

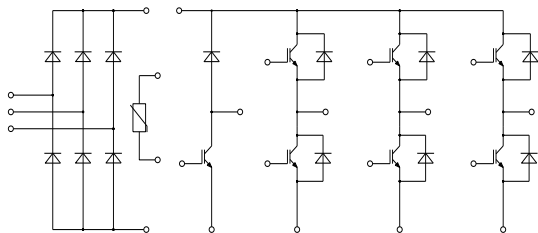
Features

- 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(10 μ s)
- Maximum Junction Temperature 175°C
- Isolated Heatsink Using DBC Technology
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

Applications

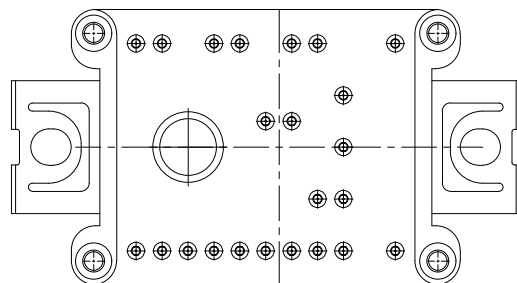
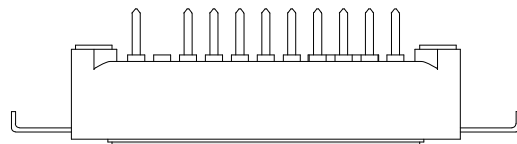
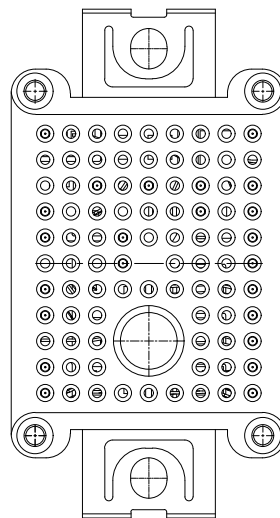
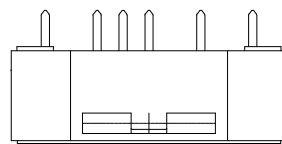
- Motor Drivers
- AC and DC Servo Drive Amplifier
- UPS (Uninterruptible Power Supplies)

Circuit Diagram



IGBT Modules 1200V 15A

P2



● IGBT- Inverter

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Collector-Emitter Voltage	V_{CES}	$V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	1200	V
Continuous Collector Current	I_C	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	15	A
Repetitive Peak Collector Current	I_{CRM}	$t_p=1ms$	30	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	155	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit		
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=0.5mA, T_{vj}=25^{\circ}C$	5.2	6.0	6.8	V		
Collector-Emitter Cut-off Current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$			1	mA		
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=15A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.8	2.2	V		
		$I_C=15A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.1		V		
		$I_C=15A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.2		V		
Gate Charge	Q_g			0.15		μC		
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz$		1.1		nF		
Reverse Transfer Capacitance	C_{res}			0.04				
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA		
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=15A, V_{GE}=\pm 15V, R_G=39\Omega, T_{vj}=25^{\circ}C$		90		ns		
Rise Time	t_r			64				
Turn-Off Delay Time	$t_{d(off)}$			180				
Fall Time	t_f			135				
Turn-On Energy	E_{on}				1.42			
Turn-Off Energy	E_{off}			0.78		mJ		
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=15A, V_{GE}=\pm 15V, R_G=39\Omega, T_{vj}=125^{\circ}C$		95		ns		
Rise Time	t_r			70				
Turn-Off Delay Time	$t_{d(off)}$			260				
Fall Time	t_f			180				
Turn-On Energy	E_{on}				1.85			
Turn-Off Energy	E_{off}				1.13			mJ
SC Data	I_{SC}		$T_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C, V_{CC}=900V, V_{CEM} \leq 1200V$		90			A

● Diode- Inverter

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_{vj}=25^{\circ}C$	1200	V
Continuous DC Forward Current	I_F		15	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1ms$	30	A
I^2t -value	I^2t	$V_R=0, t_p=10ms, T_{vj}=125^{\circ}C$	16	A^2s
		$V_R=0, t_p=10ms, T_{vj}=150^{\circ}C$	14	

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Voltage	V_F	$I_F=15A, T_{vj}=25^{\circ}C$		2	2.65	V
		$I_F=15A, T_{vj}=125^{\circ}C$		2.1		V
		$I_F=15A, T_{vj}=150^{\circ}C$		2.1		V
Recovered Charge	Q_{rr}	$I_F=15A, V_R=600V,$ $-di_F/dt=600A/\mu s, T_{vj}=25^{\circ}C$		1.2		μC
Peak Reverse Recovery Current	I_{rr}			13		A
Reverse Recovery Energy	E_{rec}			0.37		mJ
Recovered Charge	Q_{rr}	$I_F=15A, V_R=600V,$ $-di_F/dt=600A/\mu s, T_{vj}=125^{\circ}C$		2.05		μC
Peak Reverse Recovery Current	I_{rr}			12		A
Reverse Recovery Energy	E_{rec}			0.68		mJ

● IGBT- Brake-chopper

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Collector-Emitter Voltage	V_{CES}	$V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	1200	V
Continuous Collector Current	I_C	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	15	A
Repetitive Peak Collector Current	I_{CRM}	$t_p=1ms$	30	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	155	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=0.5mA, T_{vj}=25^{\circ}C$	5.2	6.0	6.8	V
Collector-Emitter Cut-off Current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$			1	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=15A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.85	2.25	V
		$I_C=15A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.15		V
		$I_C=15A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.25		V
Gate Charge	Q_g			0.09		μC
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz$		1.35		nF
Reverse Transfer Capacitance	C_{res}			0.08		
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=15A, V_{GE}=\pm 15V, R_G=39\Omega, T_{vj}=25^{\circ}C$		46		ns
Rise Time	t_r			45		
Turn-Off Delay Time	$t_{d(off)}$			182		
Fall Time	t_f			168		
Turn-On Energy	E_{on}				0.92	
Turn-Off Energy	E_{off}			0.56		
Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=15A, V_{GE}=\pm 15V, R_G=39\Omega, T_{vj}=125^{\circ}C$		46		ns
Rise Time	t_r			63		
Turn-Off Delay Time	$t_{d(off)}$			248		
Fall Time	t_f			220		
Turn-On Energy	E_{on}				1.37	
Turn-Off Energy	E_{off}			0.81		
SC Data	I_{SC}	$T_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C, V_{CC}=900V, V_{CEM} \leq 1200V$		90		A

● Diode- Brake-chopper

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	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	$V_R=0, t_p=10ms, T_{vj}=125^{\circ}C$	16	A^2s
		$V_R=0, t_p=10ms, T_{vj}=150^{\circ}C$	14	

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Voltage	V_F	$I_F=10A, T_{vj}=25^{\circ}C$		2.0	2.5	V
		$I_F=10A, T_{vj}=125^{\circ}C$		2.1		V
		$I_F=10A, T_{vj}=150^{\circ}C$		2.1		V
Recovered Charge	Q_{rr}	$I_F=10A, V_R=600V,$ $-di_F/dt=500A/\mu s, T_{vj}=25^{\circ}C$		0.9		μC
Peak Reverse Recovery Current	I_{rr}			12.5		A
Reverse Recovery Energy	E_{rec}			0.25		mJ
Recovered Charge	Q_{rr}	$I_F=10A, V_R=600V,$ $-di_F/dt=500A/\mu s, T_{vj}=125^{\circ}C$		1.7		μC
Peak Reverse Recovery Current	I_{rr}			10.4		A
Reverse Recovery Energy	E_{rec}			0.5		mJ

● Diode- Rectifier

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_j=25^{\circ}C$	1600	V
Average On-state Current 50/60Hz, sine wave	$I_{F(AV)}$	$T_C=100^{\circ}C$	20	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	$T_C=100^{\circ}C$	40	A
Surge Forward Current	I_{FSM}	$V_R=0, t_p=10ms, T_j=45^{\circ}C$	270	A
I^2t -value	I^2t	$V_R=0, t_p=10ms, T_j=45^{\circ}C$	360	A^2s

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F=15A, T_j=150^{\circ}C$		0.96		V
Reverse Current	I_r	$T_j=150^{\circ}C, V_R=1600V$			1	mA

● NTC-Thermistor

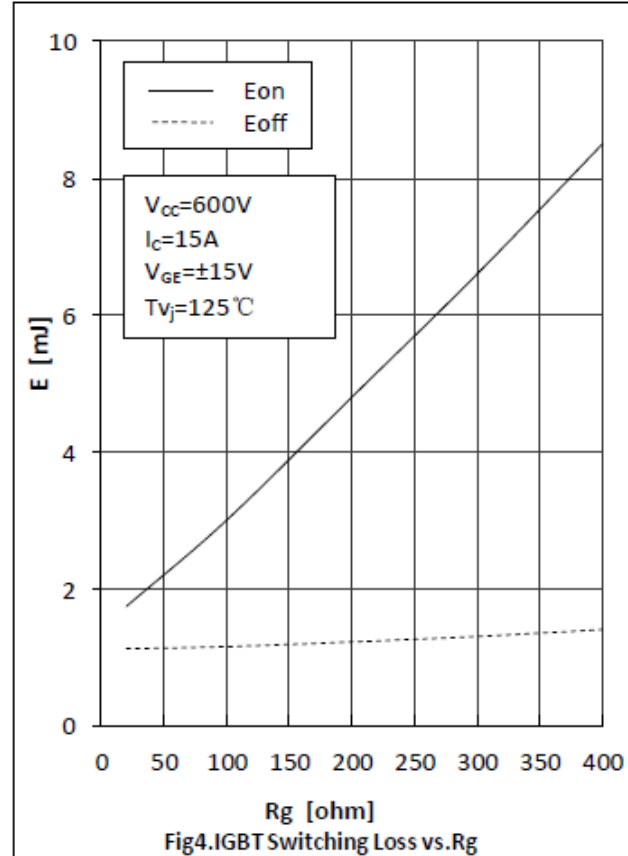
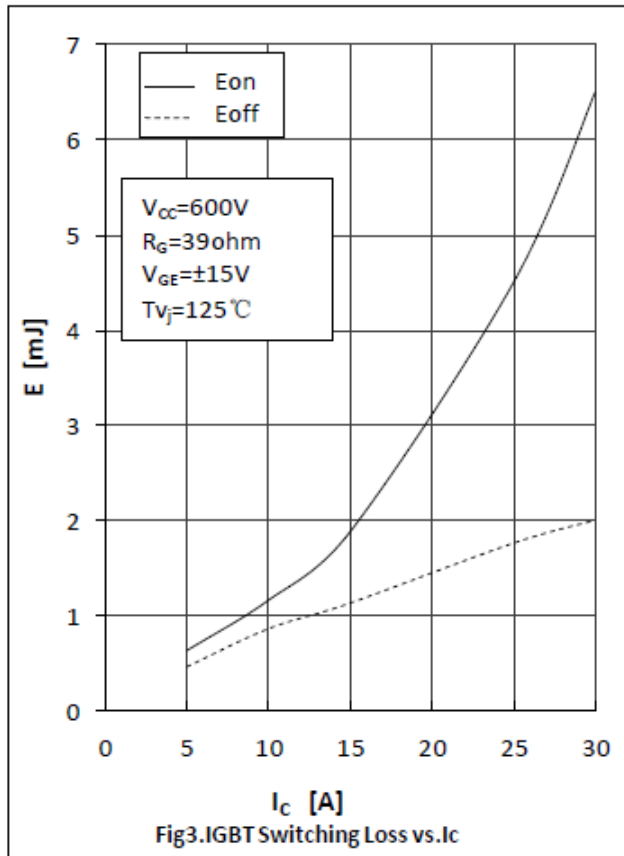
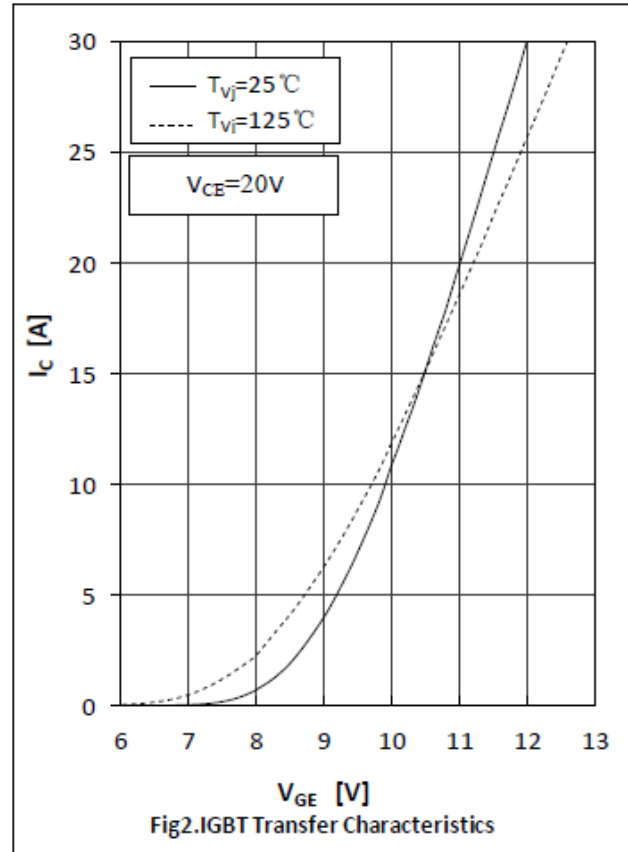
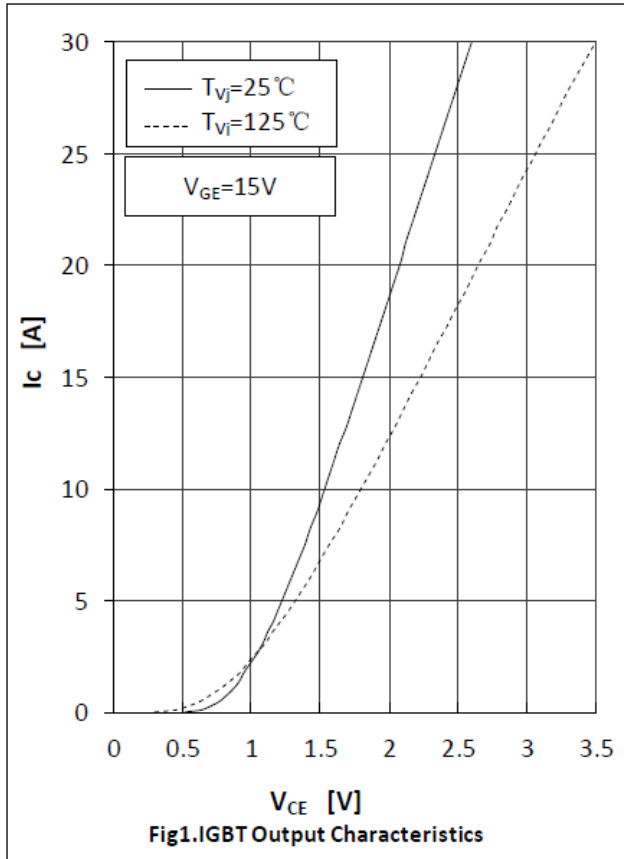
Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Rated Resistance	R_{25}			5		k Ω
Deviation of R100	$\Delta R/R$	$T_C=100, R_{100}=493.3\Omega$	-5		5	%
Power Dissipation	P_{25}			20		mW
B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K

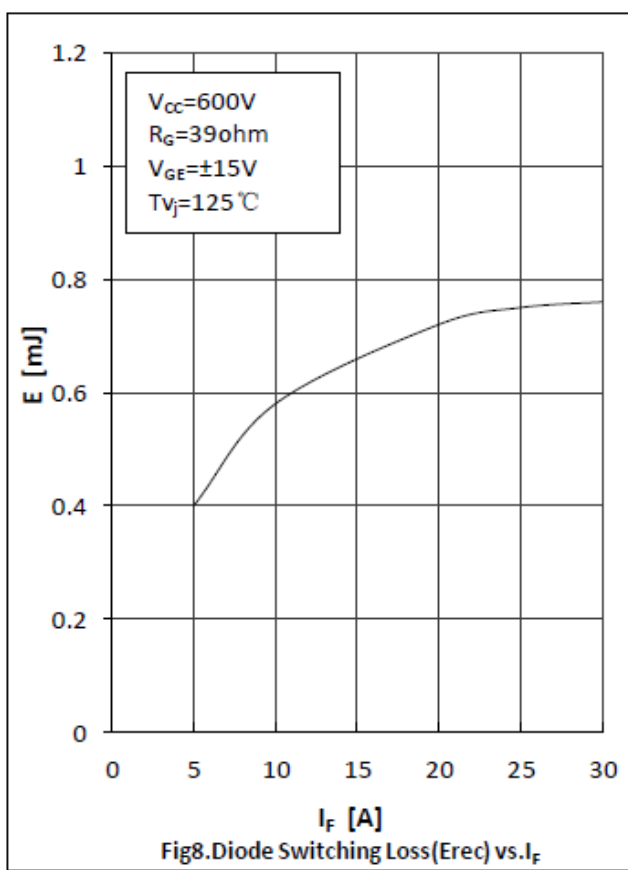
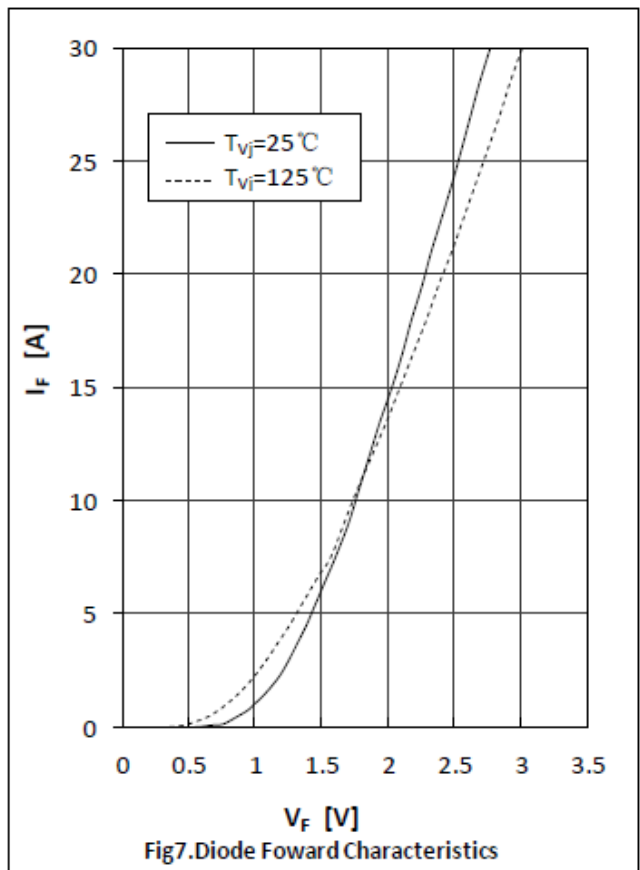
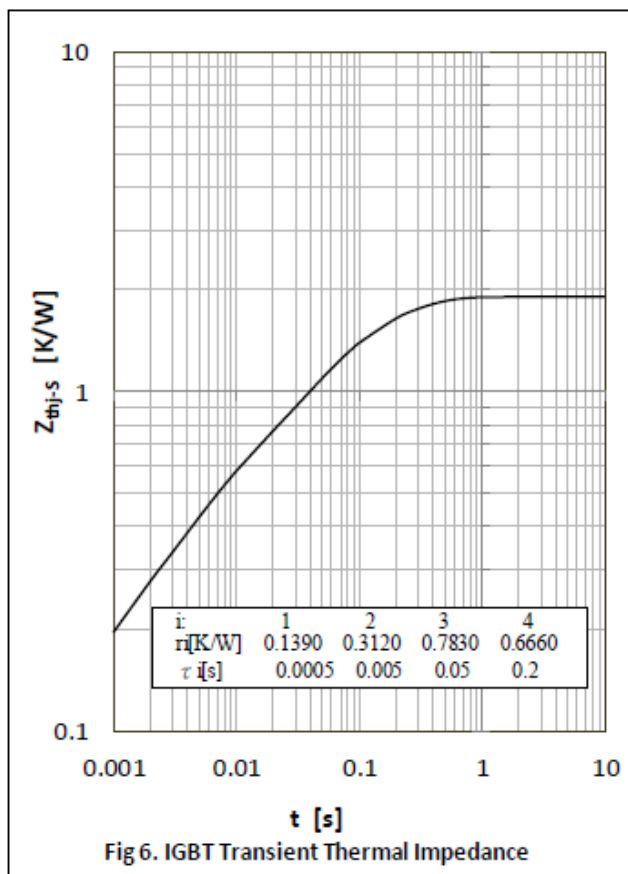
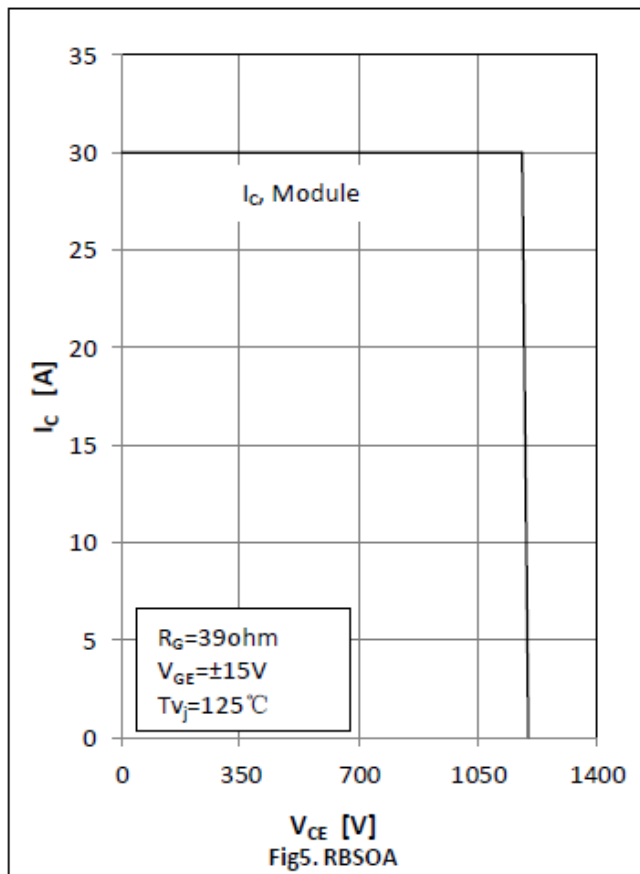
● Module Characteristics($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Isolation voltage	V_{isol}	$t=1\text{ min}, f=50\text{ Hz}$	2500			V
Maximum Junction Temperature	T_{jmax}				175	$^{\circ}\text{C}$
Operating Junction Temperature	$T_{\text{vj op}}$		-40		150	$^{\circ}\text{C}$
Operating Junction Temperature	T_{stg}		-40		125	$^{\circ}\text{C}$
Stray Inductance	L_{CE}			30		nH
Module Lead Resistance , Terminal to Chip	$R_{\text{cc'+EE'}}$	TC=25 $^{\circ}\text{C}$, per switch		8		m Ω
	$R_{\text{AA'+CC'}}$			6		
Thermal Resistance Junction to Case	$R_{\theta\text{jc}}$	per IGBT-inverter		0.95	1.05	K/W
		per Diode-inverter		1.30	1.45	
		per IGBT-brake-chopper		0.95	1.05	
		per Diode-chopper		1.75	1.9	
		per Diode-rectifier		1.03	1.13	
Thermal Resistance Case to Sink	$R_{\theta\text{cs}}$	per IGBT-inverter		0.95		K/W
		per Diode-inverter		1.05		
		per IGBT-brake-chopper		0.95		
		per Diode-chopper		1.05		
		per Diode-rectifier		1.17		
		per Module		0.058		
Mounting Force Per Clamp	F		20		50	N
Weight of Module	G			25		g

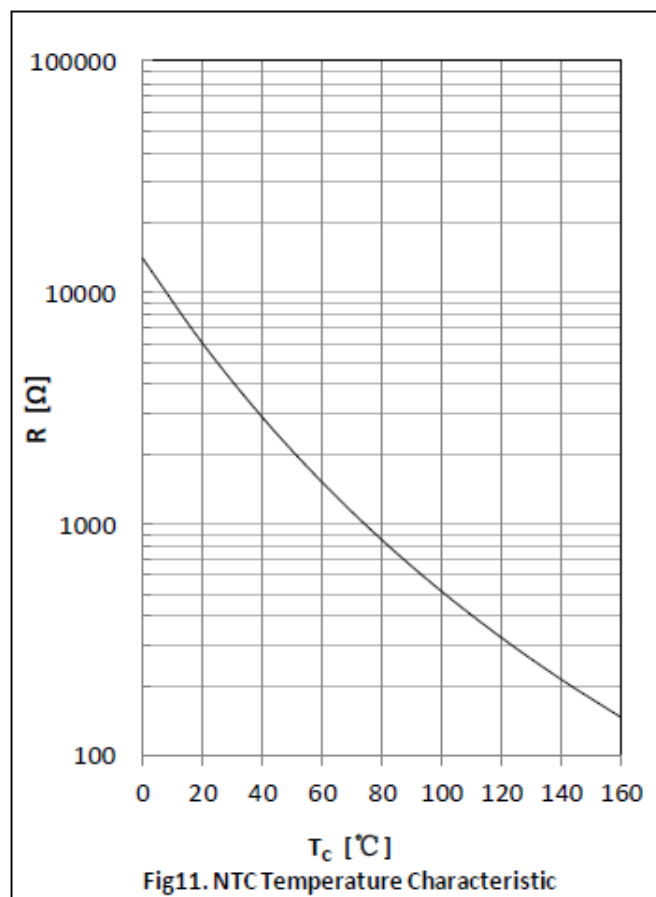
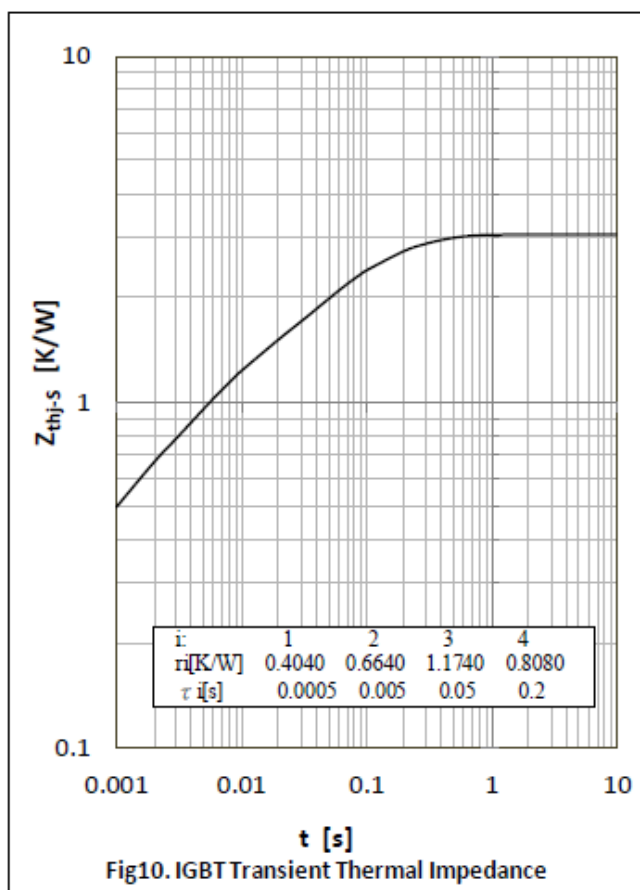
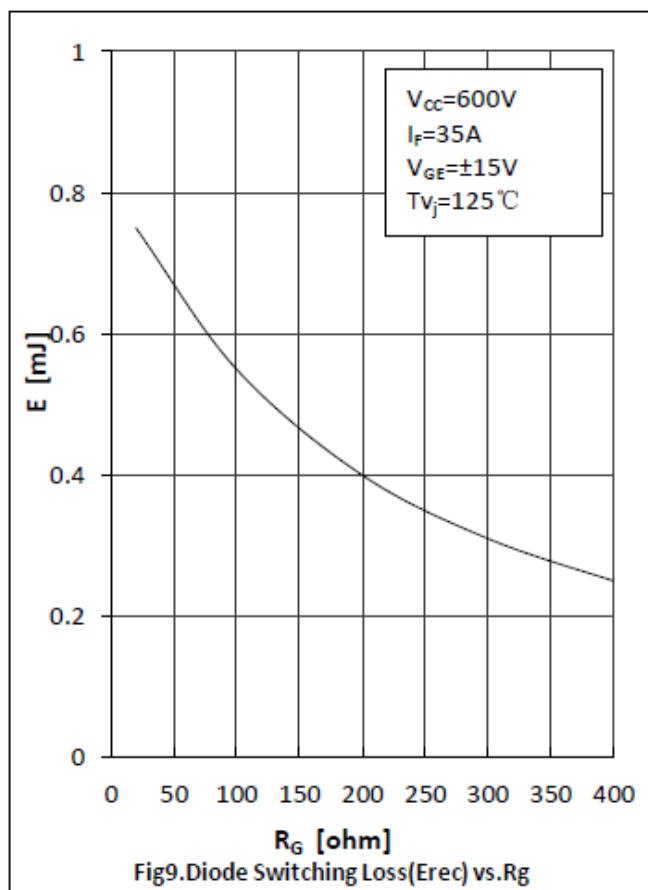
Curve Characteristics



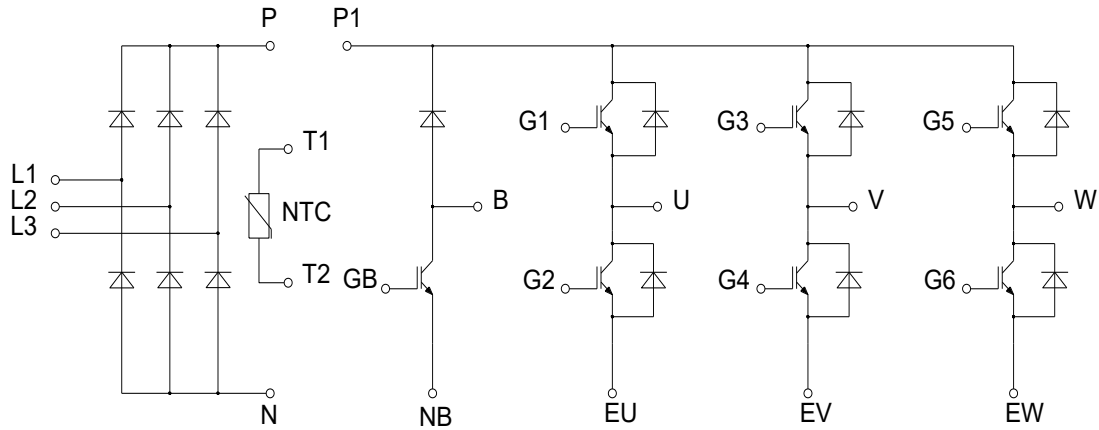
Curve Characteristics



Curve Characteristics



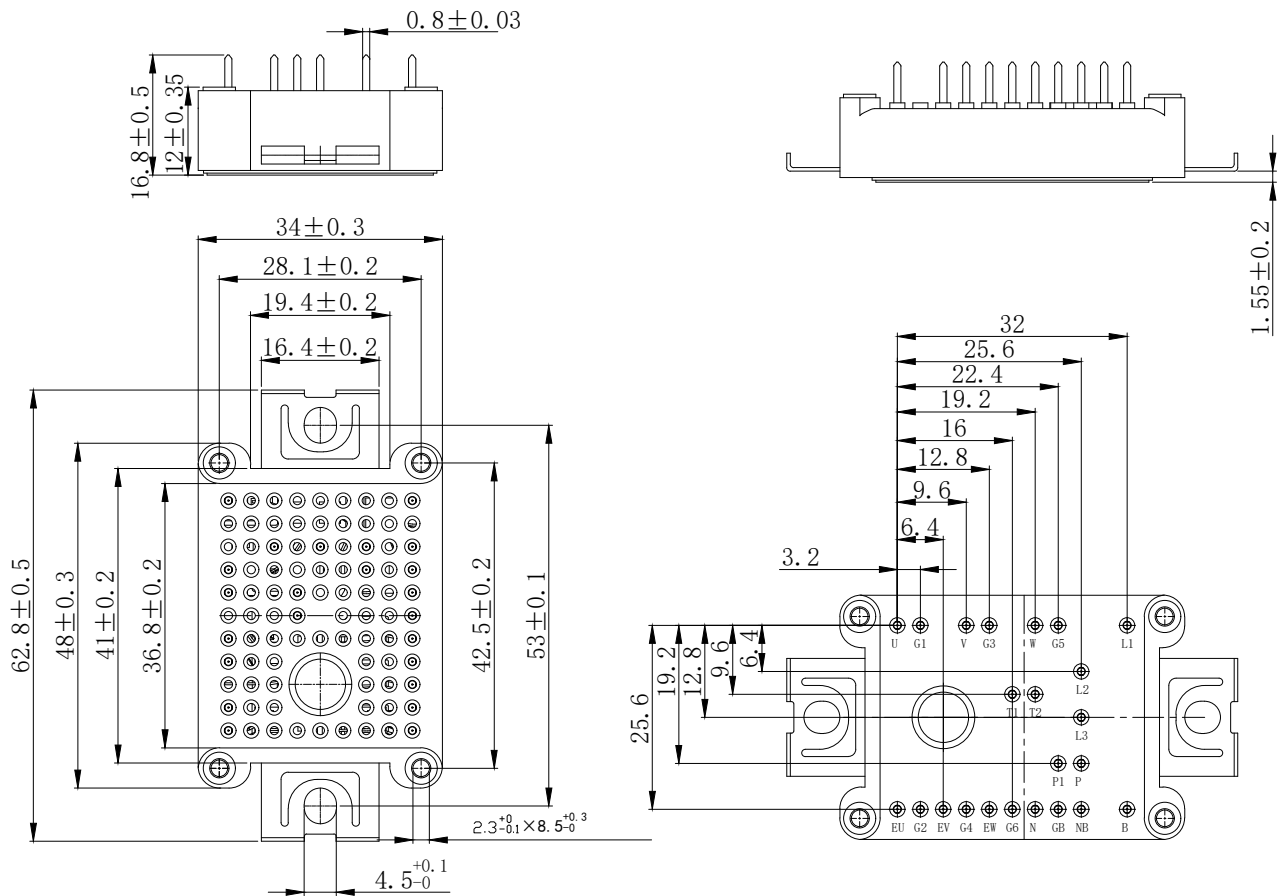
Circuit Diagram



Package Dimensions

Dimensions in mm

P2



Ordering Information

Device	Packing
Part Number-BP	Bulk: 24pcs/Box ; 240pcs/Ctn

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