LEC10G1203

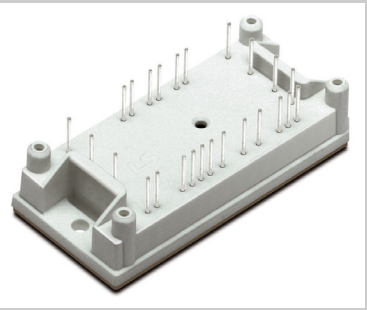
SISPM™

1200V 10A PIM(CIB) IGBT Module

Features

- Trench Field Stop Technology IGBT adopted
- Low Saturation Voltage
- Positive Temperature Coefficient
- Fast switching
- Free Wheeling Diodes with fast and soft reverse recovery
- Industrial Standard Package with insulated substrate
- Temperature Sensor included

Preliminary Data



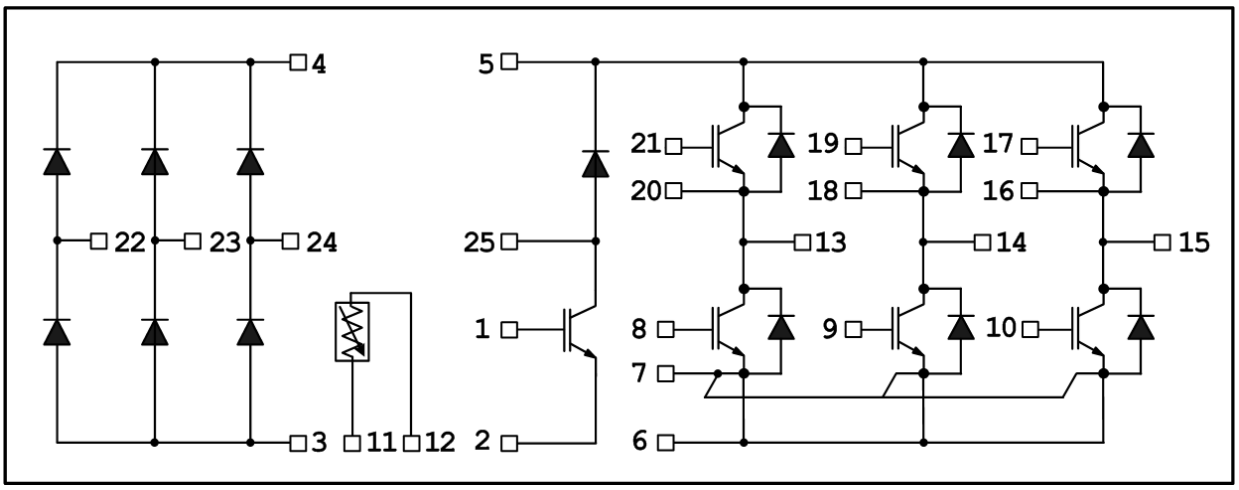
SISPM1

82.2 x 37.9 x 21.7mm

Applications

- Input from single or three phase grid
- Three Phase synchronous or asynchronous motor
- Dynamic Braking Operation

Internal Equivalent Circuit



Pin Description

Pin Number	Pin Name	Pin Description
1	GB	Gate Input for Braking IGBT
2	EB	Emitter Input for Braking IGBT
3	DCN	Negative DC Link Output
4	DCP	Positive DC Link Output
5	P	Positive DC Link Input
6	N	Negative DC Link Input
7	COM	Common Supply Ground
8, 9,10	GUN, GVN, GWN	Gate Input for Low-side U Phase, V Phase, W Phase
11, 12	TH1, TH2	NTC-, NTC+
13, 14, 15	U, V, W	Output for U Phase, V Phase, W Phase
16, 18, 20	EWP, EVP, EUP	Emitter Input for High-side W Phase, V Phase, U Phase
17, 19, 21	GWP, GVP, GUP	Gate Input for High-side W Phase, V Phase, U Phase
22, 23, 24	R, S, T	Input for R Phase, S Phase, T Phase
25	B	Output for Braking

Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Item	Symbol	Parameter	Conditions	Value	Units
Input Rectifier	V_{RPM}	Repetitive Peak Reverse Voltage		1600	V
	I_{FAV}	Forward Current per Diode	@ T_j = 150 °C, T_C = 80 °C	10	A
	I_{FSM}	Surge Forward Current (Chip level)	@ t_P = 10 ms, half sine wave	220	A
	I^2t	I^2t - Value (Chip level)	@ t_P = 10 ms, half sine wave	200	A^2s
	P_D	Maximum Power Dissipation	@ T_j = 150 °C, T_C = 80 °C	40	W
	T_j	Operating Junction Temperature *(1)	-	-40 ~ 125	°C
Transistor Inverter	V_{CES}	Collector-Emitter Breakdown Voltage	-	1200	V
	V_{GES}	Gate-Emitter Peak Voltage	-	± 20	V
	I_C	DC Collector Current	@ T_j = 150 °C, T_C = 80 °C	10	A
	I_{cpulse}	Repetitive Peak Collector Current	@ t_P = 1 ms	20	A
	P_D	Maximum Power Dissipation	@ T_j = 150 °C, T_C = 80 °C	40	W
	T_{SC}	SC Withstand Time (Chip level)	@ V_{GE} = 15 V, V_{CE} = 300 V	-	µs
	T_j	Operating Junction Temperature *(1)	-	-40 ~ 125	°C
Diode Inverter	V_{RRM}	Repetitive Peak Reverse Voltage	-	1200	V
	I_F	DC Forward Current	@ T_j = 150 °C,T_C = 80 °C	10	A
	I_{FRM}	Repetitive Peak Forward Current	@ t_P = 1 ms	20	A
	P_D	Maximum Power Dissipation	@ T_j = 150 °C, T_C = 80 °C	35	W
	T_j	Operating Junction Temperature *(1)	-	-40 ~ 125	°C
Transistor Brake	V_{CES}	Collector-Emitter Breakdown Voltage	-	1200	V
	V_{GES}	Gate-Emitter Peak Voltage	-	± 20	V
	I_C	DC Collector Current	@ T_j = 150 °C, T_C = 80 °C	10	A
	I_{cpulse}	Repetitive Peak Collector Current	@ t_P = 1 ms	20	A
	P_D	Maximum Power Dissipation	@ T_j = 150 °C, T_C = 80 °C	40	W
	T_{SC}	SC Withstand Time (Chip level)	@ V_{GE} = 15 V, V_{CE} = 300 V	-	µs
	T_j	Operating Junction Temperature *(1)	-	-40 ~ 125	°C
Diode Brake	V_{RRM}	Repetitive Peak Reverse Voltage	-	1200	V
	I_F	DC Forward Current	@ T_j = 150 °C, T_C = 80 °C	10	A
	I_{FRM}	Repetitive Peak Forward Current	@ t_P = 1 ms	20	A
	P_D	Maximum Power Dissipation	@ T_j = 150 °C, T_C = 80 °C	35	W
	T_j	Operating Junction Temperature *(1)	-	-40 ~ 125	°C
Module	T_{stg}	Storage Temperature	-	-40~125	°C
	V_{iso}	Isolation Voltage	@ AC 1minute	2500	V
	W	Weight	-	50	g

(Note *1) The Maximum junction temperature of chip is 150 °C.
(Note *2) This value is claculated. In other words, this is not the mearsured value.

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Electrical Characteristics T_C = 25°C unless otherwise noted

Input Rectifier Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_F	Diode Forward Voltage	T_C = 25 °C, I_F = 10 A	-	1.0	-	V
		T_C = 125 °C, I_F = 10 A	-	0.9	-	V
V_{to}	Threshold Voltage	T_C = 125 °C	-	0.83	-	V
I_R	Reverse Current (Chip level)	T_C = 25 °C, V_{RRM} = 600 V	-	0.1	-	mA
r_t	Slope Resistance	T_C = 125 °C	-	20.8	-	mΩ
$R_{th(J-C)}$	Thermal Resistance (IGBT Part) *(2)	Junction-to-Case	-	-	1.7	°C/W

Transistor-Inverter Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$V_{GE(th)}$	Gate-Emitter threshold Voltage	V_{CE} = V_{GE}, I_{CE} = 10 mA	-	6.1	-	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	T_C = 25 °C, I_{CE} = 10 A, V_{GE} = 15 V	-	1.95	-	V
		T_C = 125 °C, I_{CE} = 10 A, V_{GE} = 15 V	-	2.35	-	V
I_{CES}	Collector-Emitter Cut-off Current	V_{GE} = 0 V, V_{CE} = 600 V	-	-	1	mA
I_{CES}	Gate-Emitter Leakage Current	V_{GE} = ± 20 V, V_{CE} = 0 V	-	-	-	A
C_{iss}	Input Capacitance	V_{CE} = 25 V, V_{GE} = 0 V f = 1 MHz, T_C = 25 °C (Chip level)	-	605	-	pF
C_{oss}	Output Capacitance		-	37	-	pF
C_{rss}	Reverse Transfer Capacitance		-	29	-	pF
t_d(on)	Turn-On Delay Time	T_C = 125 °C, $R_{G\ ON}$ = 62 Ω $R_{G\ OFF}$ = 31 Ω, L = 500 μH V_{CE} = 600 V, V_{GE} = 0 V~15 V I_{CE} = 10 A	-	58	-	ns
t_r	Rise Time		-	30	-	ns
t_d(off)	Turn-Off Delay Time		-	364	-	ns
t_f	Fall Time		-	413	-	ns
E_{on}	Turn-On Switching Loss		-	1.1	-	mJ
E_{off}	Turn-Off Switching Loss		-	1.3	-	mJ
E_{ts}	Total Switching Loss		-	2.4	-	mJ
Q_G	Total Gate Charge	V_{GE} = 0 V ~ 15 V	-	72	-	nC
Q_{GE}	Gate-Emitter Charge		-	19	-	nC
Q_{GC}	Gate-Collector Charge		-	31	-	nC
$R_{th(J-C)}$	Thermal Resistance (IGBT Part) *(2)	Junction-to-Case		-	1.6	°C/W

Diode-Inverter Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Conditions		Min	Typ	Max	Units
V_F	Diode Forward Voltage	I_F = 10 A, V_{GE} = 0 V	T_C = 125 °C	-	1.5	-	V
t_{rr}	Diode Reverse Recovery Time	$R_{G\ ON}$ = 62 Ω L = 500 μH V_{CE} = 600 V V_{GE} = 0 V~15 V I_{CE} = 10 A	T_C = 125 °C	-	541	-	ns
I_{RRM}	Diode Peak Reverse Recovery Current		T_C = 125 °C	-	16.1	-	A
Q_{rr}	Diode Reverse Recovery Charge		T_C = 125 °C	-	2.5	-	μC
E_{rr}	Diode Reverse Recovery Energy		T_C = 125 °C	-	0.9	-	mJ
$R_{th(J-C)}$	Thermal Resistance (IGBT Part) *(2)	Junction-to-Case		-	-	1.8	°C/W

Transistor- Brake Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$V_{GE(th)}$	Gate-Emitter threshold Voltage	V_{CE} = V_{GE}, I_{CE} = 10 mA	-	6.1	-	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	T_C = 25 °C, I_{CE} = 10 A, V_{GE} = 15 V	-	1.95	-	V
		T_C = 125 °C, I_{CE} = 10 A, V_{GE} = 15 V	-	2.35	-	V
I_{CES}	Collector-Emitter Cut-off Current	V_{GE} = 0 V, V_{CE} = 600 V	-	-	1	mA
I_{CES}	Gate-Emitter Leakage Current	V_{GE} = ± 20 V, V_{CE} = 0 V	-	-	-	A
C_{iss}	Input Capacitance	V_{CE} = 25 V, V_{GE} = 0 V f = 1 MHz, T_C = 25 °C (Chip level)	-	605	-	pF
C_{oss}	Output Capacitance		-	37	-	pF
C_{rss}	Reverse Transfer Capacitance		-	29	-	pF

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_d(on)	Turn-On Delay Time	T_C = 125 °C, $R_{G\ ON}$ = 62 Ω $R_{G\ OFF}$ = 31 Ω, L = 500 μH V_{CE} = 600 V, V_{GE} = 0 V~15 V I_{CE} = 10 A	-	59	-	ns
t_r	Rise Time		-	30	-	ns
t_d(off)	Turn-Off Delay Time		-	362	-	ns
t_f	Fall Time		-	405	-	ns
E_{on}	Turn-On Switching Loss		-	1.1	-	mJ
E_{off}	Turn-Off Switching Loss		-	1.2	-	mJ
E_{ts}	Total Switching Loss		-	2.3	-	mJ
Q_G	Total Gate Charge	V_{GE} = 0 V ~ 15 V	-	72	-	nC
Q_{GE}	Gate-Emitter Charge		-	19	-	nC
Q_{GC}	Gate-Collector Charge		-	31	-	nC
$R_{th(J-C)}$	Thermal Resistance (IGBT Part) *(2)	Junction-to-Case		-	1.6	°C/W

Diode-Brake Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
V_F	Diode Forward Voltage	I_F = 10 A, V_{GE} = 0 V	T_C = 125 °C	-	1.5	-	V
t_{rr}	Diode Reverse Recovery Time	$R_{G\ ON}$ = 62 Ω L = 500 μH V_{CE} = 600 V V_{GE} = 0 V~15 V I_{CE} = 10 A	T_C = 125 °C	-	505	-	ns
I_{RRM}	Diode Peak Reverse Recovery Current		T_C = 125 °C	-	14.3	-	A
Q_{rr}	Diode Reverse Recovery Charge		T_C = 125 °C	-	2.4	-	μC
E_{rr}	Diode Reverse Recovery Energy		T_C = 125 °C	-	1.0	-	mJ
$R_{th(J-C)}$	Thermal Resistance (IGBT Part) *(2)	Junction-to-Case		-	-	1.8	°C/W

NTC thermestar Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
R_{25}	Resistance	T_C = 25 °C	-	4.7	-	kΩ
P	Power	T_C = 25 °C	-	210	-	mW
$B_{25/100}$	B Constant	T_C = 25 °C, ± 3% tolerance	-	3650	-	K

* This specifications may not be considered as an assurance of characteristics and may not have same characteristics.
in case of using different test systems from @LSIS. We therefore strongly recommend prior consultation of our engineers.

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Input Rectifier

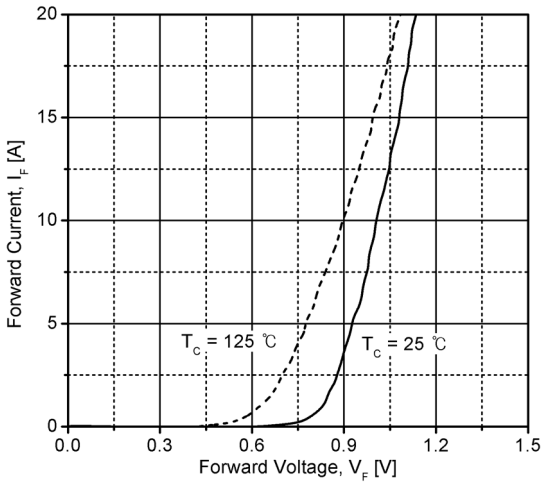

Fig 1. Typical Diode Forward Characteristics

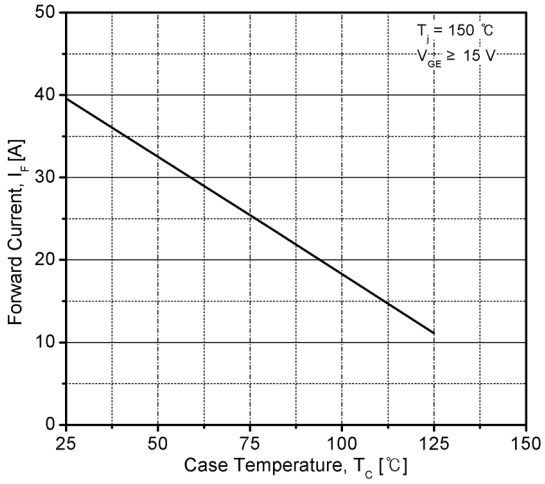

Fig 2. Case Temperature vs. Forward Current

Transistor-Inverter/Diode-Inverter

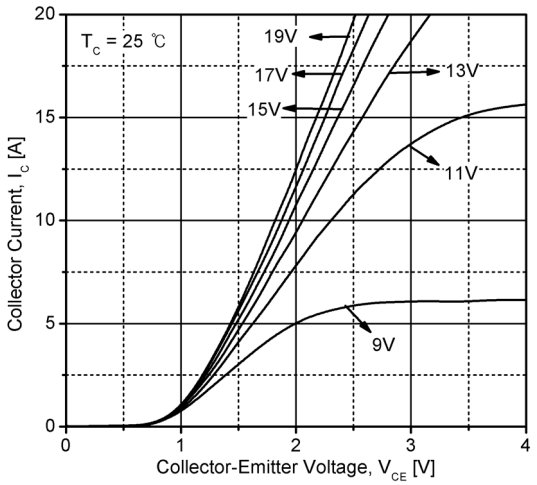

Fig 3. Typical IGBT Output Characteristics

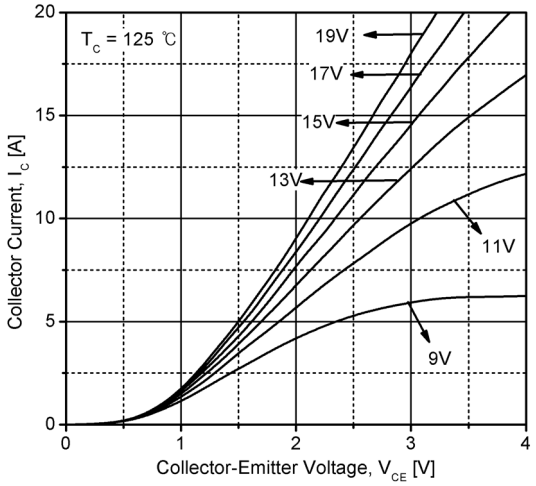

Fig 4. Typical IGBT Output Characteristics

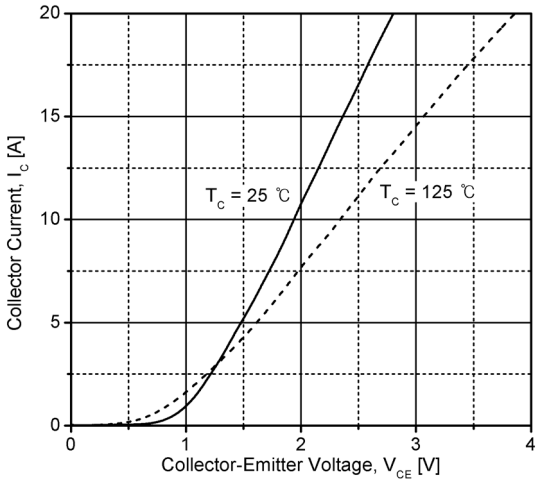

Fig 5. Typical IGBT Output Characteristics

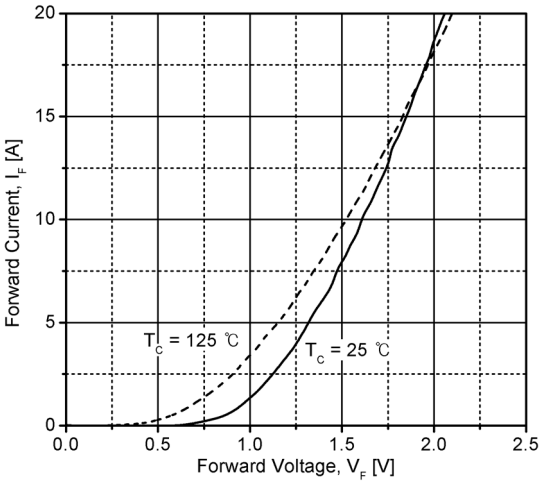

Fig 6. Typical Diode Forward Characteristics

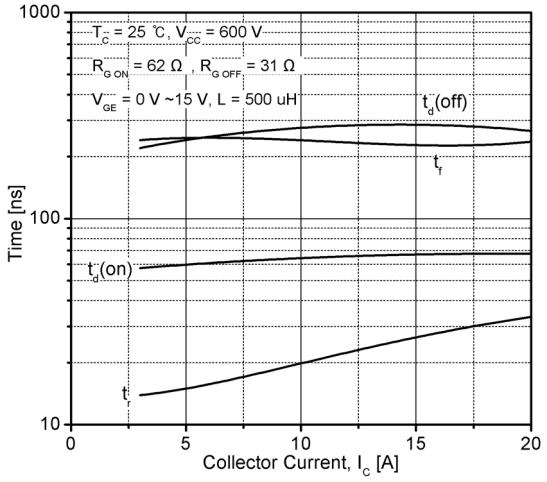

Fig 7. Typical Switching Time vs. Collector Current

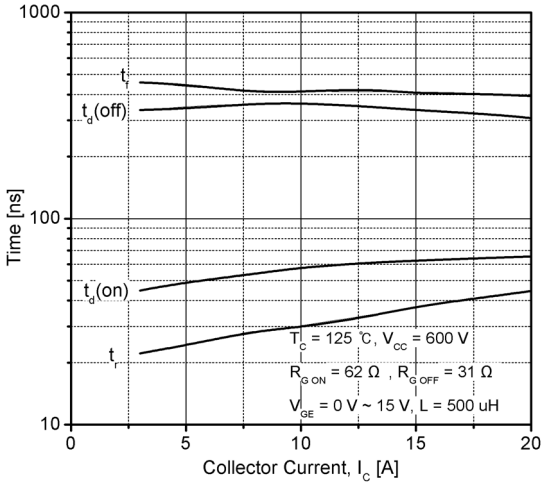

Fig 8. Typical Switching Time vs. Collector Current

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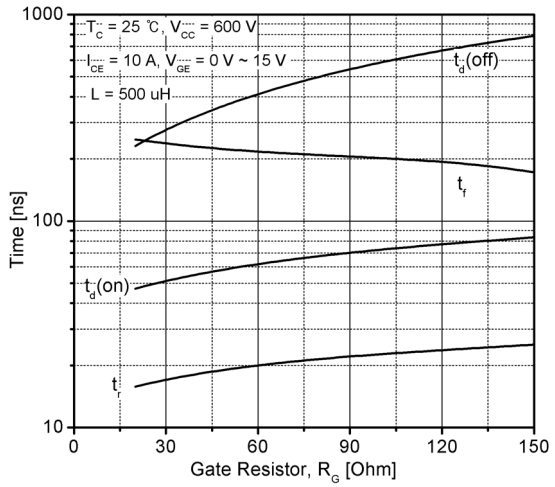

Fig 9. Typical Switching Time vs. Gate Resistor

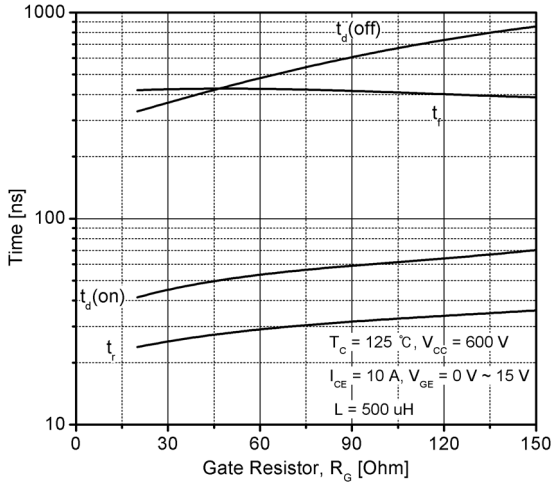

Fig 10. Typical Switching Time vs. Gate Resistor

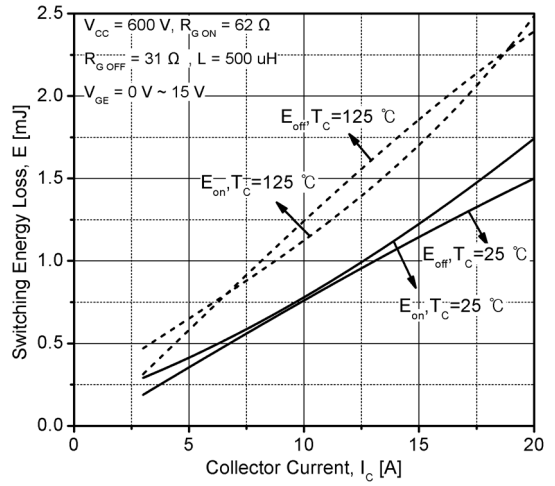

Fig 11. Typical IGBT Switching Loss

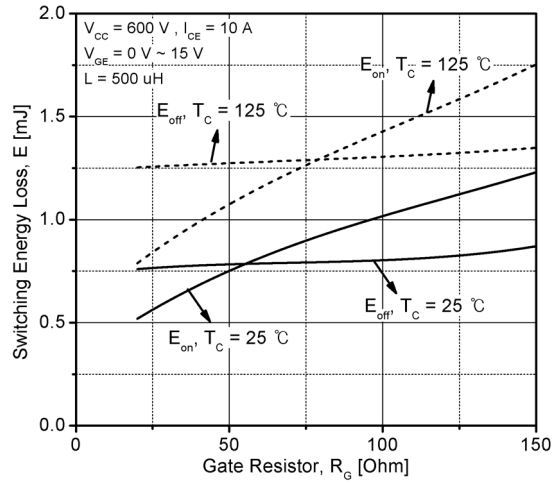

Fig 12. Typical IGBT Switching Loss

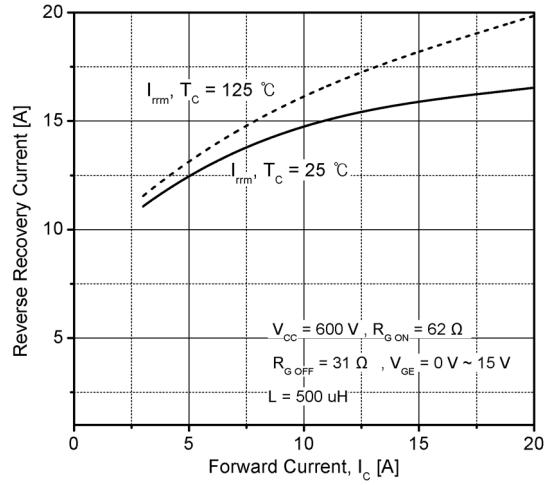

Fig 13. Typical Recovery Characteristics of Diode

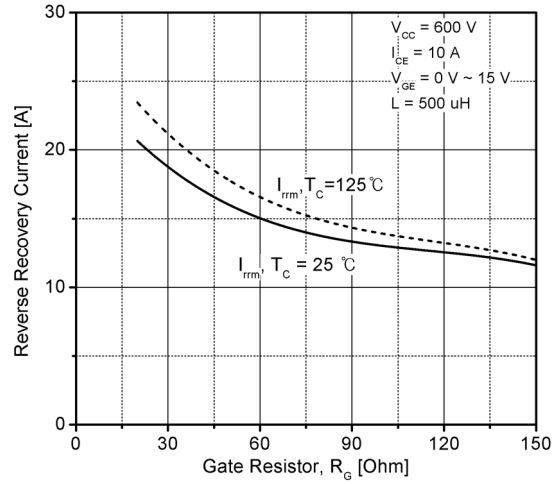

Fig 14. Typical Recovery Characteristics of Diode

Transistor-Inverter/Diode-Inverter

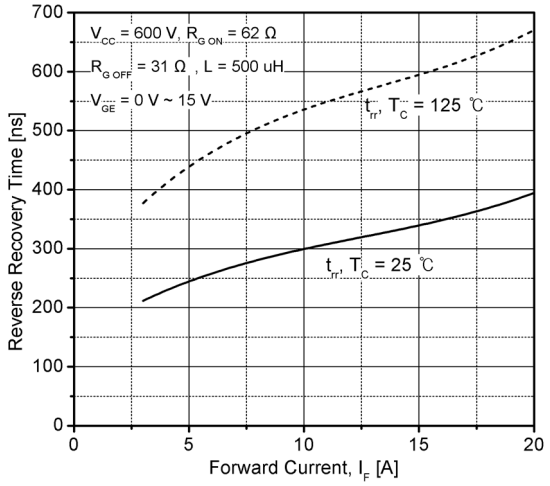

Fig 15. Typical Recovery Characteristics of Diode

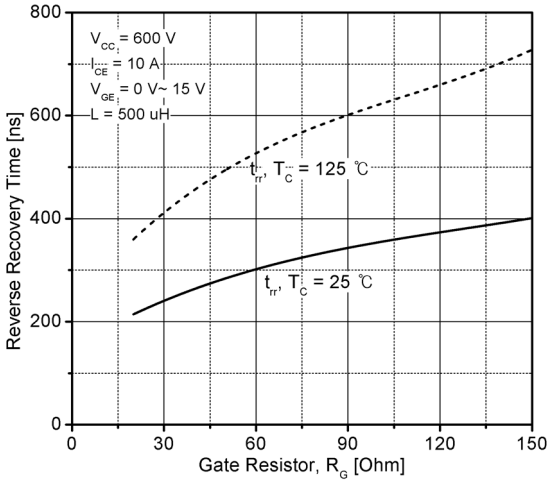

Fig 16. Typical Recovery Characteristics of Diode

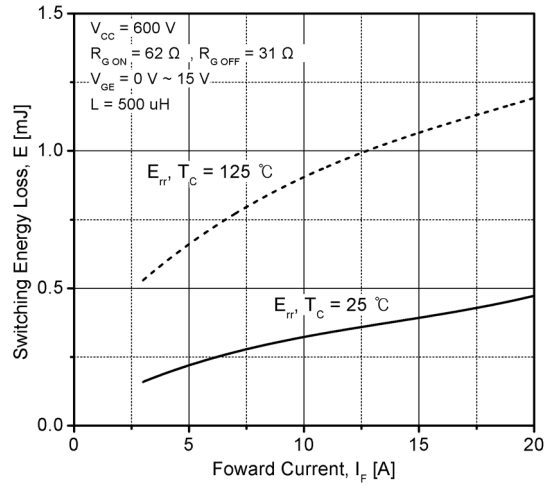

Fig 17. Typical Diode Switching Loss

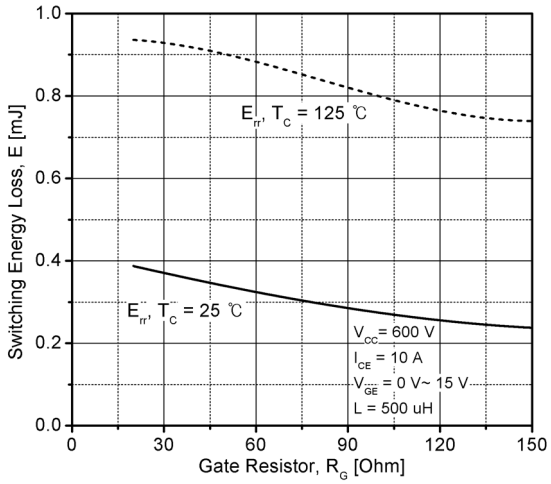

Fig 18. Typical Diode Switching Loss

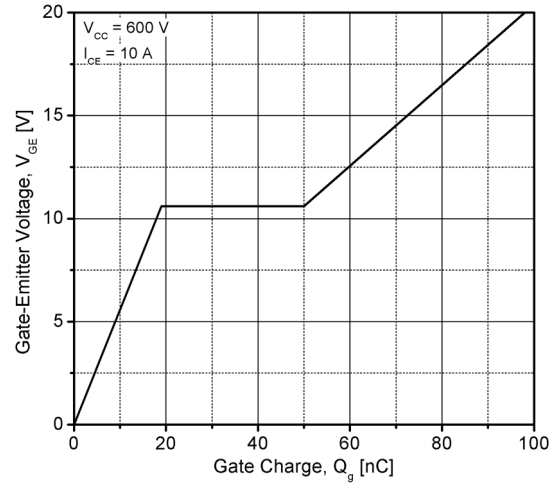

Fig 19. Typical Gate Charge Characteristics

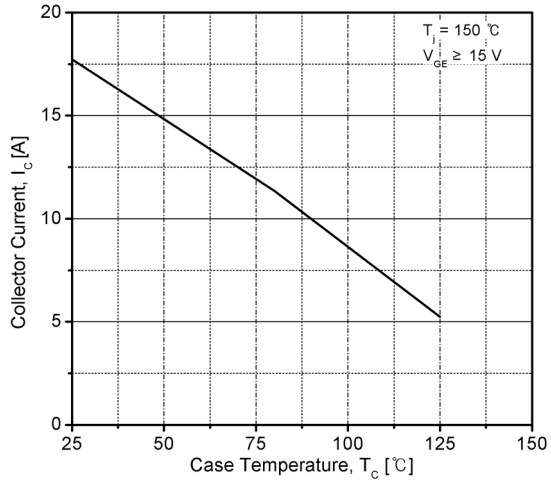

Fig 20. Case Temperature vs. Collector Current

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Transistor-Inverter/Diode-Inverter

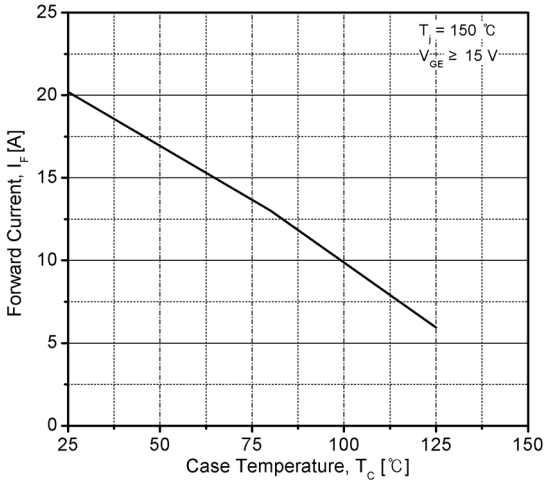

Fig 21. Case Temperature vs. Forward Current

Transistor-Brake/Diode-Brake

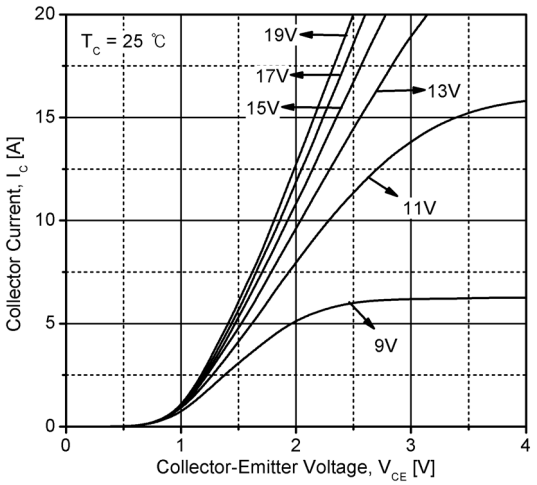

Fig 22. Typical IGBT Output Characteristics

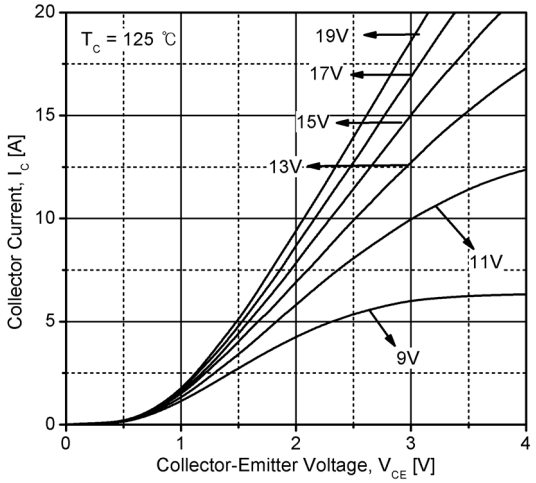

Fig 23. Typical IGBT Output Characteristics

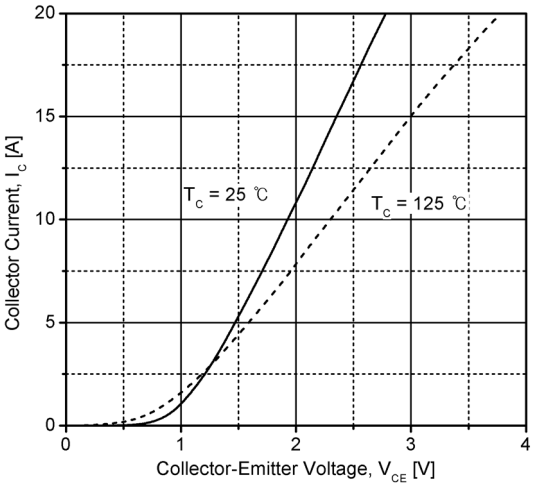

Fig 24. Typical IGBT Output Characteristics

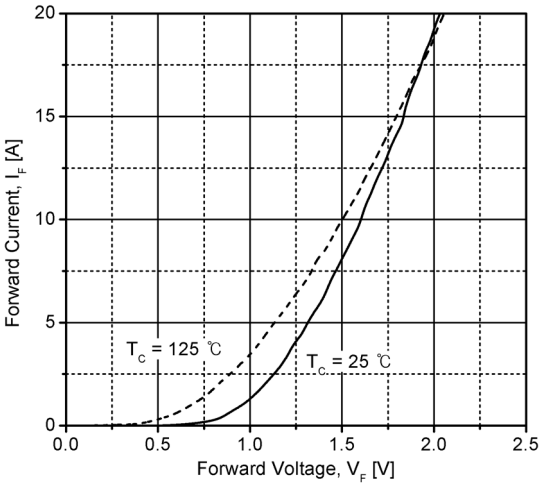

Fig 25. Typical Diode Forward Characteristics

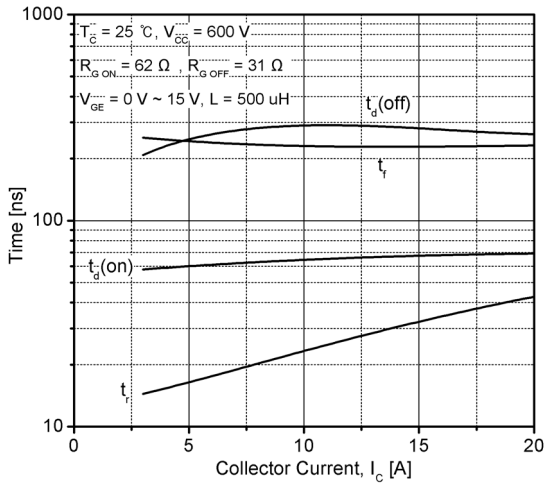

Fig 26. Typical Switching Time vs. Collector Current

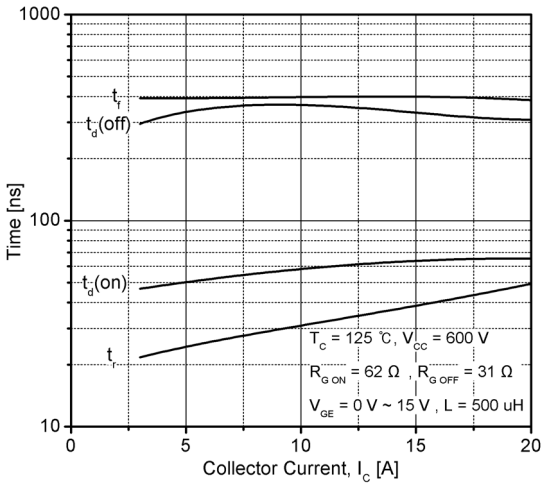

Fig 27. Typical Switching Time vs. Collector Current

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Transistor-Brake/Diode-Brake

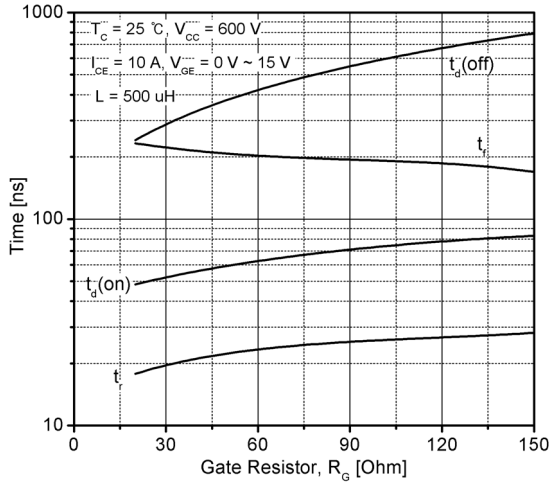

Fig 28. Typical Switching Time vs. Gate Resistor

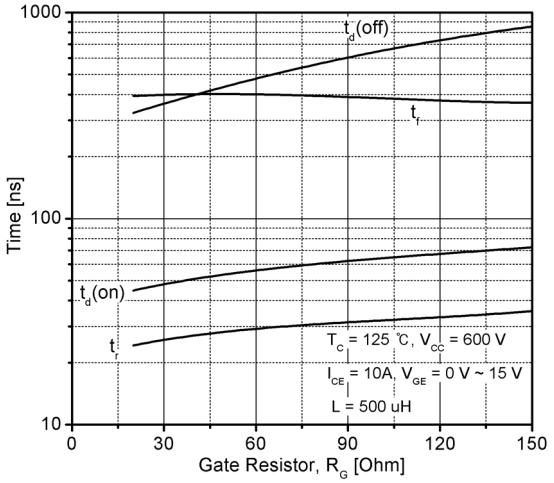

Fig 29. Typical Switching Time vs. Gate Resistor

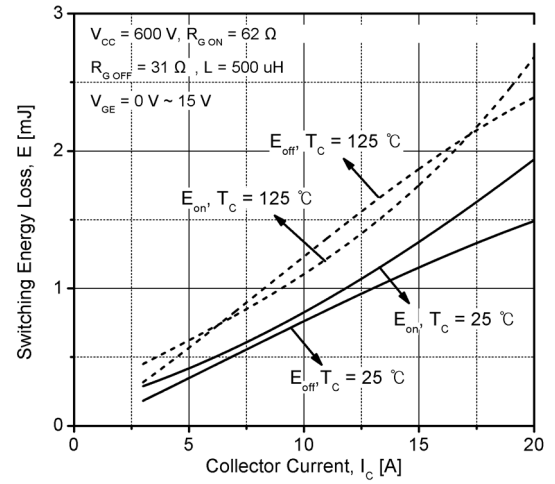

Fig 30. Typical IGBT Switching Loss

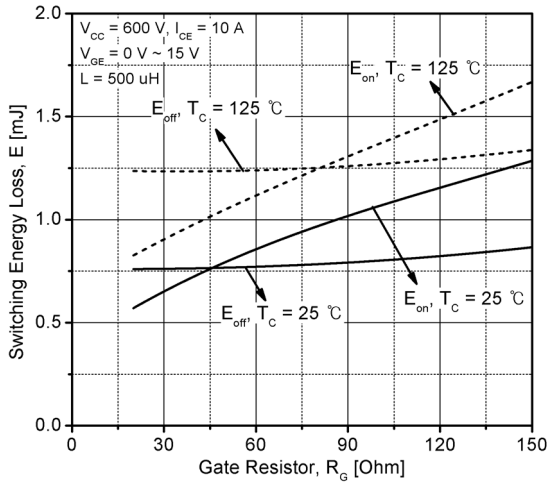

Fig 31. Typical IGBT Switching Loss

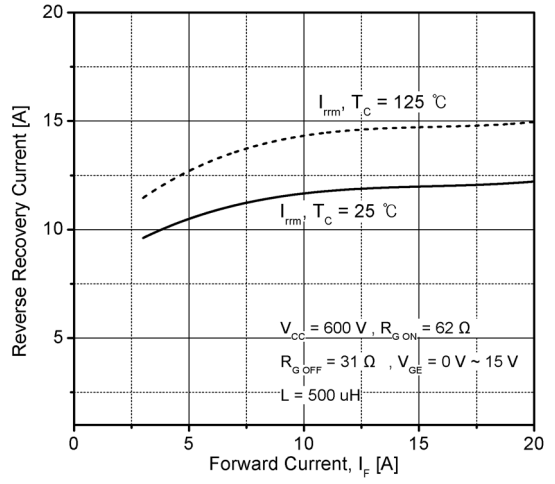

Fig 32. Typical Recovery Characteristics of Diode

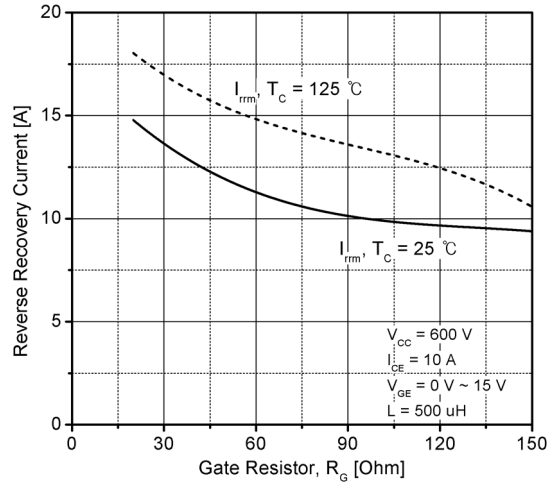

Fig 33. Typical Recovery Characteristics of Diode

Transistor-Brake/Diode-Brake

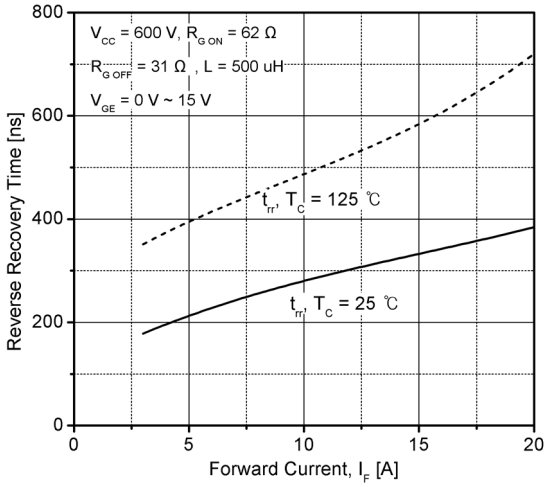

Fig 34. Typical Recovery Characteristics of Diode

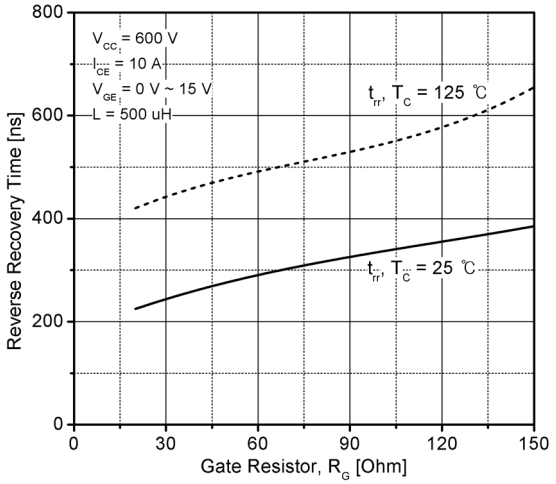

Fig 35. Typical Recovery Characteristics of Diode

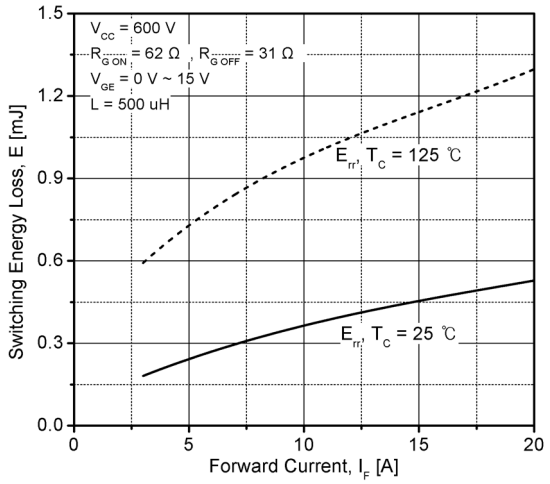

Fig 36. Typical Diode Switching Loss

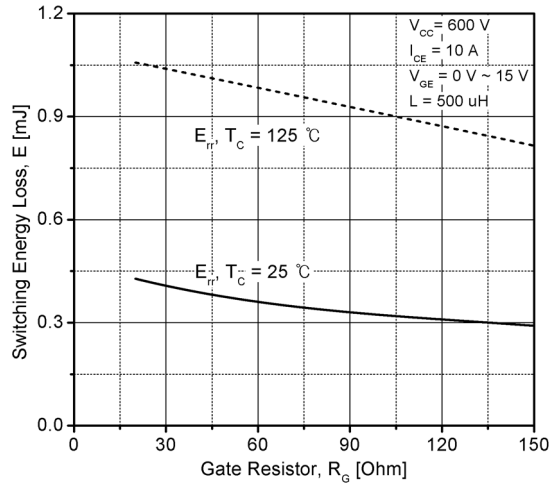

Fig 37. Typical Diode Switching Loss

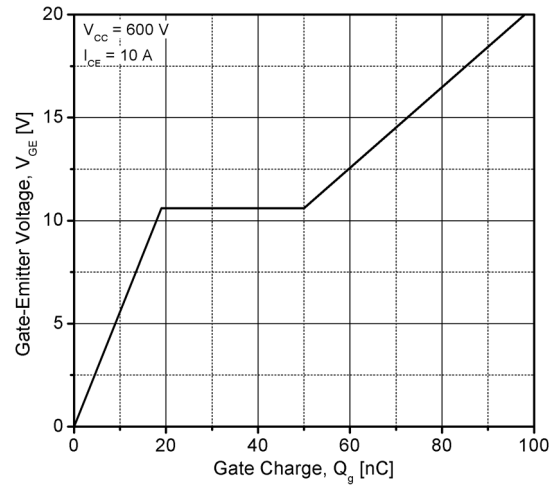

Fig 38. Typical Gate Charge Characteristics

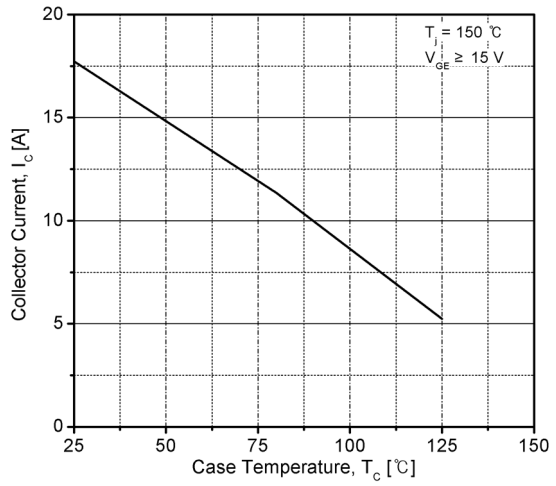

Fig 39. Case Temperature vs. Collector Current

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Transistor-Brake/Diode-Brake

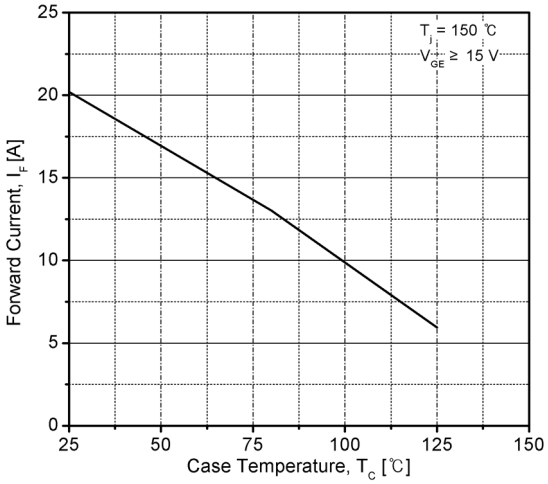

Fig 40. Case Temperature vs. Forward Current

NTC

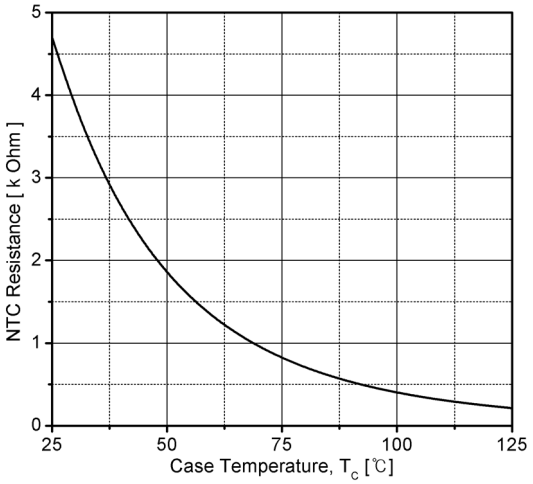

Fig 41. Typical NTC Characteristics

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Package Dimension(Dimension in mm)