RGPR50NL45HR

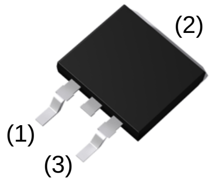
450V 45A Ignition IGBT

Datasheet

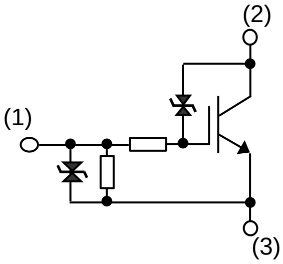
BV_{CES}	450±30V
I_C	45A
$V_{CE(sat)}$ (Typ.)	1.6V
E_{AS}	500mJ

●Outline

LPDL (TO-263L)



●Inner circuit



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

●Features

1) Low Collector - Emitter Saturation Voltage
2) High Self-Clamped Inductive Switching Energy
3) Built in Gate-Emitter Protection Diode
4) Built in Gate-Emitter Resistance
5) Qualified to AEC-Q101
6) Pb - free Lead Plating ; RoHS Compliant

●Packaging specifications

Type	Packing	Taping
	Reel size (mm)	330
	Tape width (mm)	24
	Basic ordering unit (pcs)	1,000
	Taping code	TL
	Marking	RGPR50NL45

●Application

･Ignition Coil Driver Circuits
･Solenoid Driver Circuits

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

Parameter		Symbol	Value	Unit
Collector - Emitter Voltage		V_{CES}	480	V
Emitter-Collector Voltage (V_{GE} = 0V)		V_{EC}	25	V
Gate - Emitter Voltage		V_{GE}	±10	V
Collector Current		I_C	45	A
Avalanche Energy (Single Pulse)	T_j = 25°C	E_{AS}	500	mJ
	T_j = 150°C	E_{AS} *2	250	mJ
Power Dissipation		P_D	187	W
Operating Junction Temperature		T_j	-40 to +175	°C
Storage Temperature		T_{stg}	-55 to +175	°C

●Thermal resistance

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

●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 = 2mA, V_{GE} = 0V, T_j = 25°C T_j = -40 to 175°C*2	420 415	450 -	480 485	V
Gate - Emitter Breakdown Voltage	BV_{EC}	I_C = -10mA, V_{GE} = 0V	25	35	-	V
Gate - Emitter Breakdown Voltage	BV_{GES}	I_G = ±5mA, V_{CE} = 0V	±12	-	±17	V
Collector Cut - off Current	I_{CES}	V_{CE} = 300V, V_{GE} = 0V, T_j = 25°C T_j = 150°C*2	- -	- -	7 100	μA μA
Gate - Emitter Leakage Current	I_{GES}	V_{GE} = ±10V, V_{CE} = 0V	±0.4	±0.6	±1.2	mA
Gate - Emitter Threshold Voltage	$V_{GE(th)}$	V_{CE} = 5V, I_C = 23mA, T_j = 25°C T_j = 150°C*2	1.3 -	1.7 1.3	2.1 -	V V
Collector - Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 23A, V_{GE} = 5V, T_j = 25°C T_j = 150°C*2	- -	1.60 1.80	2.00 -	V V
Collector - Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 9.2A, V_{GE} = 4.5V, T_j = 25°C T_j = 150°C*2	- -	1.20 1.17	1.50 -	V V
Collector - Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 23A, V_{GE} = 4V, T_j = 25°C T_j = 150°C*2	- -	1.70 2.00	2.10 -	V V

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input Capacitance	C_{ies}	V_{CE} = 10V, V_{GE} = 0V, f = 1MHz	-	2400	-	pF
Output Capacitance	C_{oes}		-	431	-	
Reverse transfer Capacitance	C_{res}		-	150	-	
Total Gate Charge	Q_g	V_{CE} = 12V, I_C = 10A, V_{GE} = 5V	-	40	-	nC
Turn - on Delay Time*1,*2	$t_{d(on)}$	I_C = 8A, V_{CC} = 300V, V_{GE} = 5V, R_G = 100Ω, L = 5mH, T_j = 25°C	0.19	0.27	0.60	μs
Rise Time*1,*2	t_r		0.10	0.18	0.50	
Turn - off Delay Time*1,*2	$t_{d(off)}$		1.90	2.40	5.00	
Fall Time*1,*2	t_f		1.00	2.00	5.60	
Turn - on Delay Time*1	$t_{d(on)}$	I_C = 8A, V_{CC} = 300V, V_{GE} = 5V, R_G = 100Ω, L = 5mH, T_j = 150°C	-	0.25	-	μs
Rise Time*1	t_r		-	0.22	-	
Turn - off Delay Time*1	$t_{d(off)}$		-	3.10	-	
Fall Time*1	t_f		-	3.50	-	
Avalanche Energy (Single Pulse)	E_{AS}	L = 5mH, V_{GE} = 5V, V_{CC} = 30V, R_G = 1kΩ, T_j = 25°C	500	-	-	mJ
		T_j = 150°C*2	250	-	-	mJ
Gate Series Resistance	R_G		70	100	130	Ω
Gate - Emitter Resistance	R_{GE}		8	16	24	kΩ

*1) Assurance items according to our measurement definition (Fig.18)

*2) Design assurance items

●Electrical characteristic curves

Fig.1 Typical Output Characteristics

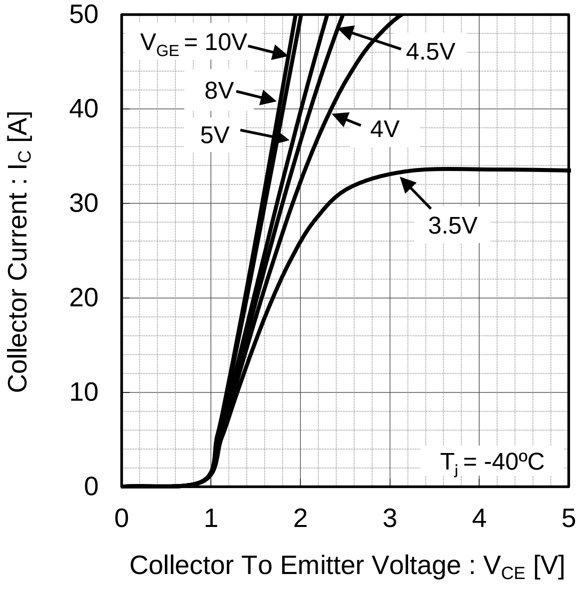


Fig.2 Typical Output Characteristics

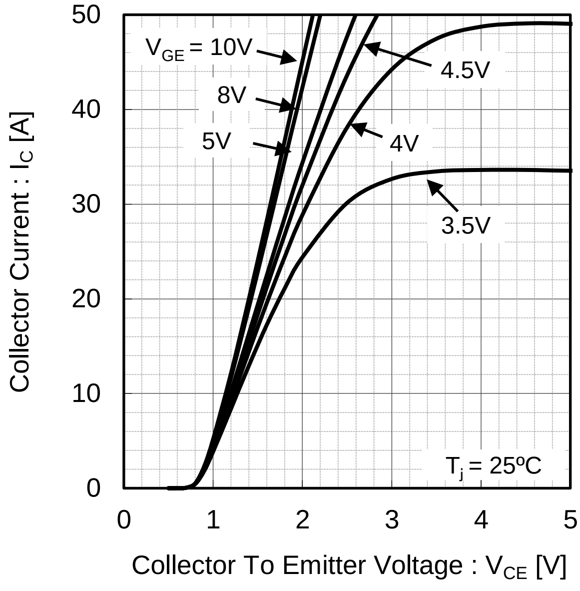


Fig.3 Typical Output Characteristics

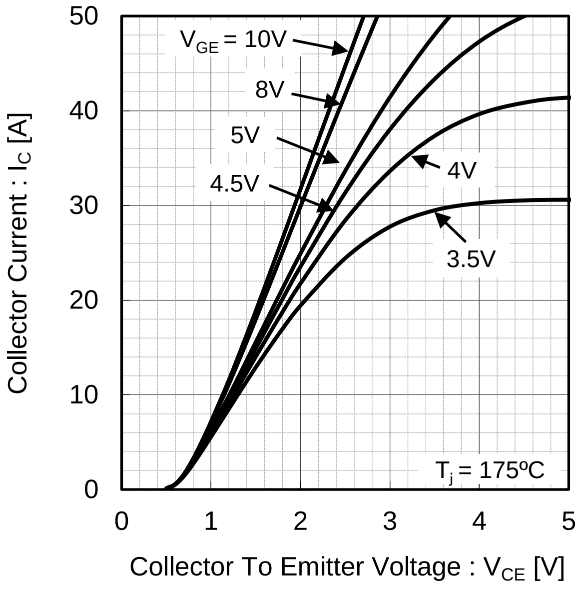
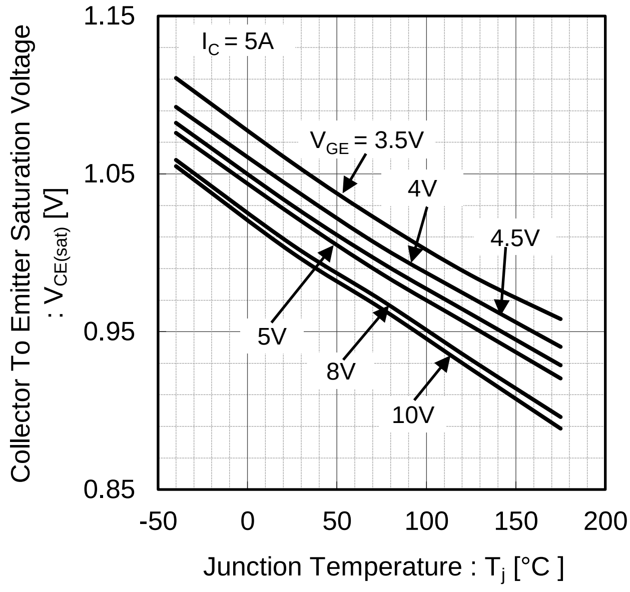


Fig.4 Typical Collector To Emitter Saturation Voltage vs. Junction Temperature



●Electrical characteristic curves

Fig.5 Typical Collector To Emitter Saturation Voltage vs. Junction Temperature

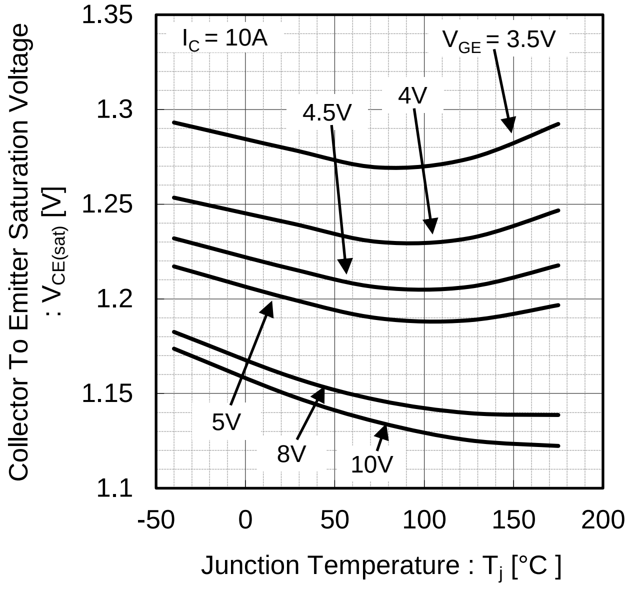


Fig.6 Typical Collector To Emitter Saturation Voltage vs. Junction Temperature

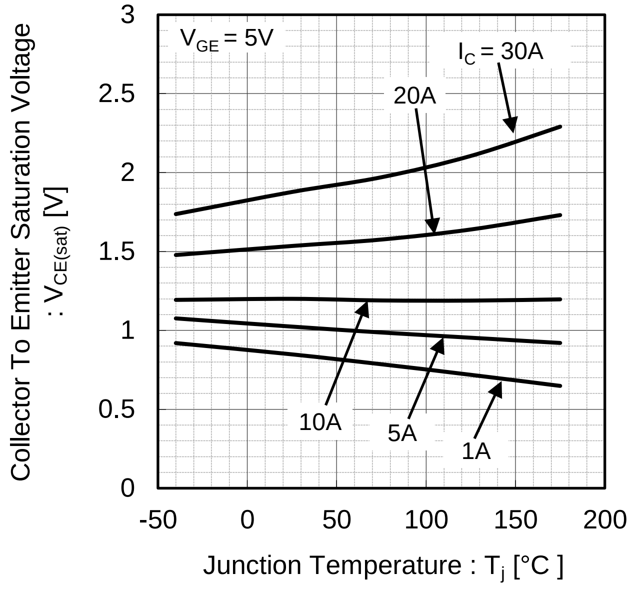


Fig.7 Typical Transfer Characteristics

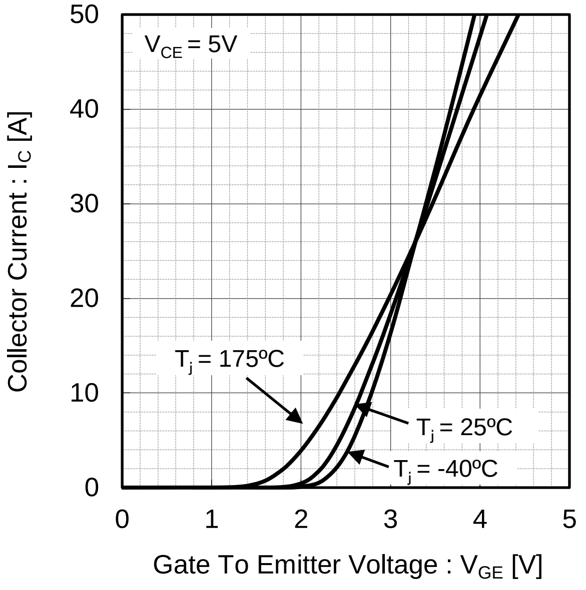
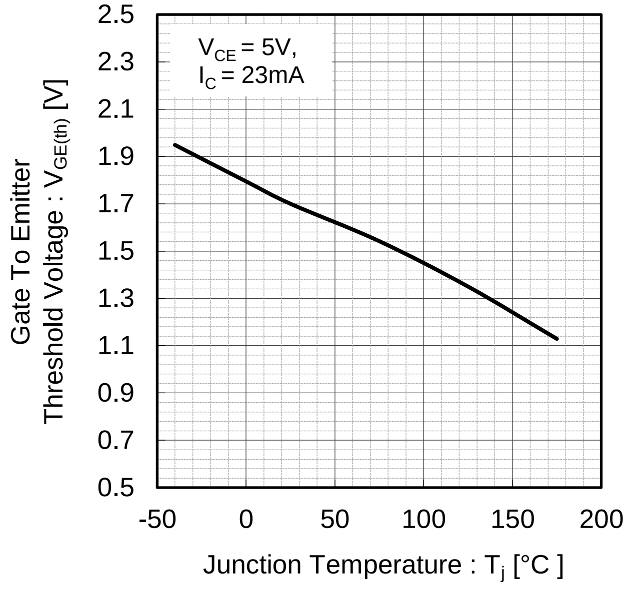
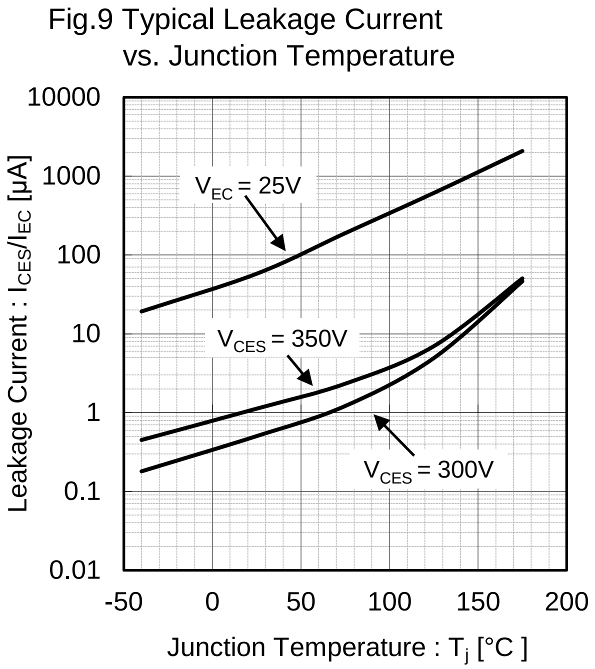
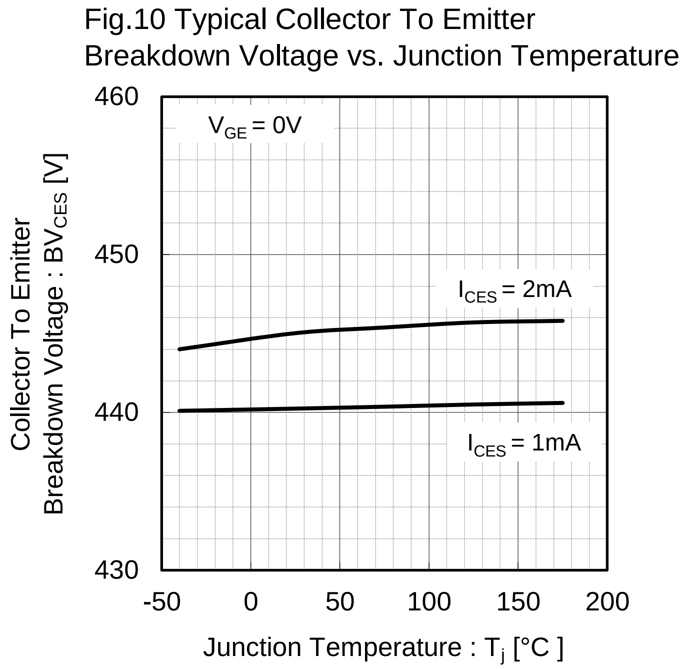


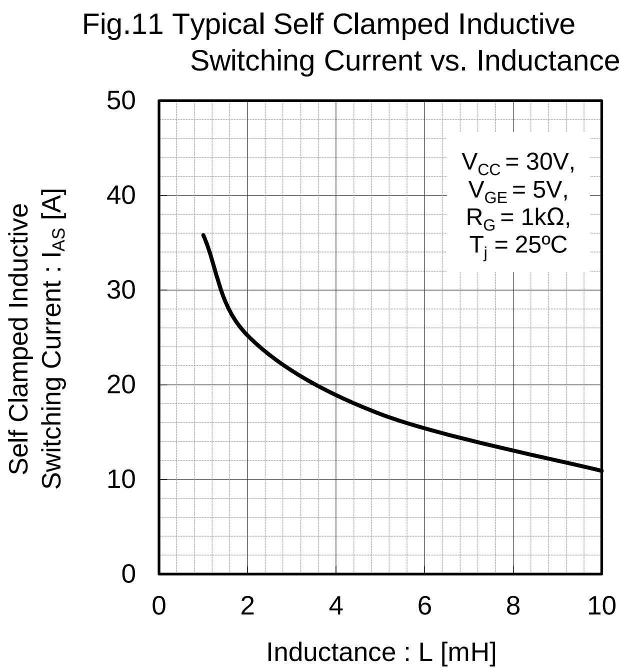
Fig.8 Typical Gate To Emitter Threshold Voltage vs. Junction Temperature

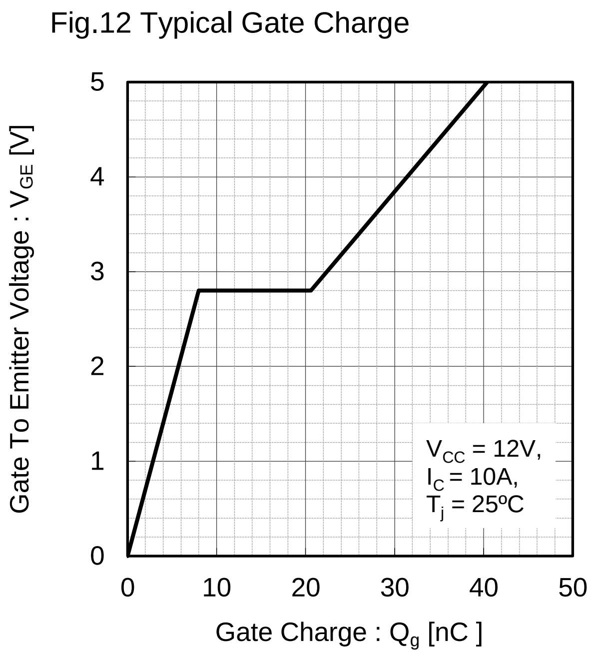


●Electrical characteristic curves









● **Electrical characteristic curves**

Fig.13 Typical Capacitance vs. Collector To Emitter Voltage

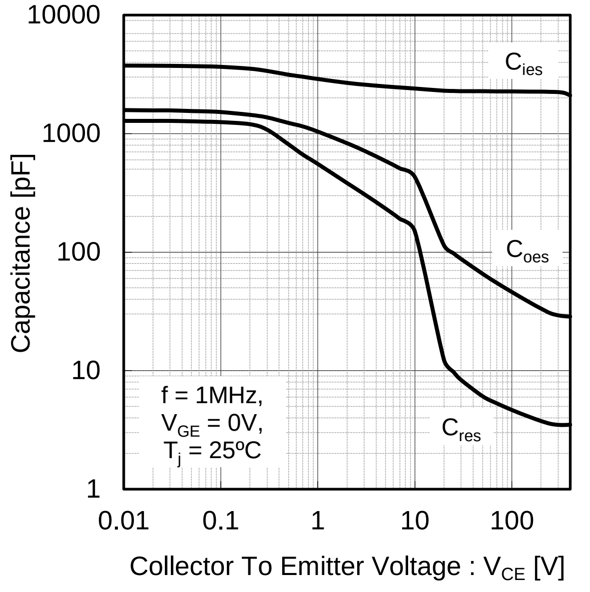


Fig.14 Typical Switching Time vs. Junction Temperature

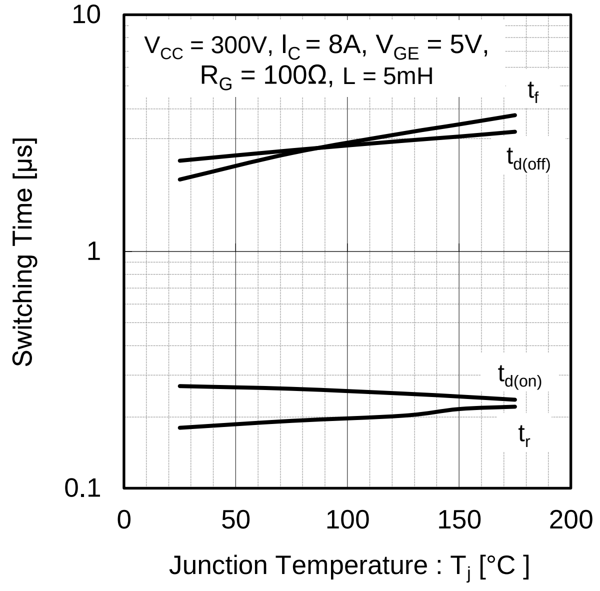
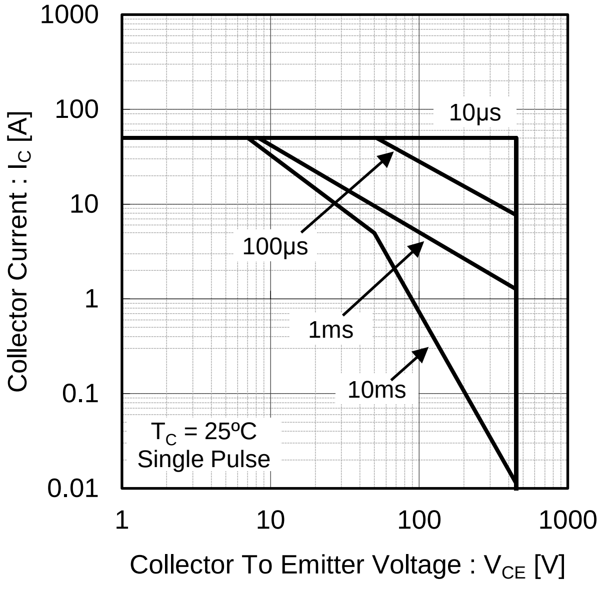
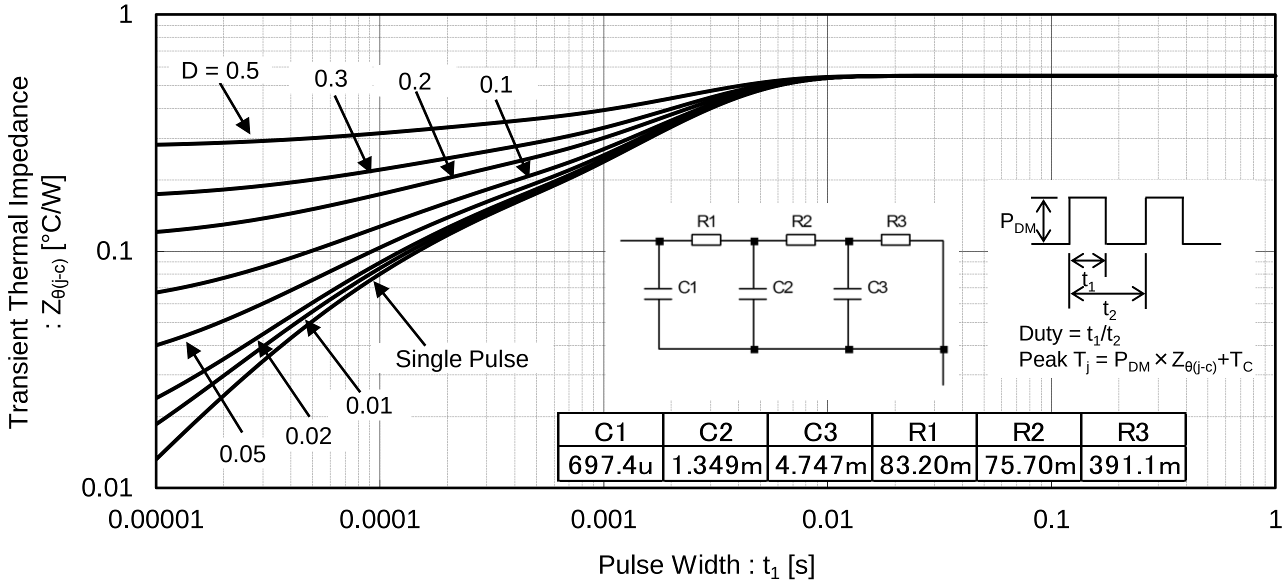


Fig.15 Forward Bias Safe Operating Area



●Electrical characteristic curves

Fig.16 Transient Thermal Impedance



C1	C2	C3	R1	R2	R3
697.4u	1.349m	4.747m	83.20m	75.70m	391.1m

●Inducitve Load Switching Circuit and Waveform

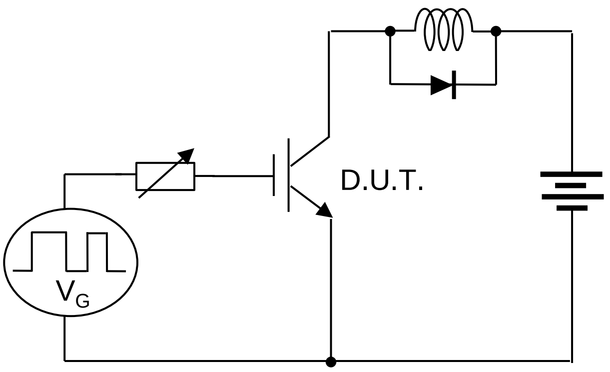


Fig.17 Inductive Load Switching Circuit

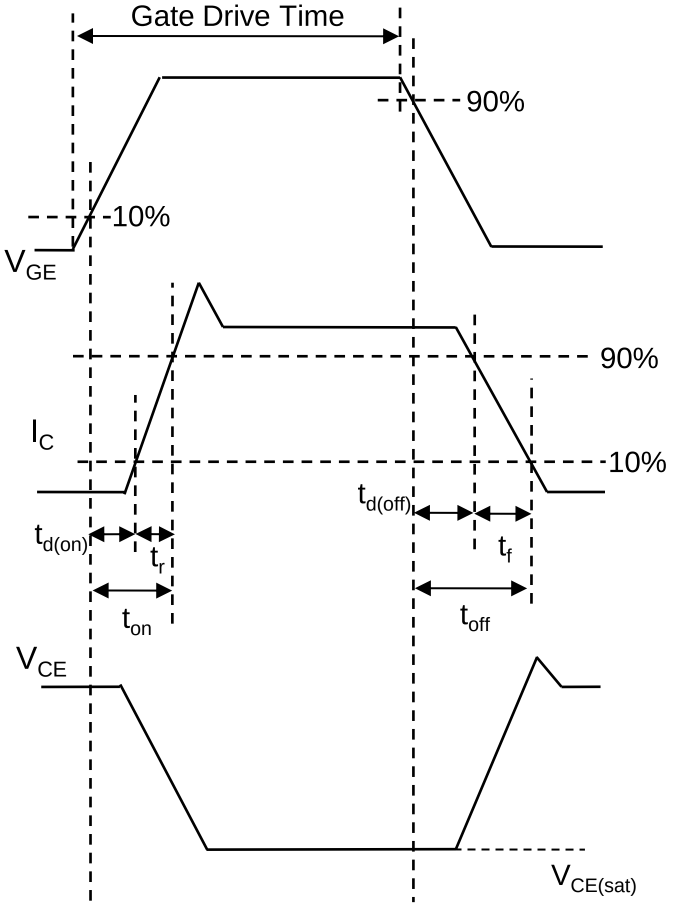


Fig.18 Inductive Load Switching Waveform

●Self Clamped Inductive Switching Circuit and Waveform

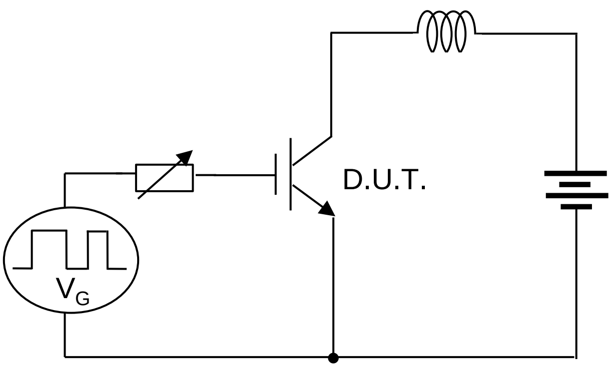


Fig.19 Self Clamped Inductive Switching Circuit

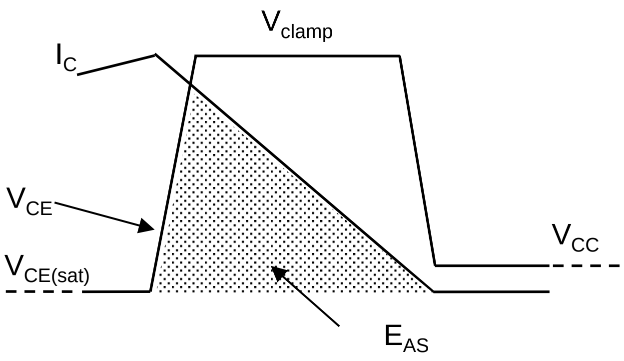


Fig.20 Self Clamped Inductive Switching Waveform

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