RGA50TSX2EHRC11

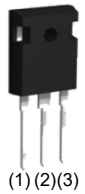
1200V 49A Field Stop Trench IGBT

Datasheet

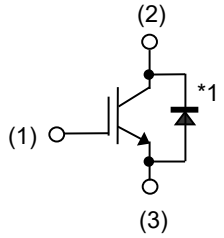
V_{CES}	1200V
I_C	49A
$V_{CE(sat)\ (Typ.)}$	1.60V
P_D	348W

●Outline

TO-247N



●Inner Circuit



(1) Gate
(2) Collector
(3) Emitter

*1 Built in FRD

●Features

1) Qualified to AEC-Q101

2) Short Circuit Withstand Time 10μs

3)Low Collector - Emitter Saturation Voltage

4) Built in Very Fast & Soft Recovery FRD

5) Pb - free Lead Plating ; RoHS Compliant

●Application

General Inverter

for Automotive and Industrial Use

HV Heater

Relay Circuit (ex. Pre Charge Relay)

●Packaging Specifications

Type	Packaging	Tube
	Reel Size (mm)	-
	Tape Width (mm)	-
	Basic Ordering Unit (pcs)	450
	Packing Code	C11
	Marking	RGA50TSX2E

●Absolute Maximum Ratings (at T_C = 25°C unless otherwise specified)

Parameter		Symbol	Value	Unit
Collector - Emitter Voltage		V_{CES}	1200	V
Gate - Emitter Voltage		V_{GES} *1	±30	V
Collector Current	T_C = 25°C	I_C	74	A
	T_C = 100°C	I_C	49	A
Pulsed Collector Current		I_{CP} *2	75	A
Diode Forward Current	T_C = 25°C	I_F	63	A
	T_C = 100°C	I_F	39	A
Diode Pulsed Forward Current		I_{FP} *2	75	A
Power Dissipation	T_C = 25°C	P_D	348	W
	T_C = 100°C	P_D	174	W
Operating Junction Temperature		T_j	-40 to +175	°C
Storage Temperature		T_{stg}	-55 to +175	°C

*1 Please be advised not to use IGBTs with V_{GE} below 10V as doing so may cause thermal runaway.

*2 Pulse width limited by T_{jmax}.

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●Thermal Resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal Resistance IGBT Junction - Case	$R_{\theta(j-c)}$	-	-	0.43	°C/W
Thermal Resistance Diode Junction - Case	$R_{\theta(j-c)}$	-	-	0.80	°C/W

●IGBT Electrical Characteristics (at T_j = 25°C unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Collector - Emitter Breakdown Voltage	BV_{CES}	I_C = 10μA, V_{GE} = 0V	1200	-	-	V
Collector Cut - off Current	I_{CES}	V_{CE} = 1200V, V_{GE}= 0V,				
		T_j = 25°C	-	-	10	μA
		T_j = 175°C	-	400	-	μA
Gate - Emitter Leakage Current	I_{GES}	V_{GE} = ±30V, V_{CE} = 0V	-	-	±500	nA
Gate - Emitter Threshold Voltage	$V_{GE(th)}$	V_{CE} = 5V, I_C = 3.1mA	5.0	5.8	6.6	V
Collector - Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 25A, V_{GE} = 15V,				
		T_j = 25°C	-	1.60	2.00	V
		T_j = 175°C	-	2.15	-	V

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●**IGBT Electrical Characteristics** (at T_j = 25°C unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input Capacitance	C_{ies}	V_{CE} = 30V,	-	4358	-	pF
Output Capacitance	C_{oes}	V_{GE} = 0V,	-	136	-	
Reverse transfer Capacitance	C_{res}	f = 1MHz	-	35	-	
Total Gate Charge	Q_g	V_{CE} = 800V,	-	163	-	nC
Gate - Emitter Charge	Q_{ge}	I_C = 25A,	-	30	-	
Gate - Collector Charge	Q_{gc}	V_{GE} = 15V	-	75	-	
Turn - on Delay Time	$t_{d(on)}$	I_C = 25A, V_{CC} = 800V, V_{GE} = 15V, R_G = 10Ω, T_j = 25°C Inductive Load *Eon does not include diode reverse recovery	-	59	-	ns
Rise Time	t_r		-	17	-	
Turn - off Delay Time	$t_{d(off)}$		-	286	-	
Fall Time	t_f		-	170	-	
Turn-on Switching Loss	E_{on}		-	1.20	-	mJ
Turn-off Switching Loss	E_{off}		-	2.04	-	
Turn - on Delay Time	$t_{d(on)}$	I_C = 25A, V_{CC} = 800V, V_{GE} = 15V, R_G = 10Ω, T_j = 175°C Inductive Load *Eon does not include diode reverse recovery	-	59	-	ns
Rise Time	t_r		-	20	-	
Turn - off Delay Time	$t_{d(off)}$		-	322	-	
Fall Time	t_f		-	247	-	
Turn-on Switching Loss	E_{on}		-	1.33	-	mJ
Turn-off Switching Loss	E_{off}		-	2.66	-	
Reverse Bias Safe Operating Area	RBSOA *3	I_C = 75A, V_{CC} = 1050V, V_p = 1200V, V_{GE} = 15V, R_G = 50Ω, T_j = 175°C	FULL SQUARE			-
Short Circuit Withstand Time	t_{sc}	V_{CC} ≤ 800V, V_{GE} = 15V, T_j = 25°C	10	-	-	μs
Short Circuit Withstand Time	t_{sc} *3	V_{CC} ≤ 800V, V_{GE} = 15V, T_j = 150°C	8	-	-	μs

*3 Design assurance without measurement

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●**FRD Electrical Characteristics** (at T_j = 25°C unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V_F	I_F = 25A, T_j = 25°C	-	1.65	2.10	V
		T_j = 175°C	-	1.85	-	
Diode Reverse Recovery Time	t_{rr}	I_F = 25A, V_{CC} = 800V, di_F/dt = 500A/μs, T_j = 25°C	-	326	-	ns
Diode Peak Reverse Recovery Current	I_{rr}		-	15.9	-	A
Diode Reverse Recovery Charge	Q_{rr}		-	2.8	-	μC
Diode Reverse Recovery Energy	E_{rr}		-	1.3	-	mJ
Diode Reverse Recovery Time	t_{rr}	I_F = 25A, V_{CC} = 800V, di_F/dt = 500A/μs, T_j = 175°C	-	460	-	ns
Diode Peak Reverse Recovery Current	I_{rr}		-	20.0	-	A
Diode Reverse Recovery Charge	Q_{rr}		-	5.0	-	μC
Diode Reverse Recovery Energy	E_{rr}		-	2.5	-	mJ

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●Electrical Characteristic Curves

Fig.1 Power Dissipation vs. Case Temperature

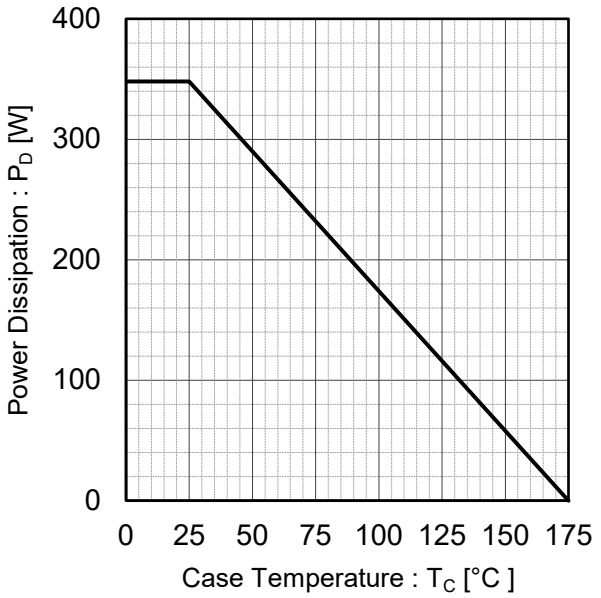


Fig.2 Collector Current vs. Case Temperature

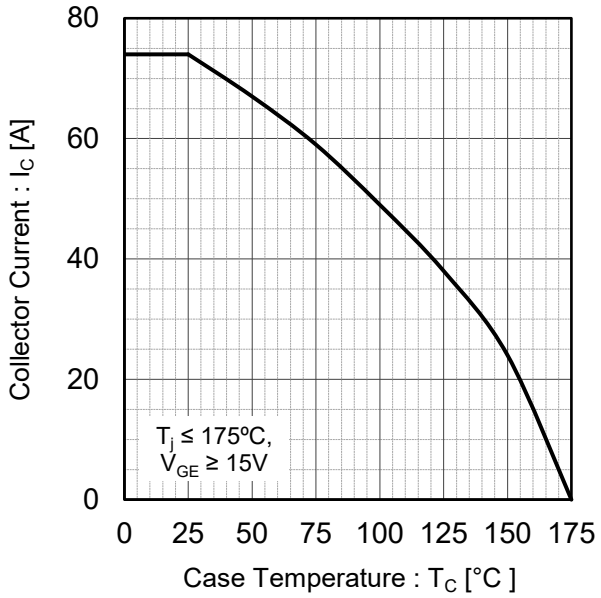


Fig.3 Forward Bias Safe Operating Area

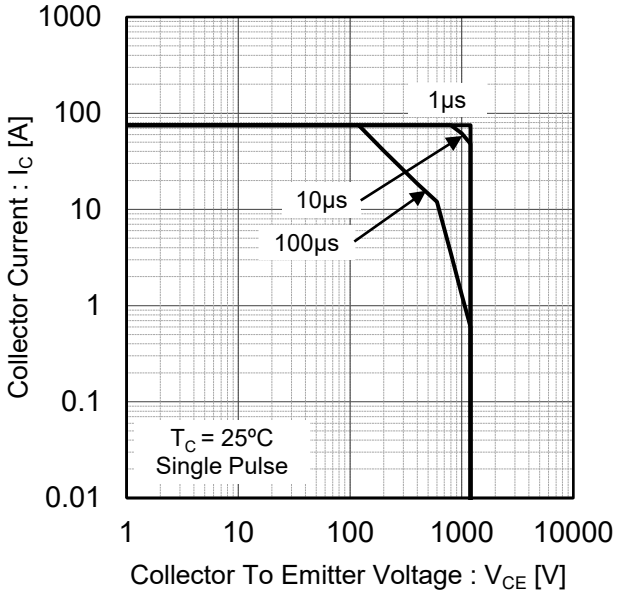
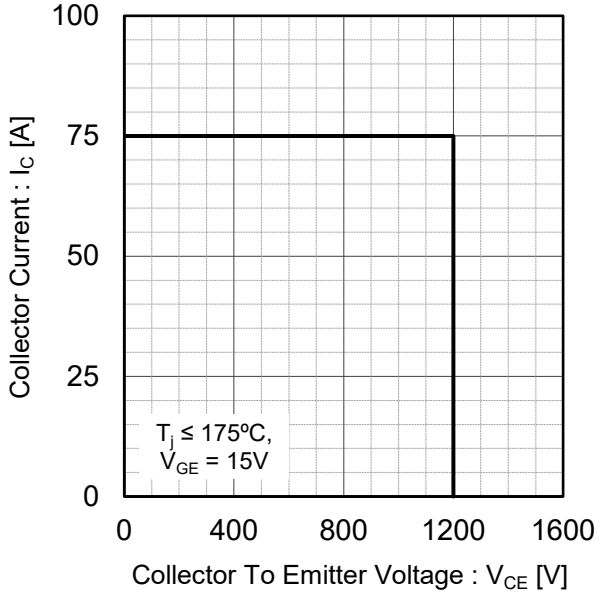


Fig.4 Reverse Bias Safe Operating Area



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●Electrical Characteristic Curves

Fig.5 Typical Output Characteristics

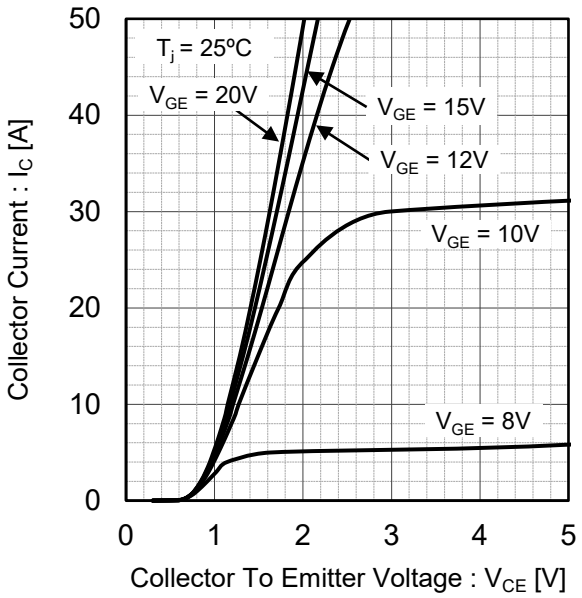


Fig.6 Typical Output Characteristics

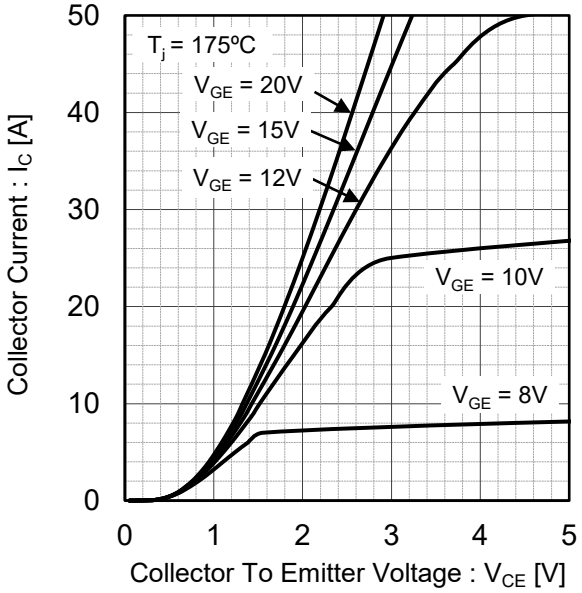


Fig.7 Typical Transfer Characteristics

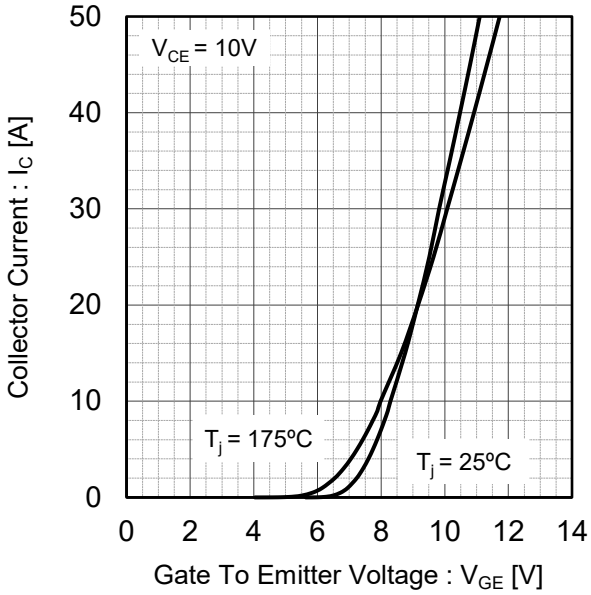
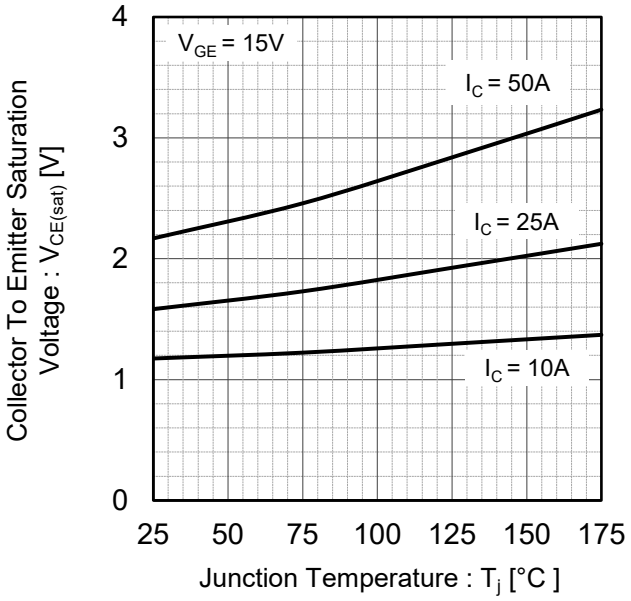


Fig.8 Typical Collector To Emitter Saturation Voltage vs. Junction Temperature



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●Electrical Characteristic Curves

Fig.9 Typical Collector To Emitter Saturation Voltage vs. Gate To Emitter Voltage

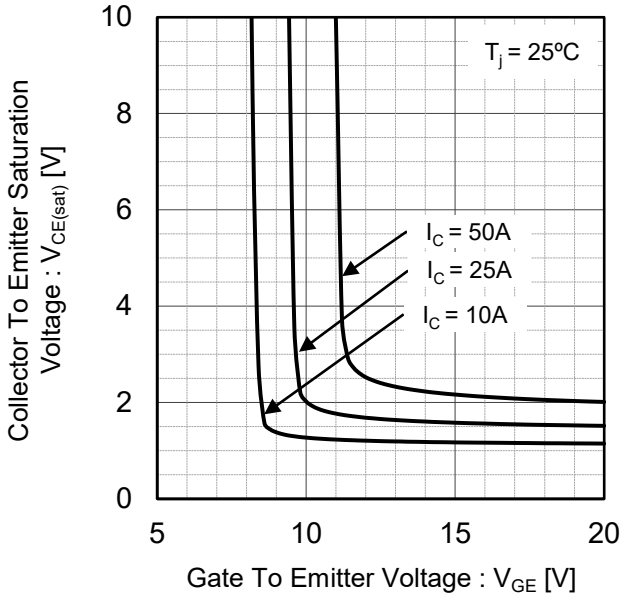


Fig.10 Typical Collector To Emitter Saturation Voltage vs. Gate To Emitter Voltage

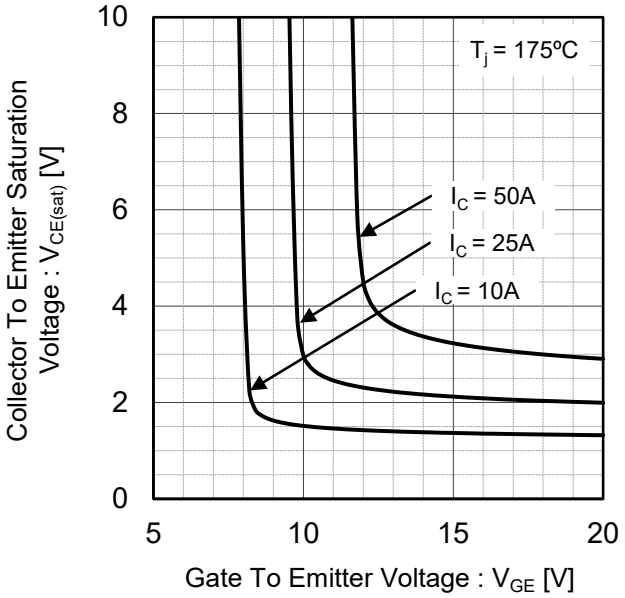


Fig.11 Typical Capacitance vs. Collector To Emitter Voltage

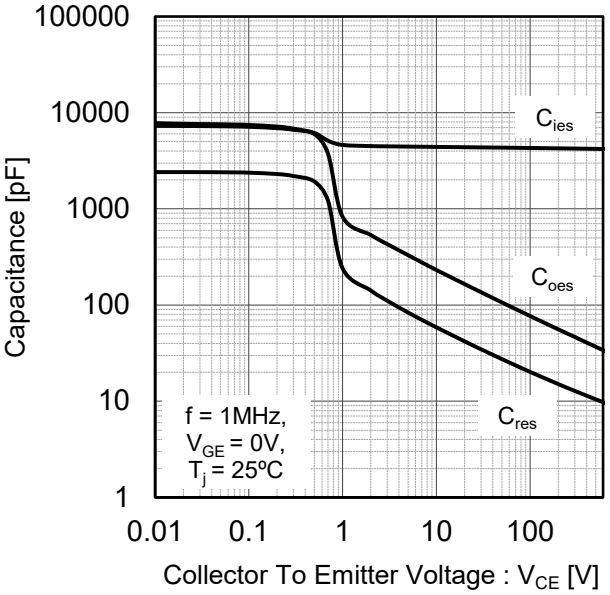
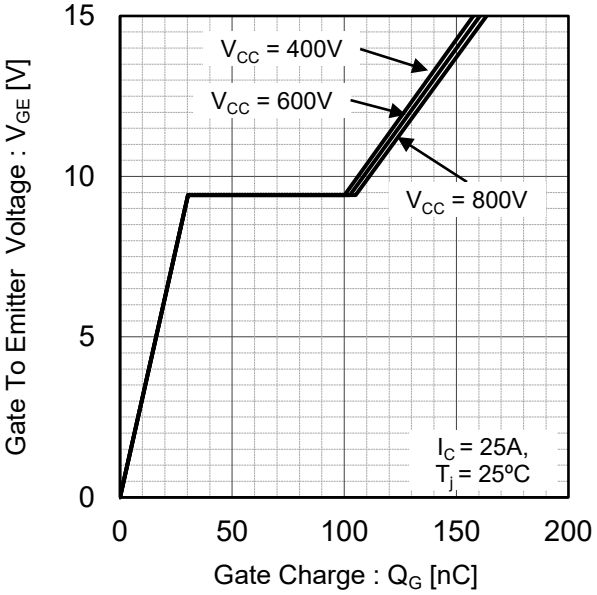


Fig.12 Typical Gate Charge



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●Electrical Characteristic Curves

Fig.13 Typical Switching Time vs. Collector Current

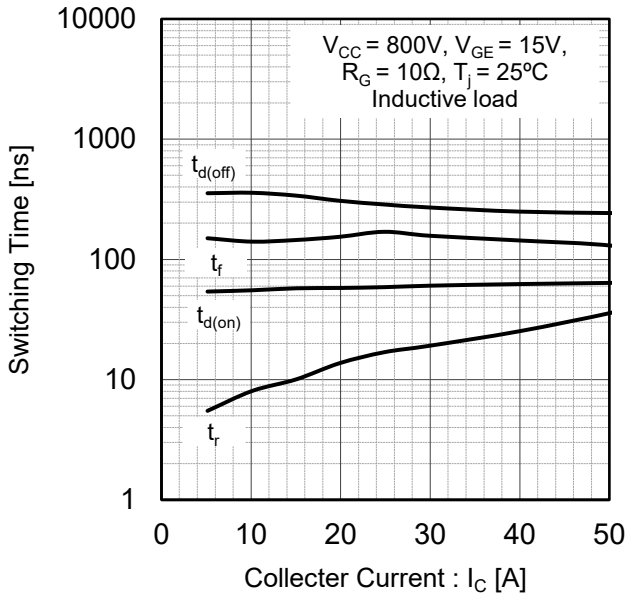


Fig.14 Typical Switching Time vs. Gate Resistance

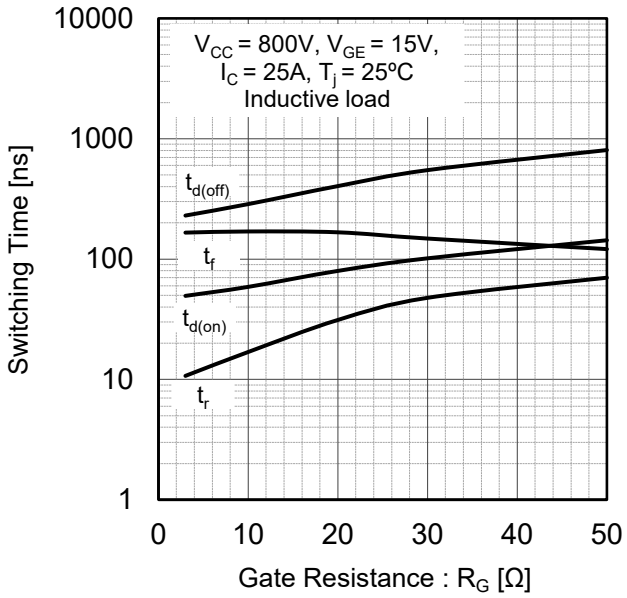


Fig.15 Typical Switching Energy Losses vs. Collector Current

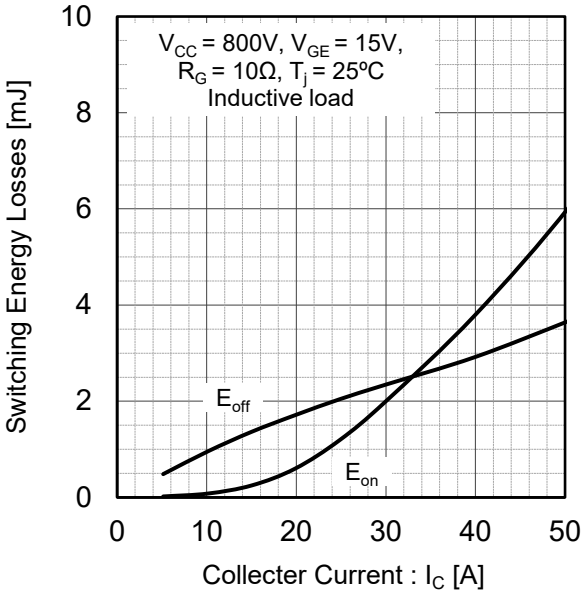
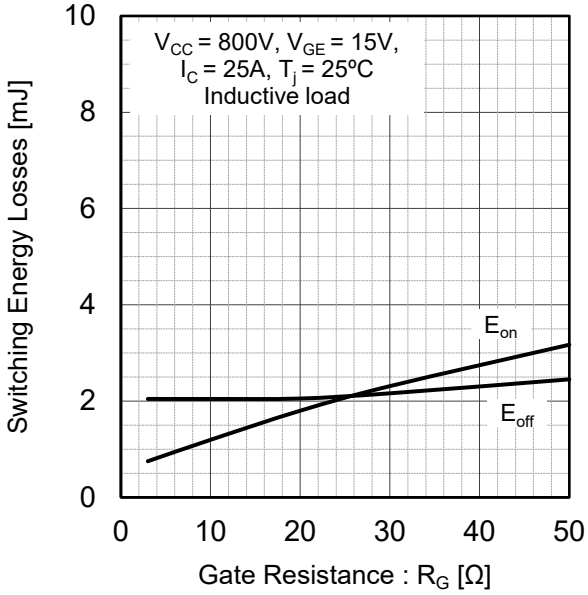


Fig.16 Typical Switching Energy Losses vs. Gate Resistance



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●Electrical Characteristic Curves

Fig.17 Typical Switching Time vs. Collector Current

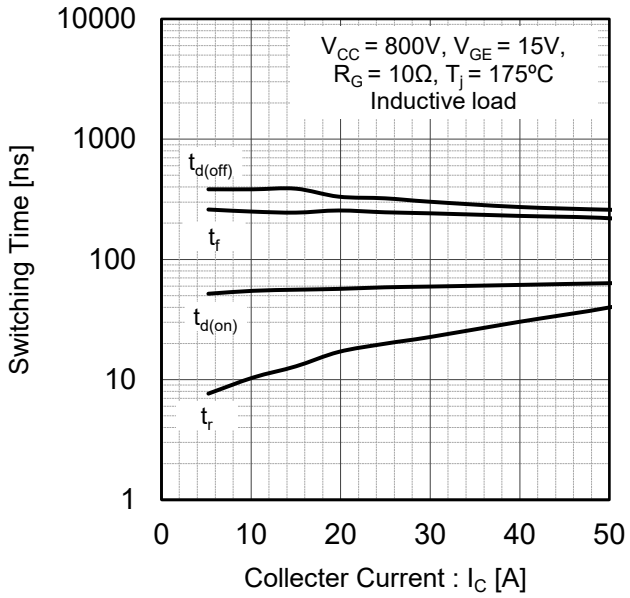


Fig.18 Typical Switching Time vs. Gate Resistance

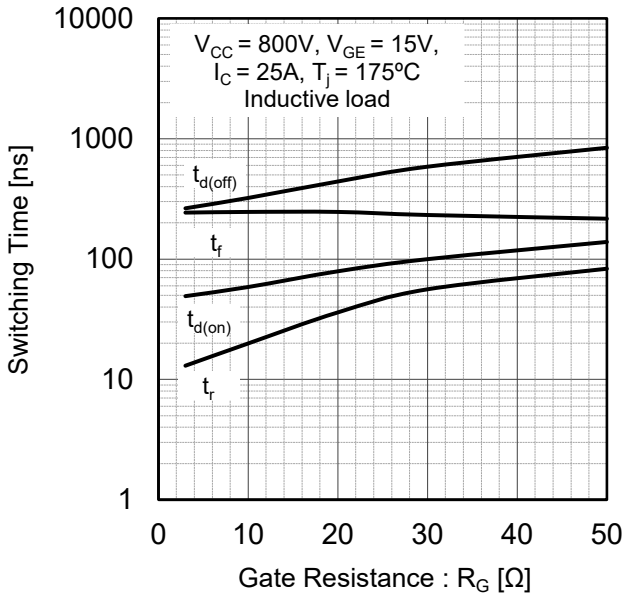


Fig.19 Typical Switching Energy Losses vs. Collector Current

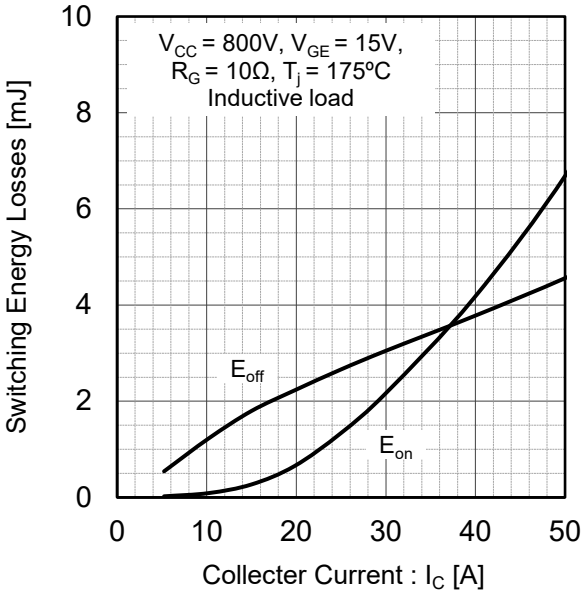
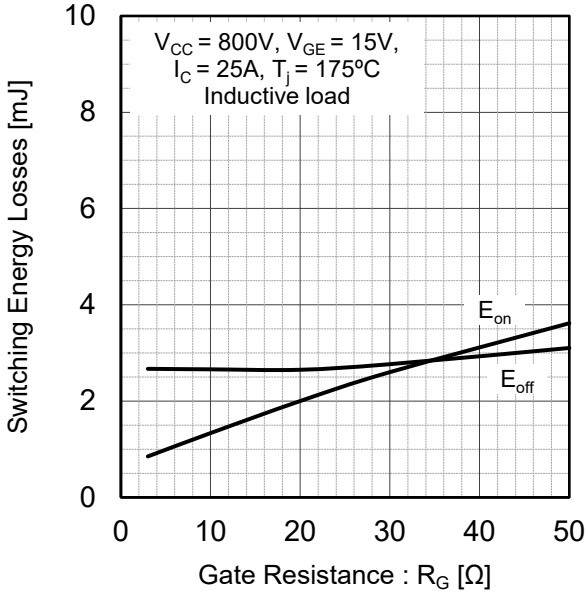


Fig.20 Typical Switching Energy Losses vs. Gate Resistance



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●Electrical Characteristic Curves

Fig.21 Typical Diode Forward Current vs. Forward Voltage

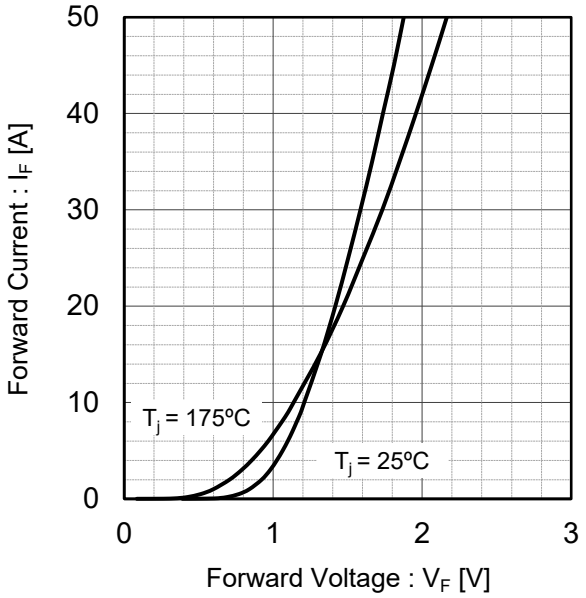


Fig.22 Typical Diode Reverce Recovery Time vs. Forward Current

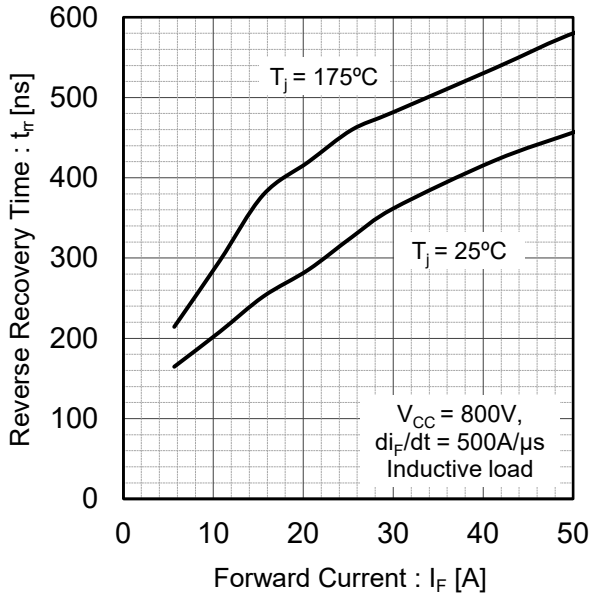


Fig.23 Typical Diode Reverse Recovery Current vs. Forward Current

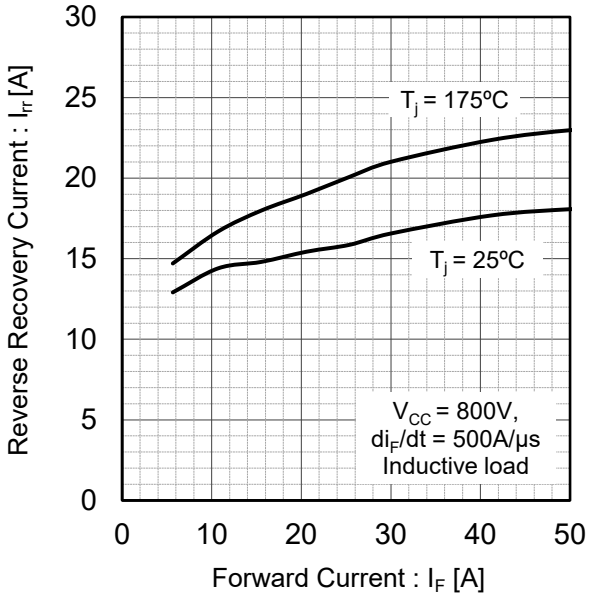
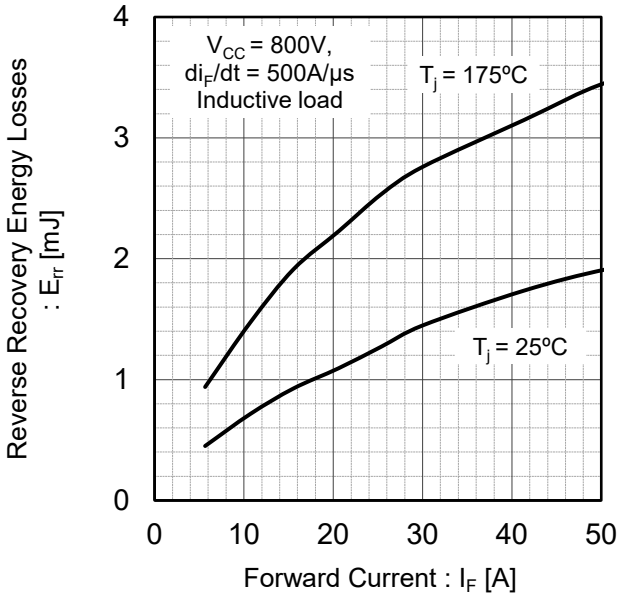


Fig.24 Typical Diode Reverse Recovery Energy Losses vs. Forward Current



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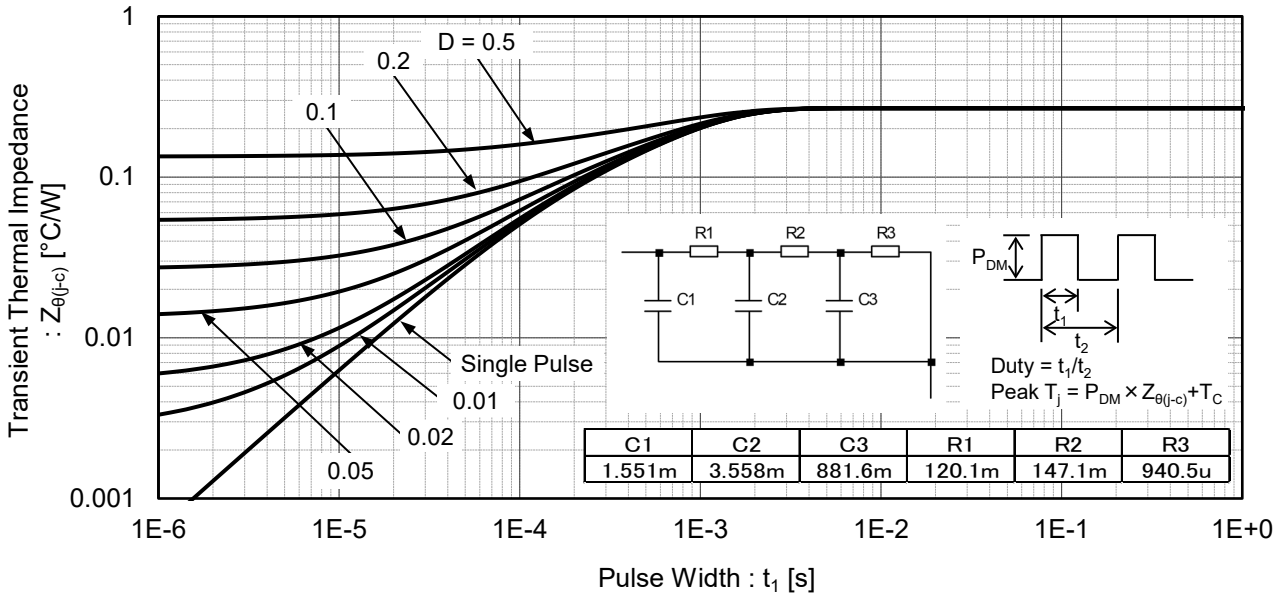
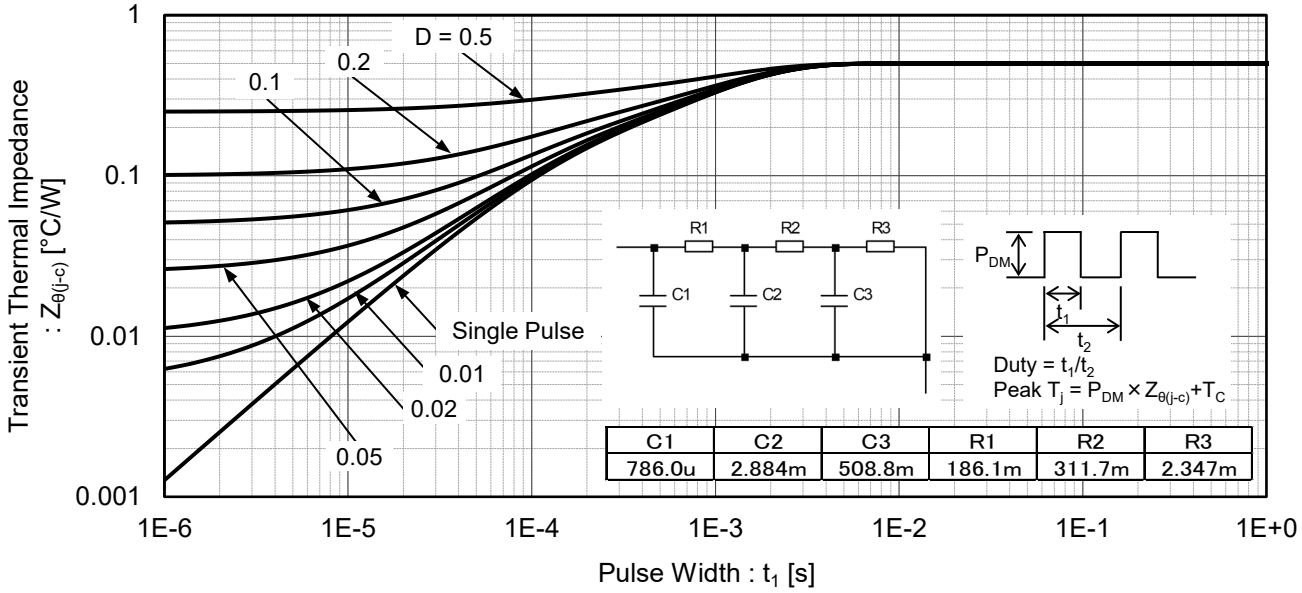
●Electrical Characteristic Curves

Fig.25 Typical IGBT Transient Thermal Impedance



C1	C2	C3	R1	R2	R3
1.551m	3.558m	881.6m	120.1m	147.1m	940.5u

Fig.26 Typical Diode Transient Thermal Impedance



C1	C2	C3	R1	R2	R3
786.0u	2.884m	508.8m	186.1m	311.7m	2.347m

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●Inductive Load Switching Circuit and Waveform and Short Circuit

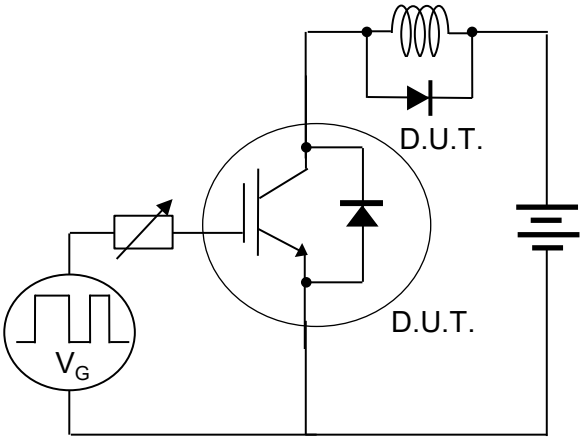

Fig.27 Inductive Load Circuit

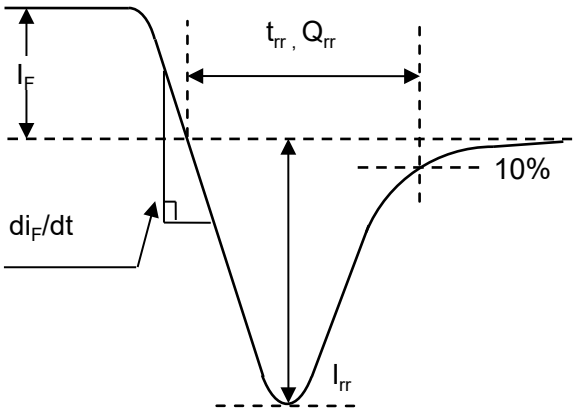

Fig.28 Diode Reverse Recovery Waveform

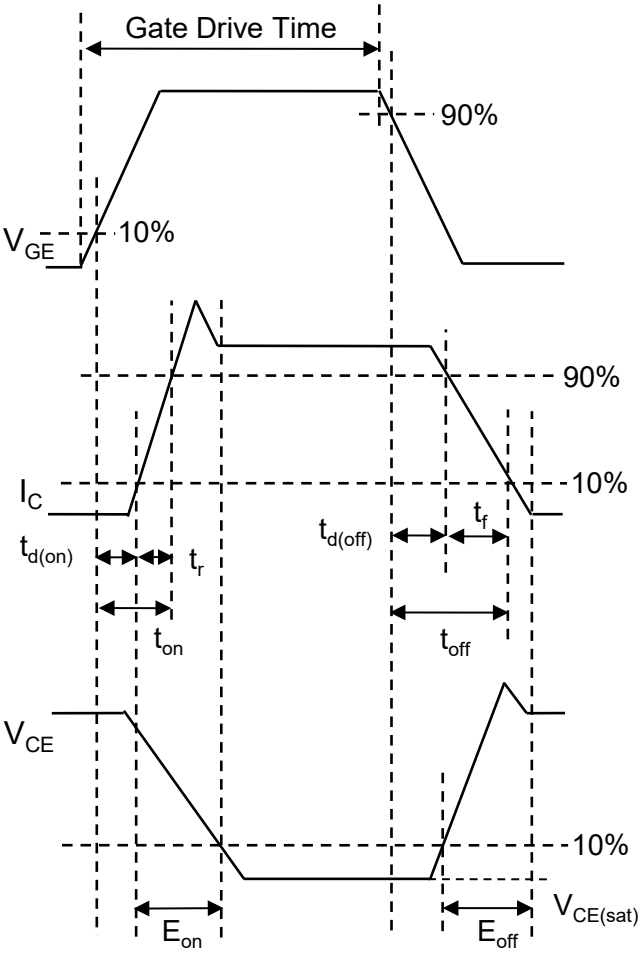

Fig.29 Inductive Load Waveform

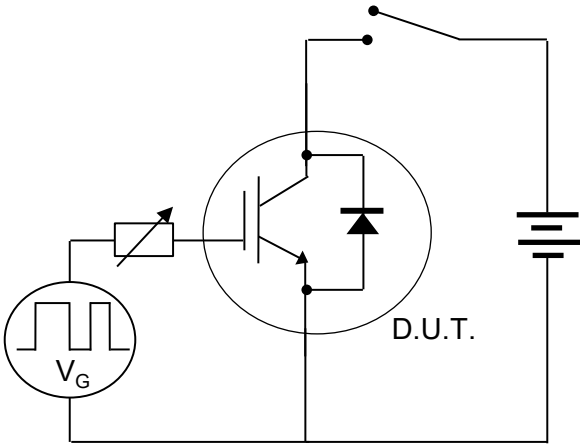

Fig.30 Short Circuit

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Notes

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2) Before you use our Products, please contact our sales representative and verify the latest specifications.

3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Poducts beyond the rating specified by ROHM.

4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM or any other parties. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.

6) The Products specified in this document are not designed to be radiation tolerant.

7) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative : transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, and power transmission systems.

8) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.

9) ROHM shall have no responsibility for any damages or injury arising from non-compliance with the recommended usage conditions and specifications contained herein.

10) ROHM has used reasonable care to ensure the accuracy of the information contained in this document. However, ROHM does not warrants that such information is error-free, and ROHM shall have no responsibility for any damages arising from any inaccuracy or misprint of such information.

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ROHM SEMICONDUCTOR

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