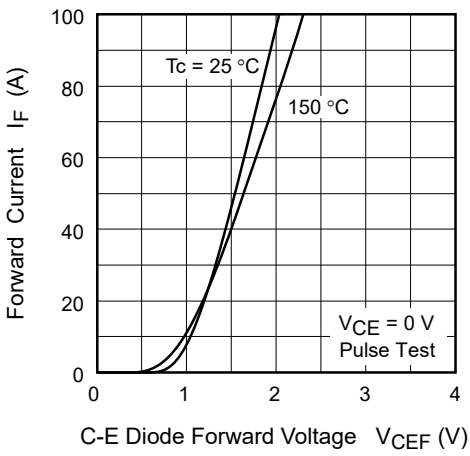
Dynamic Input Characteristics (Typical)

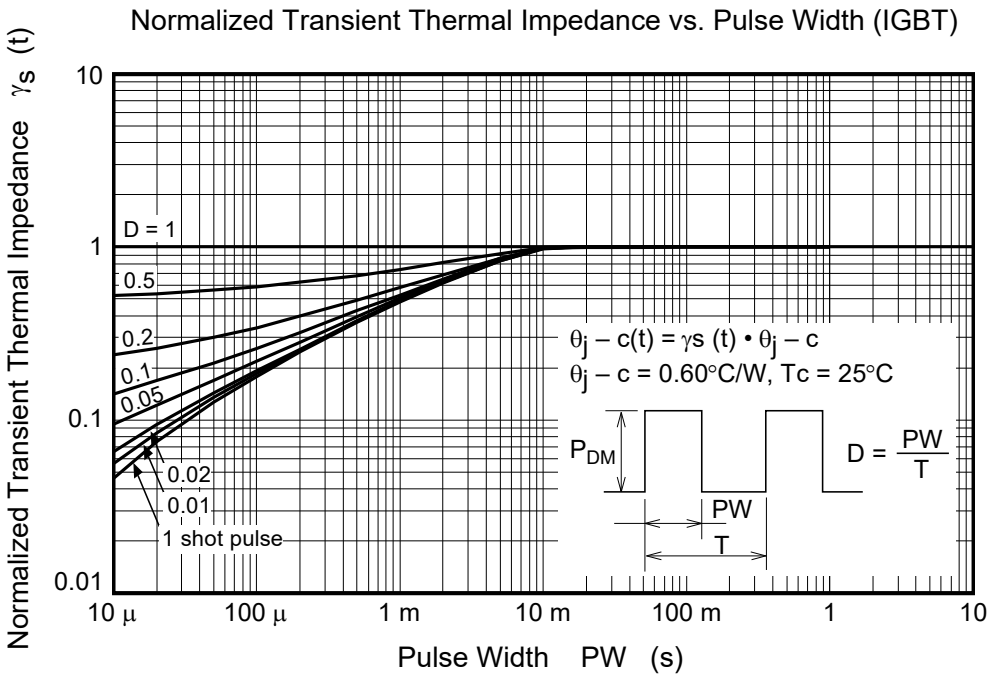


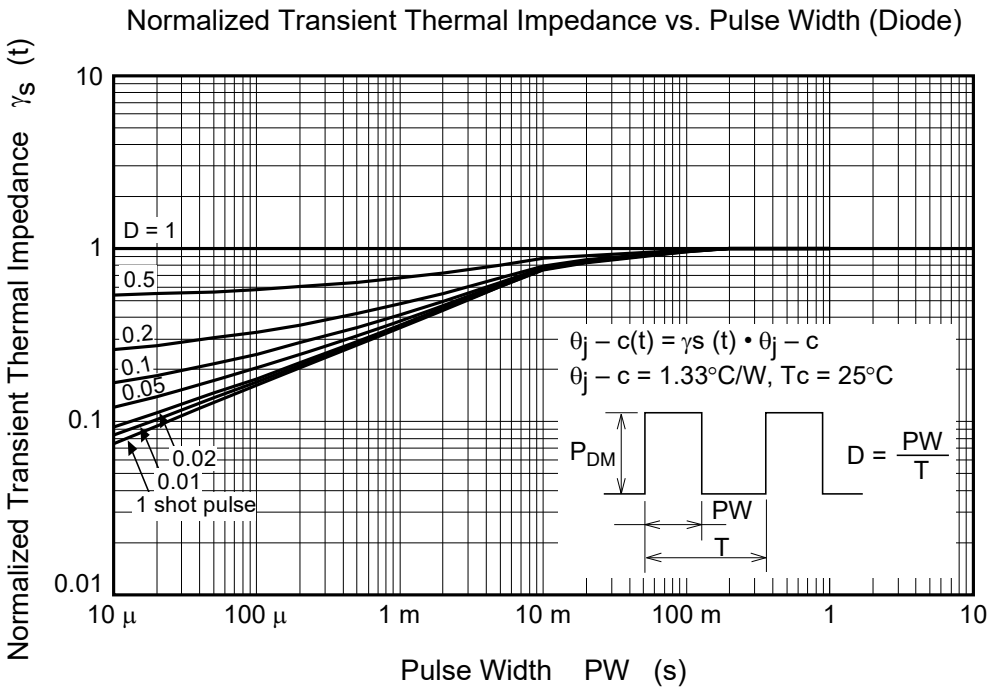
Reverse Recovery Time vs.
Forward Current (Typical)



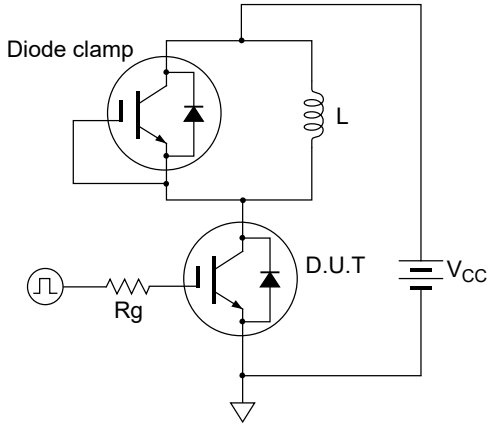
Forward Current vs. Forward Voltage (Typical)



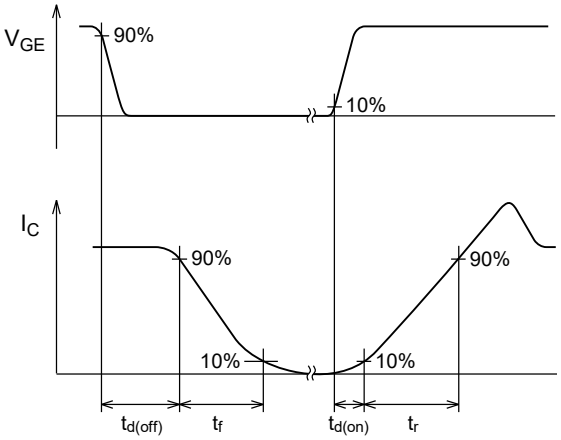

Normalized Transient Thermal Impedance vs. Pulse Width (IGBT)
Normalized Transient Thermal Impedance γs (t)
10
1
0.1
0.01
D = 1
0.5
0.2
0.1
0.05
0.02
0.01
1 shot pulse
θj – c(t) = γs (t) • θj – c
θj – c = 0.60°C/W, Tc = 25°C
PDM
D = PW / T
PW
T
10 μ
100 μ
1 m
10 m
100 m
1
10
Pulse Width PW (s)


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)

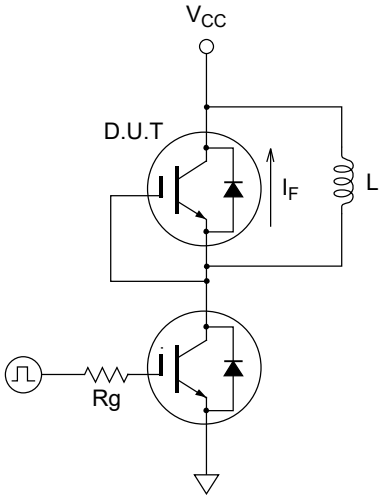
Switching Time Test Circuit



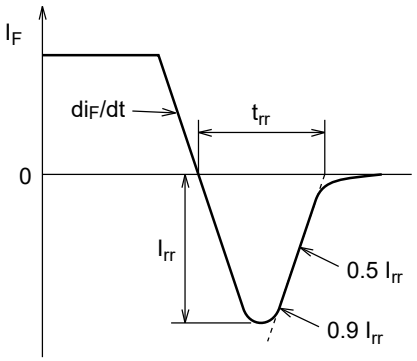
Waveform



Diode Reverse Recovery Time Test Circuit



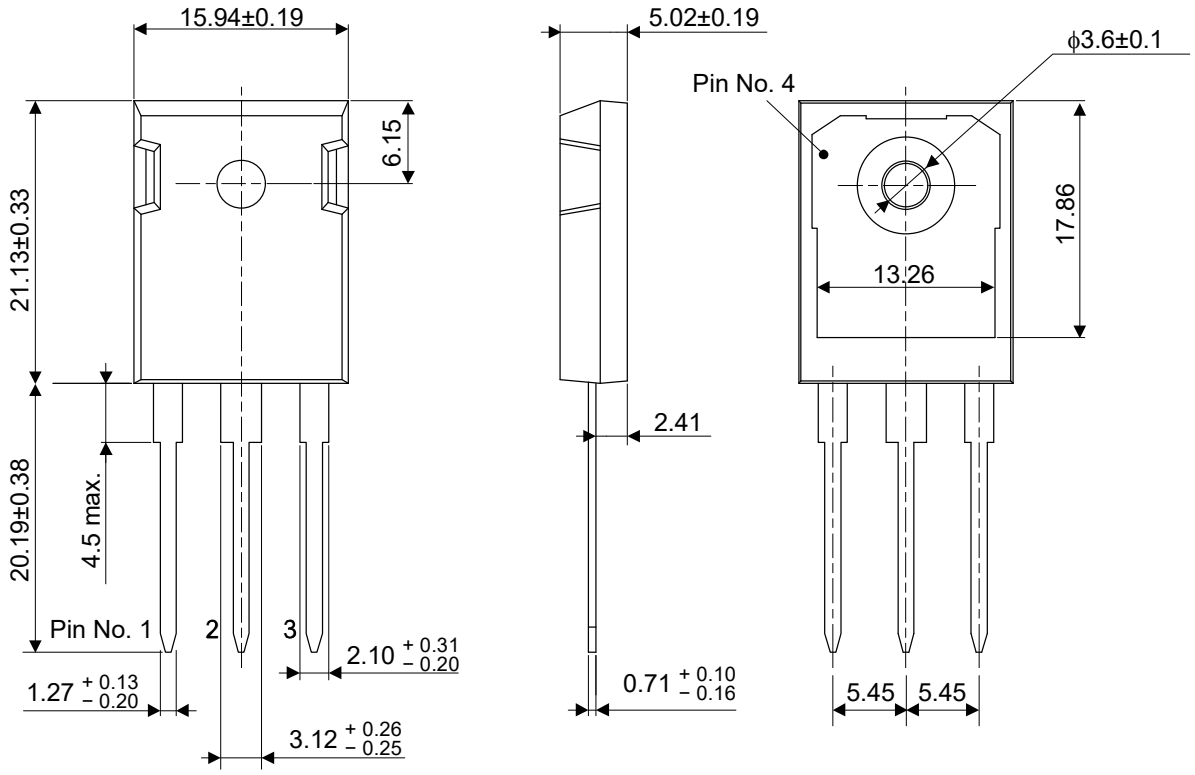
Waveform



Package Dimensions

JEDEC Package Code	RENESAS Code	Previous Code	MASS (Typ) [g]
TO-247A	PRSS0003ZH-A	—	6.14

Unit: mm



Ordering Information

Orderable Part Number	Quantity	Shipping Container
RJH65T14DPQ-A0#T0	240 pcs	Box (Tube)

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(Rev.4.0-1 November 2017)

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