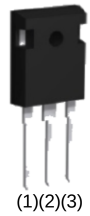
RGS80TS65D

650V 40A Field Stop Trench IGBT Data Sheet

V_{CES}	650V
$I_{C(100°C)}$	40A
$V_{CE(sat)}$ (Typ.)	1.65V
P_D	272W

●Outline

TO-247N



●Features

1) Low Collector - Emitter Saturation Voltage

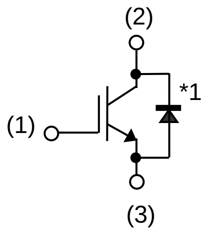
2) Short Circuit Withstand Time 8μs

3) Qualified to AEC-Q101

4) Built in Very Fast & Soft Recovery FRD

5) Pb - free Lead Plating ; RoHS Compliant

●Inner Circuit



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

*1 Built in FRD

●Applications

General Inverter
for Automotive and Industrial Use

●Packaging Specifications

Type	Packaging	Tube
	Reel Size (mm)	-
	Tape Width (mm)	-
	Basic Ordering Unit (pcs)	450
	Packing Code	C11
	Marking	RGS80TS65D

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

Parameter		Symbol	Value	Unit
Collector - Emitter Voltage		V_{CES}	650	V
Gate - Emitter Voltage		V_{GES}	±30	V
Collector Current	T_C = 25°C	I_C	73	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	56	A
	T_C = 100°C	I_F	30	A
Diode Pulsed Forward Current		I_{FP} *1	120	A
Power Dissipation	T_C = 25°C	P_D	272	W
	T_C = 100°C	P_D	136	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	$R_{\theta(j\text{-}c)}$	-	-	0.55	°C/W
Thermal Resistance Diode Junction - Case	$R_{\theta(j\text{-}c)}$	-	-	1.17	°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	650	-	-	V
Collector Cut - off Current	I_{CES}	V_{CE} = 650V, V_{GE} = 0V T_j = 25°C T_j = 175°C	- -	- -	10 5	μA mA
Gate - Emitter Leakage Current	I_{GES}	V_{GE} = ±30V, V_{CE} = 0V	-	-	±200	nA
Gate - Emitter Threshold Voltage	$V_{GE(th)}$	V_{CE} = 5V, I_C = 2.0mA	5.0	6.0	7.0	V
Collector - Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 40A, V_{GE} = 15V T_j = 25°C T_j = 175°C	- -	1.65 2.15	2.10 -	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	-	1240	-	pF
Output Capacitance	C_{oes}	V_{GE} = 0V	-	103	-	
Reverse Transfer Capacitance	C_{res}	f = 1MHz	-	16	-	
Total Gate Charge	Q_g	V_{CE} = 300V	-	48	-	nC
Gate - Emitter Charge	Q_{ge}	I_C = 40A	-	12	-	
Gate - Collector Charge	Q_{gc}	V_{GE} = 15V	-	19	-	
Turn - on Delay Time	$t_{d(on)}$	I_C = 40A, V_{CC} = 400V	-	37	-	ns
Rise Time	t_r	V_{GE} = 15V, R_G = 10Ω	-	17	-	
Turn - off Delay Time	$t_{d(off)}$	T_j = 25°C	-	112	-	
Fall Time	t_f	Inductive Load	-	96	-	
Turn - on Switching Loss	E_{on}	*E_{on} includes diode	-	1.05	-	mJ
Turn - off Switching Loss	E_{off}	reverse recovery	-	1.03	-	
Turn - on Delay Time	$t_{d(on)}$	I_C = 40A, V_{CC} = 400V	-	34	-	ns
Rise Time	t_r	V_{GE} = 15V, R_G = 10Ω	-	28	-	
Turn - off Delay Time	$t_{d(off)}$	T_j = 175°C	-	141	-	
Fall Time	t_f	Inductive Load	-	150	-	
Turn - on Switching Loss	E_{on}	*E_{on} includes diode	-	1.43	-	mJ
Turn - off Switching Loss	E_{off}	reverse recovery	-	1.47	-	
Reverse Bias Safe Operating Area	RBSOA	I_C = 120A, V_{CC} = 520V V_P = 650V, V_{GE} = 15V R_G = 50Ω, T_j = 175°C	FULL SQUARE			-
Short Circuit Withstand Time	t_{sc}	V_{CC} ≦ 360V V_{GE} = 15V, T_j = 25°C	8	-	-	μs
Short Circuit Withstand Time	t_{sc} *2	V_{CC} ≦ 360V V_{GE} = 15V, T_j = 150°C	6	-	-	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 = 30A T_j = 25°C T_j = 175°C	- -	1.45 1.55	1.90 -	V
Diode Reverse Recovery Time	t_{rr}	I_F = 30A V_{CC} = 400V di_F/dt = 200A/μs T_j = 25°C	-	103	-	ns
Diode Peak Reverse Recovery Current	I_{rr}		-	7.1	-	A
Diode Reverse Recovery Charge	Q_{rr}		-	0.4	-	μC
Diode Reverse Recovery Energy	E_{rr}		-	15	-	μJ
Diode Reverse Recovery Time	t_{rr}	I_F = 30A V_{CC} = 400V di_F/dt = 200A/μs T_j = 175°C	-	242	-	ns
Diode Peak Reverse Recovery Current	I_{rr}		-	9.8	-	A
Diode Reverse Recovery Charge	Q_{rr}		-	1.3	-	μC
Diode Reverse Recovery Energy	E_{rr}		-	113	-	μJ

●Electrical Characteristic Curves

Fig.1 Power Dissipation vs. Case Temperature

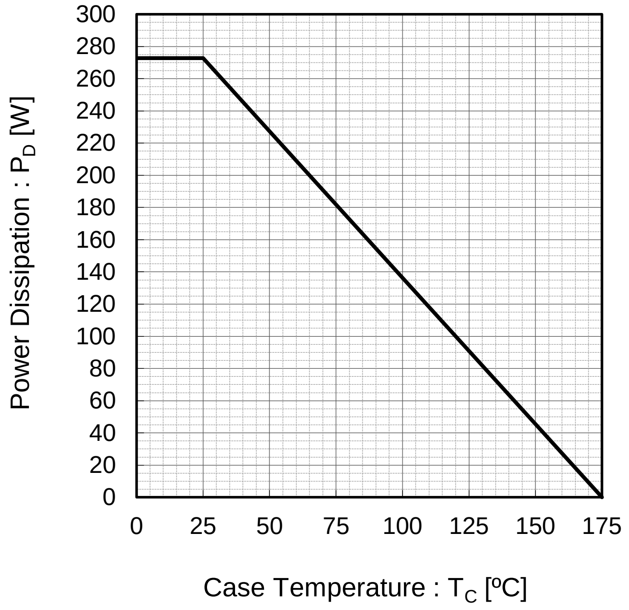


Fig.2 Collector Current vs. Case Temperature

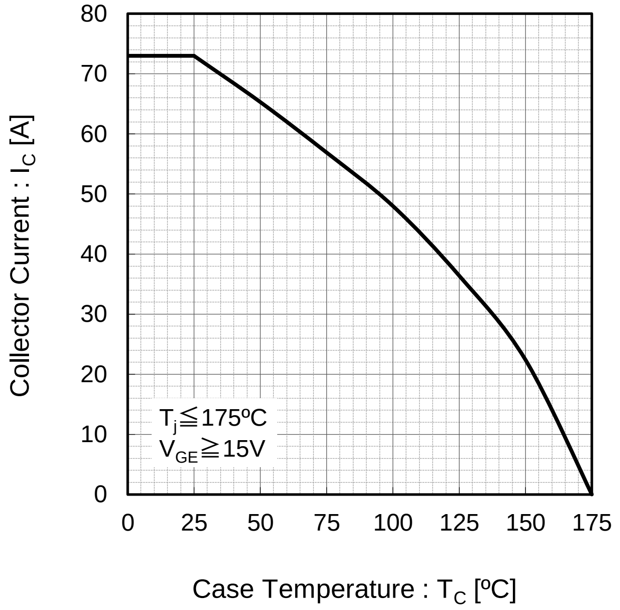


Fig.3 Forward Bias Safe Operating Area

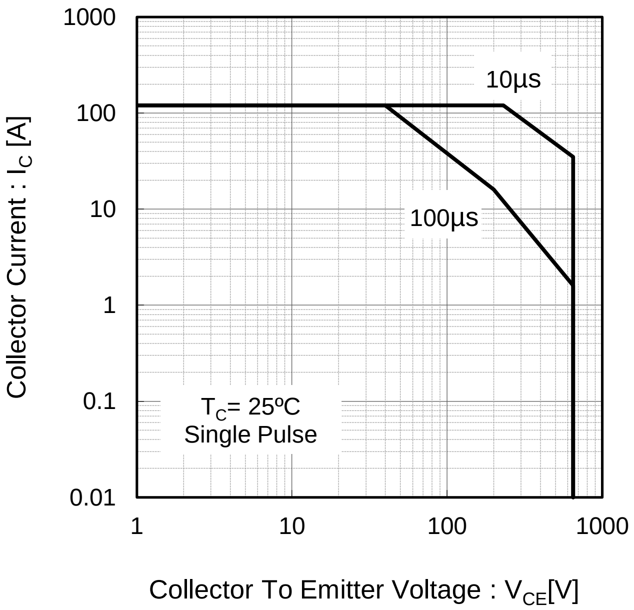
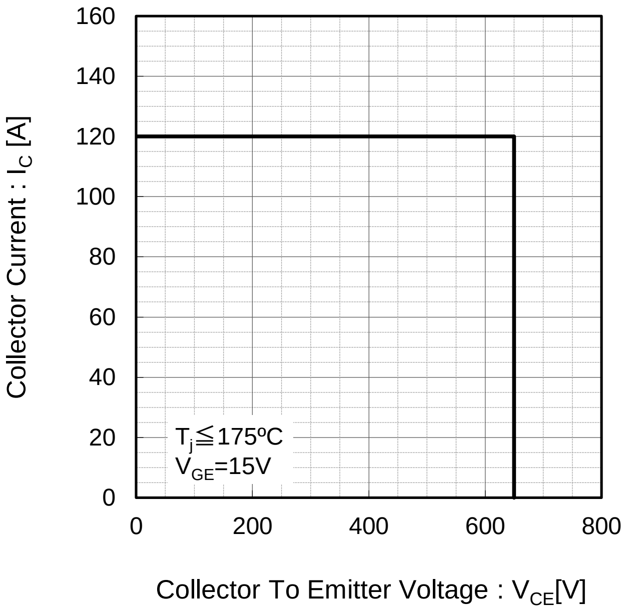


Fig.4 Reverse Bias Safe Operating Area



●Electrical Characteristic Curves

Fig.5 Typical Output Characteristics

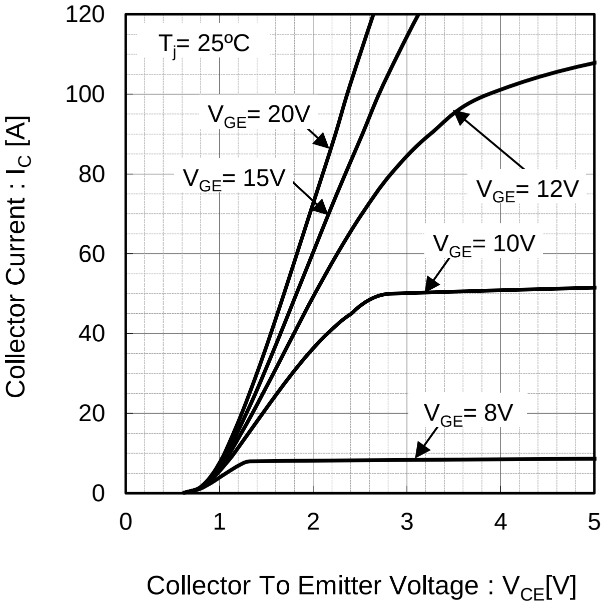


Fig.6 Typical Output Characteristics

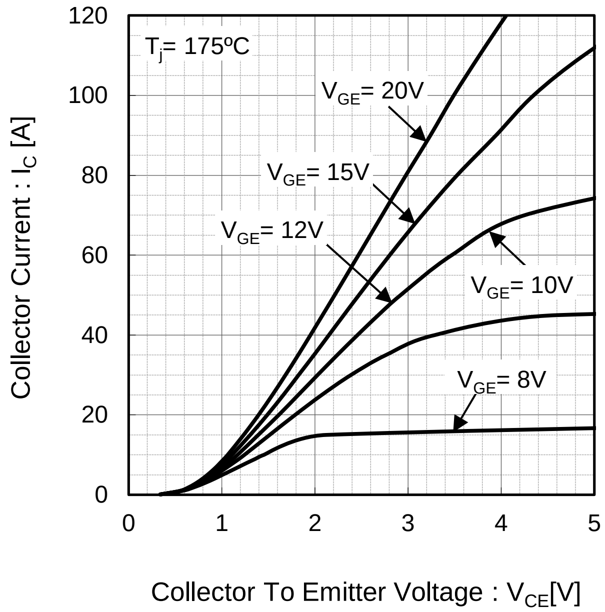


Fig.7 Typical Transfer Characteristics

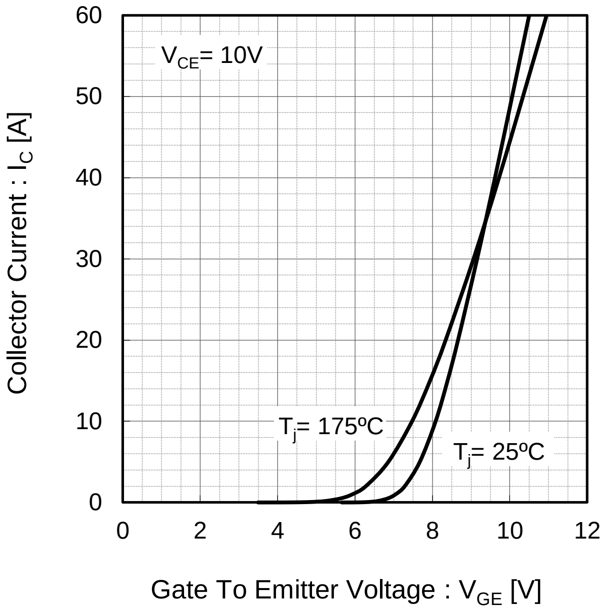
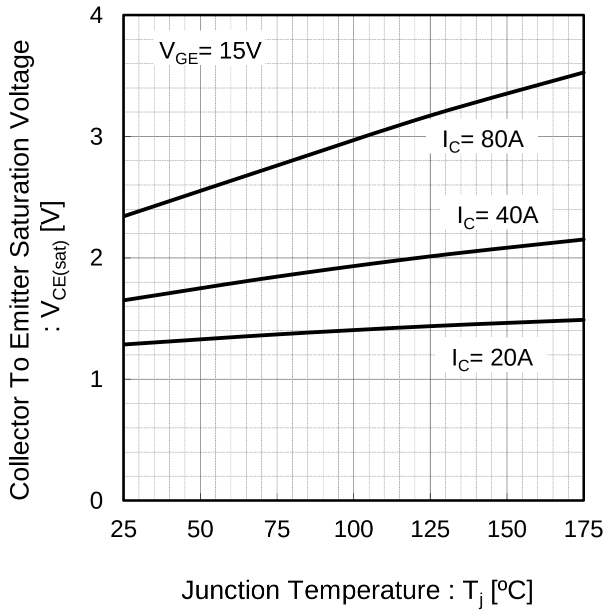


Fig.8 Typical Collector To Emitter Saturation Voltage vs. Junction Temperature



●Electrical Characteristic Curves

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

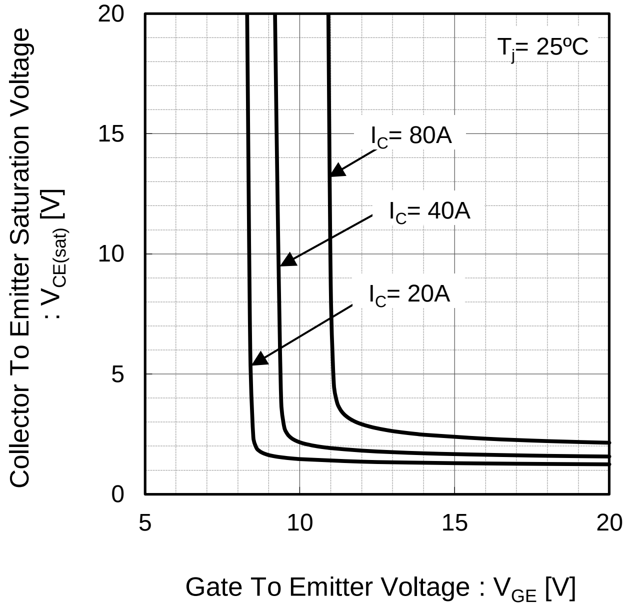


Fig.10 Typical Collector To Emitter Saturation Voltage vs. Gate To Emitter Voltage

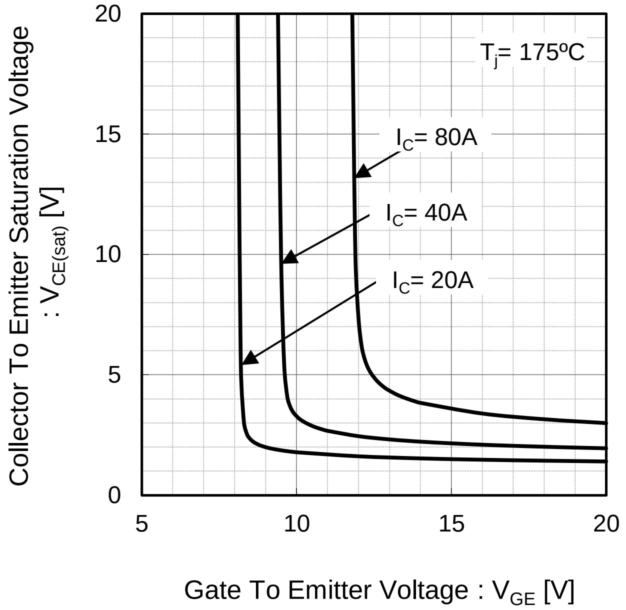


Fig.11 Typical Switching Time vs. Collector Current

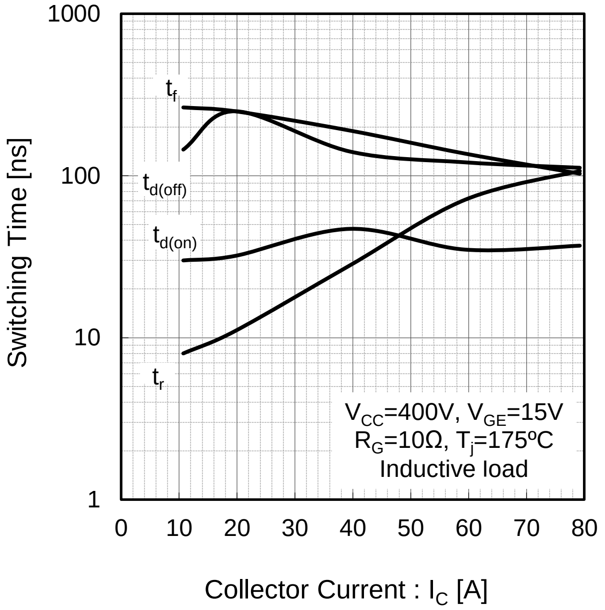
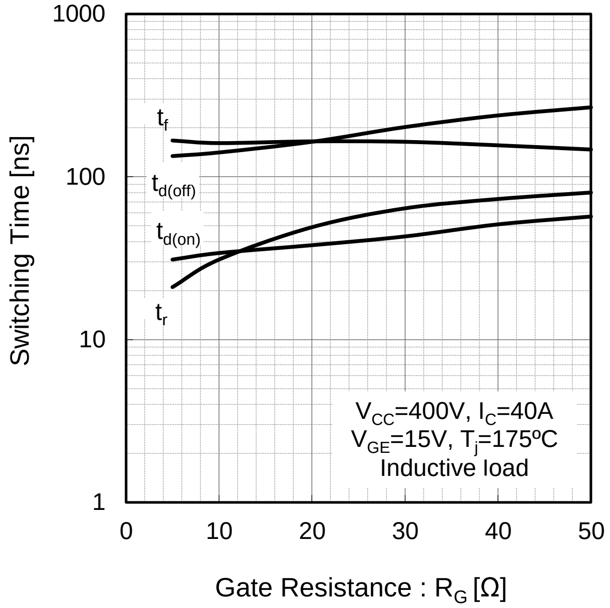


Fig.12 Typical Switching Time vs. Gate Resistance



●Electrical Characteristic Curves

Fig.13 Typical Switching Energy Losses vs. Collector Current

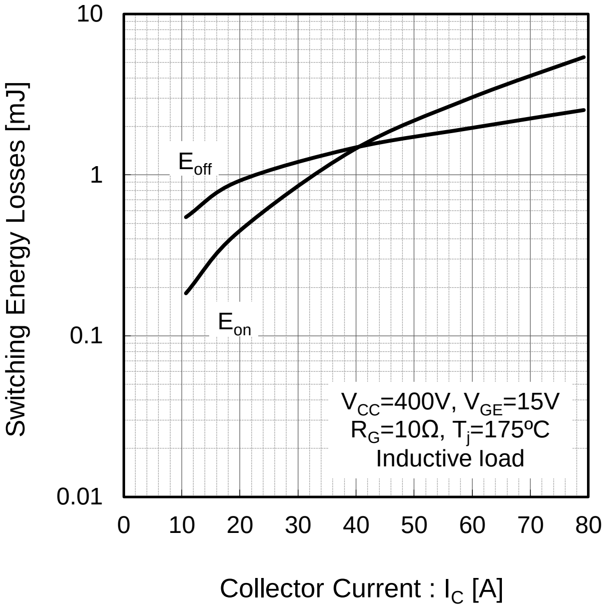


Fig.14 Typical Switching Energy Losses vs. Gate Resistance

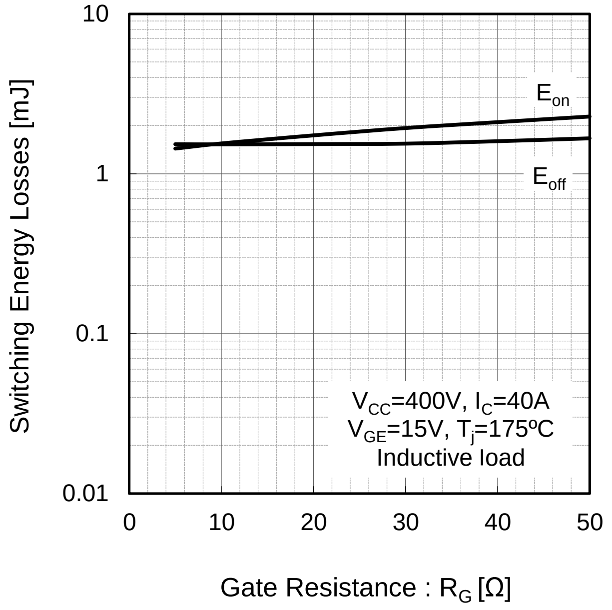


Fig.15 Typical Capacitance vs. Collector To Emitter Voltage

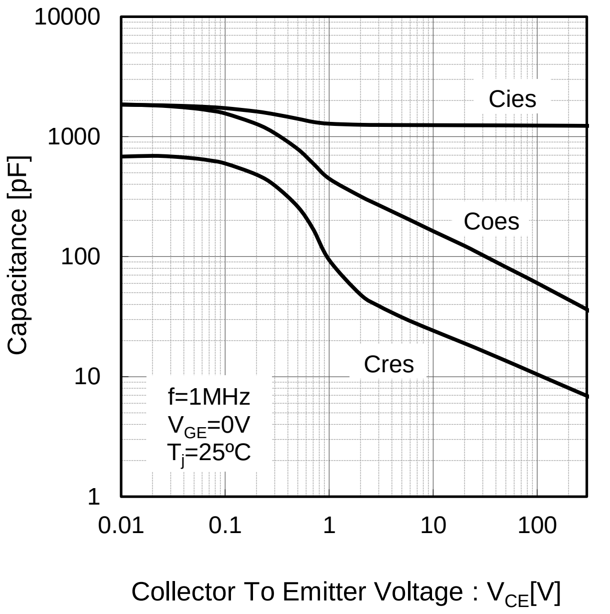
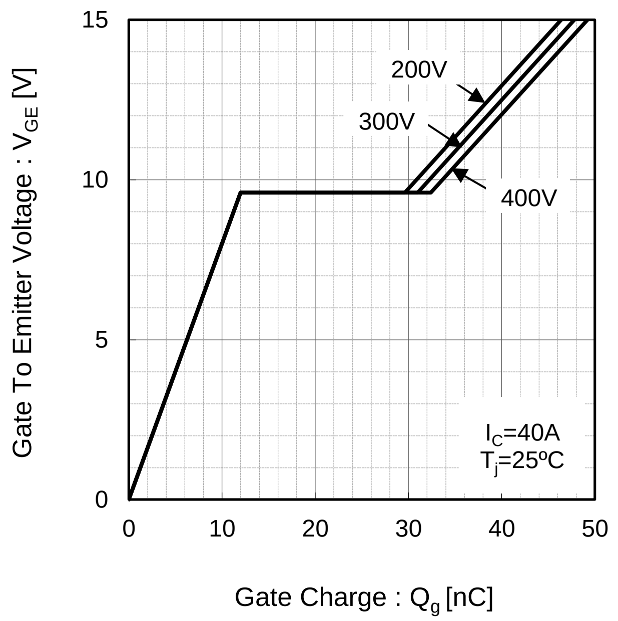


Fig.16 Typical Gate Charge



●Electrical Characteristic Curves

Fig.17 Typical Diode Forward Current vs. Forward Voltage

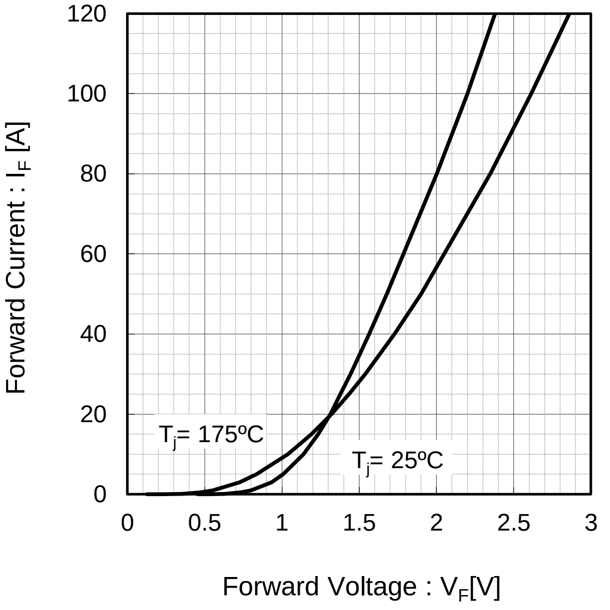


Fig.18 Typical Diode Reverse Recovery Time vs. Forward Current

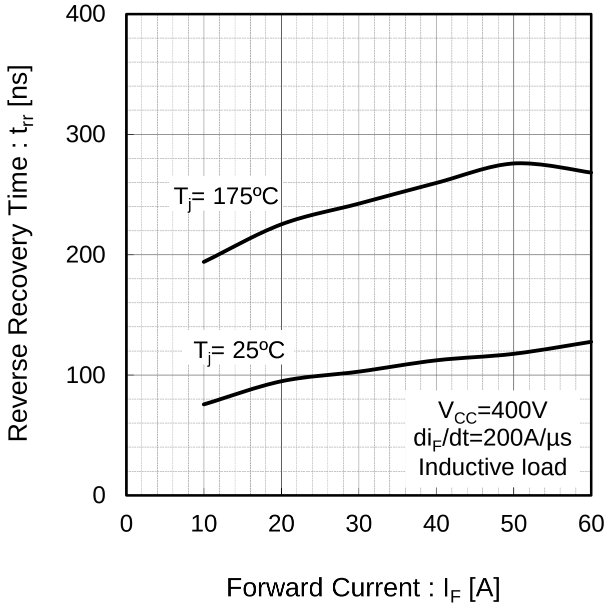


Fig.19 Typical Diode Reverse Recovery Current vs. Forward Current

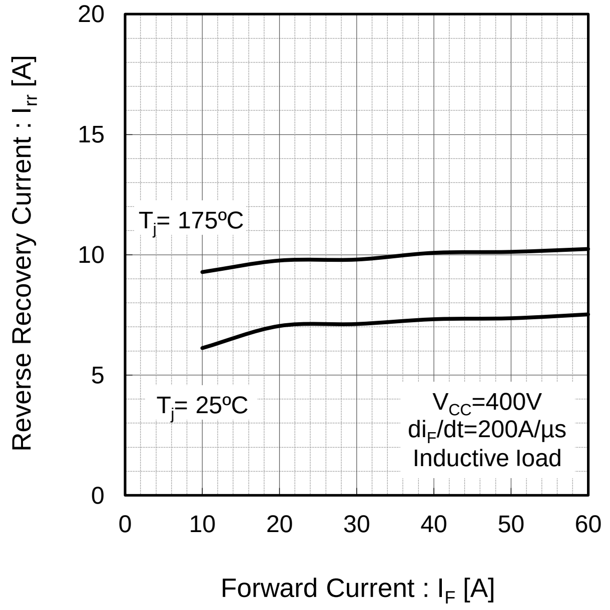
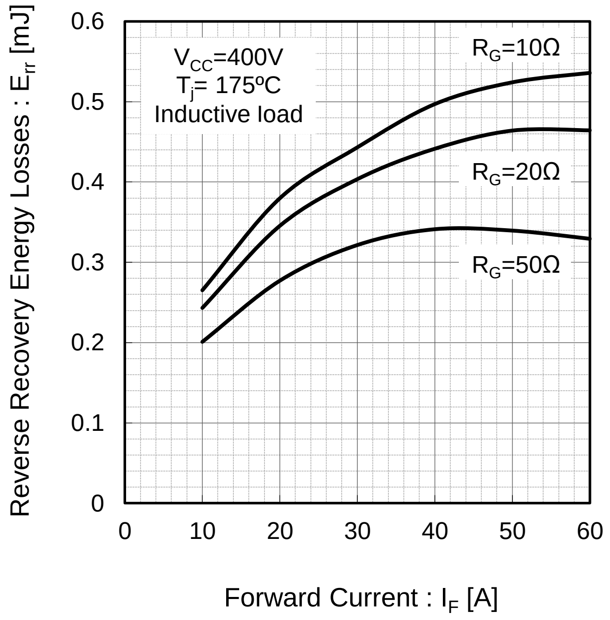


Fig.20 Typical Diode Reverse Recovery Energy Losses vs. Forward Current



●**Electrical Characteristic Curves**

Fig.21 IGBT Transient Thermal Impedance

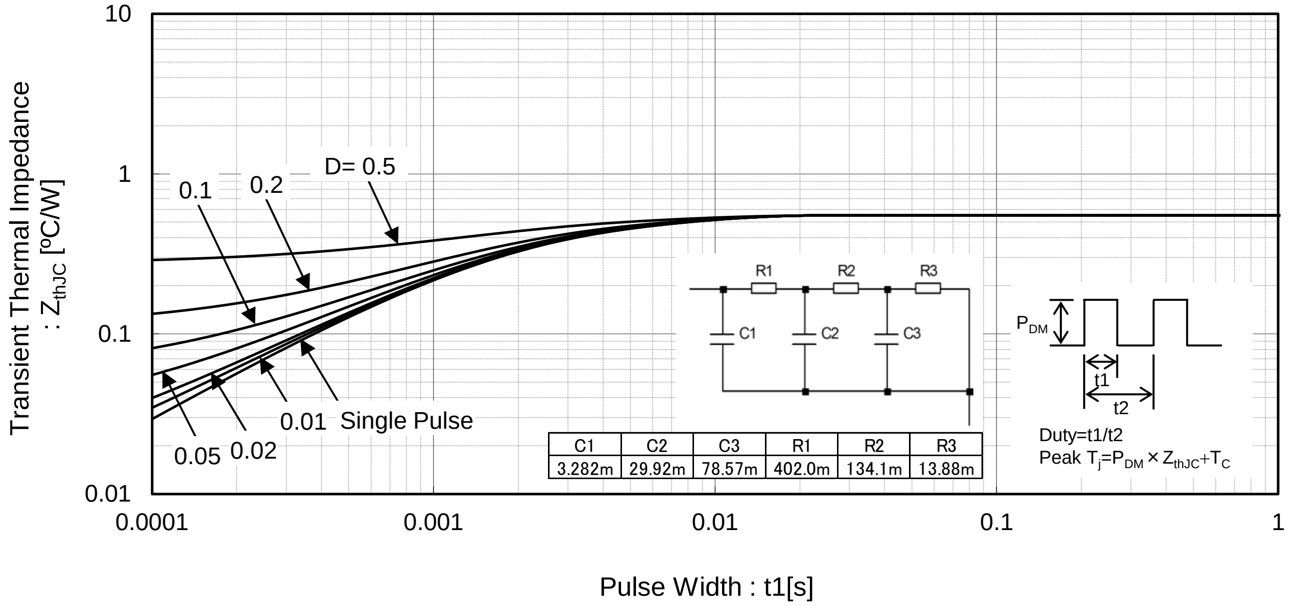
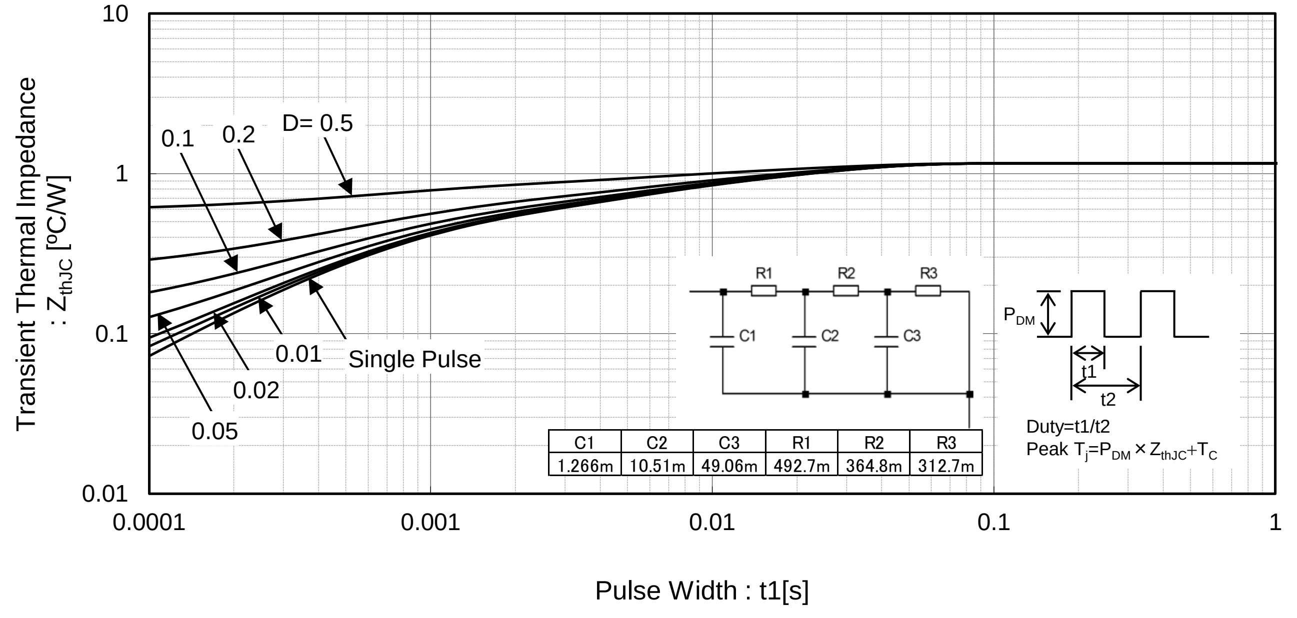


Fig.22 Diode Transient Thermal Impedance



●Inductive Load Switching Circuit and Waveform

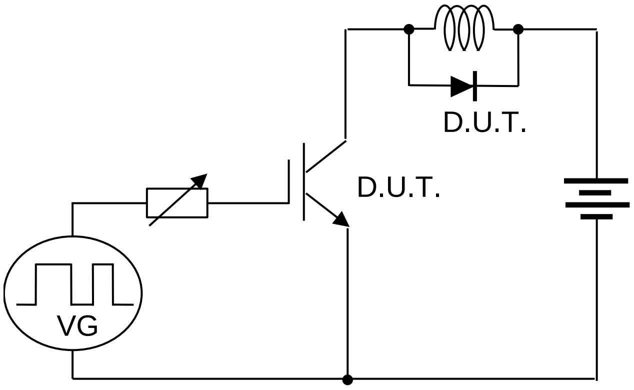


Fig.23 Inductive Load Circuit

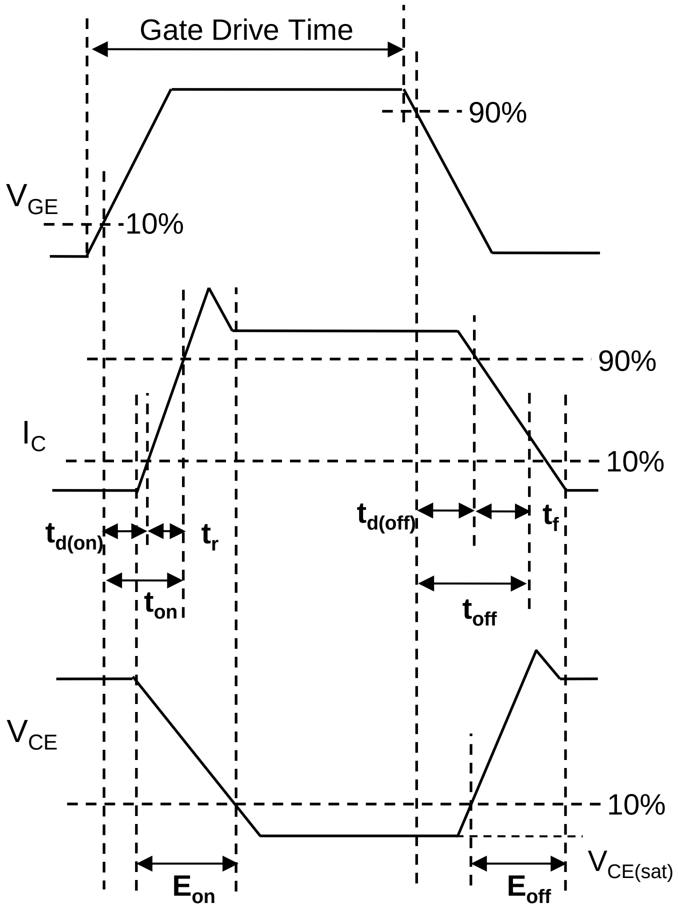


Fig.24 Inductive Load Waveform

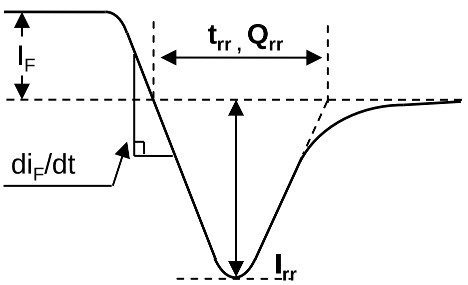


Fig.25 Diode Reverce Recovery Waveform

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RGS80TS65DHR - Web Page

Part Number	RGS80TS65DHR
Package	TO-247N
Unit Quantity	450
Minimum Package Quantity	30
Packing Type	Tube
Constitution Materials List	inquiry
RoHS	Yes