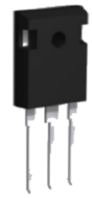
RGTH80TS65D

650V 40A Field Stop Trench IGBT Data Sheet

V_{CES}	650V
$I_{C(100°C)}$	40A
$V_{CE(sat)}$ (Typ.)	1.6V
P_D	234W

●Outline

TO-247N



●Features

1) Low Collector - Emitter Saturation Voltage

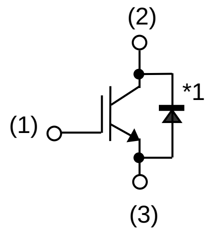
2) High Speed Switching

3) Low Switching Loss & Soft Switching

4) Built in Very Fast & Soft Recovery FRD (RFN - Series)

5) Pb - free Lead Plating ; RoHS Compliant

●Inner Circuit



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

*1 Built in FRD

●Applications

PFC

UPS

Power Conditioner

IH

●Packaging Specifications

Type	Packaging	Tube
	Reel Size (mm)	-
	Tape Width (mm)	-
	Basic Ordering Unit (pcs)	450
	Taping Code	C11
	Marking	RGTH80TS65D

●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	70	A
	T_C = 100°C	I_C	40	A
Pulsed Collector Current		I_{CP} *1	160	A
Diode Forward Current	T_C = 25°C	I_F	40	A
	T_C = 100°C	I_F	20	A
Diode Pulsed Forward Current		I_{FP} *1	160	A
Power Dissipation	T_C = 25°C	P_D	234	W
	T_C = 100°C	P_D	117	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	$R_{\theta(j-c)}$	-	-	0.64	°C/W
Thermal Resistance Diode Junction - Case	$R_{\theta(j-c)}$	-	-	2.00	°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	-	-	10	μA
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 = 27.6mA	4.5	5.5	6.5	V
Collector - Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 40A, V_{GE} = 15V				V
		T_j = 25°C	-	1.6	2.1	
		T_j = 175°C	-	2.1	-	

● **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	-	2210	-	pF
Output Capacitance	C_{oes}	V_{GE} = 0V	-	85	-	
Reverse Transfer Capacitance	C_{res}	f = 1MHz	-	35	-	
Total Gate Charge	Q_g	V_{CE} = 300V	-	79	-	nC
Gate - Emitter Charge	Q_{ge}	I_C = 40A	-	21	-	
Gate - Collector Charge	Q_{gc}	V_{GE} = 15V	-	29	-	
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	-	50	-	
Turn - off Delay Time	$t_{d(off)}$	T_j = 25°C	-	120	-	
Fall Time	t_f	Inductive Load	-	47	-	
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	-	50	-	
Turn - off Delay Time	$t_{d(off)}$	T_j = 175°C	-	135	-	
Fall Time	t_f	Inductive Load	-	59	-	
Reverse Bias Safe Operating Area	RBSOA	I_C = 160A, V_{CC} = 520V V_P = 650V, V_{GE} = 15V R_G = 60Ω, T_j = 175°C	FULL SQUARE			-

●**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 = 20A T_j = 25°C T_j = 175°C	- -	1.35 1.15	1.8 -	V
Diode Reverse Recovery Time	t_{rr}	I_F = 20A V_{CC} = 400V di_F/dt = 200A/μs T_j = 25°C	-	58	-	ns
Diode Peak Reverse Recovery Current	I_{rr}		-	6.5	-	A
Diode Reverse Recovery Charge	Q_{rr}		-	0.21	-	μC
Diode Reverse Recovery Time	t_{rr}	I_F = 20A V_{CC} = 400V di_F/dt = 200A/μs T_j = 175°C	-	236	-	ns
Diode Peak Reverse Recovery Current	I_{rr}		-	10.7	-	A
Diode Reverse Recovery Charge	Q_{rr}		-	1.36	-	μC

●Electrical Characteristic Curves

Fig.1 Power Dissipation vs. Case Temperature

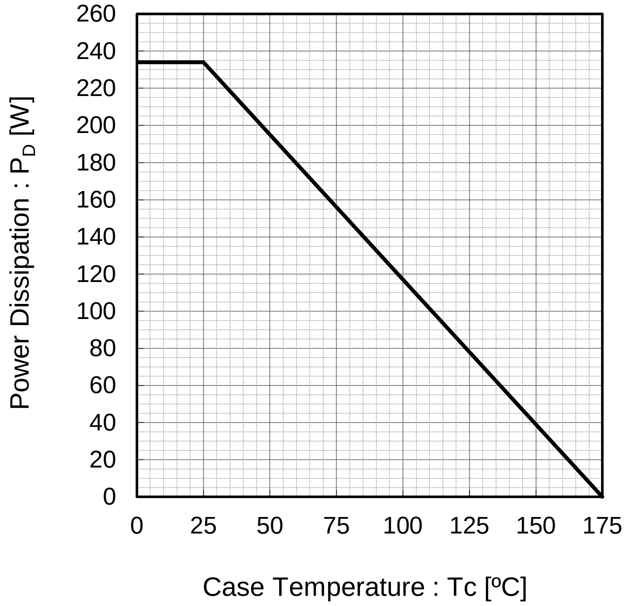


Fig.2 Collector Current vs. Case Temperature

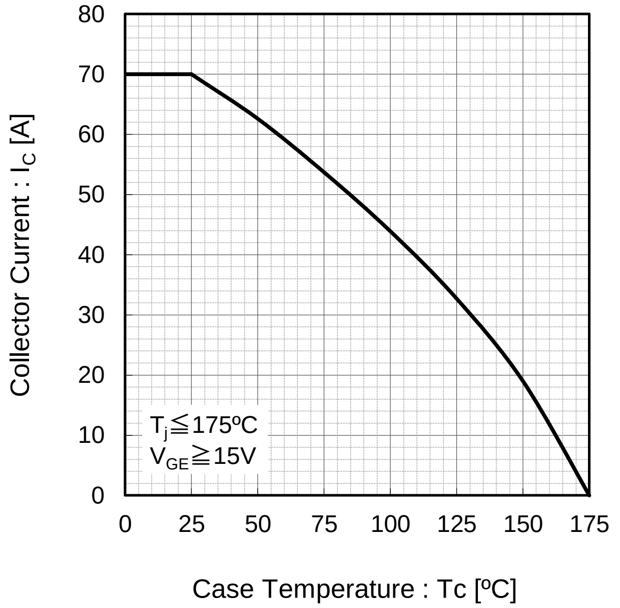


Fig.3 Forward Bias Safe Operating Area

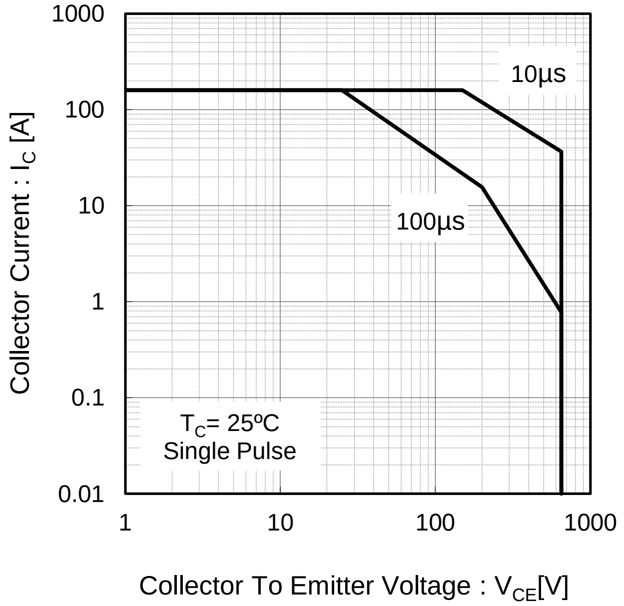
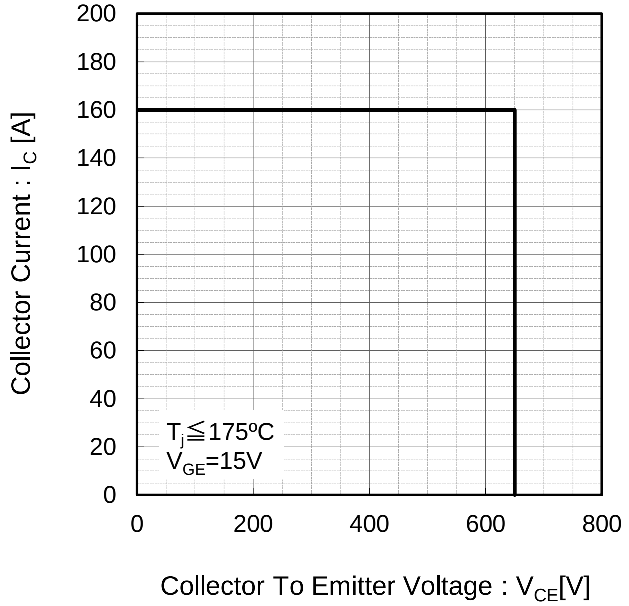


Fig.4 Reverse Bias Safe Operating Area



●Electrical Characteristic Curves

Fig.5 Typical Output Characteristics

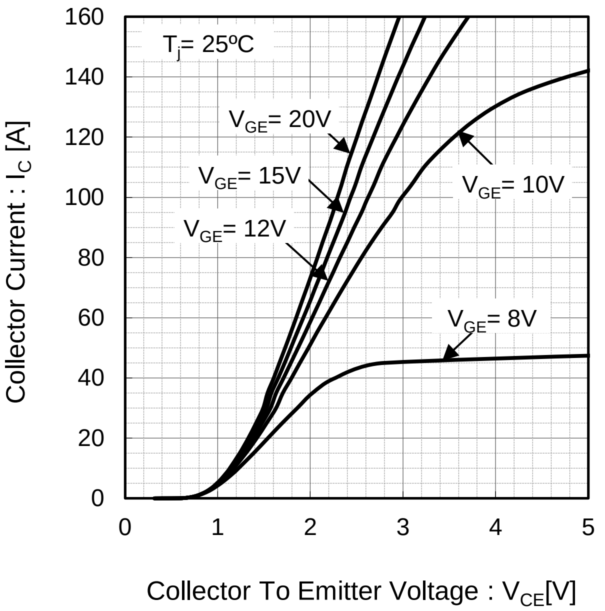


Fig.6 Typical Output Characteristics

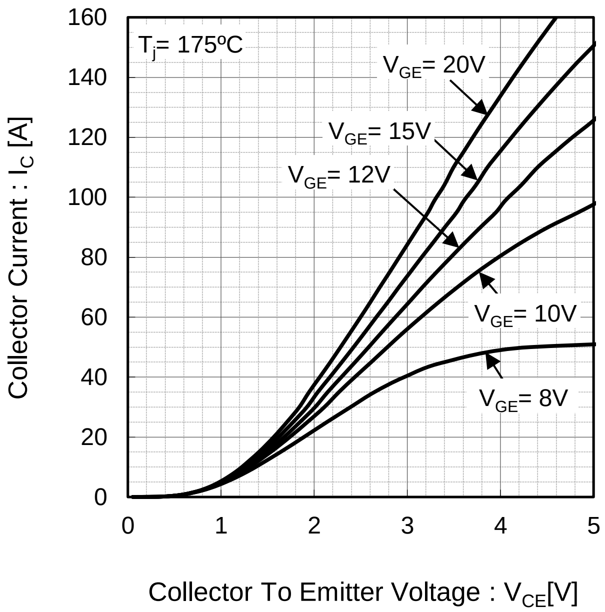


Fig.7 Typical Transfer Characteristics

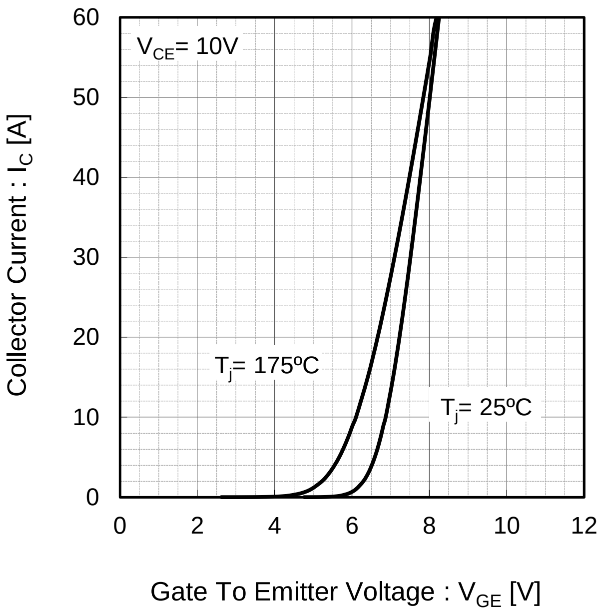
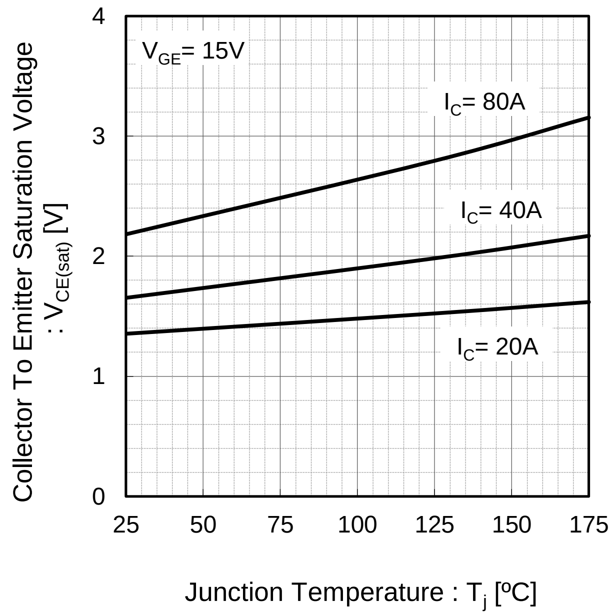


Fig.8 Typical Collector To Emitter Saturation Voltage vs. Junction Temperature



●Electrical Characteristic Curves

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

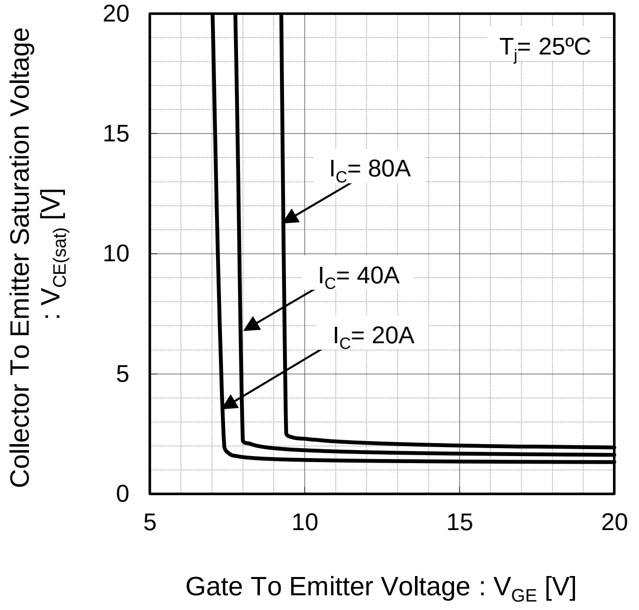


Fig.10 Typical Collector To Emitter Saturation Voltage vs. Gate To Emitter Voltage

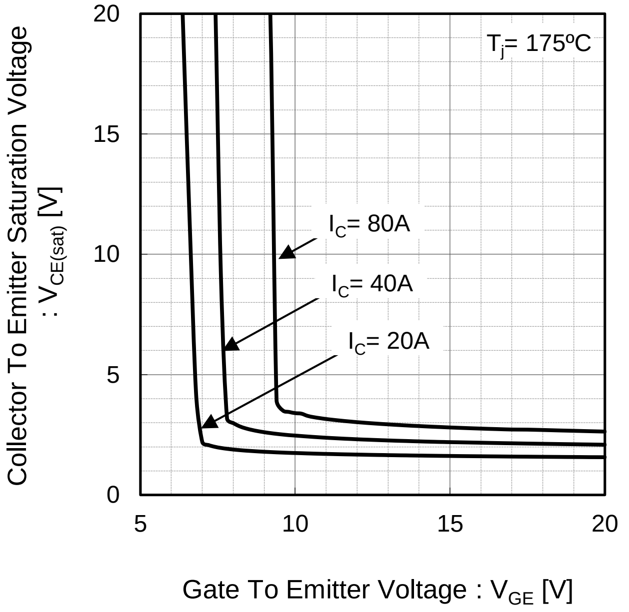


Fig.11 Typical Switching Time vs. Collector Current

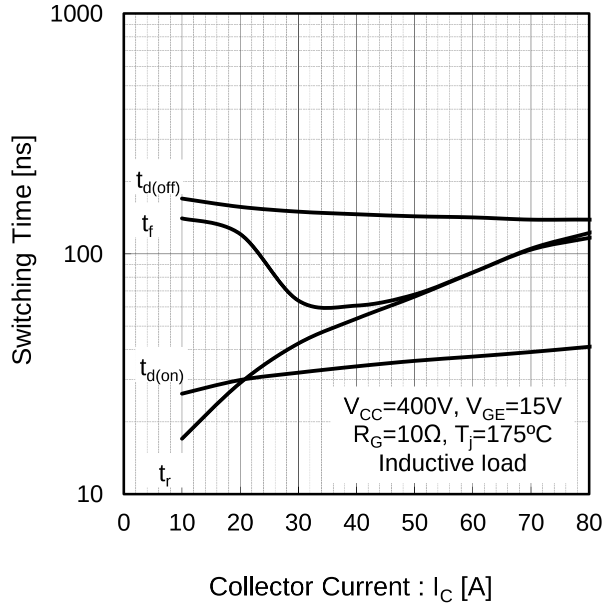
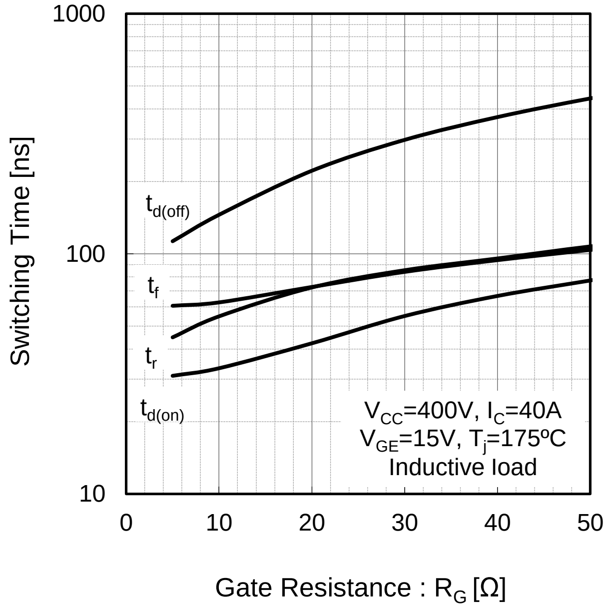


Fig.12 Typical Switching Time vs. Gate Resistance



●Electrical Characteristic Curves

Fig.13 Typical Switching Energy Losses vs. Collector Current

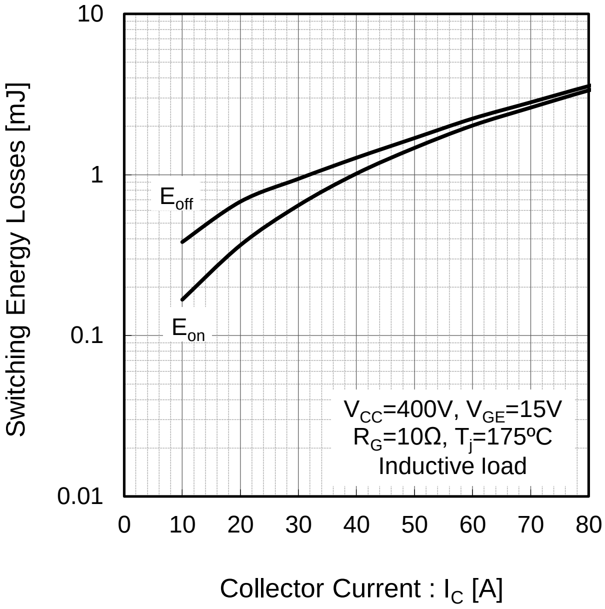


Fig.14 Typical Switching Energy Losses vs. Gate Resistance

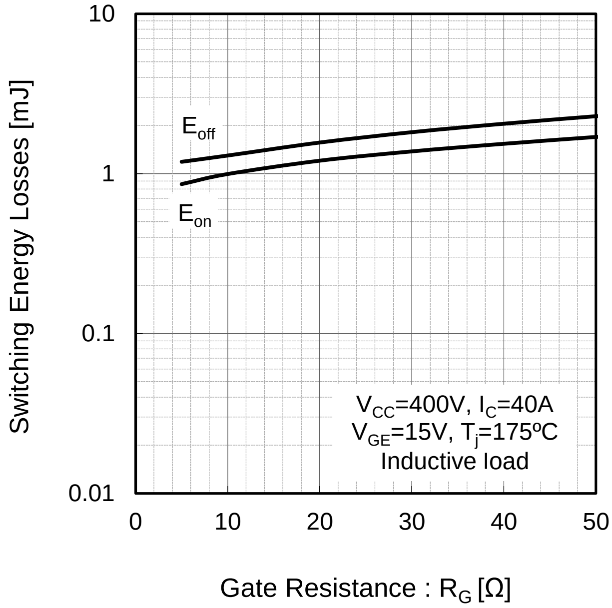


Fig.15 Typical Capacitance vs. Collector To Emitter Voltage

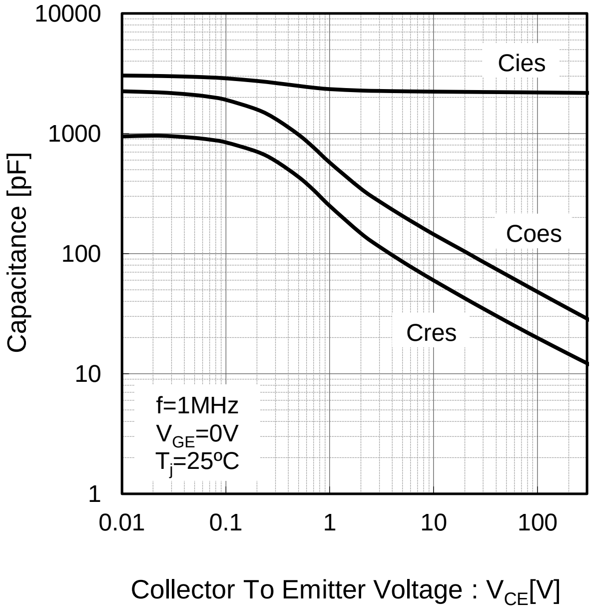
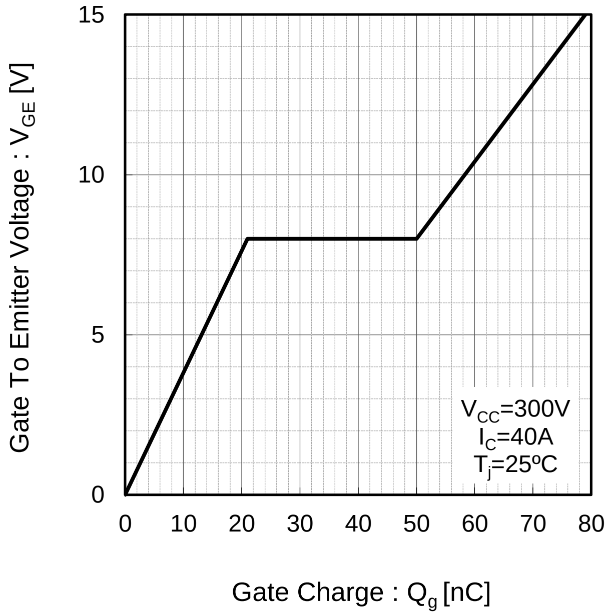


Fig.16 Typical Gate Charge



●Electrical Characteristic Curves

Fig.17 Typical Diode Forward Current vs. Forward Voltage

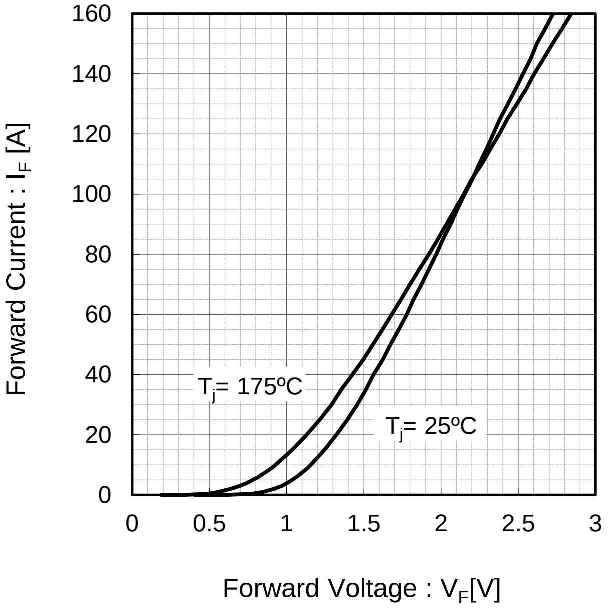


Fig.18 Typical Diode Reverse Recovery Time vs. Forward Current

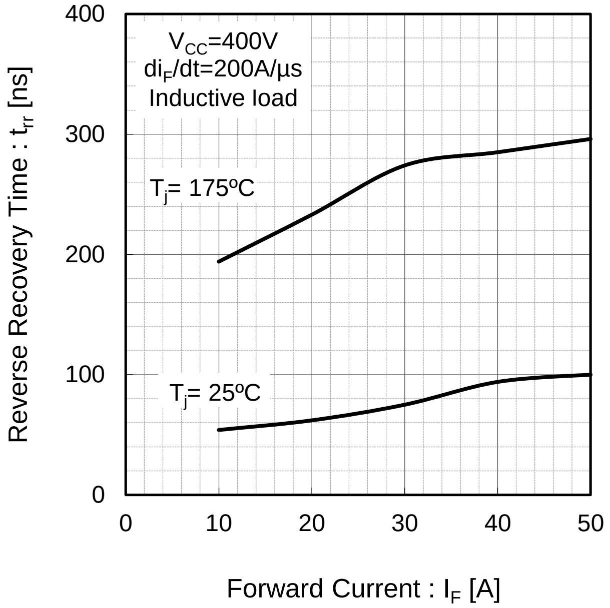


Fig.19 Typical Diode Reverse Recovery Current vs. Forward Current

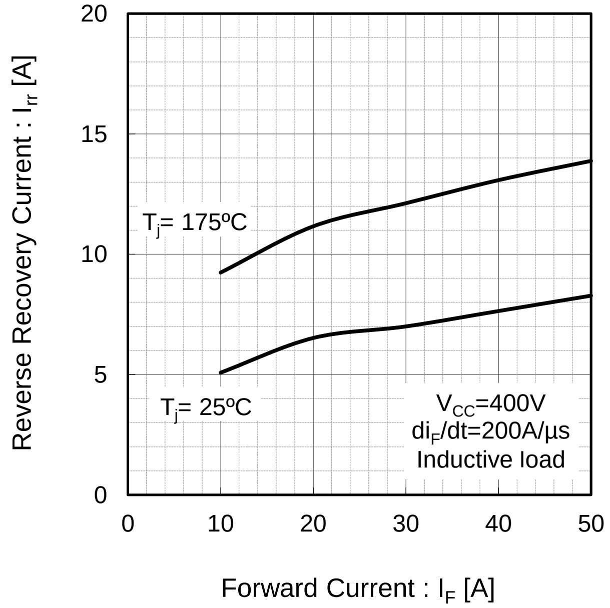
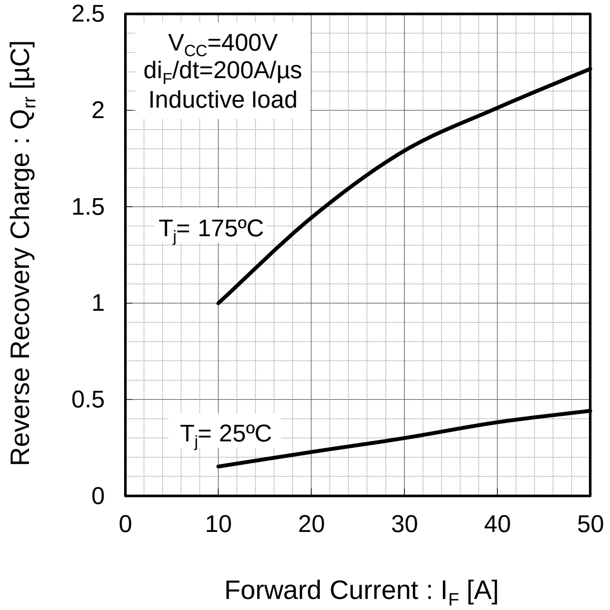


Fig.20 Typical Diode Reverse Recovery Charge vs. Forward Current



●Electrical Characteristic Curves

Fig.21 IGBT Transient Thermal Impedance

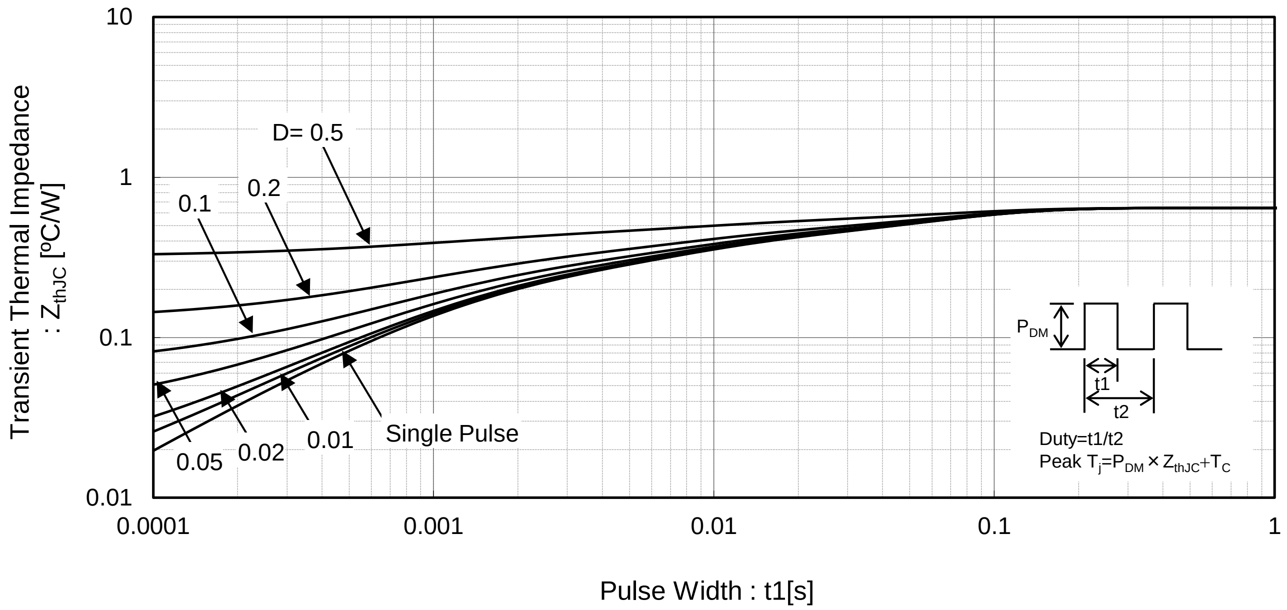
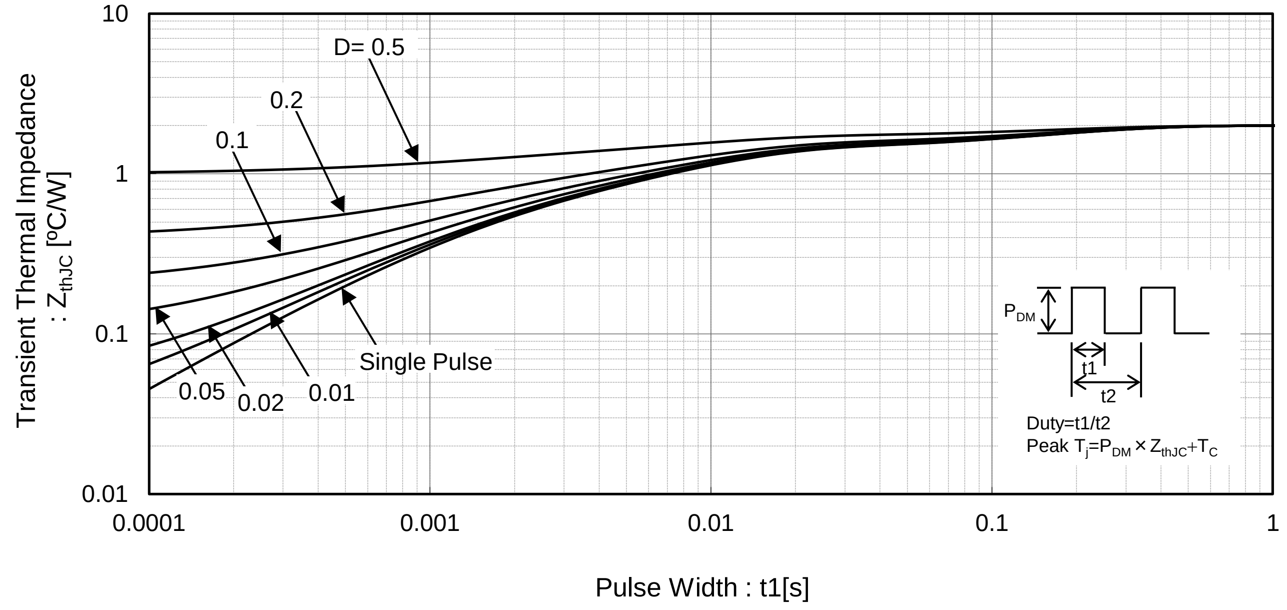


Fig.22 Diode Transient Thermal Impedance



●Inductive Load Switching Circuit and Waveform

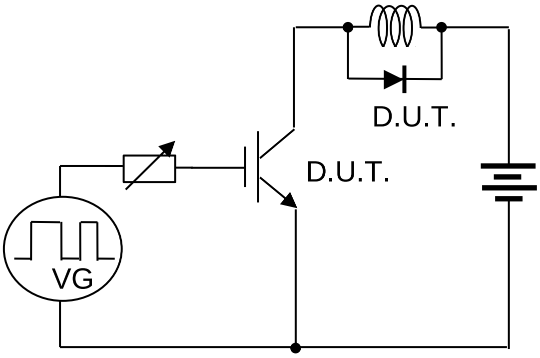


Fig.23 Inductive Load Circuit

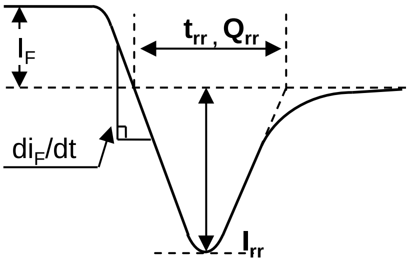


Fig.25 Diode Reverce Recovery Waveform

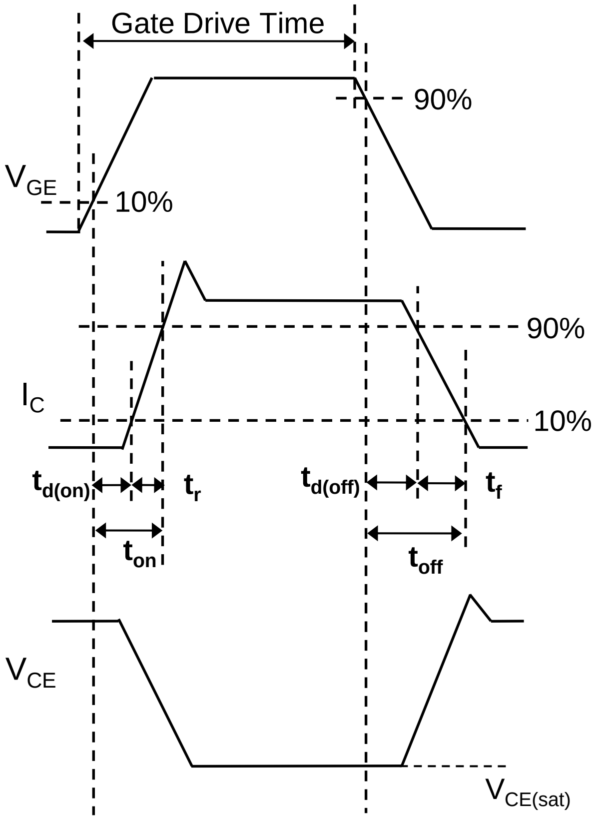


Fig.24 Inductive Load Waveform

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