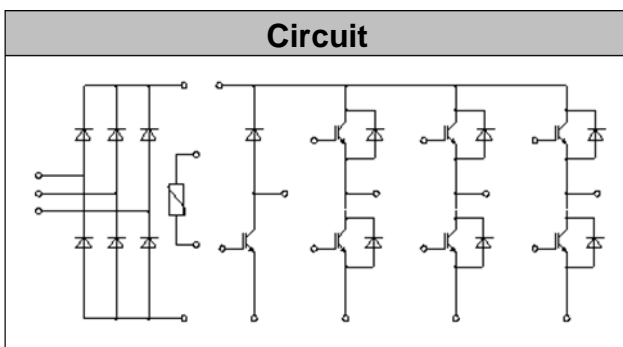


## IGBT Modules

$V_{CES}$	1200V
$I_c$	10A

## Applications

- Motor Drivers
- AC and DC Servo Drive Amplifier
- UPS (Uninterruptible Power Supplies)



## Features

- Low switching losses
- Low  $V_{CE(sat)}$  with positive temperature coefficient
- Including fast & soft recovery anti-parallel FWD
- Low inductance case
- High short circuit capability(10us)
- Isolated heatsink using DBC technology
- Maximum junction temperature 175°C

## ● IGBT- inverter

### Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Collector-Emitter Voltage	$V_{CES}$	$V_{GE}=0V, I_c=1mA, T_{vj}=25^{\circ}C$	1200	V
Continuous Collector Current	$I_c$	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	10	A
Repetitive Peak Collector Current	$I_{CRM}$	$t_p=1ms$	20	A
Gate-Emitter Voltage	$V_{GES}$	$T_{vj}=25^{\circ}C$	$\pm 20$	V
Total Power Dissipation	$P_{tot}$	$T_C=25^{\circ}C$ $T_{vjmax}=175^{\circ}C$	140	W



## ● IGBT- inverter

### Characteristic values

Parameter	Symbol	Conditions	Value			Unit	
			Min.	Typ.	Max.		
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=0.5mA, T_{vj}=25^{\circ}C$	5.2	6.0	6.6	V	
Collector-Emitter Cut-off Current	$I_{CES}$	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$			1.0	mA	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=10A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.85	2.20	V	
		$I_C=10A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.15			
		$I_C=10A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.25			
Gate Charge	$Q_G$			0.13		uC	
Input Capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V, f=1MHz, T_{vj}=25^{\circ}C$		1.0		nF	
Reverse Transfer Capacitance	$C_{res}$			0.03		nF	
Gate-Emitter leakage current	$I_{GES}$	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA	
Turn-on Delay Time	$t_{d(on)}$	$I_C=10A, V_{CE}=600V, V_{GE}=\pm 15V, R_G=47, T_{vj}=25^{\circ}C$		85		ns	
Rise Time	$t_r$			50		ns	
Turn-off Delay Time	$t_{d(off)}$			262		ns	
Fall Time	$t_f$			140		ns	
Energy Dissipation During Turn-on Time	$E_{on}$			0.98		mJ	
Energy Dissipation During Turn-off Time	$E_{off}$			0.48		mJ	
Turn-on Delay Time	$t_{d(on)}$		$I_C=10A, V_{CE}=600V, V_{GE}=\pm 15V, R_G=47, T_{vj}=125^{\circ}C$		90		ns
Rise Time	$t_r$				60		ns
Turn-off Delay Time	$t_{d(off)}$				285		ns
Fall Time	$t_f$				150		ns
Energy Dissipation During Turn-on Time	$E_{on}$			1.33		mJ	
Energy Dissipation During Turn-off Time	$E_{off}$			0.9		mJ	
SC Data	$I_{sc}$	$t_p=10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C, V_{CC}=900V, V_{CEM}=1200V$			70		A



## ● Diode-inverter

### Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	$V_{RRM}$	$T_{vj}=25^{\circ}\text{C}$	1200	V
Continuous DC Forward Current	$I_F$		10	A
Repetitive Peak Forward Current	$I_{FRM}$	$t_p=1\text{ms}$	20	A
$I^2t$ -value	$I^2t$	$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=125^{\circ}\text{C}$	16.0	A <sup>2</sup> s
		$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=150^{\circ}\text{C}$	14.0	

### Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	$V_F$	$I_F=10\text{A}, T_{vj}=25^{\circ}\text{C}$		2.0	2.5	V
		$I_F=10\text{A}, T_{vj}=125^{\circ}\text{C}$		2.1		
		$I_F=10\text{A}, T_{vj}=150^{\circ}\text{C}$		2.1		
Recovered Charge	$Q_{rr}$	$I_F=10\text{A}$		0.90		$\mu\text{C}$
Peak Reverse Recovery Current	$I_{rr}$	$V_R=600\text{V}$ $-di_F/dt=500\text{A}/\mu\text{s}$		12.5		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj}=25^{\circ}\text{C}$		0.25		mJ
Recovered Charge	$Q_{rr}$	$I_F=10\text{A}$		1.70		$\mu\text{C}$
Peak Reverse Recovery Current	$I_{rr}$	$V_R=600\text{V}$ $-di_F/dt=500\text{A}/\mu\text{s}$		10.4		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj}=125^{\circ}\text{C}$		0.50		mJ



## ● IGBT-brake-chopper

### Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Collector-Emitter Voltage	$V_{CES}$	$V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	1200	V
Continuous Collector Current	$I_C$	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	10	A
Repetitive Peak Collector Current	$I_{CRM}$	$t_p=1ms$	20	A
Gate-Emitter Voltage	$V_{GES}$	$T_{vj}=25^{\circ}C$	$\pm 20$	V
Total Power Dissipation	$P_{tot}$	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	105	W

### Characteristic Values

Parameter	Symbol	Conditions	Value			Unit	
			Min.	Typ.	Max.		
Gate-emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=0.5mA, T_{vj}=25^{\circ}C$	5.2	6.0	6.6	V	
Collector-Emitter Cut-off Current	$I_{CES}$	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$			1.0	mA	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=10A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.85	2.25	V	
		$I_C=10A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.15			
		$I_C=10A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.25			
Gate Charge	$Q_G$			0.13		uC	
Input Capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V$		1.0		nF	
Reverse Transfer Capacitance	$C_{res}$	$f=1MHz, T_{vj}=25^{\circ}C$		0.03		nF	
Gate-Emitter leakage current	$I_{GES}$	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA	
Turn-on Delay Time	$t_{d(on)}$	$I_C=10A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=47$ $T_{vj}=25^{\circ}C$		85		ns	
Rise Time	$t_r$				50		ns
Turn-off Delay Time	$t_{d(off)}$				262		ns
Fall Time	$t_f$				140		ns
Energy Dissipation During Turn-on Time	$E_{on}$				0.98		mJ
Energy Dissipation During Turn-off Time	$E_{off}$				0.48		mJ



Turn-on Delay Time	$t_{d(on)}$	$I_C=10A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=47$ $T_{vj}=125^\circ C$	90	ns
Rise Time	$t_r$		60	ns
Turn-off Delay Time	$t_{d(off)}$		285	ns
Fall Time	$t_f$		150	ns
Energy Dissipation During Turn-on Time	$E_{on}$		1.33	mJ
Energy Dissipation During Turn-off Time	$E_{off}$		0.9	mJ
SC Data	$I_{sc}$		$t_p=10\mu s, V_{GE}=15V, T_{vj}=150^\circ C$ $V_{CC}=900V, V_{CEM}=1200V$	70

## ● Diode-brake-chopper

### Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	$V_{RRM}$	$T_{vj}=25^\circ C$	1200	V
Continuous DC Forward Current	$I_F$		10	A
Repetitive Peak Forward Current	$I_{FRM}$	$t_p=1ms$	20	A
$I^2t$ -value	$I^2t$	$V_R=0V, t_p=10ms, T_{vj}=125^\circ C$	16.0	A <sup>2</sup> s
		$V_R=0V, t_p=10ms, T_{vj}=150^\circ C$	14.0	

### Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	$V_F$	$I_F=10A, T_{vj}=25^\circ C$		2.0	2.5	V
		$I_F=10A, T_{vj}=125^\circ C$		1.8		
		$I_F=10A, T_{vj}=150^\circ C$		1.75		
Recovered Charge	$Q_{rr}$	$I_F=10A$		0.90		$\mu C$
Peak Reverse Recovery Current	$I_{rr}$	$V_R=600V$ $-di_F/dt=500A/\mu s$		12.5		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj}=25^\circ C$		0.25		mJ
Recovered Charge	$Q_{rr}$	$I_F=10A$		1.70		$\mu C$
Peak Reverse Recovery Current	$I_{rr}$	$V_R=600V$ $-di_F/dt=500A/\mu s$		10.4		A
Reverse Recovery Energy	$E_{rec}$	$T_{vj}=125^\circ C$		0.50		mJ



## ● Diode-rectifier

### Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	$V_{RRM}$	$T_{vj}=25^{\circ}\text{C}$	1600	V
Average output Current 50/60Hz, sine wave	$I_{F(AV)}$	$T_C=100^{\circ}\text{C}$	10	A
Maximum RMS Current at Rectifier Output	$I_{RMSM}$	$T_C=100^{\circ}\text{C}$	10	A
Surge Forward Current	$I_{FSM}$	$V_R=0\text{V}$ , $t_p=10\text{ms}$ , $T_{vj}=45^{\circ}\text{C}$	150	A
$I^2t$ -value	$I^2t$	$V_R=0\text{V}$ , $t_p=10\text{ms}$ , $T_{vj}=45^{\circ}\text{C}$	110	$\text{A}^2\text{s}$

### Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	$V_F$	$I_F=10\text{A}$ , $T_{vj}=150^{\circ}\text{C}$		1.00		V
Reverse Current	$I_R$	$T_{vj}=150^{\circ}\text{C}$ , $V_R=1600\text{V}$			1.0	mA

## ● NTC Thermistor

### Characteristic Values

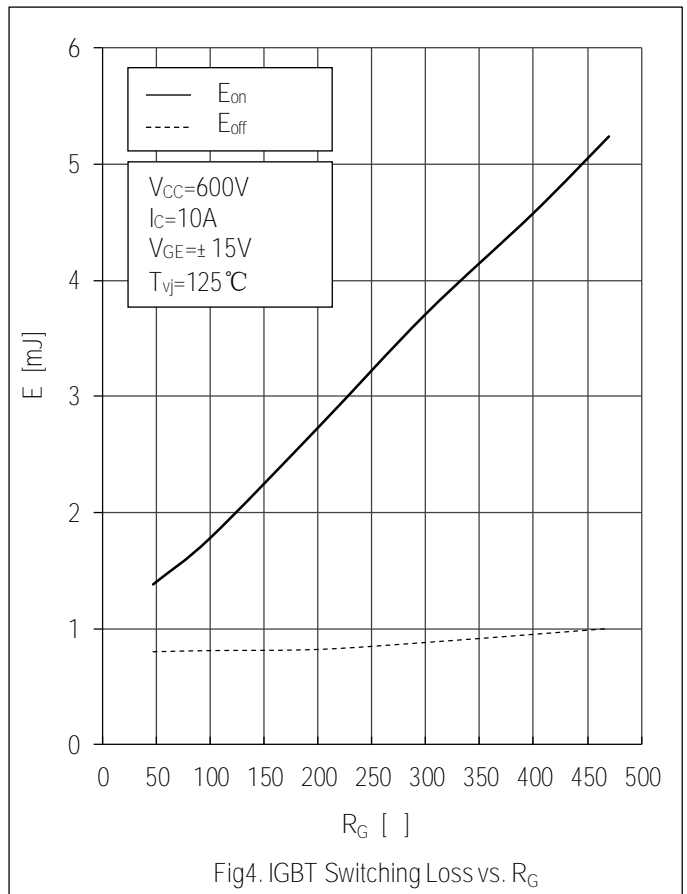
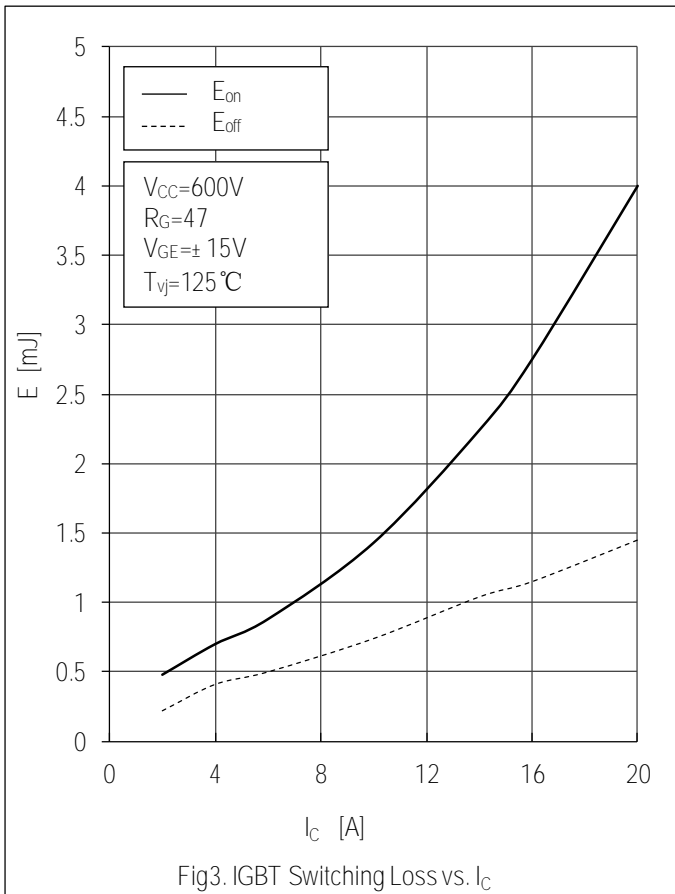
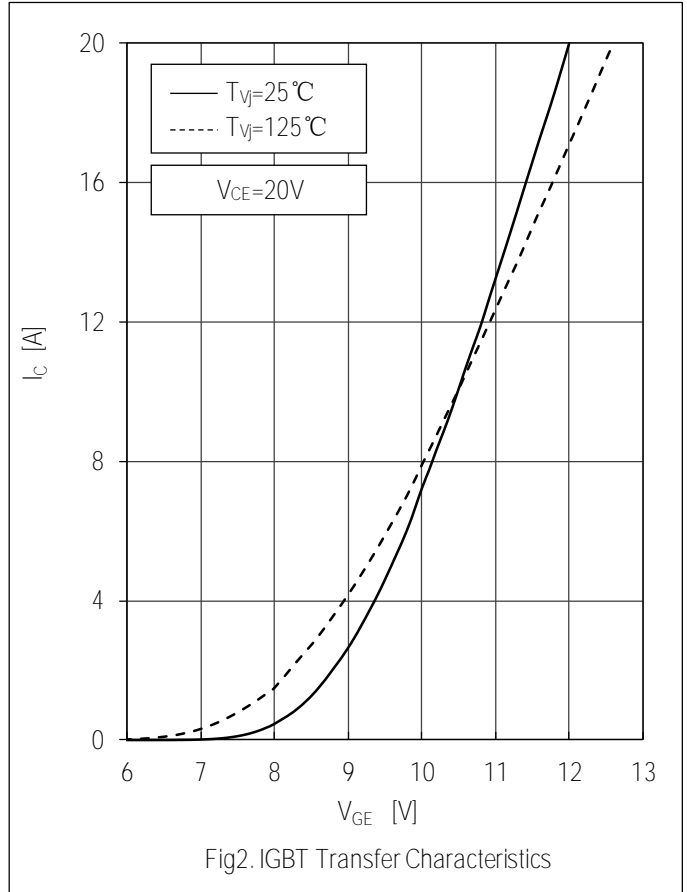
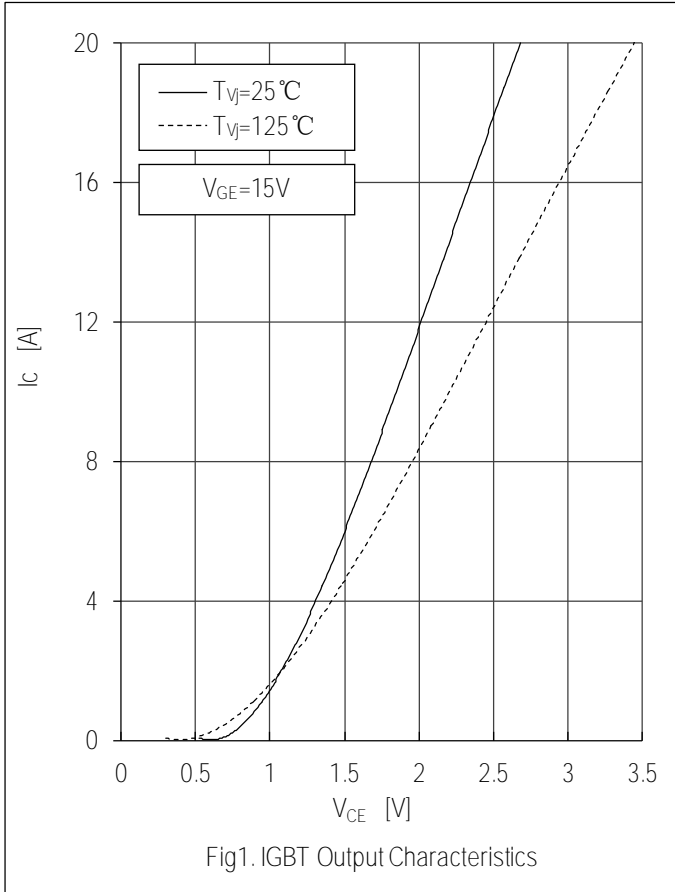
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			Min.	Typ.	Max.	
Rated Resistance	$R_{25}$			5.0		k
Deviation of R100	R/R	$T_C=100^{\circ}\text{C}$ , $R_{100}=493.3$	-5		5	%
Power Dissipation	$P_{25}$				20.0	mW
B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3375		K



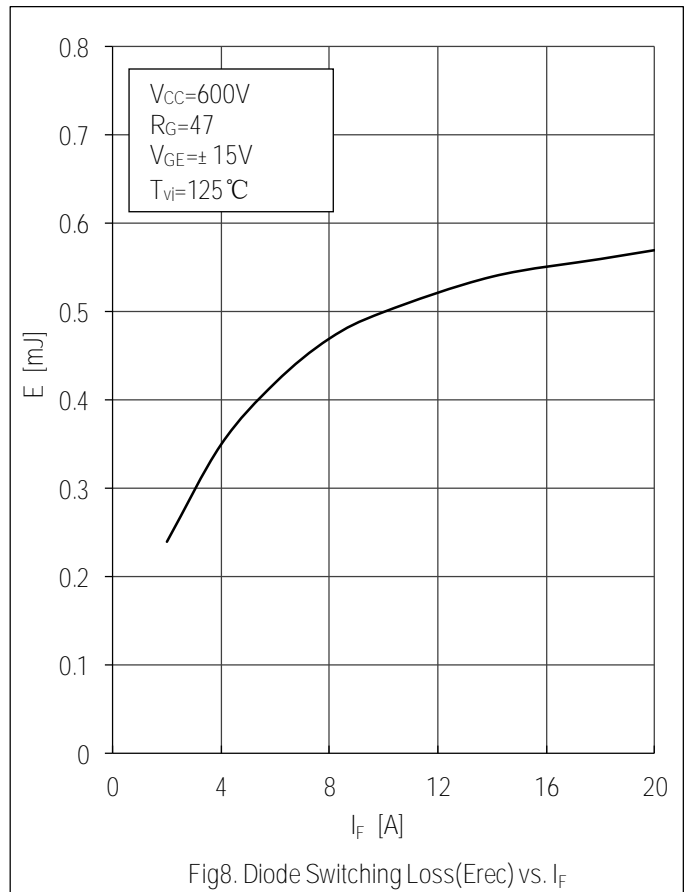
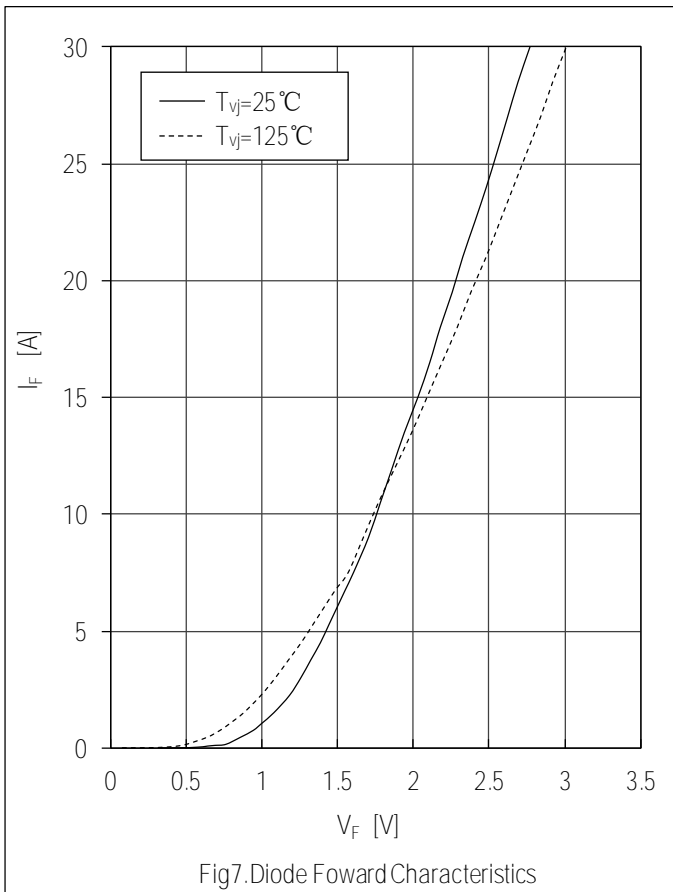
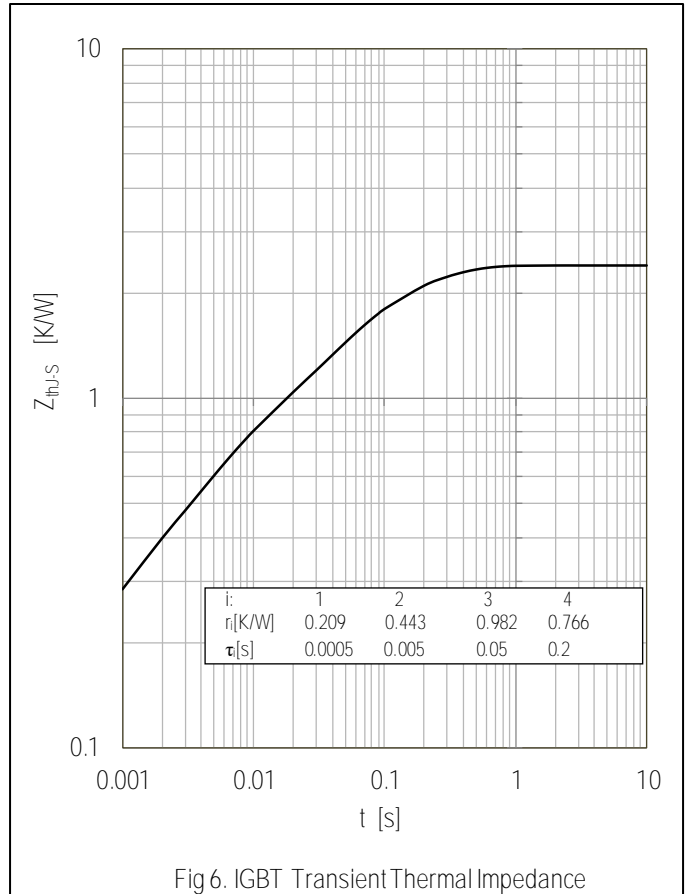
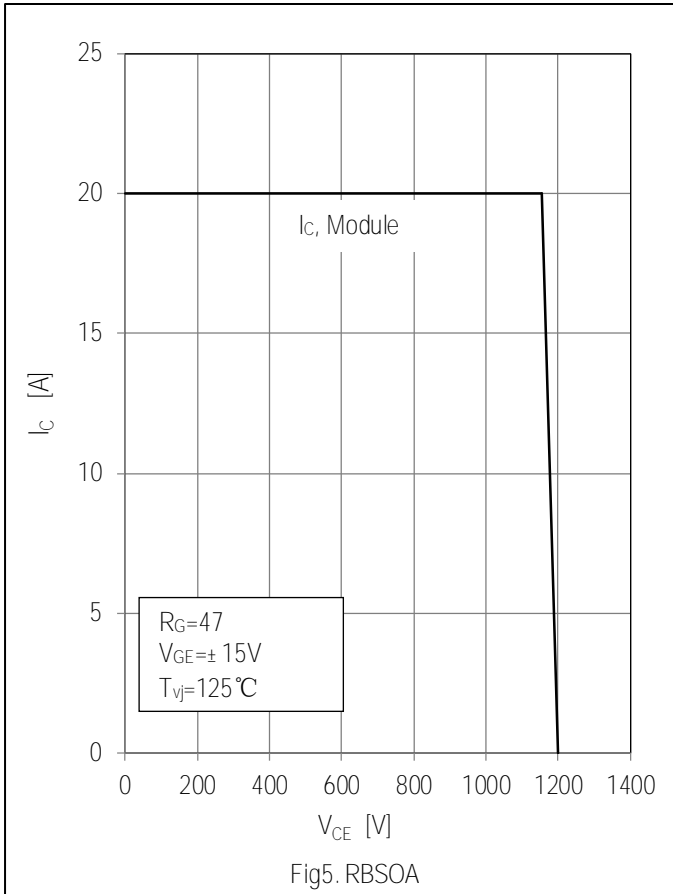
## ● Module Characteristics

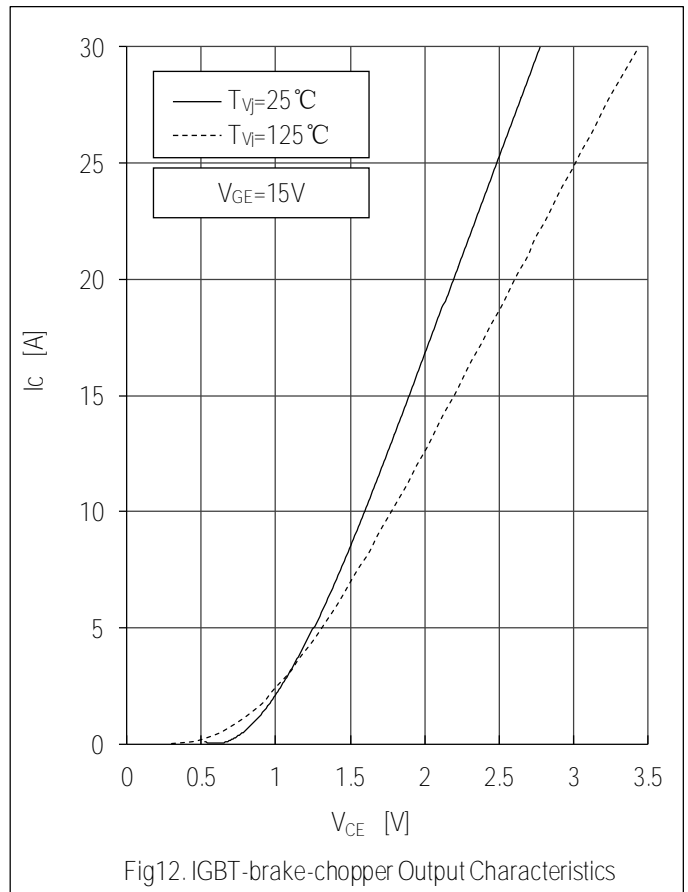
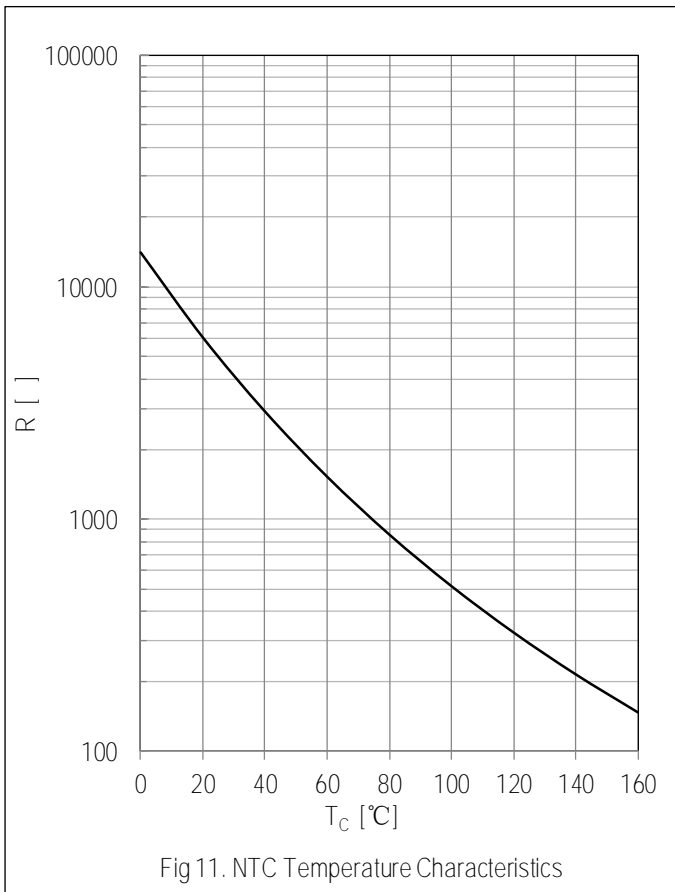
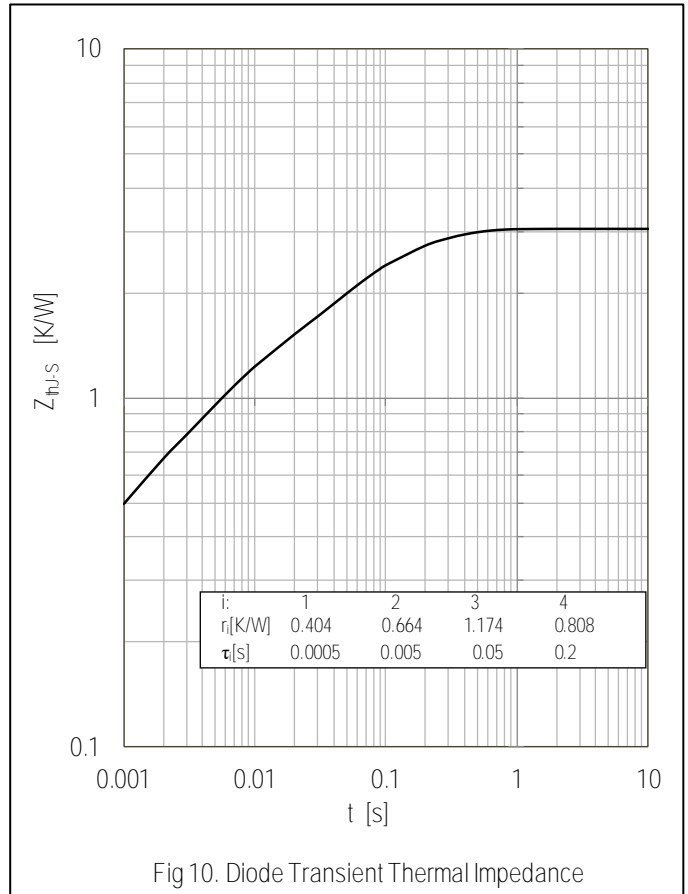
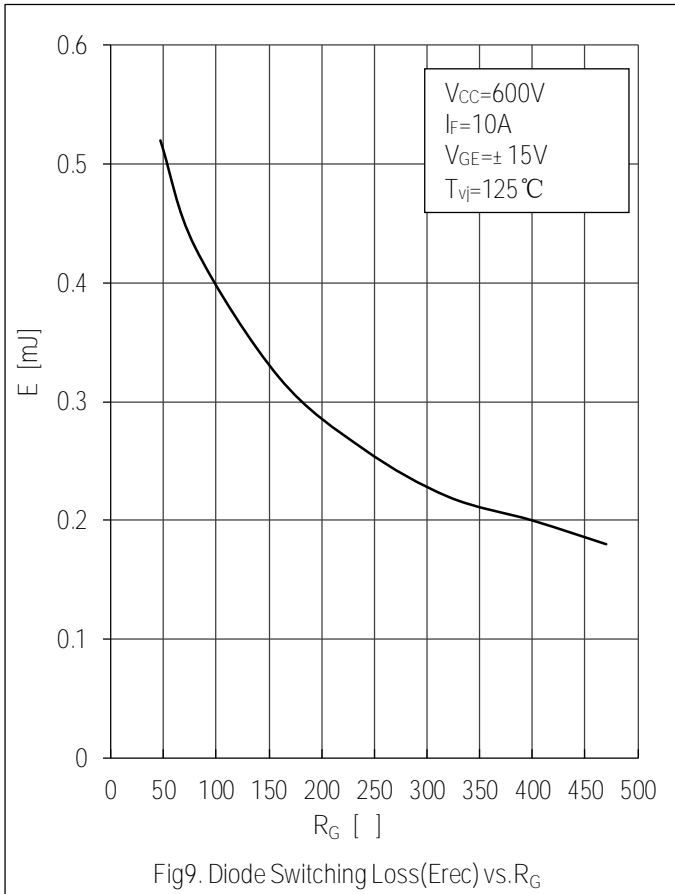
$T_c=25^{\circ}\text{C}$  unless otherwise specified

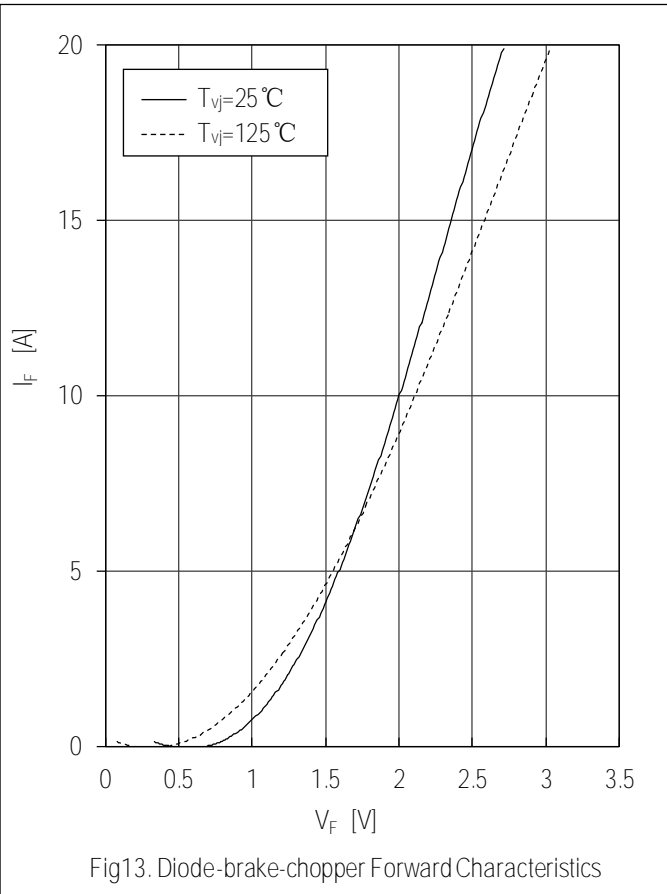
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Isolation Voltage	$V_{\text{isol}}$	$t=1\text{min}, f=50\text{Hz}$	2500			V
Maximum Junction Temperature	$T_{\text{jmax}}$				175	$^{\circ}\text{C}$
Operating Junction Temperature	$T_{\text{vj op}}$		-40		150	$^{\circ}\text{C}$
Storage Temperature	$T_{\text{stg}}$					



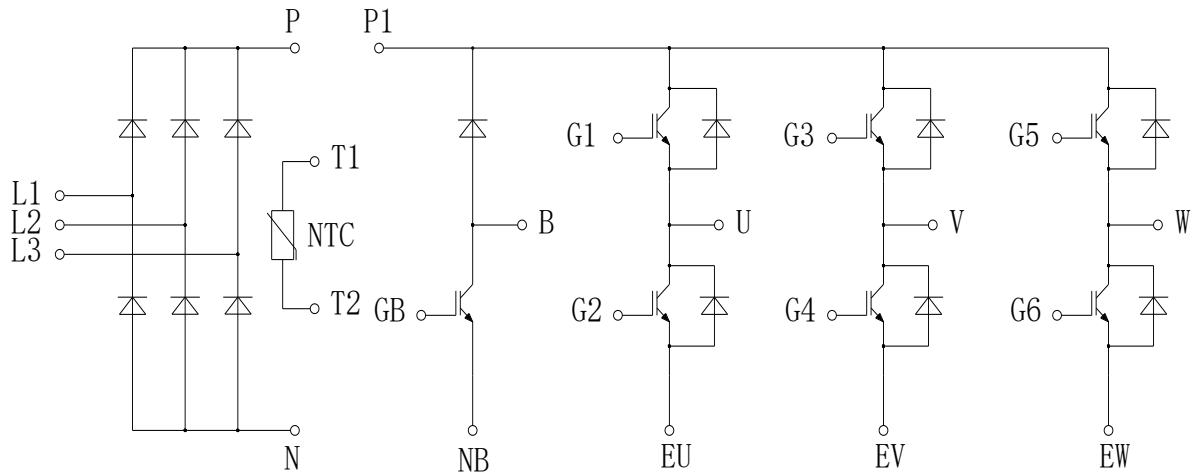




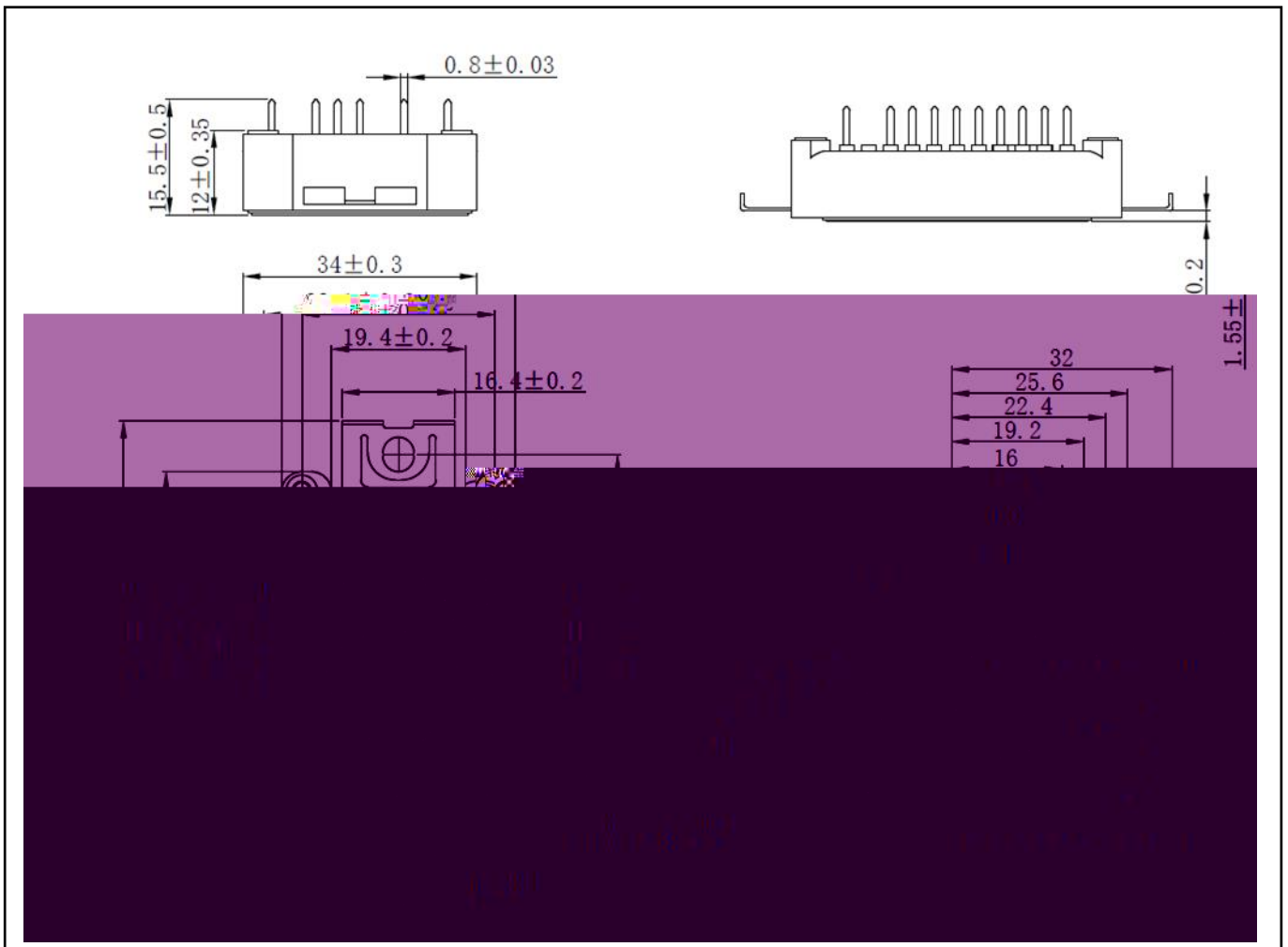




## Circuit Diagram



## ● Package Dimensions





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