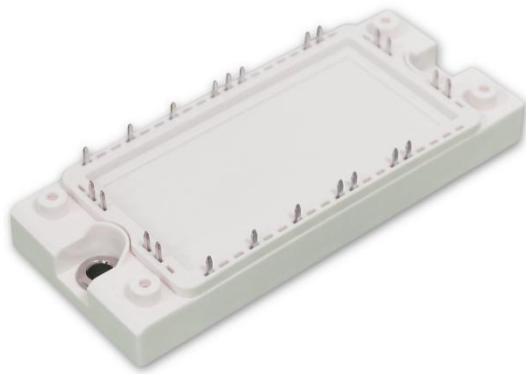


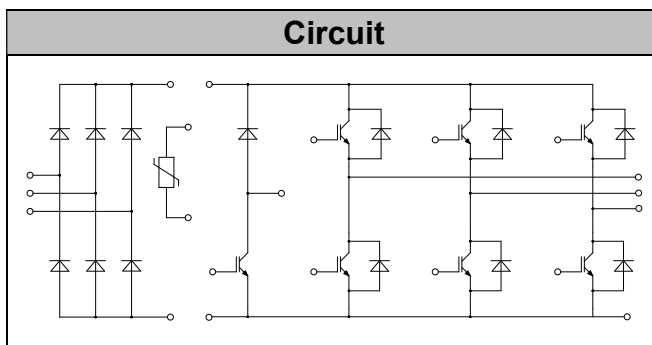
IGBT Modules



V_{CES} 1200V
I_c 25A

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)
- Maximum junction temperature 175°C

- IGBT-invert
- 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	$T_c=80^{\circ}C, T_{vjmax}=175^{\circ}C$	25	A
Repetitive Peak Collector Current	I_{CRM}	$t_p=1ms$	50	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation (IGBT-inverter)	P_{tot}	$T_c=25^{\circ}C,$ $T_{vjmax}=175^{\circ}C$	166	W



Characteristic values

Parameter	Symbol	Conditions	Value			Unit	
			Min.	Typ.	Max.		
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1.2mA, T_{vj}=25^{\circ}C$	5.6	6.2	7.0	V	
Collector-Emitter Cut-offCurrent	I_{CES}	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$			1.0	mA	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=25A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.90	2.25	V	
		$I_C=25A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.20			
		$I_C=25A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.30			
Gate Charge	Q_G			0.24		uC	
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz, T_{vj}=25^{\circ}C$		1.60		nF	
Reverse Transfer Capacitance	C_{res}			0.07		nF	
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			100	nA	
Turn-on Delay Time	$t_{d(on)}$	$I_C=25A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=18\Omega$ $T_{vj}=25^{\circ}C$		175		ns	
Rise Time	t_r			38		ns	
Turn-off Delay Time	$t_{d(off)}$			420		ns	
Fall Time	t_f			65		ns	
Energy Dissipation During Turn-on Time	E_{on}			1.95		mJ	
Energy Dissipation During Turn-off Time	E_{off}			1.20		mJ	
Turn-on Delay Time	$t_{d(on)}$		$I_C=25A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=18\Omega$ $T_{vj}=125^{\circ}C$		185		ns
Rise Time	t_r				43		ns
Turn-off Delay Time	$t_{d(off)}$			510		ns	
Fall Time	t_f			120		ns	
Energy Dissipation During Turn-on Time	E_{on}			2.60		mJ	
Energy Dissipation During Turn-off Time	E_{off}			2.00		mJ	



Turn-on Delay Time	$t_{d(on)}$	$I_C = 25\text{ A}$ $V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 18\Omega$ $T_{vj} = 150^\circ\text{C}$	195		ns
Rise Time	t_r		45		ns
Turn-off Delay Time	$t_{d(off)}$		530		ns
Fall Time	t_f		125		ns
Energy Dissipation During Turn-on Time	E_{on}		2.80		mJ
Energy Dissipation During Turn-off Time	E_{off}		2.20		mJ
SC Data	I_{sc}	$T_p \leq 10\mu\text{s}, V_{GE} = 15\text{ V}, T_{vj} = 150^\circ\text{C}, V_{cc} = 900\text{ V}, V_{CEM} \leq 1200\text{ V}$	200		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		25	A
Repetitive Peak Forward Current	I_{FRM}	$t_p = 1\text{ ms}$	50	A
I^2t -value	I^2t	$V_R = 0, t_p = 10\text{ ms}, T_{vj} = 125^\circ\text{C}$	90.0	A ² s
		$V_R = 0, t_p = 10\text{ ms}, T_{vj} = 150^\circ\text{C}$	75.0	

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	$I_F = 25\text{ A}, T_{vj} = 25^\circ\text{C}$		2.00	2.40	V
		$I_F = 25\text{ A}, T_{vj} = 125^\circ\text{C}$		2.10		
		$I_F = 25\text{ A}, T_{vj} = 150^\circ\text{C}$		2.10		
Recovered Charge	Q_{rr}	$I_F = 25\text{ A}$		2.10		uC
Peak Reverse Recovery Current	I_{rr}	$V_R = 600\text{ V}$ $-di_F/dt = 900\text{ A/us}$		42.0		A
Reverse Recovery Energy	E_{rec}	$T_{vj} = 25^\circ\text{C}$		0.80		mJ
Recovered Charge	Q_{rr}	$I_F = 25\text{ A}$		3.80		uC
Peak Reverse Recovery Current	I_{rr}	$V_R = 600\text{ V}$ $-di_F/dt = 900\text{ A/us}$		46.0		A
Reverse Recovery Energy	E_{rec}	$T_{vj} = 125^\circ\text{C}$		1.45		mJ



Recovered Charge	Q_{rr}	$I_F = 25\text{ A}$ $V_R = 600\text{ V}$ $-di_F/dt = 900\text{ A/us}$ $T_{vj} = 150^\circ\text{ C}$		4.25		uC
Peak Reverse Recovery Current	I_{rr}		48.0		A	
Reverse Recovery Energy	E_{rec}		1.78		mJ	

● IGBT-brake-chopper
Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Collector-Emitter Voltage	V_{CES}	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}, T_{vj} = 25^\circ\text{ C}$	1200	V
Continuous Collector Current	I_C	$T_c = 100^\circ\text{ C}, T_{vjmax} = 175^\circ\text{ C}$	15	A
Repetitive Peak Collector Current	I_{CRM}	$tp = 1\text{ ms}$	30	A
Gate-Emitter Voltage	V_{GES}	$T_{vj} = 25^\circ\text{ C}$	± 20	V
Total Power Dissipation	P_{tot}	$T_c = 25^\circ\text{ C}, T_{vjmax} = 175^\circ\text{ C}$	125	W

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 1.2\text{ mA}, T_{vj} = 25^\circ\text{ C}$	6.0	6.6	7.2	V
Collector-Emitter Cut-off Current	I_{CES}	$V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^\circ\text{ C}$			1.0	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 15\text{ A}, V_{GE} = 15\text{ V}, T_{vj} = 25^\circ\text{ C}$		1.90	2.20	V
		$I_C = 15\text{ A}, V_{GE} = 15\text{ V}, T_{vj} = 125^\circ\text{ C}$		2.20		
		$I_C = 15\text{ A}, V_{GE} = 15\text{ V}, T_{vj} = 150^\circ\text{ C}$		2.30		
Gate Charge	Q_G			0.14		uC
Input Capacitance	C_{ies}	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V},$ $f = 1\text{ MHz}, T_{vj} = 25^\circ\text{ C}$		1.0		nF
Reverse Transfer Capacitance	C_{res}			0.03		nF
Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^\circ\text{ C}$			400	nA



Turn-on Delay Time	$t_{d(on)}$	$I_C = 15\text{ A}$ $V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 51\Omega$ $T_{vj} = 25^\circ\text{C}$	80	ns
Rise Time	t_r		55	ns
Turn-off Delay Time	$t_{d(off)}$		170	ns
Fall Time	t_f		150	ns
Energy Dissipation During Turn-on Time	E_{on}		1.50	mJ
Energy Dissipation During Turn-off Time	E_{off}		0.85	mJ
Turn-on Delay Time	$t_{d(on)}$	$I_C = 15\text{ A}$ $V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 51\Omega$ $T_{vj} = 125^\circ\text{C}$	90	ns
Rise Time	t_r		65	ns
Turn-off Delay Time	$t_{d(off)}$		250	ns
Fall Time	t_f		205	ns
Energy Dissipation During Turn-on Time	E_{on}		2.10	mJ
Energy Dissipation During Turn-off Time	E_{off}		1.20	mJ
Turn-on Delay Time	$t_{d(on)}$	$I_C = 15\text{ A}$ $V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 51\Omega$ $T_{vj} = 150^\circ\text{C}$	95	ns
Rise Time	t_r		70	ns
Turn-off Delay Time	$t_{d(off)}$		290	ns
Fall Time	t_f		265	ns
Energy Dissipation During Turn-on Time	E_{on}		2.25	mJ
Energy Dissipation During Turn-off Time	E_{off}		1.25	mJ
SC Data	I_{sc}	$T_p \leq 10\mu\text{s}, V_{GE} = 15\text{ V}, T_{vj} = 150^\circ\text{C}, V_{cc} = 900\text{ V}, V_{CEM} \leq 1200\text{ V}$	90	A



● **Diode-brake-chopper**
Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_j=25^\circ\text{C}$	1200	V
Continuous DC Forward Current	I_F		15	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1\text{ms}$	30	A
I ² t-value	I ² t	$V_R=0, t_p=10\text{ms}, T_j=125^\circ\text{C}$	48.0	A ² s
		$V_R=0, t_p=10\text{ms}, T_j=150^\circ\text{C}$	42.0	

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	$I_F=15\text{A}, T_{vj}=25^\circ\text{C}$		2.00	2.40	V
		$I_F=15\text{A}, T_{vj}=125^\circ\text{C}$		2.10		
		$I_F=15\text{A}, T_{vj}=150^\circ\text{C}$		2.10		
Recovered Charge	Q_{rr}	$I_F = 15\text{ A}$ $V_R=600\text{V}$ $-di_F/dt = 550\text{A/us}$ $T_{vj}=25^\circ\text{C}$		1.10		uC
Peak Reverse Recovery Current	I_{rr}			12.0		A
Reverse Recovery Energy	E_{rec}			0.30		mJ
Recovered Charge	Q_{rr}	$I_F = 15\text{ A}$ $V_R=600\text{V}$ $-di_F/dt = 550\text{A/us}$ $T_{vj}=125^\circ\text{C}$		1.90		uC
Peak Reverse Recovery Current	I_{rr}			14.0		A
Reverse Recovery Energy	E_{rec}			0.60		mJ
Recovered Charge	Q_{rr}	$I_F = 15\text{ A}$ $V_R=600\text{V}$ $-di_F/dt = 550\text{A/us}$ $T_{vj}=150^\circ\text{C}$		2.00		uC
Peak Reverse Recovery Current	I_{rr}			15.0		A
Reverse Recovery Energy	E_{rec}			0.65		mJ



● Diode- Rectifier Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_j=25^{\circ}\text{C}$	1600	V
Average output Current 50/60Hz, sine wave	$I_{F(AV)}$	$T_c=100^{\circ}\text{C}$	30	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	$T_c=100^{\circ}\text{C}$	60	A
Surge Forward Current	I_{FSM}	$V_R=0, t_p=10\text{ms}, T_j=45^{\circ}\text{C}$	320	A
I^2t -value	I^2t	$V_R=0, t_p=10\text{ms}, T_j=45^{\circ}\text{C}$	510	A^2s

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V_F	$I_F=25\text{A}, T_j=150^{\circ}\text{C}$		1.02		V
Reverse Current	I_R	$T_j=125, V_R=1600\text{V}$			2	mA

● NTC-Thermistor Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Rated Resistance	R_{25}			5.0		$\text{k}\Omega$
Deviation of R100	$\Delta R/R$	$T_C=100, R_{100}=493.3\ \Omega$	-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

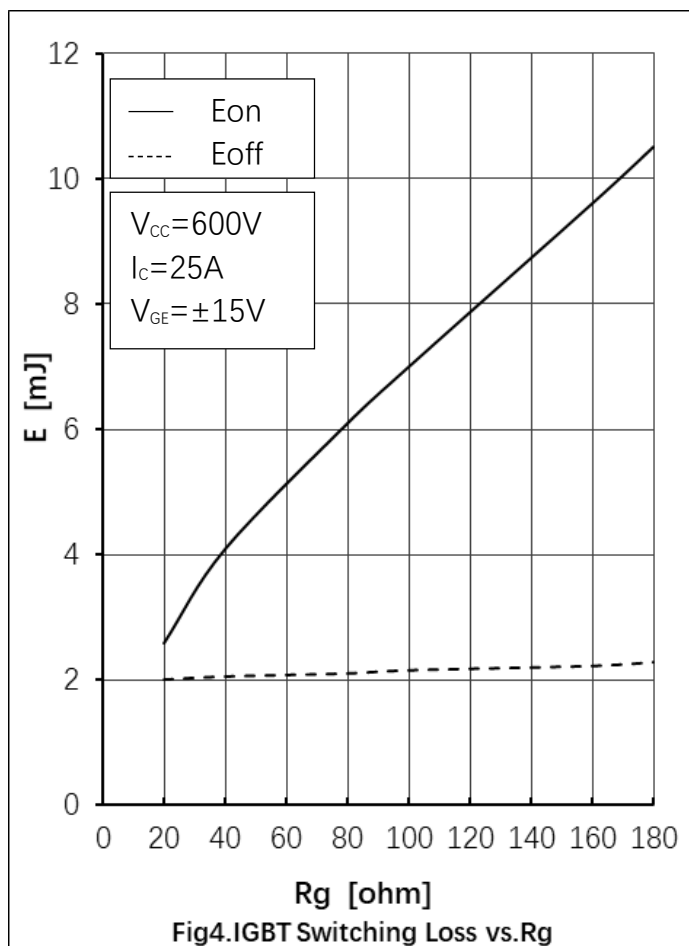
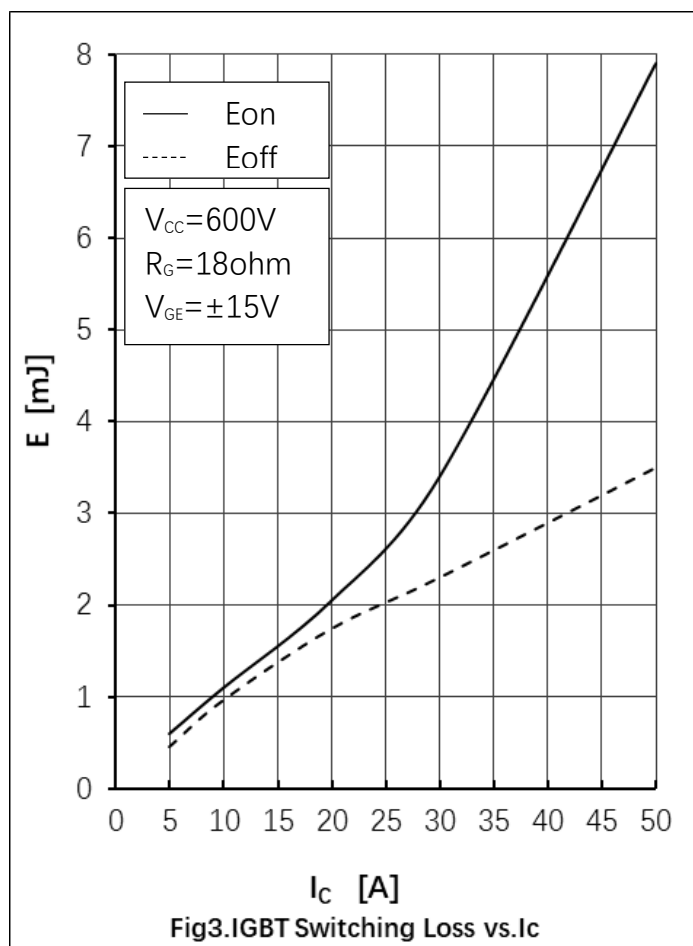
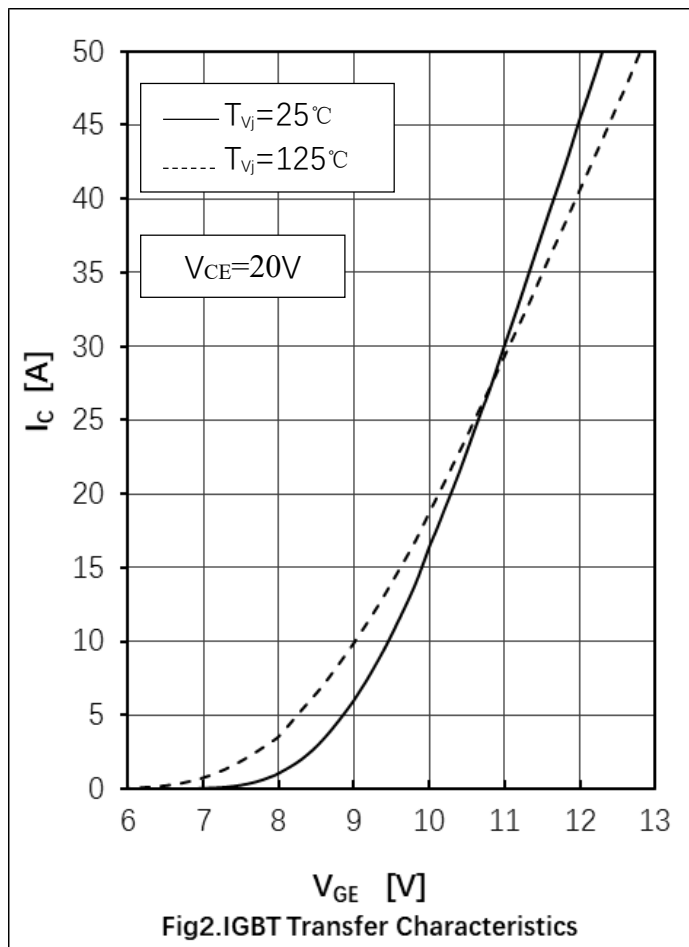
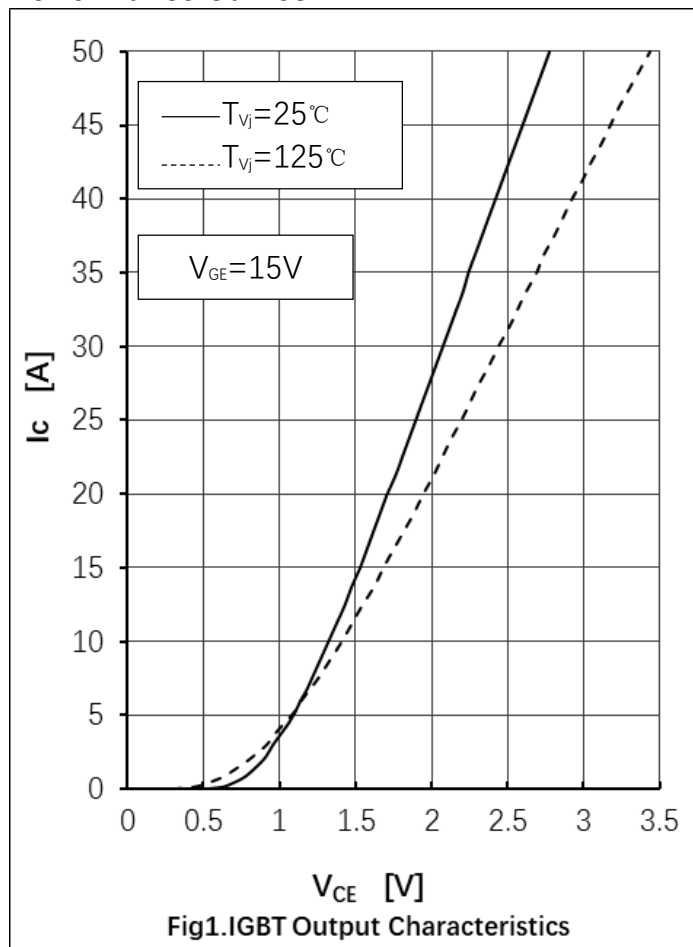


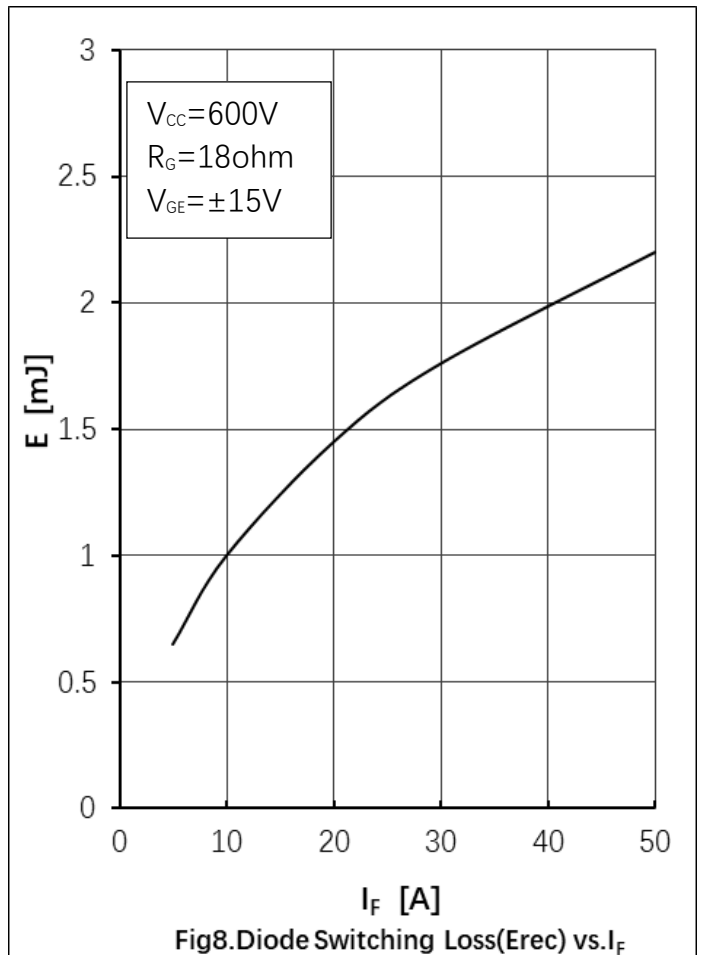
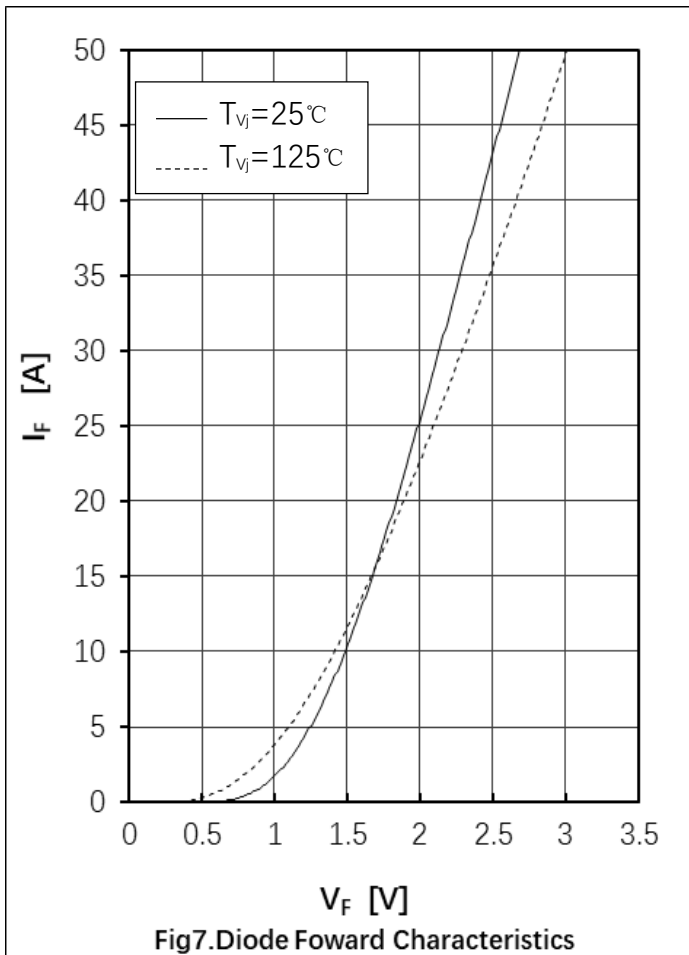
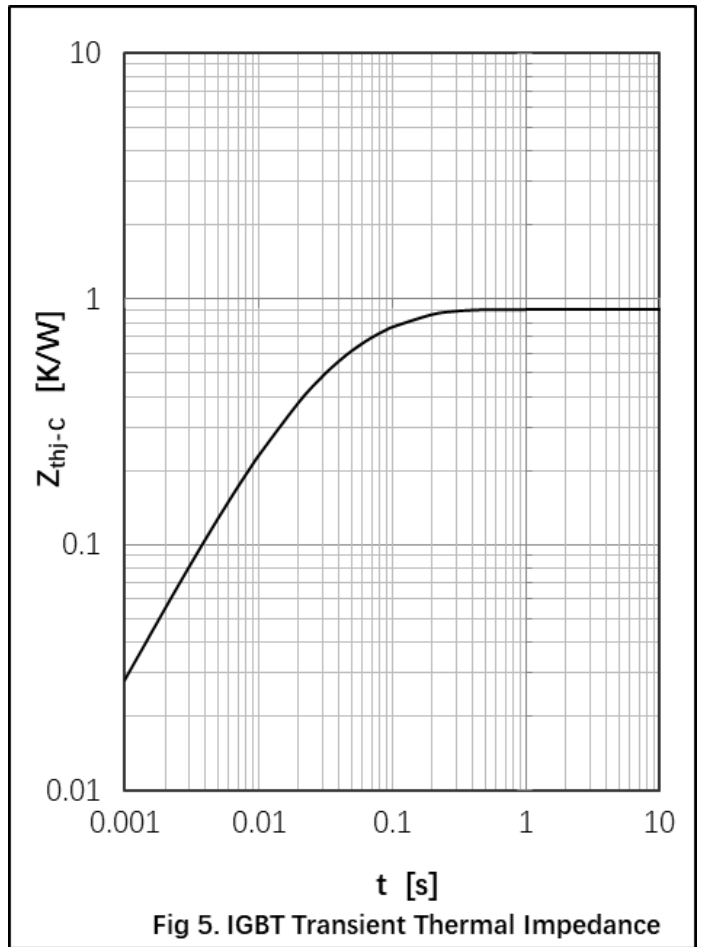
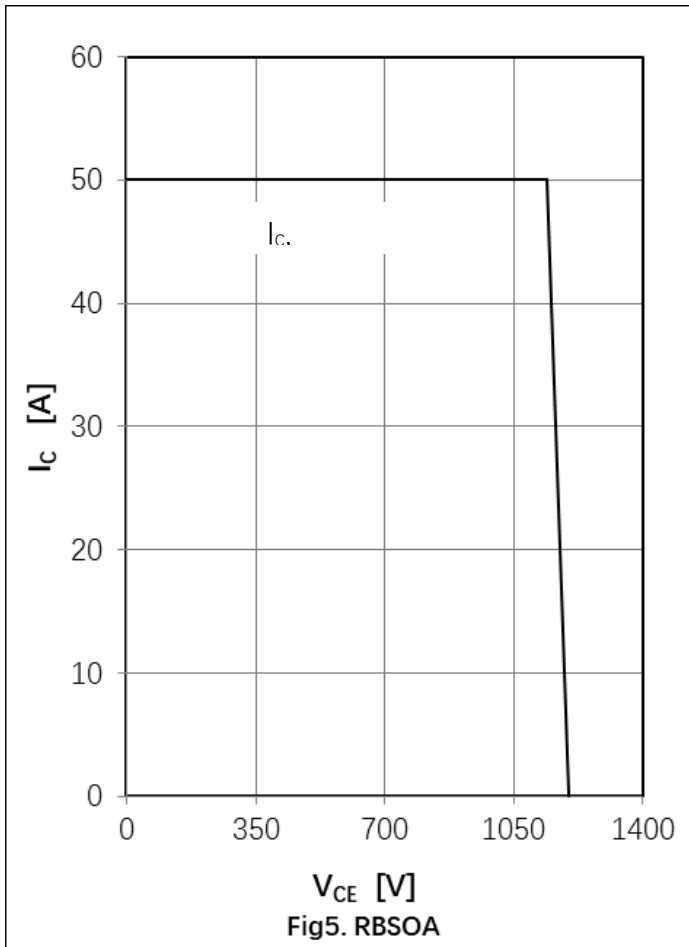
● **Module Characteristics** $T_c=25^\circ\text{C}$ unless otherwise specified

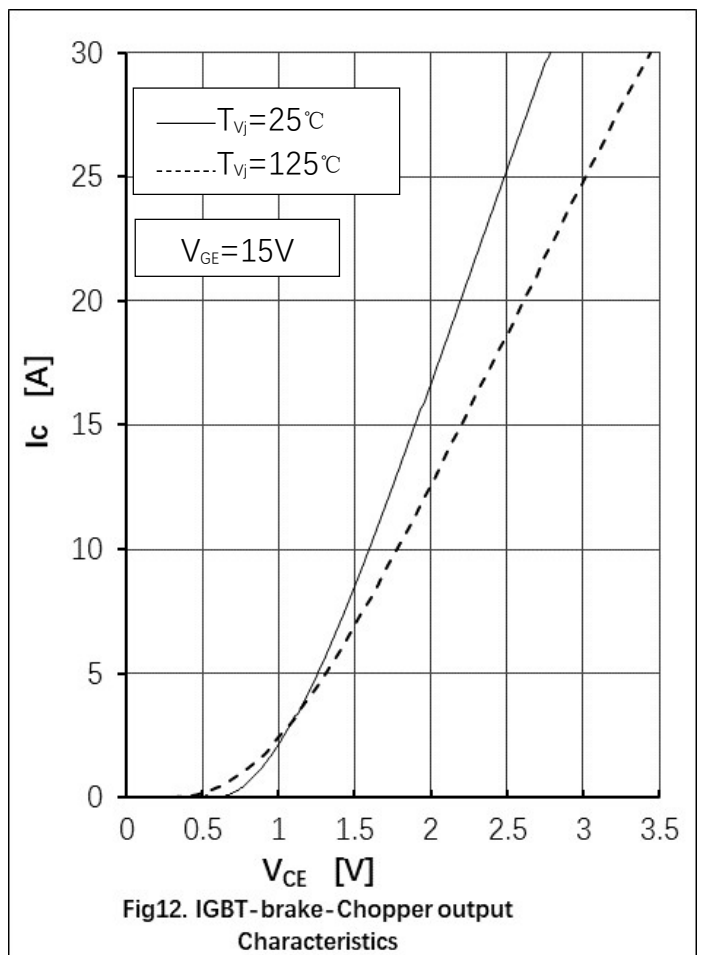
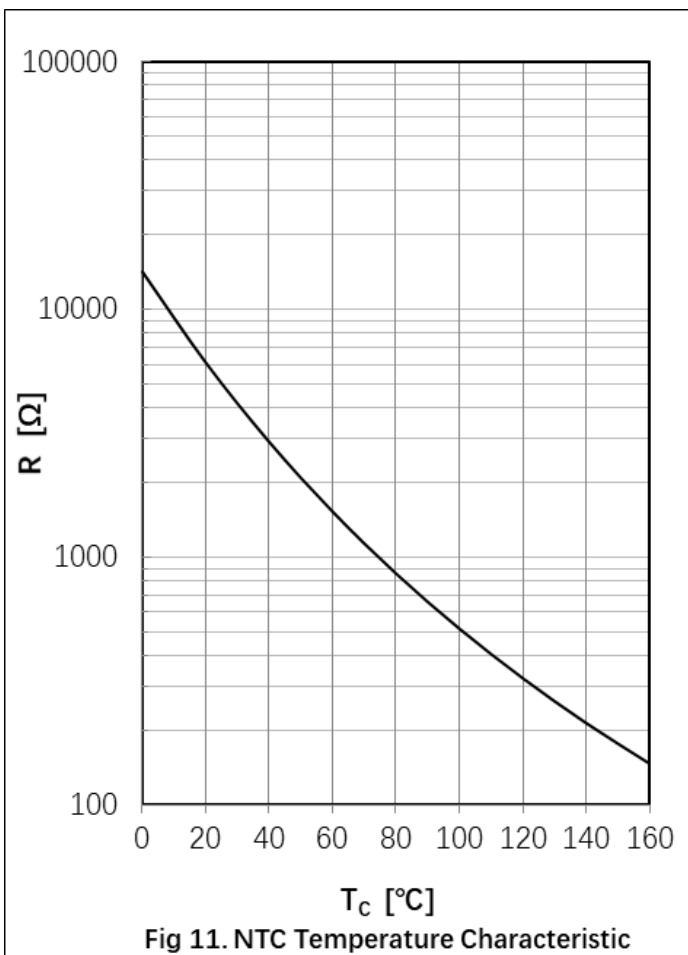
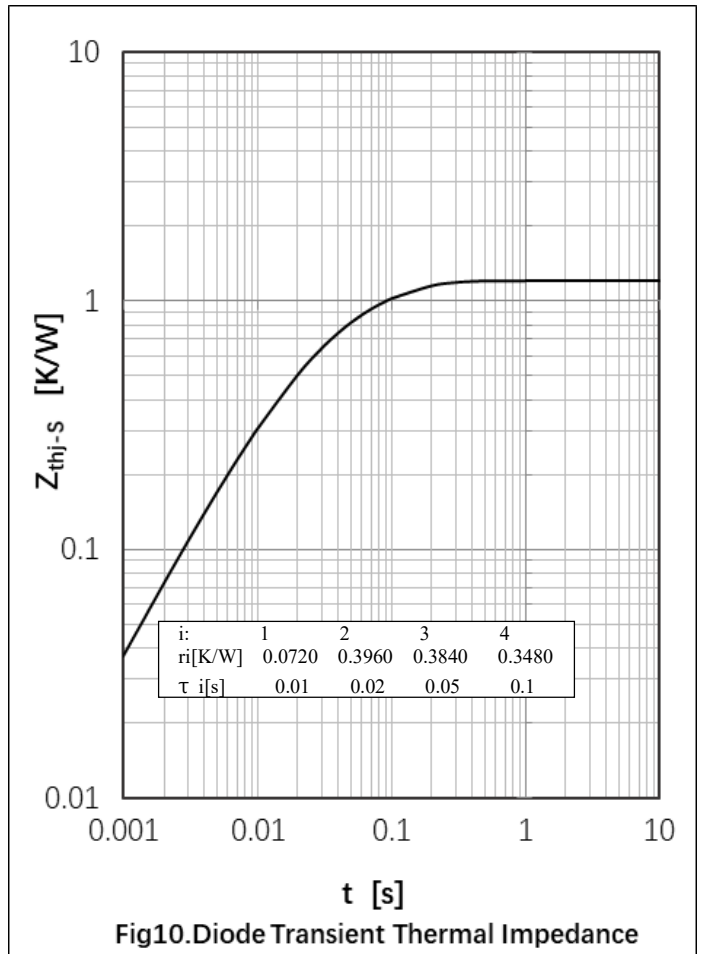
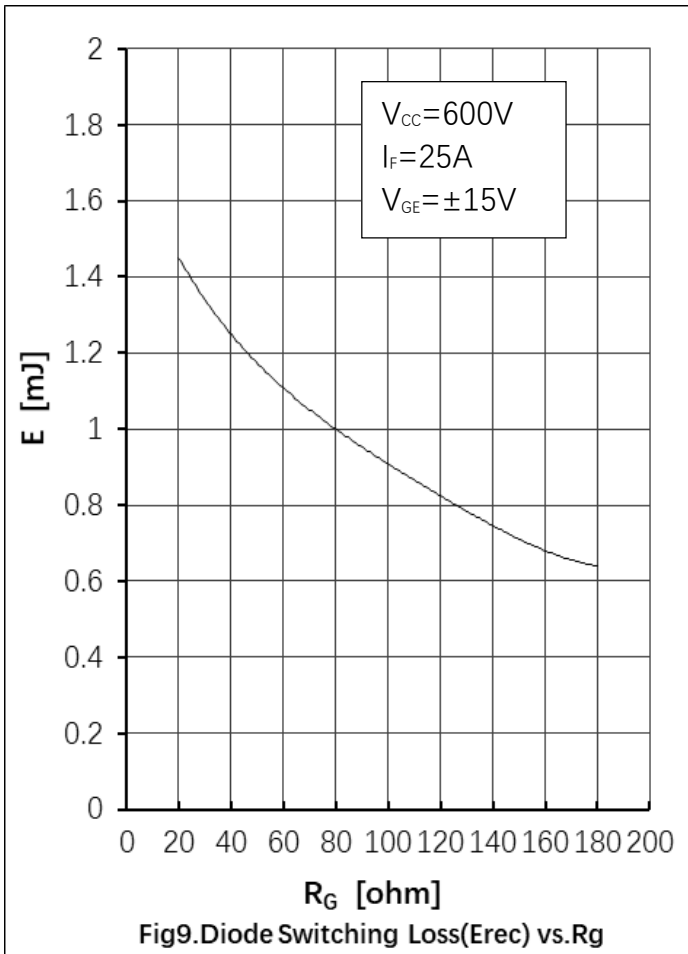
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Isolation voltage	V_{isol}	$t=1\text{min}, f=50\text{Hz}$	2500			V
Maximum Junction Temperature	T_{jmax}	Inverter, brake			175	$^\circ\text{C}$
		rectifier			150	
Operating Junction Temperature	$T_{vj\ op}$		-40		150	$^\circ\text{C}$
Storage Temperature	T_{stg}		-40		125	$^\circ\text{C}$
Stray Inductance	L_{CE}			60		nH
Module Lead Resistance , Terminal to Chip	$R_{cc'+EE'}$	$T_c=25^\circ\text{C}$, perswitch		4.0		$\text{m}\ \Omega$
	$R_{AA'+CC'}$			3.0		
Thermal Resistance Junction-to Case	$R_{\theta\ JC}$	per IGBT-inverter			0.90	K/W
		per Diode-inverter			1.20	
		per IGBT-brake-chopper			1.20	
		per Diode-chopper			1.50	
		per Diode-rectifier			1.15	
Thermal Resistance Case-to Sink	$R_{\theta\ CS}$	per IGBT-inverter		0.33		K/W
		per Diode-inverter		0.46		
		per IGBT-brake-chopper		0.46		
		per Diode-chopper		0.70		
		per Diode-rectifier		0.49		
		per Module		0.02		
Module-to-Sink Torque	M_s		3.0		6.0	N·m
Weight of Module	G			180		g

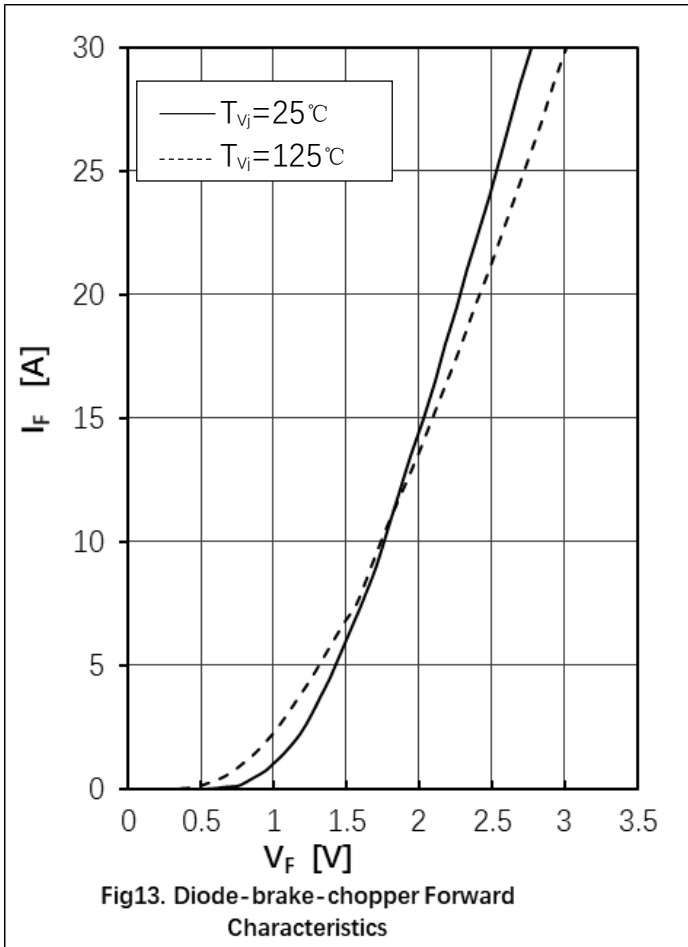


Performance Curves







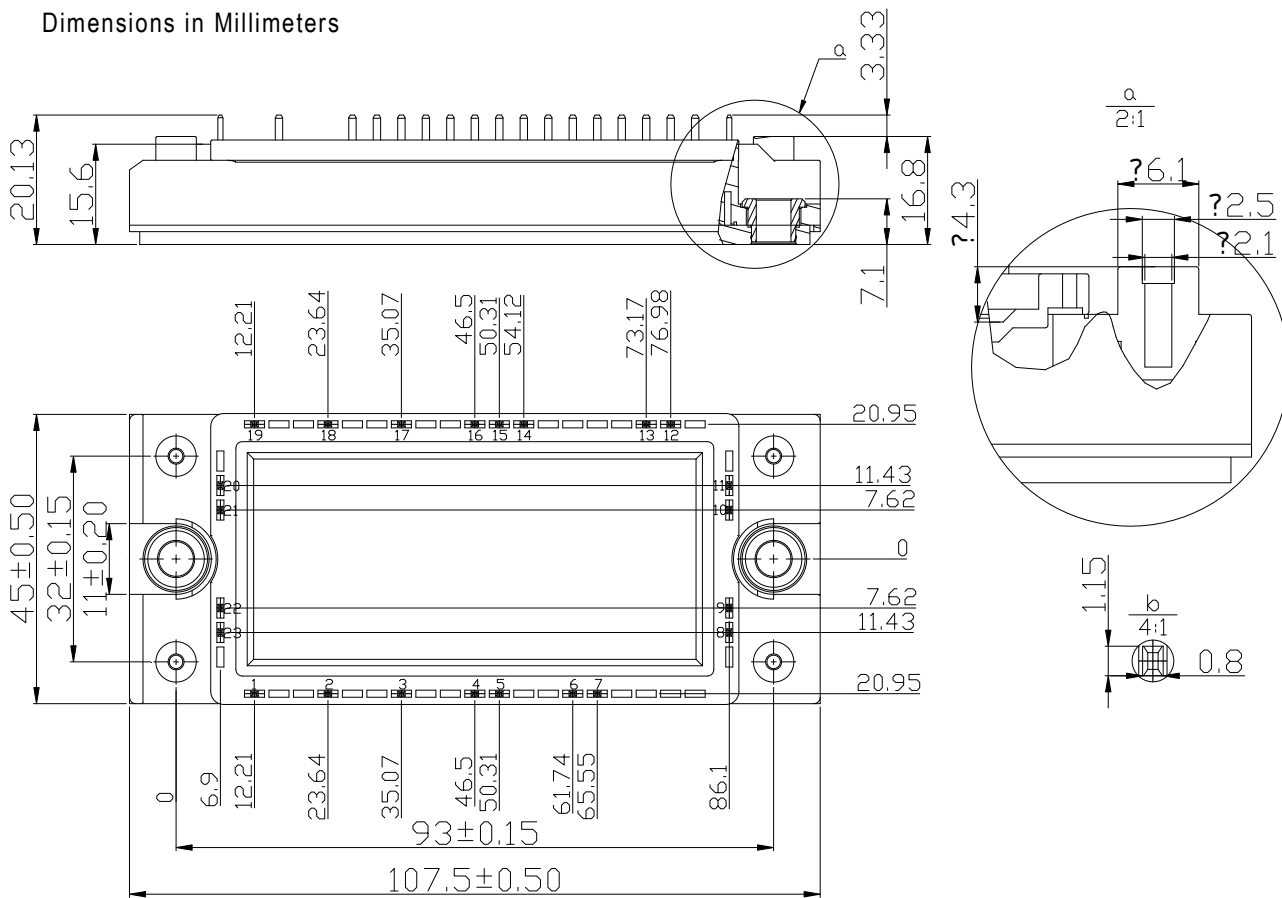




Package Outline Information

CASE: E1A

Dimensions in Millimeters



Dimensions in mm