1200V 25A PIM IGBT Module

Features

- Trench Field Stop technology
- Low saturation voltage
- 10μs Short Circuit current
- Low turn-off losses
- Positive temperature coefficient

Applications

- AC Motor Drives
- Motion / Servo Drives
- Inverter and Power supplies

■ Absolute Maximum Ratings T_j = 25°C unless otherwise noted

Item	Symbol	Parameter	Conditions	Value	Units
Diode Rectifier	V_{RRM}	Repetitive Peak Reverse Voltage		1600	V
	I_{FAV}	Average Output Current	50Hz/60Hz Sine wave	25	A
	I_{FSM}	Surge Forward Current (Non Repetitive)	@ t_P = 10 ms, half sine wave	450	A
	I2t	I2t - Value	@ t_P = 10 ms, half sine wave	1000	A^2S
	T_j	Operating Junction Temperature	-	-40 ~ 150	°C
IGBT 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 = 100 °C	25	A
			@ T_j = 150 °C, T_C = 25 °C	50	A
	I_{CM}	Repetitive Peak Forward Current	tp = 1ms	50	A
	P_D	Maximum Power Dissipation	@ T_j = 175 °C, T_C = 25 °C	175	W
	T_j	Operating Junction Temperature	-	-40 ~ 175	°C
Diode Inverter	V_{RRM}	Repetitive Peak Reverse Voltage	-	1200	V
	I_F	DC Forward Current		25	A
	I_{FRM}	Repetitive Peak Forward Current	@ t_P = 1 ms	50	A
	T_j	Operating Junction Temperature	-	-40 ~ 175	°C
IGBT 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	25	A
	I_{cpulse}	Repetitive Peak Collector Current	@ t_P = 1 ms	50	A
	P_D	Maximum Power Dissipation	@ T_j = 150 °C, T_C = 25 °C	175	W
	T_{SC}	SC Withstand Time (Chip level)	@ V_{GE} = 15 V, V_{CE} = 300 V	10	μs
	T_j	Operating Junction Temperature	-	-40 ~ 175	°C
Diode Brake	V_{RRM}	Repetitive Peak Reverse Voltage	-	1200	V
	I_F	DC Forward Current		20	A
	I_{FRM}	Repetitive Peak Forward Current	@ t_P = 1 ms	40	A
	T_j	Operating Junction Temperature	-	-40 ~ 175	°C
Module	T_{stg}	Storage Temperature	-	-40~150	°C
	V_{iso}	Isolation Voltage	@ AC 1minute	2500	V
	W	Weight	-	39	g

■Electrical Characteristics of IGBT and Diode Tj = 25°C unless otherwise noted

◘ Diode Rectifier Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=25A , T_J=25℃	-	1.1	1.5	V
		I_F=25A , T_J=150℃	-	-		V
I_R	Reverse Leakage Current	V_R=1600V, T_J=25℃	-		100	μA
		V_R=1600V, T_J=150℃	-		1	mA

◘ IGBT-Inverter Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BVCES	C-E Breakdown Voltage	VGE = 0 V, IC = 250 μA	1200	-		
ICES	C-E Cut-Off Current	VCE = VCES, VGE = 0 V	-	-	1	mA
IGES	G-E Leakage Current	VGE = VGES, VCE = 0 V	-	-	± 400	nA
VGE(th)	G-E Threshold Voltage	VGE = VCE, IC = 0.8mA	5.2	-	6.5	V
VCE(sat)	Collector to Emitter Saturation Voltage	IC = 25 A, VGE = 15 V, Tj = 25 °C	1.35	1.70	2.10	V
		IC = 25 A, VGE = 15 V, Tj = 125 °C	-	-	-	V
ISC	Short Current	VGE ≤15 V, VCC = 900 V VCE ≤ VCES, Tj = 150°C, TP ≤ 10us	-	90	-	A
Cies	Input Capacitance	VCE = 25 V, VGE = 0 V f = 1 MHz, Tj = 25 °C	-	1.45	-	nF
Coes	Output Capacitance		-	-	-	nF
Cres	Reverse Transfer Capacitance		-	0.05	-	nF
td(on)	Turn-On Delay Time	Tj = 25 °C, RG = 20 Ω L = 100 nH, VDC = 600 V VGE = 15 V ~ -15 V IC = 25 A	-	26	-	ns
tr	Rise Time		-	16	-	ns
td(off)	Turn-Off Delay Time		-	190	-	ns
tf	Fall Time		-	110	-	ns
Eon	Turn-On Switching Loss		-	3.0	-	mJ
Eoff	Turn-Off Switching Loss		-	1.6	-	mJ
td(on)	Turn-On Delay Time	Tj = 125 °C, RG = 20 Ω L = 100 nH, VDC = 600 V VGE = 15 V ~ -15 V IC = 25 A	-	26	-	ns
tr	Rise Time		-	18	-	ns
td(off)	Turn-Off Delay Time		-	220	-	ns
tf	Fall Time		-	180	-	ns
Eon	Turn-On Switching Loss		-	3.6	-	mJ
Eoff	Turn-Off Switching Loss		-	2.1	-	mJ
td(on)	Turn-On Delay Time	Tj = 150 °C, RG = 20 Ω L = 100 nH, VDC = 600 V VGE = 15 V ~ -15 V IC = 25 A	-	26	-	ns
tr	Rise Time		-	20	-	ns
td(off)	Turn-Off Delay Time		-	240	-	ns
tf	Fall Time		-	200	-	ns
Eon	Turn-On Switching Loss		-	3.8	-	mJ
Eoff	Turn-Off Switching Loss		-	2.3	-	mJ
Qg	Total Gate Charge	VGE = 15 V ~ -15 V,VCE = 600 V	-	0.15	-	uC

■Electrical Characteristics of IGBT and Diode T_j = 25°C unless otherwise noted

◘ Diode-Inverter Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
VF	Diode Forward Voltage	IF = 25 A VGE = 0V	Tj = 25 °C	1.6	2.0	2.45	V
			Tj = 125 °C	-	-	-	
trr	Diode Reverse Recovery Time	IF= 25 A diF/dt = 700 A/μs VR = 600 V VGE = 15 V	Tj = 25 °C	-	150	-	ns
			Tj = 125 °C	-	-	-	
I_{RRM}	Diode Peak Reverse Recovery Current		Tj = 25 °C	-	24	-	A
			Tj = 125 °C	-	-	-	
Qrr	Diode Reverse Recovery Charge		Tj = 25 °C	-	2.0	-	μC
			Tj = 125 °C	-	-	-	
Err	Diode Reverse Recovery Energy		Tj = 25 °C	-	1.8	-	mJ
			Tj = 125 °C	-	-	-	

◘ IGBT-Brake Chopper Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BVCES	C-E Breakdown Voltage	VGE = 0 V, IC = 250 μA	1200	-		
ICES	C-E Cut-Off Current	VCE = VCES, VGE = 0 V	-	-	1.0	mA
IGES	G-E Leakage Current	VGE = VGES, VCE = 0 V	-	-	± 400	nA
VGE(th)	G-E Threshold Voltage	VGE = VCE, IC = 0.8mA	5.2	-	6.5	V
VCE(sat)	Collector to Emitter Saturation Voltage	IC = 25 A, VGE = 15 V, Tj = 25 °C	1.35	1.70	2.1	V
		IC = 25 A, VGE = 15 V, Tj = 125 °C	-	-	-	V
ISC	Short Current	VGE ≤15 V, VCC = 600 V VCE ≤ VCES, Tj = 150°C, TP ≤ 10us	-	90	-	A
Cies	Input Capacitance	VCE = 25 V, VGE = 0 V f = 1 MHz, Tj = 25 °C	-	1.45	-	nF
Coes	Output Capacitance		-	-	-	nF
Cres	Reverse Transfer Capacitance		-	0.05	-	nF
td(on)	Turn-On Delay Time	Tj = 25 °C, RG = 36 Ω L = 100 nH, VDC = 600 V VGE = 15 V ~ -15 V IC = 25 A	-	26	-	ns
tr	Rise Time		-	16	-	ns
td(off)	Turn-Off Delay Time		-	190	-	ns
tf	Fall Time		-	18	-	ns
Eon	Turn-On Switching Loss		-	2.4	-	mJ
Eoff	Turn-Off Switching Loss		-	1.6	-	mJ
Qg	Total Gate Charge	VGE = 15 V ~ -15 V,VCE = 600 V	-	0.15	-	uC

◘ Diode-Brake Chopper Characteristics

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
VF	Diode Forward Voltage	IF = 20 A VGE = 0V	Tj = 25 °C	1.5	2.0	2.40	V
			Tj = 125 °C	-	-	-	
trr	Diode Reverse Recovery Time	IF= 20 A diF/dt = 400 A/μs VR = 600 V VGE = 15 V	Tj = 25 °C	-	150	-	ns
			Tj = 125 °C	-	-	-	
I_{RRM}	Diode Peak Reverse Recovery Current		Tj = 25 °C	-	24	-	A
			Tj = 125 °C	-	-	-	
Qrr	Diode Reverse Recovery Charge		Tj = 25 °C	-	2.0	-	μC
			Tj = 125 °C	-	-	-	
Err	Diode Reverse Recovery Energy		Tj = 25 °C	-	1.8	-	mJ
			Tj = 125 °C	-	-	-	

NTC Thermistor Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
R25	Rated resistance	TC =25°C	-	5.00		kΩ
ΔR/R	Deviation of R100	TC=10°C, R100=493 Ω	-5	-	5	%
P25	Power Dissipation	TC=25°C	-	-	20.0	mW
$B_{25/50}$	B-Value	$R_2=R_{25}exp[B_{25/50}(1/T2-1/(298.15K))]$	-	3375	-	K
$B_{25/80}$		$R_2=R_{25}exp[B_{25/80}(1/T2-1/(298.15K))]$	-	3411	-	K
$B_{25/100}$		$R_2=R_{25}exp[B_{25/100}(1/T2-1/(298.15K))]$	-	3433	-	K

Thermal Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Rth(J-C)	Thermal Resistance (J-C)	Junction-to-Case	-	0.75	0.85	K/W
Rth(J-H)	Thermal Resistance (C-H)	Case-to-Heatsink	-	0.70	-	°C/W

Figure 1. Typical Output Characteristics IGBT-inverter

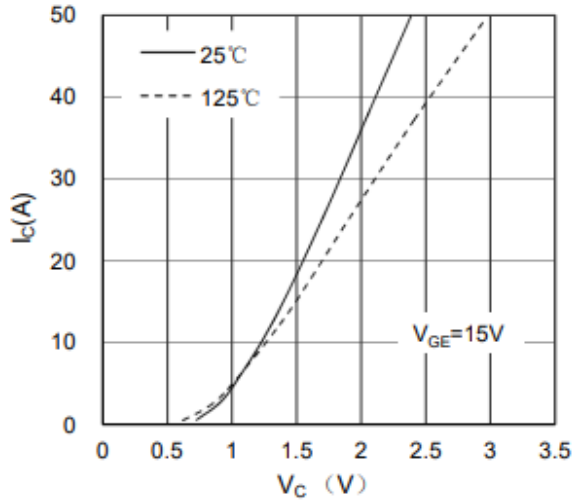


Figure 2. Typical Output Characteristics IGBT-inverter

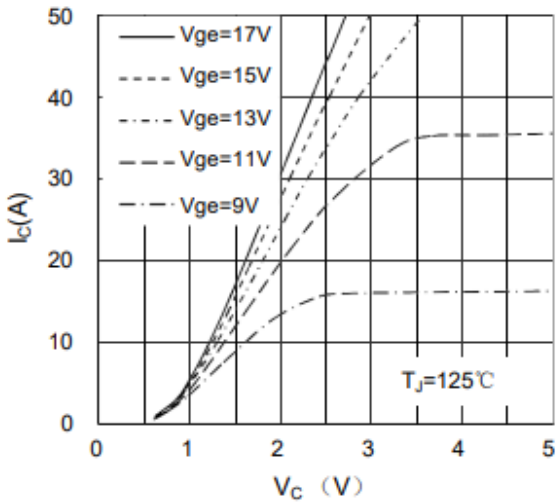


Figure 3. Typical Transfer characteristics IGBT-inverter

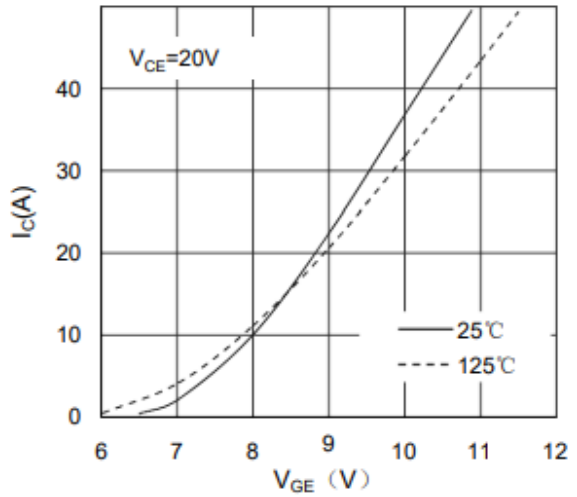


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

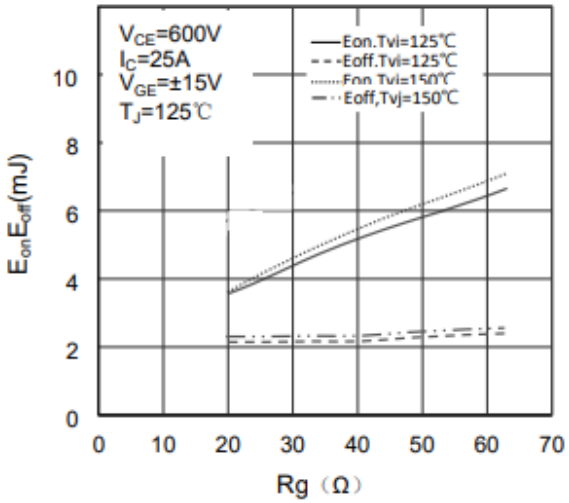


Figure 5. Switching Energy vs Collector Current IGBT -inverter

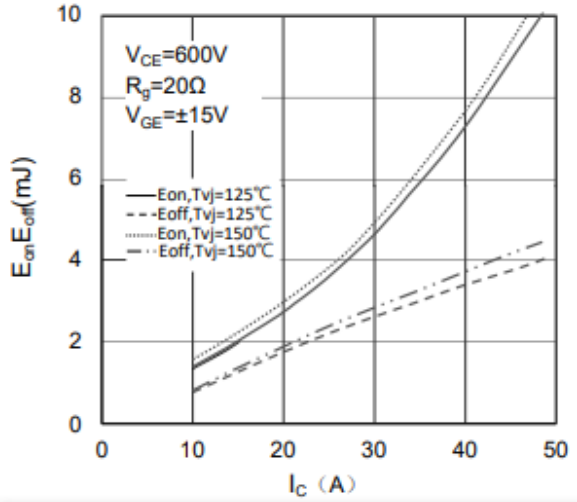


Figure 6. Reverse Biased Safe Operating Area IGBT - inverter

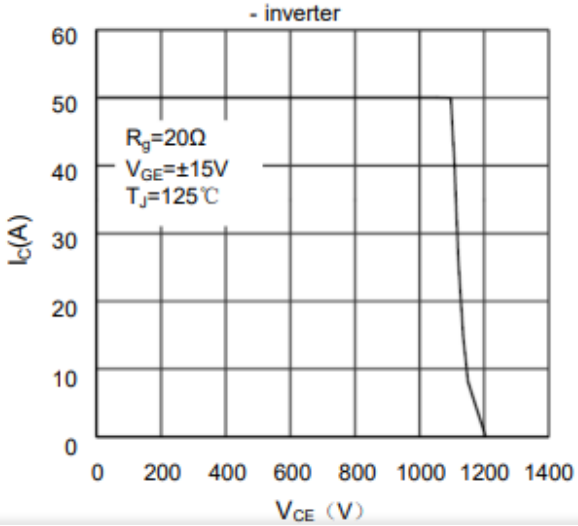


Figure 7. Diode Forward Characteristics Diode -inverter

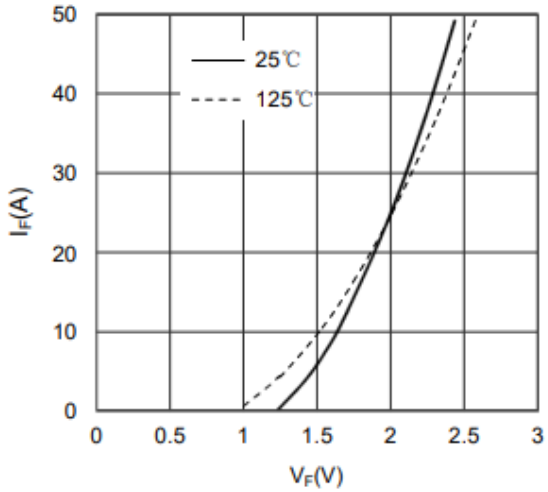


Figure 8. Switching Energy vs Gate Resistor Diode -inverter

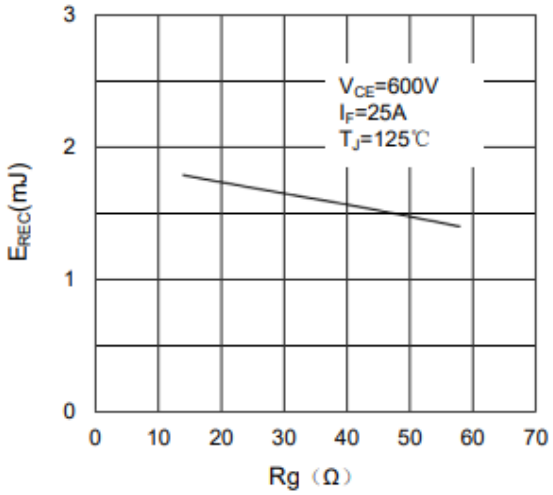


Figure 9. Switching Energy vs Forward Current Diode -inverter

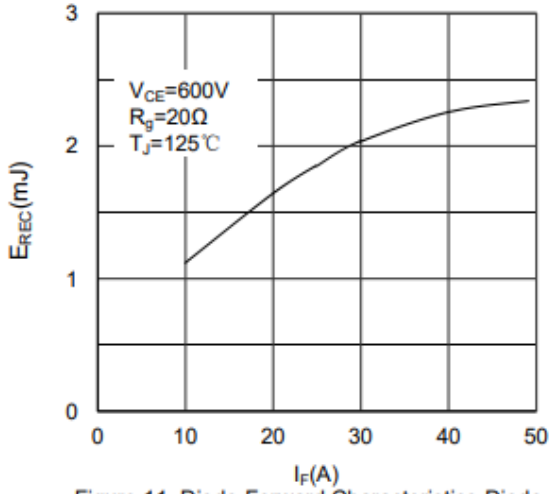


Figure 10. Transient Thermal Impedance of Diode and IGBT -inverter

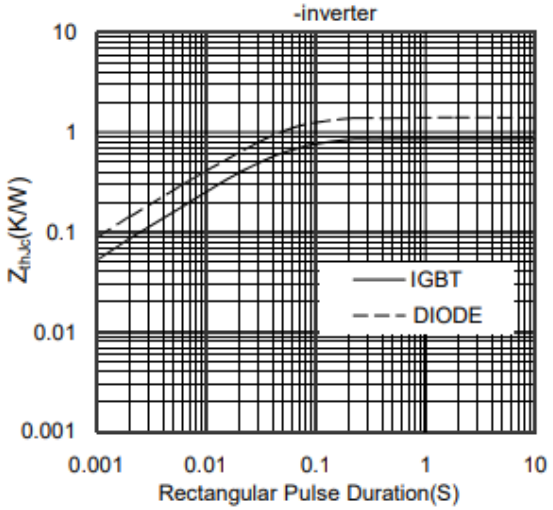


Figure 11. Diode Forward Characteristics Diode - rectifier

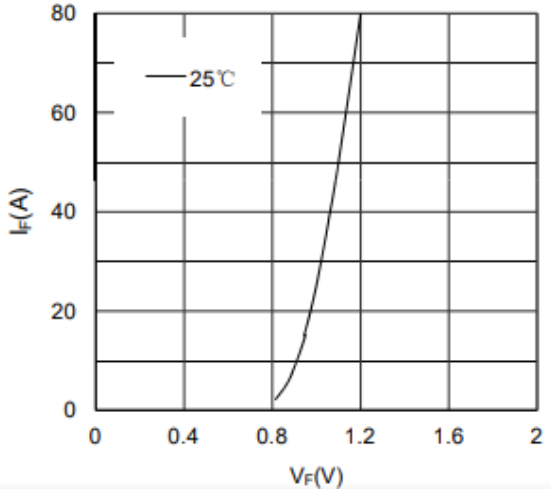


Figure 12. Typical Output Characteristics IGBT - brake chopper

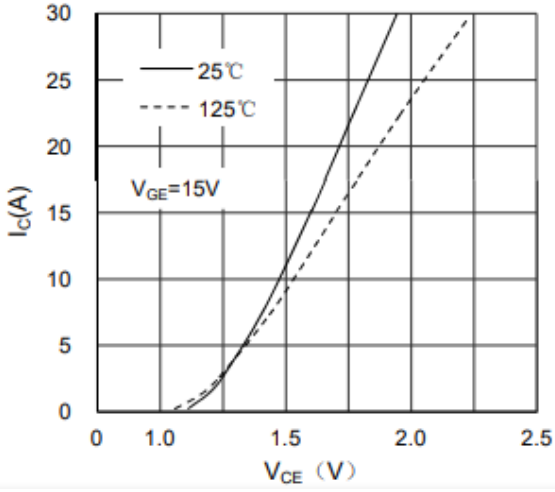


Figure 13. Diode Forward Characteristics Diode - brake chopper

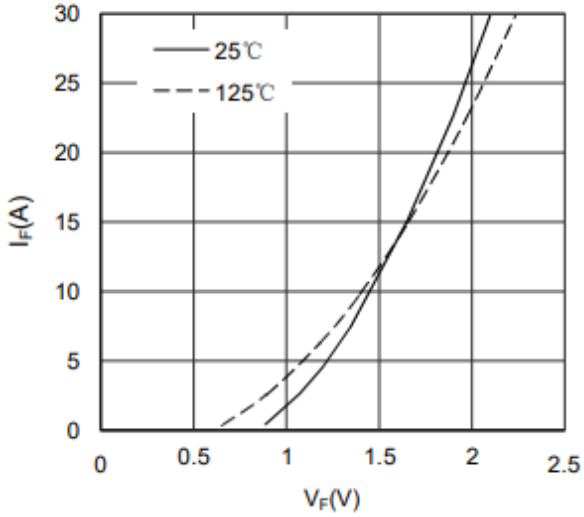


Figure 14. NTC Characteristics

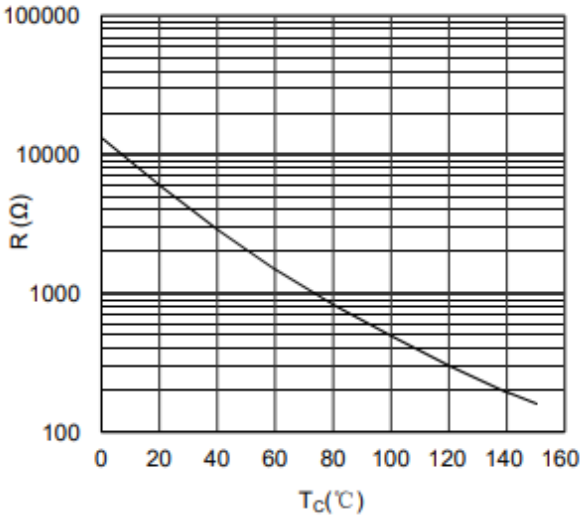


Figure 15. Collector Current vs Case temperature IGBT -inverter

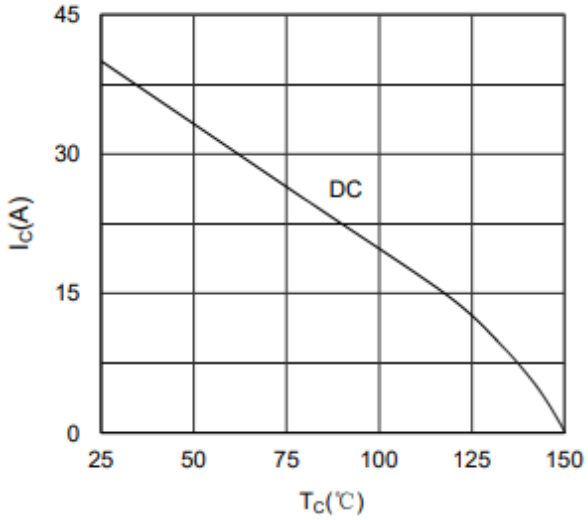
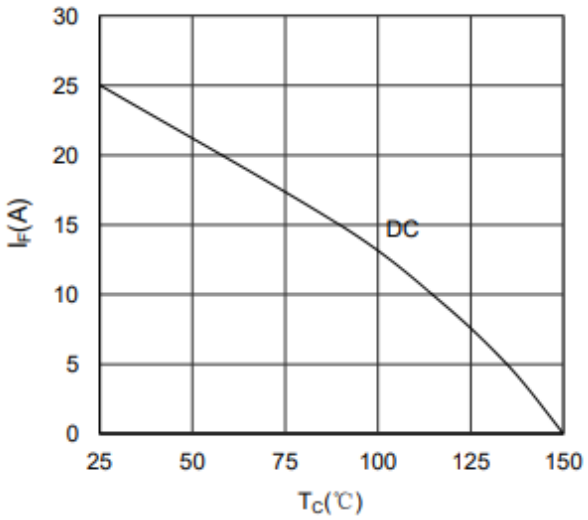
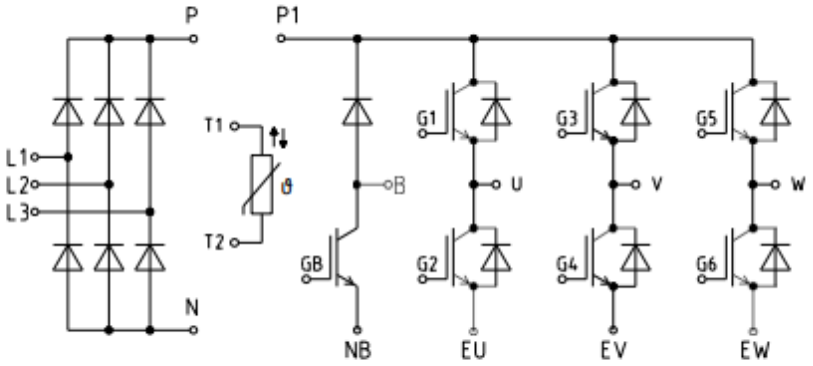


Figure 16. Forward current vs Case temperature Diode -inverter



■Internal Circuit Diagram



■Package Dimension (Dimension in mm)