RGS80TSX2DHR

1200V 40A Field Stop Trench IGBT

Datasheet

V_{CES}	1200V
$I_{C\ (100°C)}$	40A
$V_{CE(sat)\ (Typ.)}$	1.7V
P_D	555W

●Features

1) Low Collector - Emitter Saturation Voltage

2) Short Circuit Withstand Time 10μs

3) Qualified to AEC-Q101

4) Built in Very Fast & Soft Recovery FRD

5) Pb - free Lead Plating ; RoHS Compliant

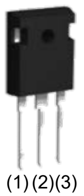
●Application

General Inverter

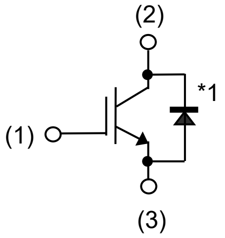
for Automotive and Industrial Use

●Outline

TO-247N



●Inner Circuit



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

*1 Built in FRD

●Packaging Specifications

Type	Packaging	Tube
	Reel Size (mm)	-
	Tape Width (mm)	-
	Basic Ordering Unit (pcs)	450
	Packing Code	C11
	Marking	RGS80TSX2D

●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}	±30	V
Collector Current	T_C = 25°C	I_C	80	A
	T_C = 100°C	I_C	40	A
Pulsed Collector Current		I_{CP}^{*1}	120	A
Diode Forward Current	T_C = 25°C	I_F	80	A
	T_C = 100°C	I_F	40	A
Diode Pulsed Forward Current		I_{FP}^{*1}	120	A
Power Dissipation	T_C = 25°C	P_D	555	W
	T_C = 100°C	P_D	277	W
Operating Junction Temperature		T_j	-40 to +175	°C
Storage Temperature		T_{stg}	-55 to +175	°C

*1 Pulse width limited by $T_{jmax.}$

●Thermal Resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal Resistance IGBT Junction - Case	$R_{\theta(j\text{-}c)}$	-	-	0.27	°C/W
Thermal Resistance Diode Junction - Case	$R_{\theta(j\text{-}c)}$	-	-	0.56	°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℃	-	-	10	μA
		T_j = 175℃	-	-	5	mA
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 = 6.1mA	5.0	6.0	7.0	V
Collector - Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 40A, V_{GE} = 15V				
		T_j = 25°C	-	1.70	2.10	V
		T_j = 175°C	-	2.20	-	V

●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 V_{GE} = 0V f = 1MHz	-	2820	-	pF
Output Capacitance	C_{oes}		-	161	-	
Reverse transfer Capacitance	C_{res}		-	25	-	
Total Gate Charge	Q_g	V_{CE} = 500V I_C = 40A V_{GE} = 15V	-	104	-	nC
Gate - Emitter Charge	Q_{ge}		-	25	-	
Gate - Collector Charge	Q_{gc}		-	42	-	
Turn - on Delay Time	$t_{d(on)}$	I_C = 40A, V_{CC} = 600V, V_{GE} = 15V, R_G = 10Ω, T_j = 25°C Inductive Load *E_{on} include diode reverse recovery	-	49	-	ns
Rise Time	t_r		-	27	-	
Turn - off Delay Time	$t_{d(off)}$		-	199	-	
Fall Time	t_f		-	227	-	
Turn-on Switching Loss	E_{on}		-	3.00	-	mJ
Turn-off Switching Loss	E_{off}		-	3.10	-	
Turn - on Delay Time	$t_{d(on)}$	I_C = 40A, V_{CC} = 600V, V_{GE} = 15V, R_G = 10Ω, T_j = 175°C Inductive Load *E_{on} include diode reverse recovery	-	49	-	ns
Rise Time	t_r		-	40	-	
Turn - off Delay Time	$t_{d(off)}$		-	258	-	
Fall Time	t_f		-	371	-	
Turn-on Switching Loss	E_{on}		-	3.80	-	mJ
Turn-off Switching Loss	E_{off}		-	4.50	-	
Reverse Bias Safe Operating Area	RBSOA	I_C = 120A, 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} ≤ 600V V_{GE} = 15V, T_j = 25°C	10	-	-	μs
Short Circuit Withstand Time	t_{sc} *2	V_{CC} ≤ 600V V_{GE} = 15V, T_j = 150°C	8	-	-	μs

*2 Design assurance without measurement

●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 = 40A T_j = 25°C	-	1.65	2.10	V
		T_j = 175°C	-	1.85	-	
Diode Reverse Recovery Time	t_{rr}	I_F = 40A V_{CC} = 600V di_F/dt = 500A/μs T_j = 25°C	-	198	-	ns
Diode Peak Reverse Recovery Current	I_{rr}		-	21.7	-	A
Diode Reverse Recovery Charge	Q_{rr}		-	2.5	-	μC
Diode Reverse Recovery Energy	E_{rr}		-	568	-	μJ
Diode Reverse Recovery Time	t_{rr}	I_F = 40A V_{CC} = 600V di_F/dt = 500A/μs T_j = 175°C	-	337	-	ns
Diode Peak Reverse Recovery Current	I_{rr}		-	29.1	-	A
Diode Reverse Recovery Charge	Q_{rr}		-	5.9	-	μC
Diode Reverse Recovery Energy	E_{rr}		-	2504	-	μJ

●Electrical Characteristic Curves

Fig.1 Power Dissipation
vs. Case Temperature

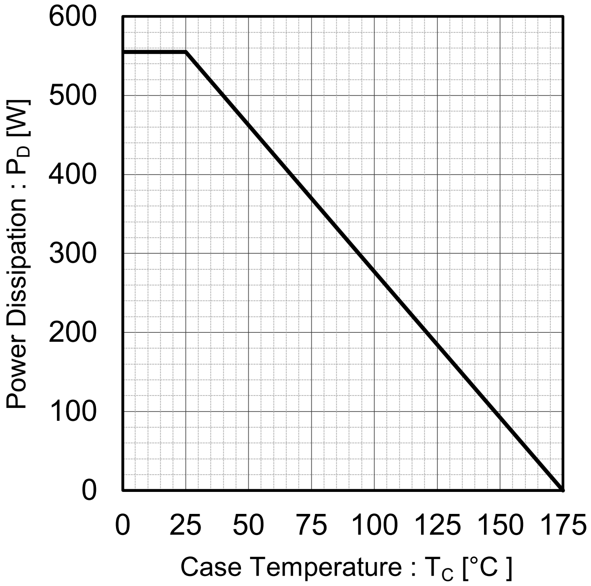


Fig.2 Collector Current
vs. Case Temperature

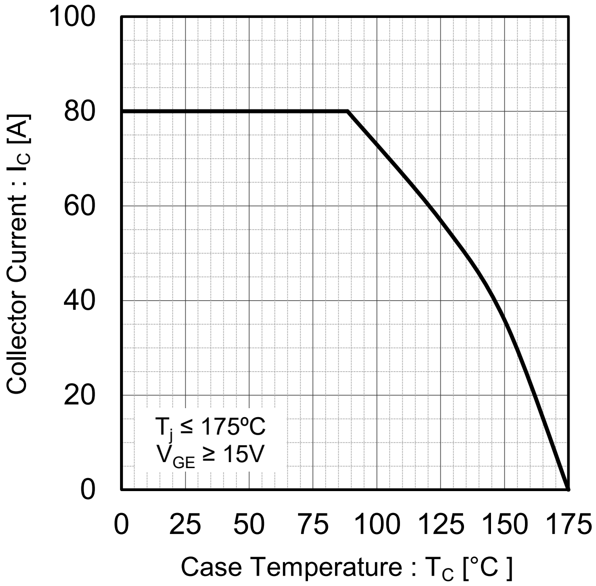


Fig.3 Forward Bias Safe Operating Area

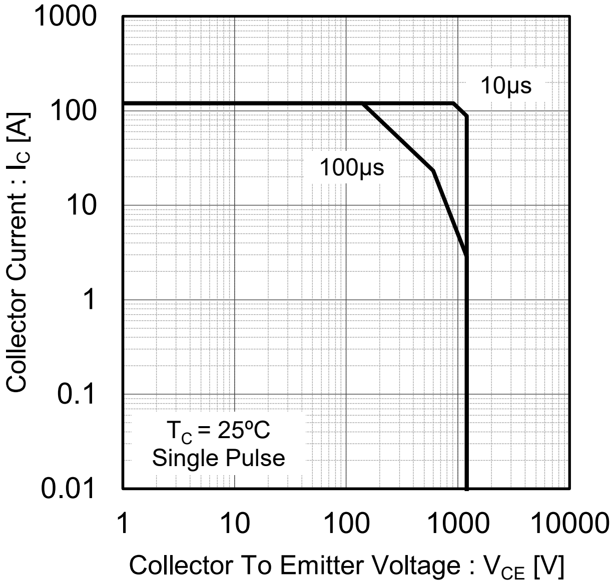
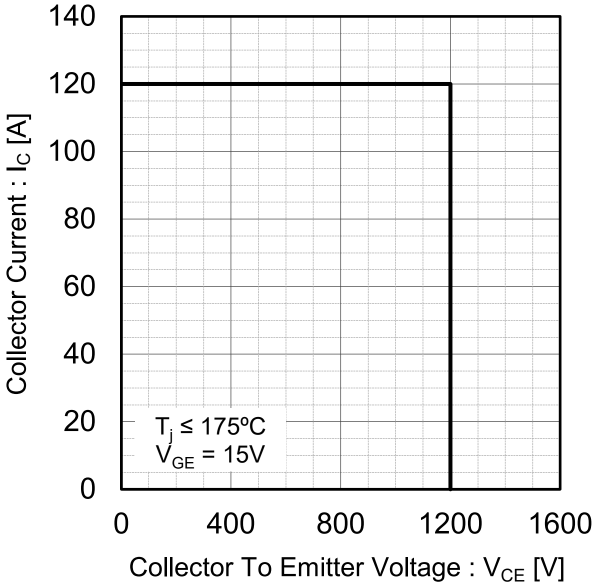


Fig.4 Reverse Bias Safe Operating Area



●Electrical Characteristic Curves

Fig.5 Typical Output Characteristics

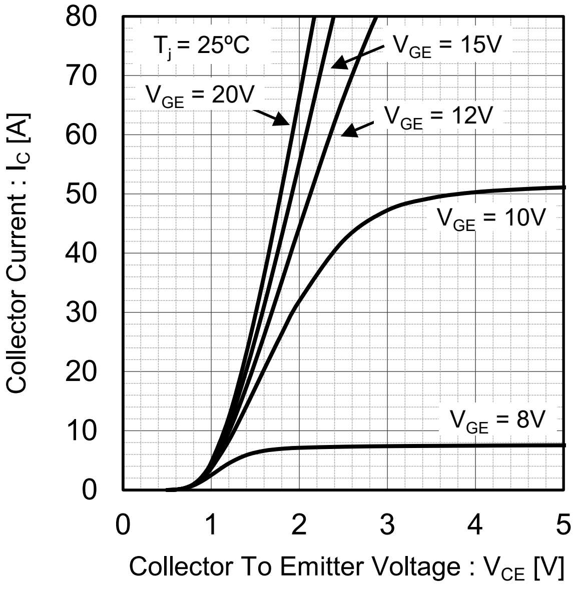


Fig.6 Typical Output Characteristics

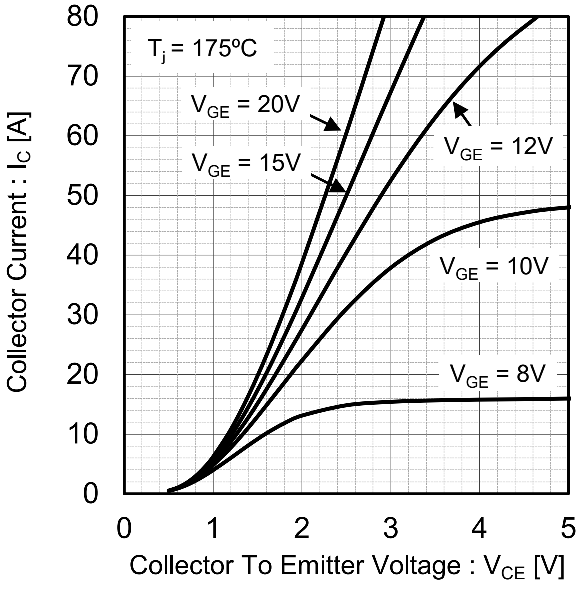


Fig.7 Typical Transfer Characteristics

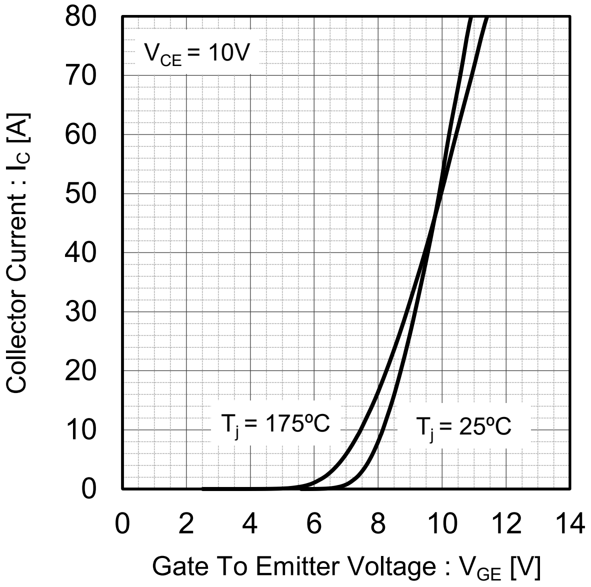
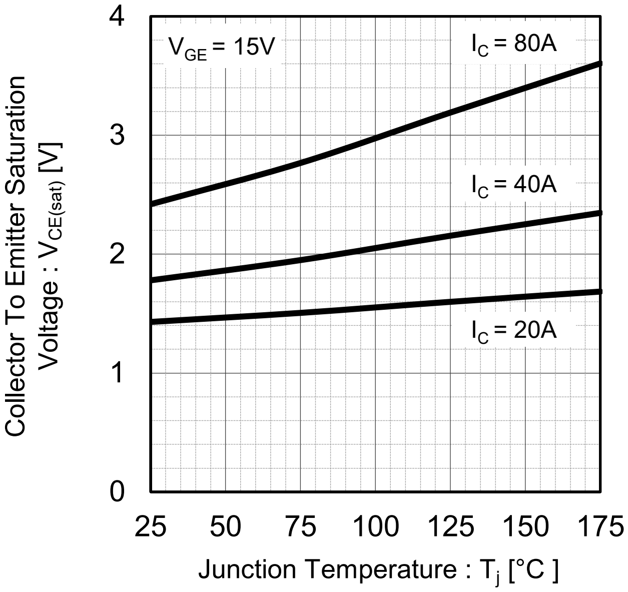


Fig.8 Typical Collector To Emitter Saturation Voltage vs. Junction Temperature



●Electrical Characteristic Curves

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

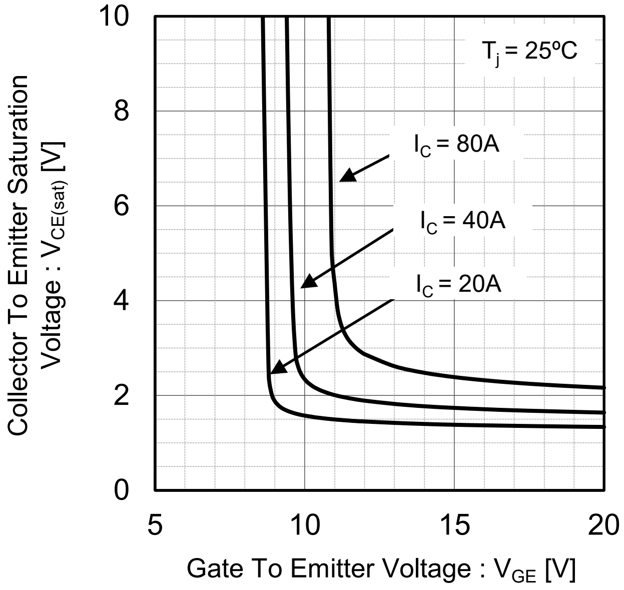


Fig.10 Typical Collector To Emitter Saturation Voltage vs. Gate To Emitter Voltage

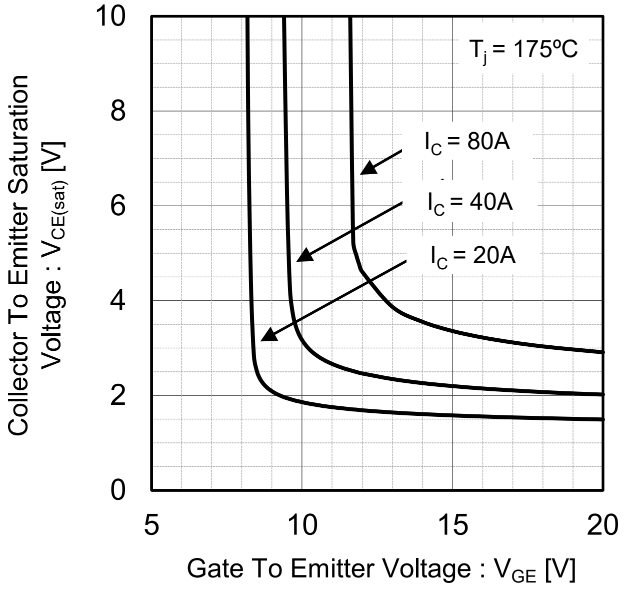


Fig.11 Typical Switching Time vs. Collector Current

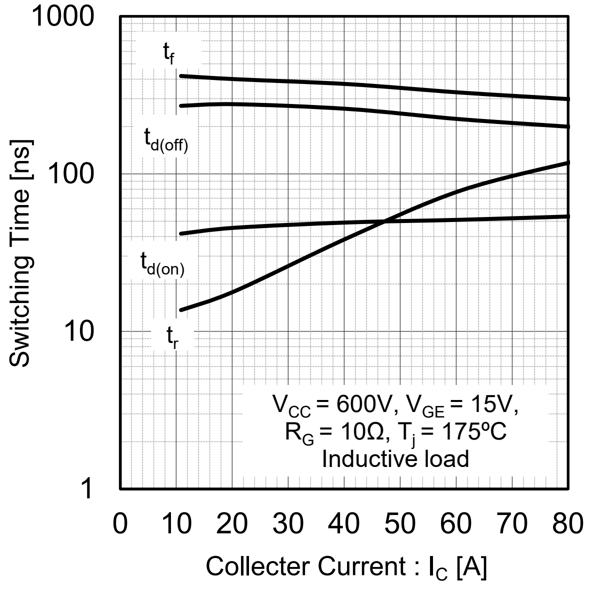
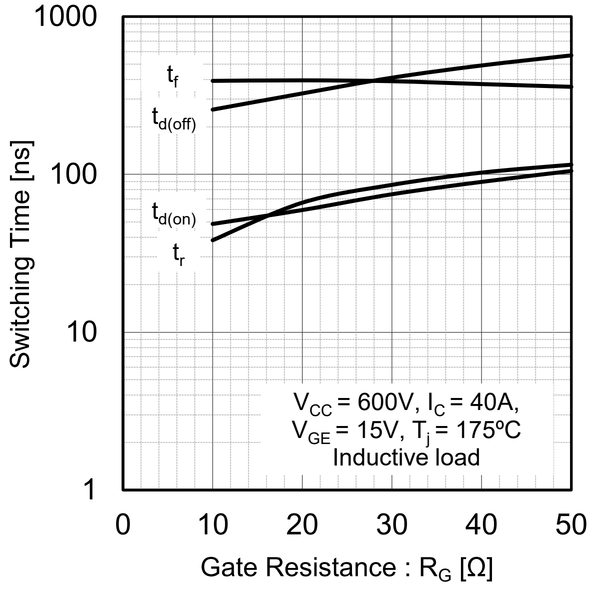


Fig.12 Typical Switching Time vs. Gate Resistance



●Electrical Characteristic Curves

Fig.13 Typical Switching Energy Losses vs. Collector Current

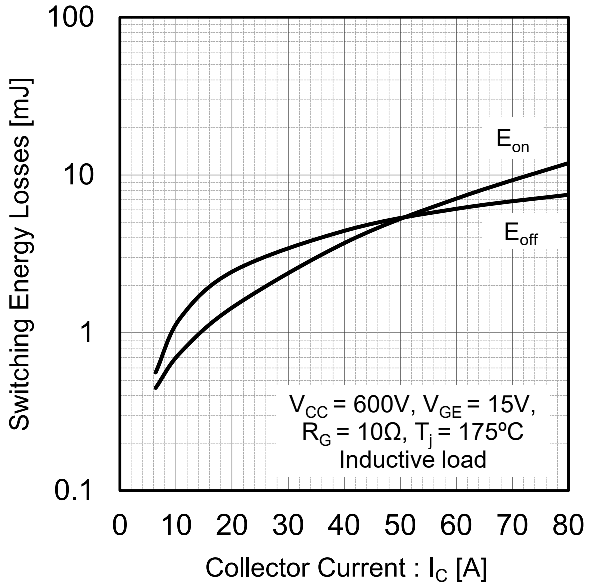


Fig.14 Typical Switching Energy Losses vs. Gate Resistance

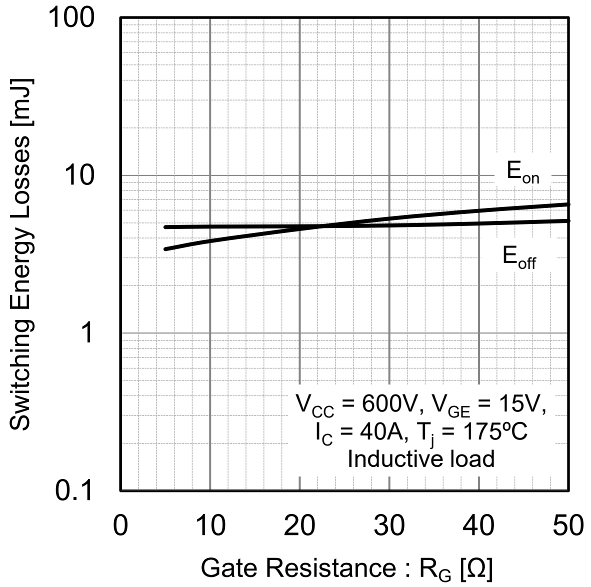


Fig.15 Typical Capacitance vs. Collector To Emitter Voltage

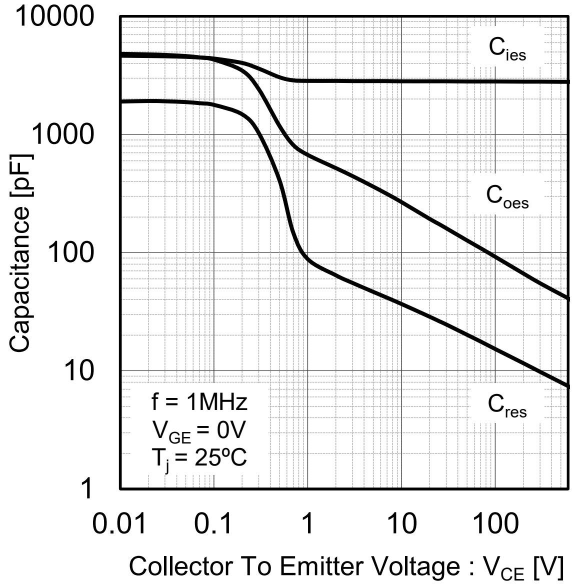
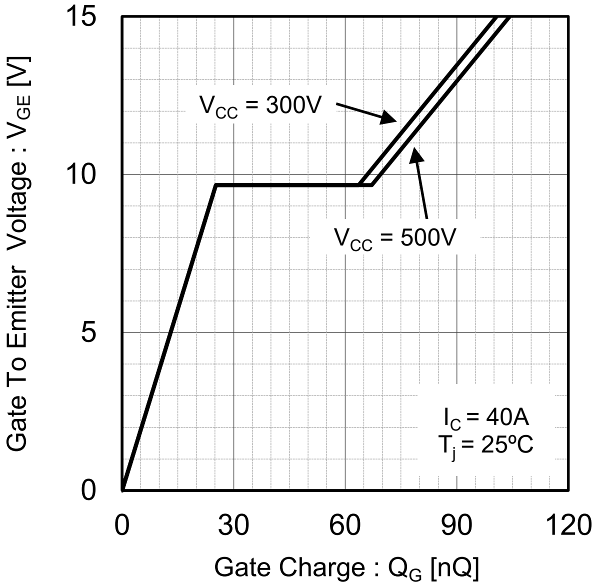


Fig.16 Typical Gate Charge



●Electrical Characteristic Curves

Fig.17 Typical Diode Forward Current vs. Forward Voltage

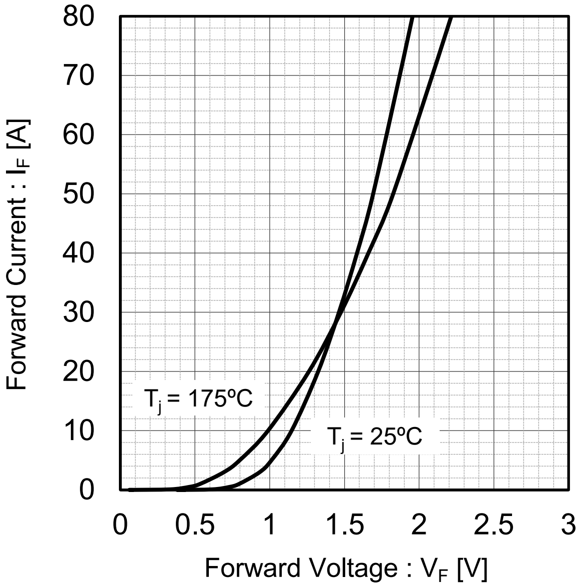


Fig.18 Typical Diode Reverce Recovery Time vs. Forward Current

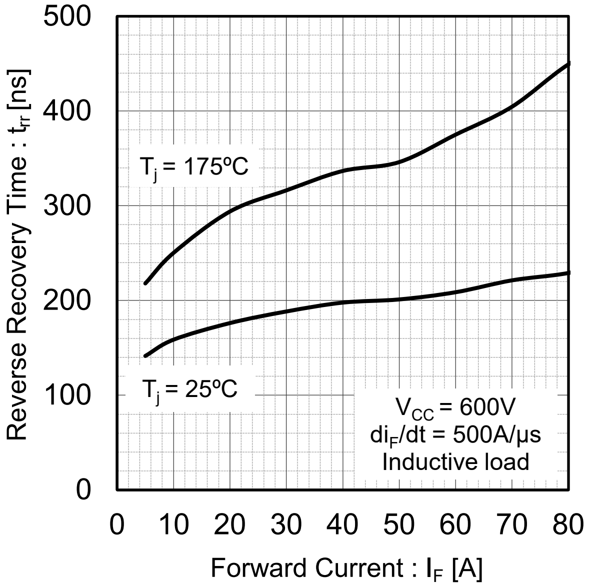


Fig.19 Typical Diode Reverse Recovery Current vs. Forward Current

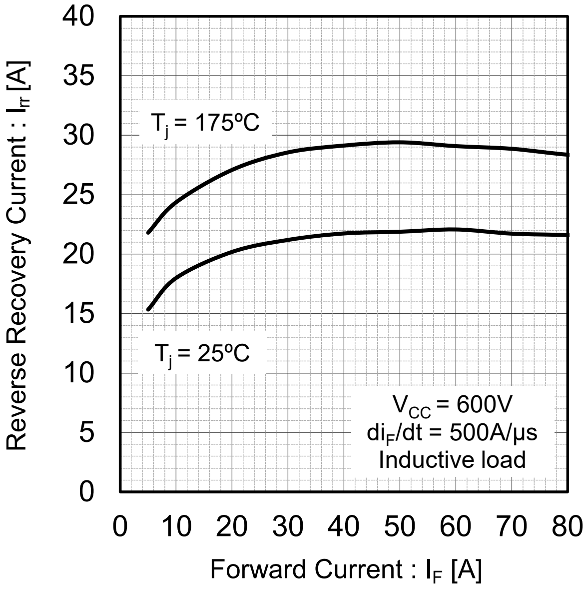
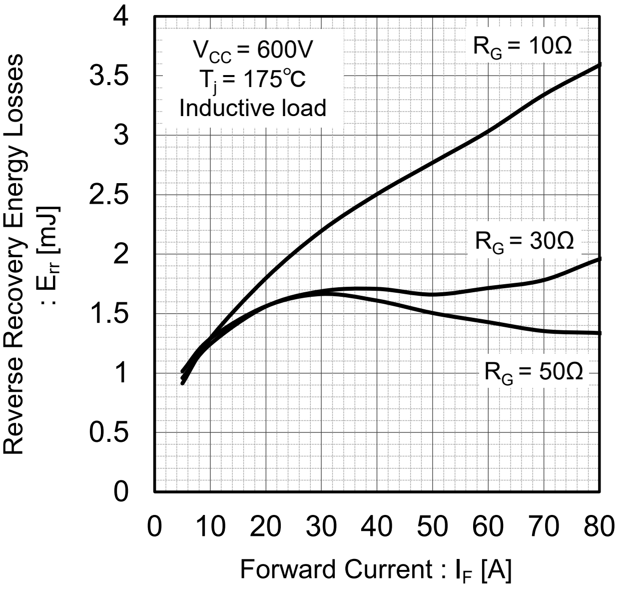
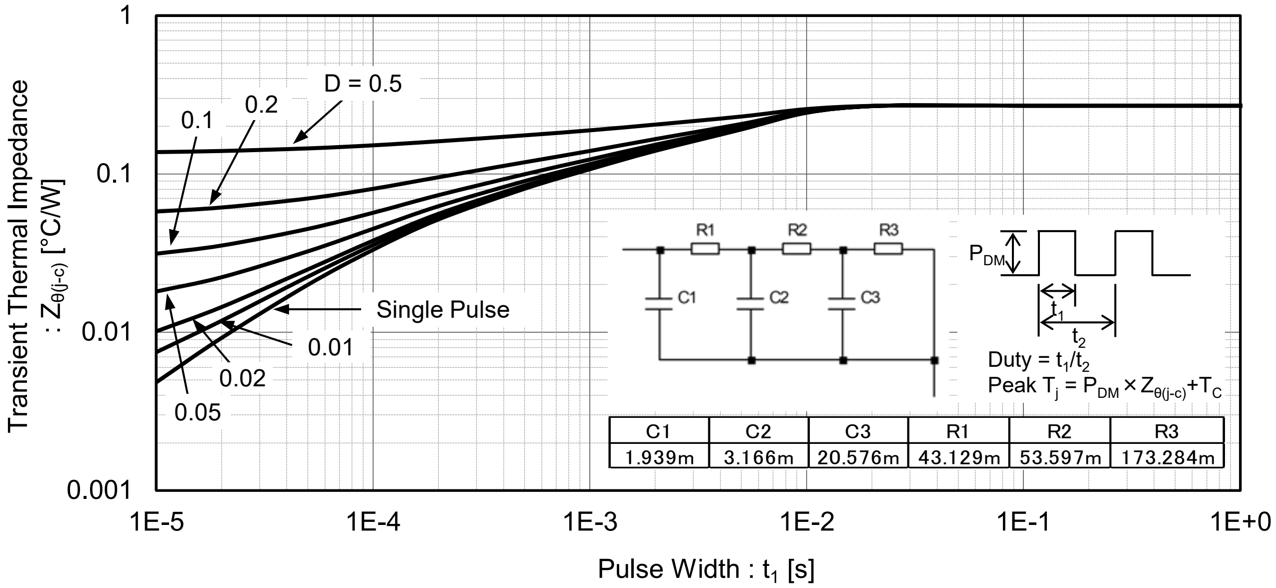


Fig.20 Typical Diode Reverse Recovery Energy Losses vs. Forward Current



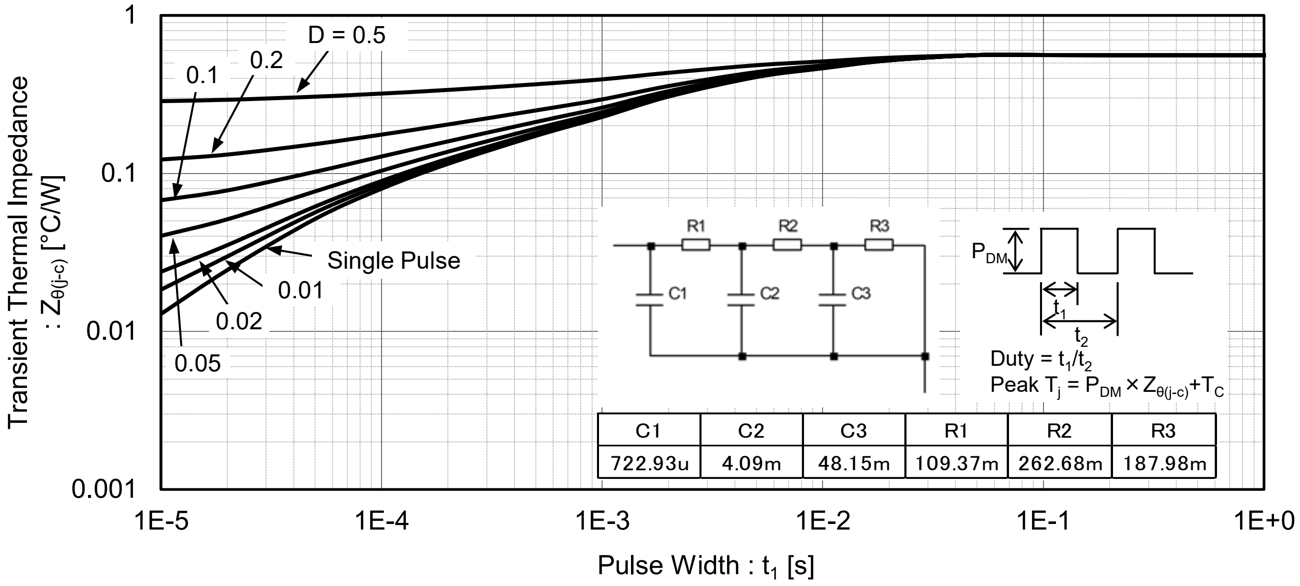
●Electrical Characteristic Curves

Fig.21 IGBT Transient Thermal Impedance



C1	C2	C3	R1	R2	R3
1.939m	3.166m	20.576m	43.129m	53.597m	173.284m

Fig.22 Diode Transient Thermal Impedance



C1	C2	C3	R1	R2	R3
722.93u	4.09m	48.15m	109.37m	262.68m	187.98m

●Inductive Load Switching Circuit and Waveform

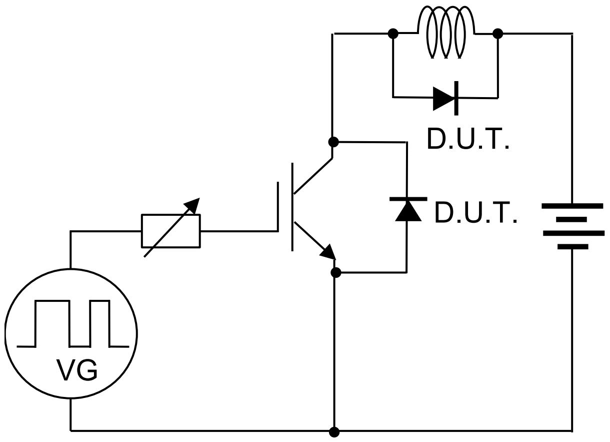


Fig.23 Inductive Load Circuit

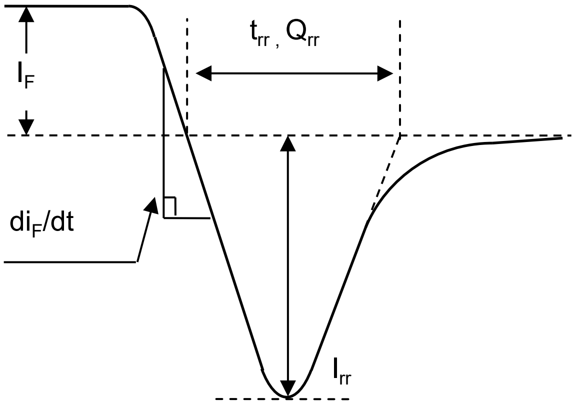


Fig.24 Diode Reverce Recovery Waveform

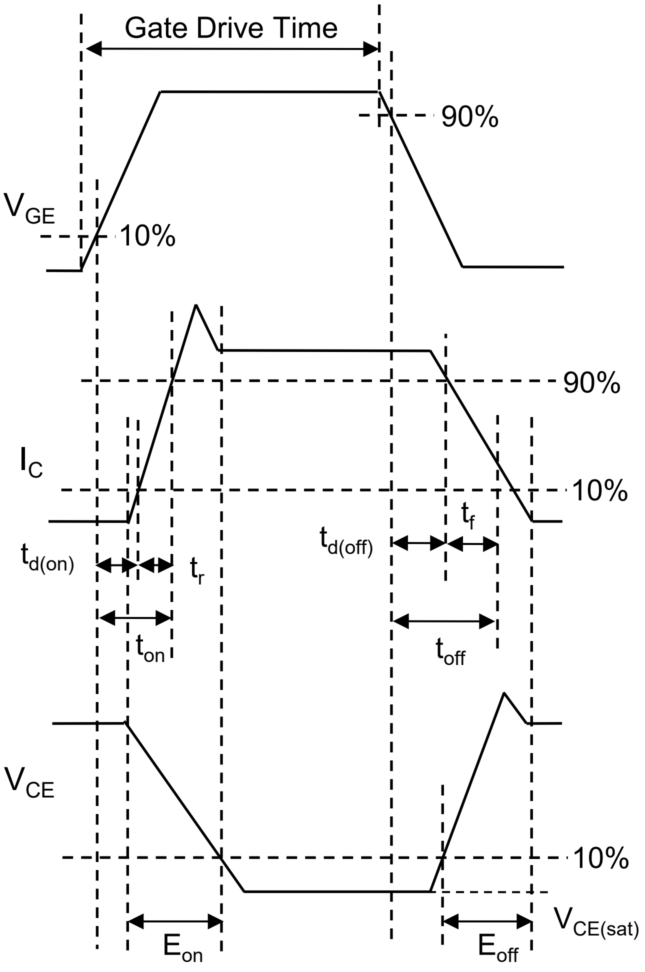


Fig.25 Inductive Load Waveform

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