RGA60TS65HRC11

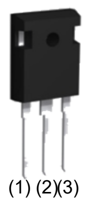
650V 34A Field Stop Trench IGBT

Datasheet

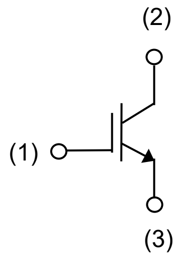
V_{CES}	650V
I_C	34A
$V_{CE(sat)}$ (Typ.)	1.55V
P_D	170W

●Outline

TO-247N



●Inner Circuit



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

●Features

1) Qualified to AEC-Q101

2) Short Circuit Withstand Time 7μs

3) Low Collector - Emitter Saturation Voltage

4) Pb - free Lead Plating ; RoHS Compliant

●Packaging Specifications

Type	Packaging	Tube
	Reel Size (mm)	-
	Tape Width (mm)	-
	Basic Ordering Unit (pcs)	450
	Packing Code	C11
	Marking	RGA60TS65

●Application

General Inverter

for Automotive and Industrial Use

Heater for Automotive

Relay Circuit (ex. Pre Charge Relay)

●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} *1	±30	V
Collector Current	T_C = 25°C	I_C	53	A
	T_C = 100°C	I_C	34	A
Pulsed Collector Current		I_{CP} *2	90	A
Power Dissipation	T_C = 25°C	P_D	170	W
	T_C = 100°C	P_D	85	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 VGE below 10V as doing so may cause thermal runaway.

*2 Pulse width limited by Tjmax.

●Thermal Resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal Resistance IGBT Junction - Case	$R_{\theta(j-c)}$	-	-	0.88	°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 = 1μA, 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	- -	- 100	1 -	μA 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 = 7.1mA	5.2	6.0	6.8	V
Collector - Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 30A, V_{GE} = 15V, T_j = 25°C T_j = 175°C	- -	1.55 2.00	1.85 -	V V

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

Parameter	Symbol	Conditions	Values Min.	Values Typ.	Values Max.	Unit
Input Capacitance	C_{ies}	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	-	2333	-	pF
Output Capacitance	C_{oes}		-	56	-	
Reverse transfer Capacitance	C_{res}		-	20	-	
Total Gate Charge	Q_g	V_{CE} = 400V, I_C = 30A, V_{GE} = 15V	-	89	-	nC
Gate - Emitter Charge	Q_{ge}		-	28	-	
Gate - Collector Charge	Q_{gc}		-	38	-	
Turn - on Delay Time	$t_{d(on)}$	I_C = 30A, V_{CC} = 400V, V_{GE} = 15V, R_G = 10Ω, T_j = 25°C Inductive Load	-	43	-	ns
Rise Time	t_r		-	16	-	
Turn - off Delay Time	$t_{d(off)}$		-	124	-	
Fall Time	t_f		-	82	-	
Turn-on Switching Loss	E_{on}		-	0.60	-	mJ
Turn-off Switching Loss	E_{off}		-	0.58	-	
Turn - on Delay Time	$t_{d(on)}$	I_C = 30A, V_{CC} = 400V, V_{GE} = 15V, R_G = 10Ω, T_j = 175°C Inductive Load	-	43	-	ns
Rise Time	t_r		-	18	-	
Turn - off Delay Time	$t_{d(off)}$		-	139	-	
Fall Time	t_f		-	118	-	
Turn-on Switching Loss	E_{on}		-	0.67	-	mJ
Turn-off Switching Loss	E_{off}		-	0.78	-	
Reverse Bias Safe Operating Area	RBSOA *2	I_C = 90A, V_{CC} = 550V, V_p = 650V, V_{GE} = 15V, R_G = 50Ω, T_j = 175°C	FULL SQUARE			-
Short Circuit Withstand Time	t_{sc}	V_{GE} = 15V, T_j = 25°C, V_{CC} ≤ 360V *2	7	-	-	μs
		V_{CC} ≤ 400V	6.5	-	-	μs
Short Circuit Withstand Time	t_{sc} *2	V_{GE} = 15V, T_j = 150°C, V_{CC} ≤ 400V	5	-	-	μs

*2 Design assurance without measurement

●Electrical Characteristic Curves

Fig.1 Power Dissipation vs. Case Temperature

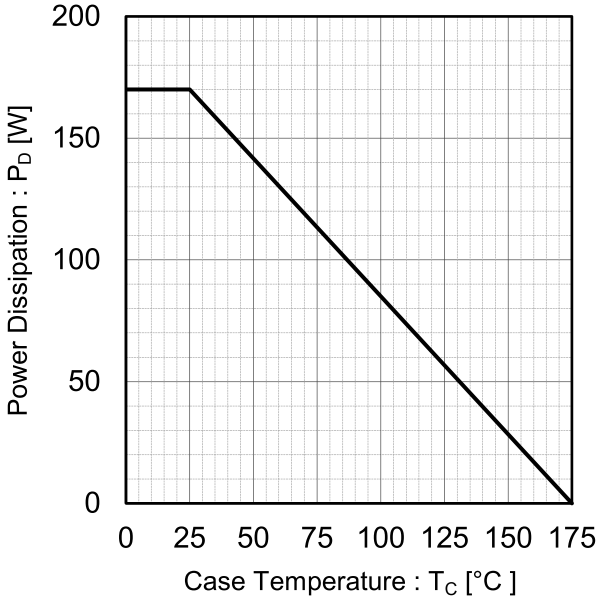


Fig.2 Collector Current vs. Case Temperature

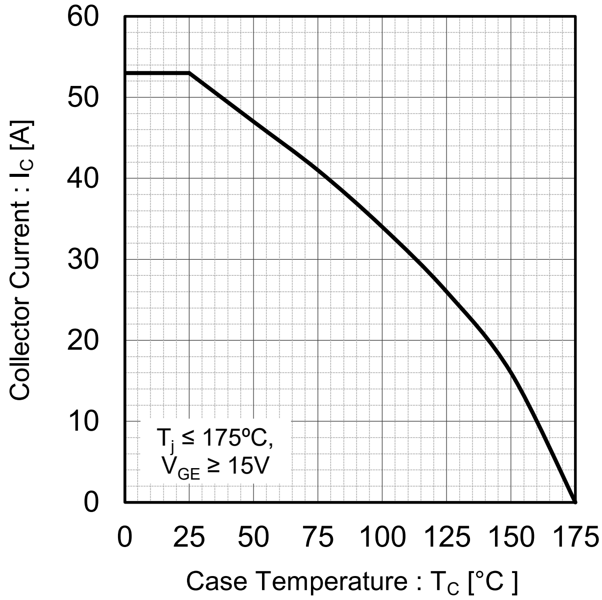


Fig.3 Forward Bias Safe Operating Area

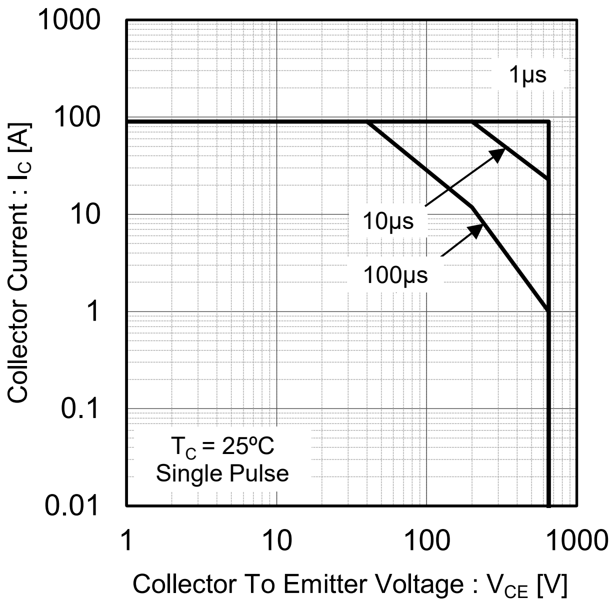
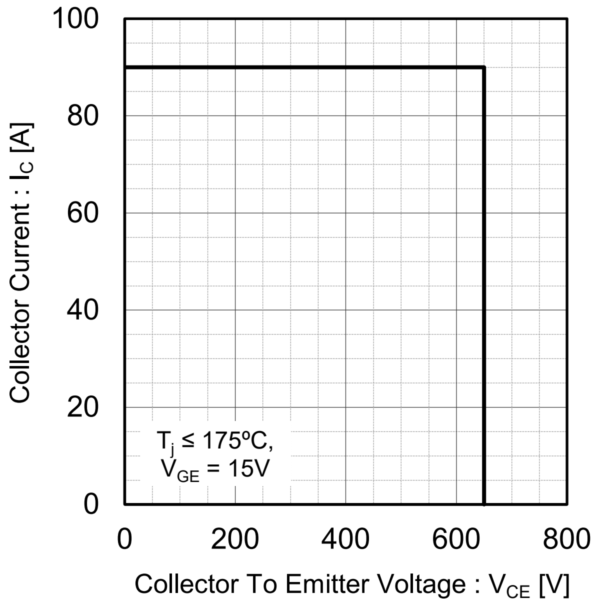


Fig.4 Reverse Bias Safe Operating Area



●Electrical Characteristic Curves

Fig.5 Typical Output Characteristics

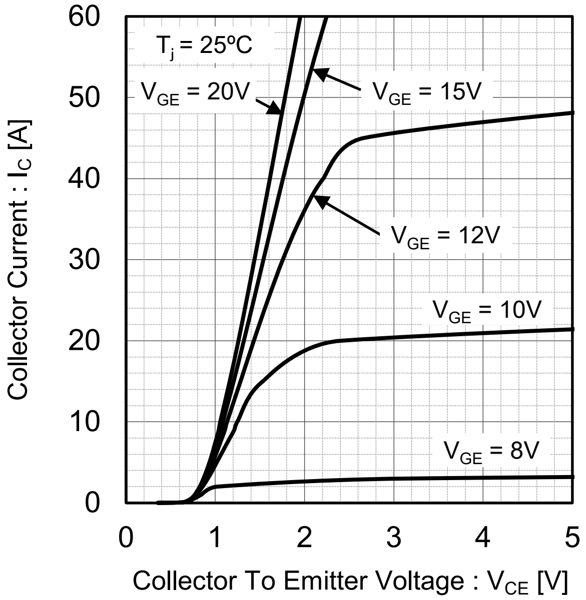


Fig.6 Typical Output Characteristics

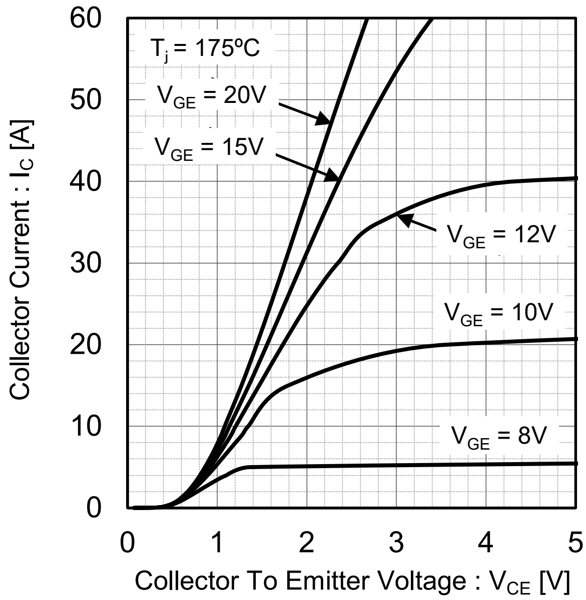


Fig.7 Typical Transfer Characteristics

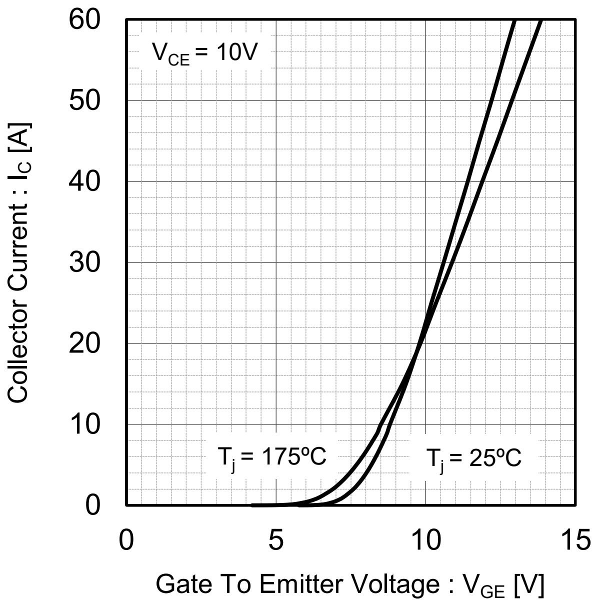
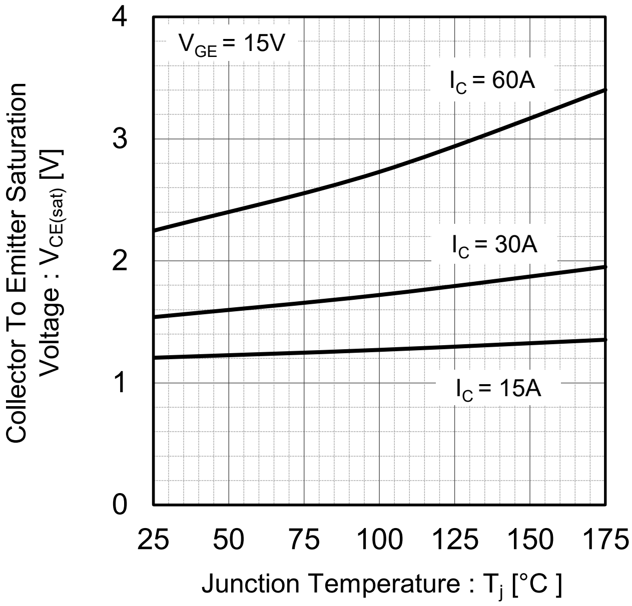


Fig.8 Typical Collector To Emitter Saturation Voltage vs. Junction Temperature



●Electrical Characteristic Curves

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

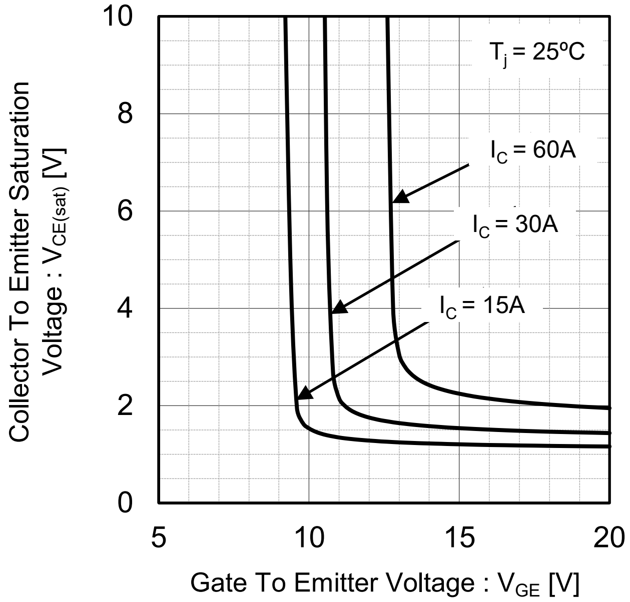


Fig.10 Typical Collector To Emitter Saturation Voltage vs. Gate To Emitter Voltage

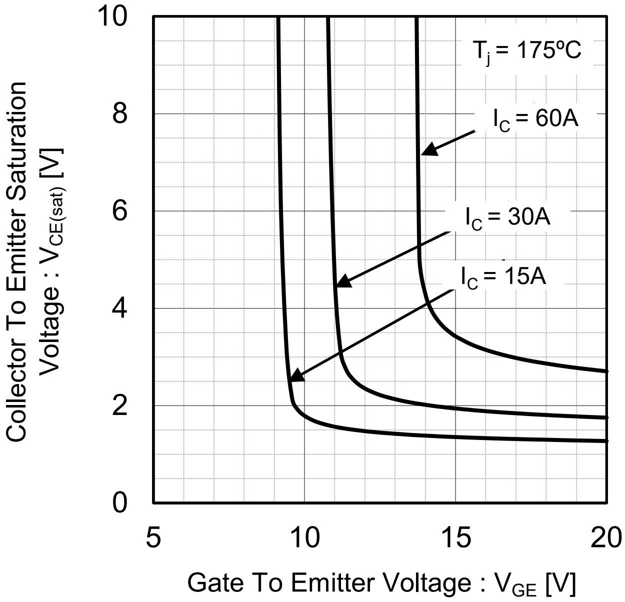


Fig.11 Typical Capacitance vs. Collector To Emitter Voltage

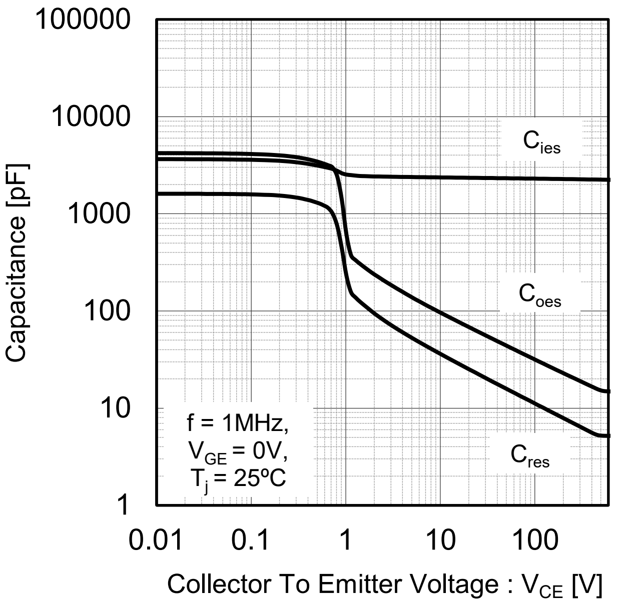
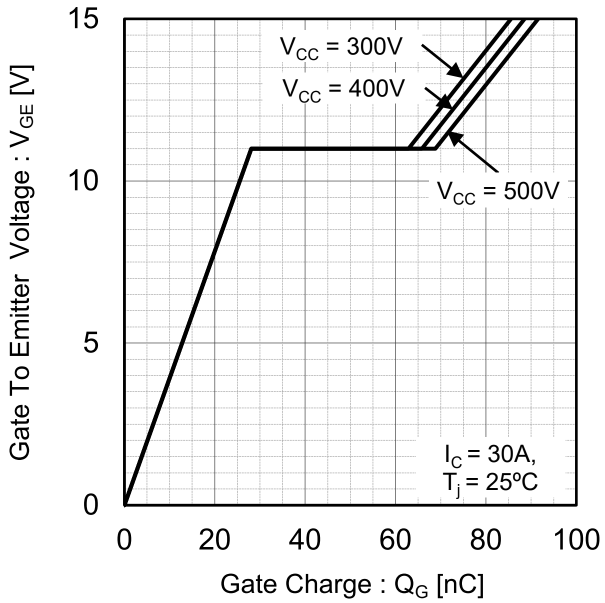


Fig.12 Typical Gate Charge



●Electrical Characteristic Curves

Fig.13 Typical Switching Time vs. Collector Current

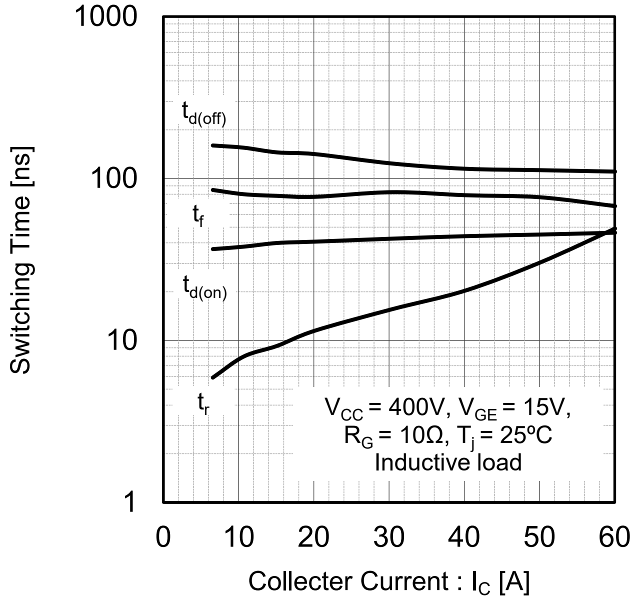


Fig.14 Typical Switching Time vs. Gate Resistance

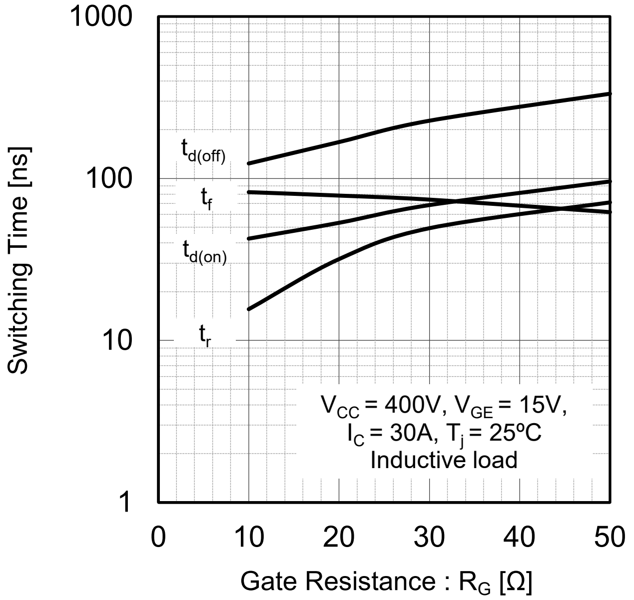


Fig.15 Typical Switching Energy Losses vs. Collector Current

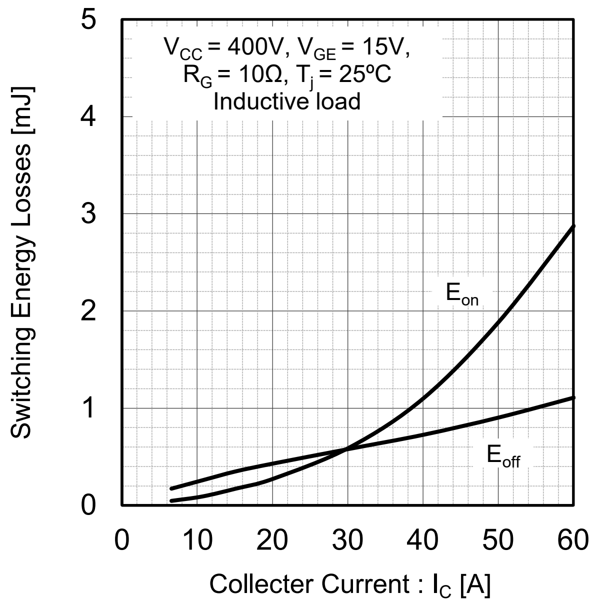
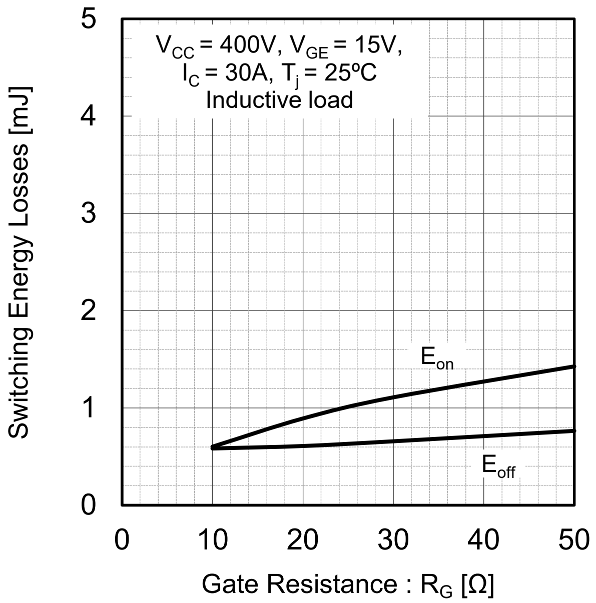


Fig.16 Typical Switching Energy Losses vs. Gate Resistance



●Electrical Characteristic Curves

Fig.17 Typical Switching Time
vs. Collector Current

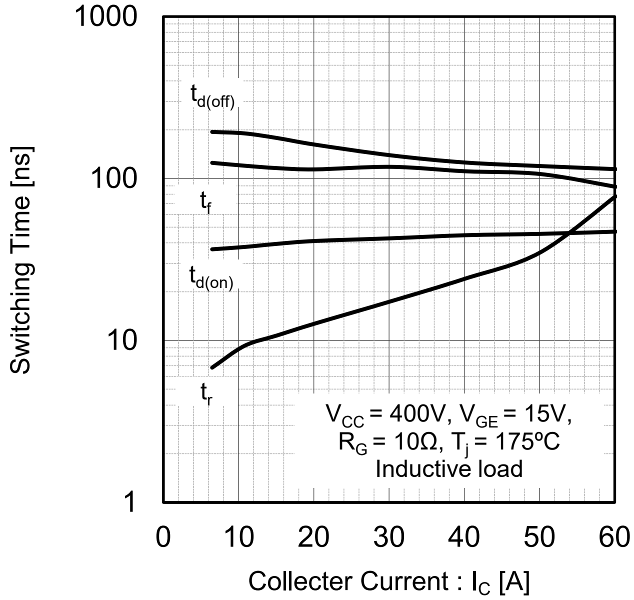


Fig.18 Typical Switching Time
vs. Gate Resistance

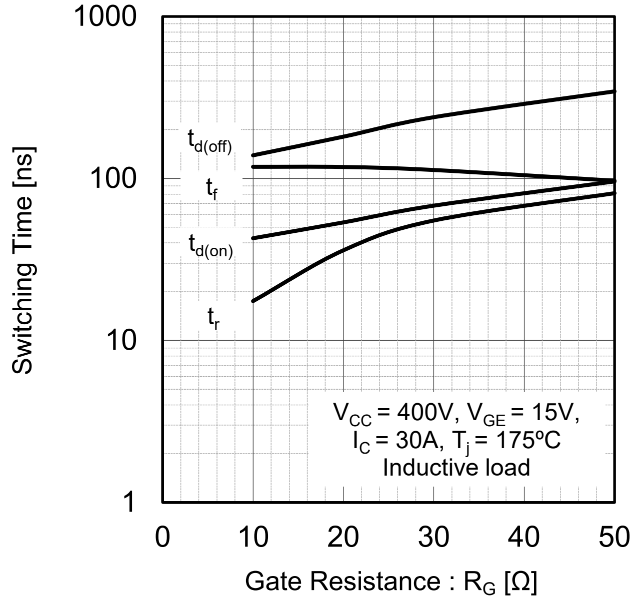


Fig.19 Typical Switching Energy Losses
vs. Collector Current

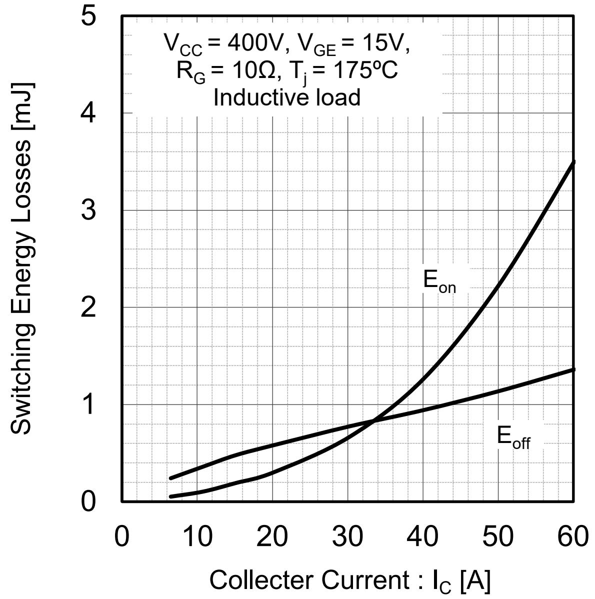
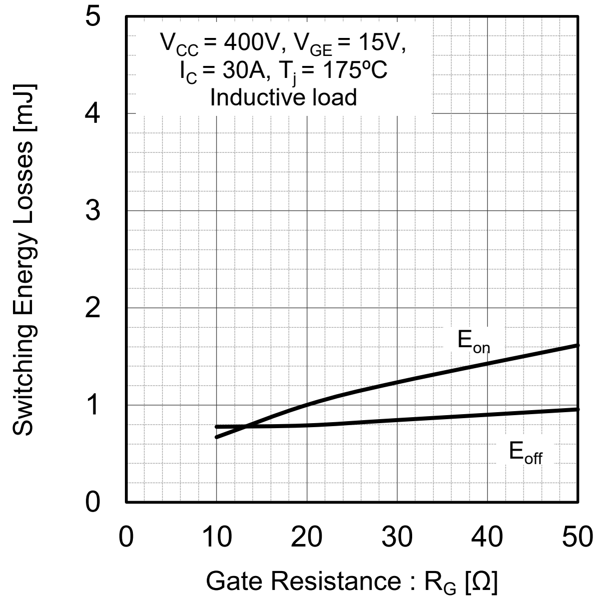
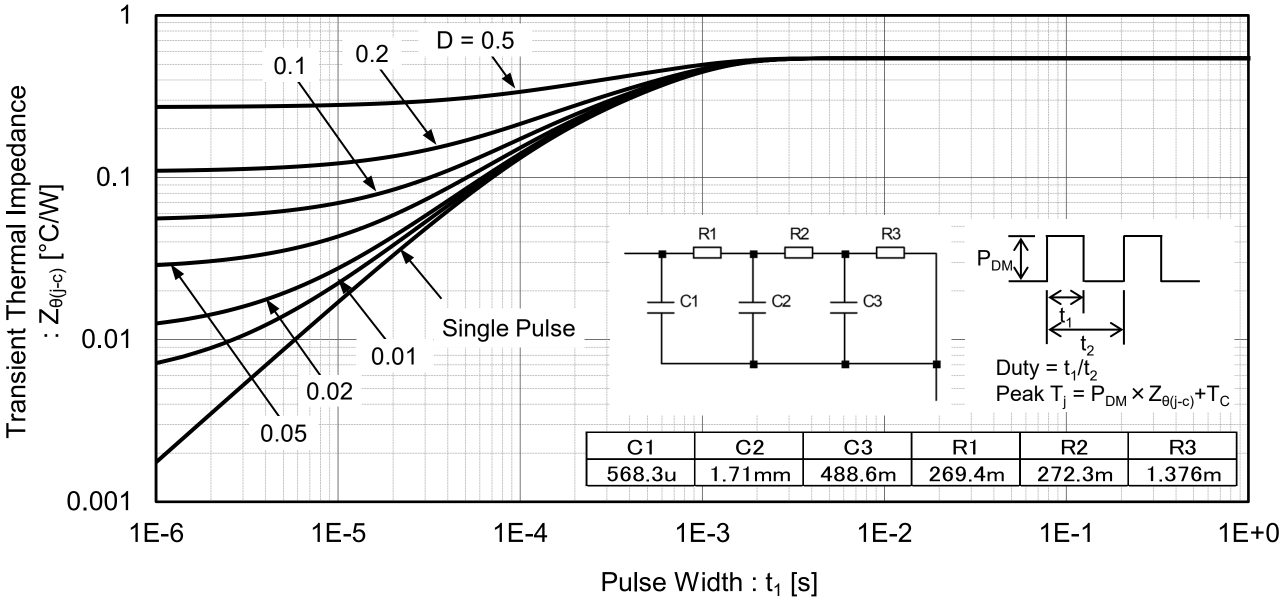


Fig.20 Typical Switching Energy Losses
vs. Gate Resistance



●Electrical Characteristic Curves

Fig.21 Typical IGBT Transient Thermal Impedance



●Inductive Load Switching Circuit and Waveform and Short Circuit

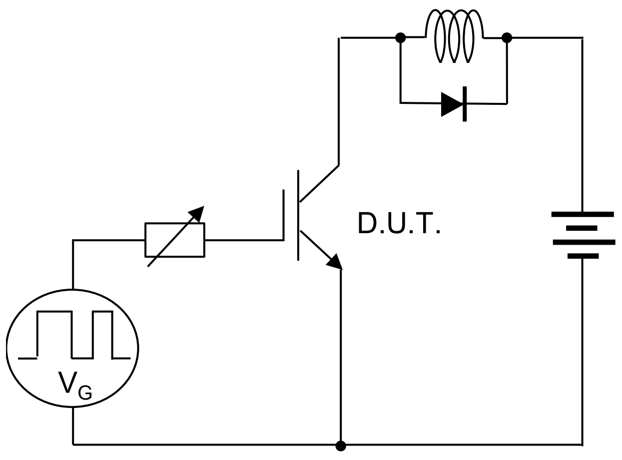


Fig.22 Inductive Load Circuit

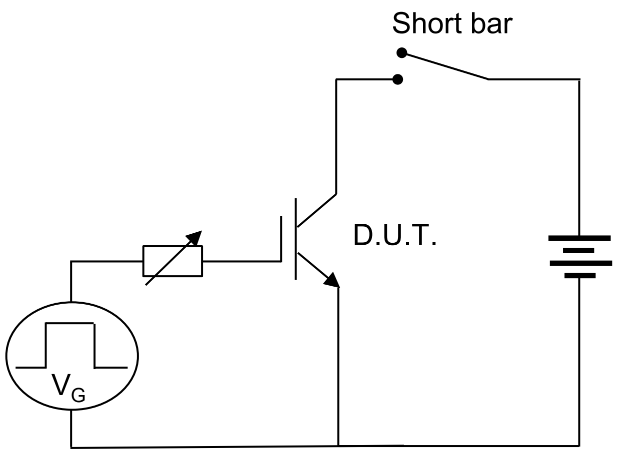


Fig.24 Short Circuit

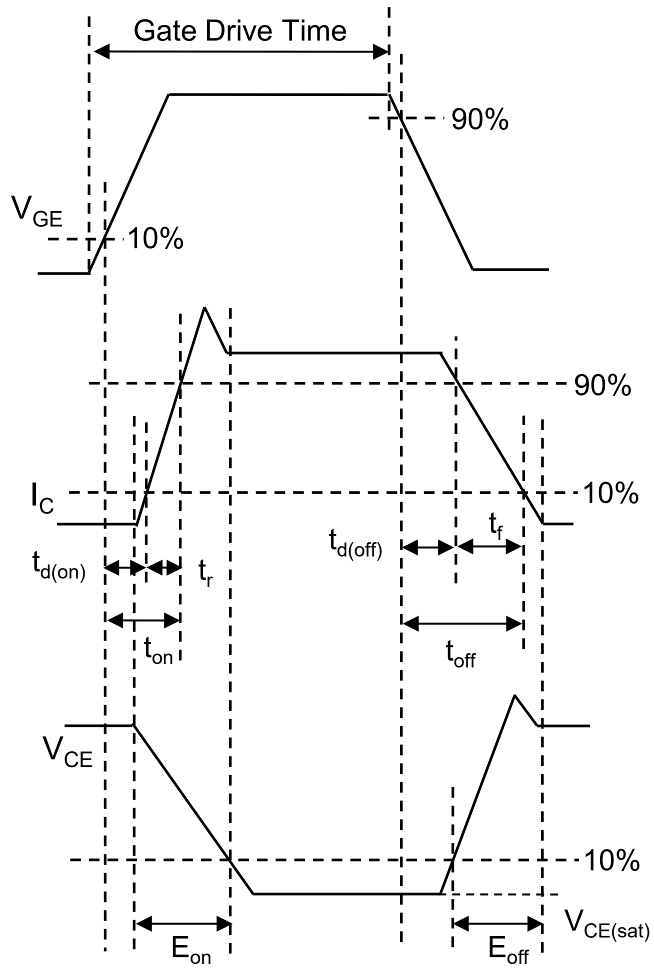


Fig.23 Inductive Load Waveform

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