

Features

- Low $V_{CE(SAT)}$
- $V_{CE(SAT)}$ with positive temperature coefficient

Applications

- Inverter for motor drives AC and DC servo drives
- High power converters
- UPS systems

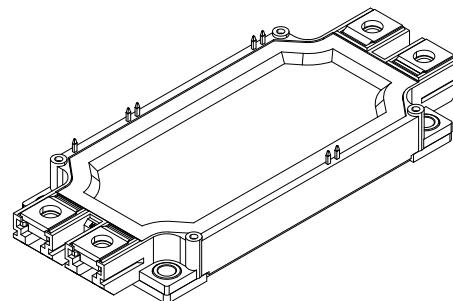


Table 1 Key Performance and Package Parameters

Type	V_{CE}	I_C	$V_{CE(SAT)}$ ($T_{vj} = 25^{\circ}C$, $I_C = 600A$, $V_{GE} = 15V$)	T_{vjmax}	Package
IGBT	1200V	600A	1.50V	175°C	D3

Table 2 Absolute Maximum Ratings ($T_a = 25^{\circ}C$)

Parameter	Symbol	Conditions	Value	Unit
Collector emitter voltage	V_{CE}	$T_{vj} = 25^{\circ}C$	1200	V
Continuous DC collector current	I_{CDC}	$T_C = 70^{\circ}C$	600	A
Repetitive peak collector current	I_{CRM}	$T_p = 1ms$	1200	A
Continuous DC forward current	I_F		600	A
Repetitive peak forward current	I_{FRM}	$T_p = 1ms$	1200	A
Gate Emitter Voltage	V_{GE}	$T_{vj} = 25^{\circ}C$	± 20	V
Junction temperature	T_{vj}		-40 to +175	°C
Storage temperature	T_{stg}		-40 to +125	°C
Operating virtual junction temperature	T_{vjop}		-40 to +150	°C

Table 3 Thermal Resistance

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
IGBT Thermal resistance junction - case	R_{thJC}	Per IGBT	-	0.07	-	°C / W
Diode Thermal resistance junction - case	R_{thJC}	Per diode	-	0.10	-	°C / W

Table 4 Static Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector emitter voltage	$V_{(BR)CES}$	$T_{vj} = 25^{\circ}\text{C}$	1200	-	-	V
Collector emitter saturation voltage	V_{CEsat} (terminal)	$V_{GE} = 15\text{V}, I_C = 600\text{A}, T_{vj} = 25^{\circ}\text{C}$	-	1.50	-	V
		$V_{GE} = 15\text{V}, I_C = 600\text{A}, T_{vj} = 175^{\circ}\text{C}$	-	1.82	-	
	V_{CEsat} (Chip)	$V_{GE} = 15\text{V}, I_C = 600\text{A}, T_{vj} = 25^{\circ}\text{C}$	-	1.40	-	
		$V_{GE} = 15\text{V}, I_C = 600\text{A}, T_{vj} = 175^{\circ}\text{C}$	-	1.70	-	
Diode forward voltage	V_F (terminal)	$V_{GE} = 0\text{V}, I_C = 600\text{A}, T_{vj} = 25^{\circ}\text{C}$	-	1.75	-	V
		$V_{GE} = 0\text{V}, I_C = 600\text{A}, T_{vj} = 175^{\circ}\text{C}$	-	1.70	-	
	V_F (Chip)	$V_{GE} = 0\text{V}, I_C = 600\text{A}, T_{vj} = 25^{\circ}\text{C}$	-	1.70	-	
		$V_{GE} = 0\text{V}, I_C = 600\text{A}, T_{vj} = 175^{\circ}\text{C}$	-	1.60	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 18\text{mA}$	5.00	5.60	6.20	V
Zero gate voltage collector current	I_{CES}	$V_{CE} = 1200\text{V}, V_{GE} = 0\text{V}, T_{vj} = 25^{\circ}\text{C}$	-	-	100	uA
Gate-emitter leakage current	I_{GES}	$V_{GE} = \pm 20, V_{CE} = 0\text{V},$	-100	-	100	nA
Input capacitance	C_{ies}	$V_{GE} = 0\text{V}, V_{CE} = 25\text{V}, f = 100\text{kHz}$	-	106	-	nF
Output capacitance	C_{oes}		-	2.3	-	
Reverse transfer capacitance	C_{res}		-	0.49	-	
Gate input resistance	R_G	$f = 1\text{M Hz}$	-	0.5	-	Ω
Gate charge	Q_G	$V_{GE} = -15\text{V to } 15\text{V}, V_{CE} = 600\text{V}$	-	4.36	-	μC

Table 5 Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Turn-on delay time	t_{don}	$T_{vj} = 25^{\circ}\text{C}$, $V_{CC} = 600\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)}=0.51\Omega, R_{G(off)}= 0.51\Omega$	-	220	-	ns
Rise time	t_r		-	72	-	
Turn-off delay time	t_{doff}		-	590	-	
Fall time	t_f		-	200	-	
Turn-on energy	E_{on}		-	17.7	-	mJ
Turn-off energy	E_{off}		-	74.0	-	
Total switching energy	E_{ts}		-	91.7	-	
Turn-on delay time	t_{don}	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 600\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)}= 0.51\Omega, R_{G(off)}= 0.51\Omega$	-	250	-	ns
Rise time	t_r		-	90	-	
Turn-off delay time	t_{doff}		-	725	-	
Fall time	t_f		-	385	-	
Turn-on energy	E_{on}		-	39.7	-	mJ
Turn-off energy	E_{off}		-	104	-	
Total switching energy	E_{ts}		-	143.7	-	
Short circuit current	I_{SC}	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 800\text{V}$, $V_{GE} = 15\text{V}$, $V_{CEmax} = V_{CES} - L_{sCE} * di/dt$ $T_P \leq 6 \text{ us}$	-	1800	-	A

Table 6 Diode Recovery Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse recovery time	T_{rr}	$T_{vj} = 25^{\circ}\text{C}$, $V_{CC} = 600\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)} = 0.51\Omega$, $R_{G(off)} = 0.51\Omega$	-	312	-	ns
Peak reverse recovery current	I_{rrm}		-	324	-	A
Reverse recovery charge	Q_{rr}		-	36.8	-	μC
Reverse recovery energy	E_{rec}		-	20.6	-	mJ
Reverse recovery time	T_{rr}	$T_{vj} = 175^{\circ}\text{C}$, $V_{CC} = 600\text{V}$, $I_C = 600\text{A}$, $V_{GE} = -15/15\text{V}$, $R_{G(on)} = 0.51\Omega$, $R_{G(off)} = 0.51\Omega$	-	527	-	ns
Peak reverse recovery current	I_{rrm}		-	460	-	A
Reverse recovery charge	Q_{rr}		-	93.1	-	μC
Reverse recovery energy	E_{rec}		-	43.2	-	mJ

Table 7 Module characteristics

Parameter	Symbol	Conditions	Value	Typ
Isolation test voltage	V _{ISOL}	RMS, f = 50 Hz, t = 1min	3.4	kV
Material of module baseplate			Cu+Ni	
Internal isolation		Basic insulation	Al ₂ O ₃	
Mounting torque of screws to heat sink	M	M5	3.0-6.0	N·m
Mounting torque of screws to terminals	M	M6	3.0-6.0	N·m
Creepage distance	d _{Creep}	terminal to heatsink	15.0	mm
Creepage distance	d _{Creep}	terminal to terminal	13.0	mm
Clearance	d _{Clear}	terminal to heatsink	12.5	mm
Clearance	d _{Clear}	terminal to terminal	10.0	mm
Comperative tracking index	CTI		>200	

Table 8 NTC-Thermistor

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Rated resistance	R25	TC = 25°C	-	5	-	kΩ
Deviation of R100	ΔR/R	TC = 100°C, R100 = 493 Ω	-5	-	5	%
B-value	B25/50	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15K))]$	-	3375	-	K

Characteristics Diagrams

Fig.1 Typical Output Characteristic, IGBT, Inverter
 $I_C = f(V_{CE})$ / (terminal)
 $V_{GE} = 15V$

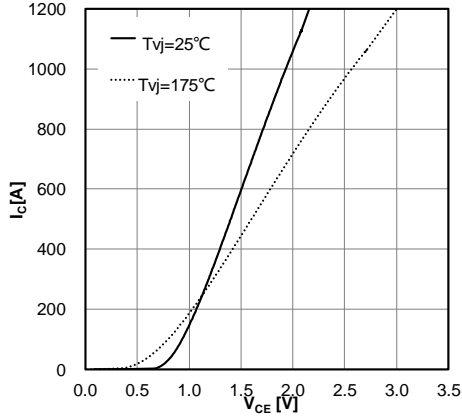


Fig.2 Typical Output Characteristic, IGBT, Inverter
 $I_C = f(V_{CE})$ / (terminal)
 $T_{vj} = 175^{\circ}C$

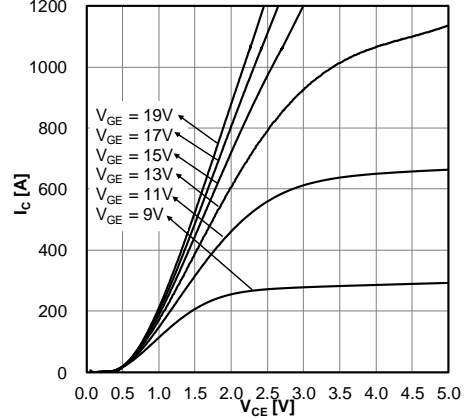


Fig.3 Typical Output Characteristic, IGBT, Inverter
 $I_C = f(V_{GE})$
 $V_{CE} = 20V$

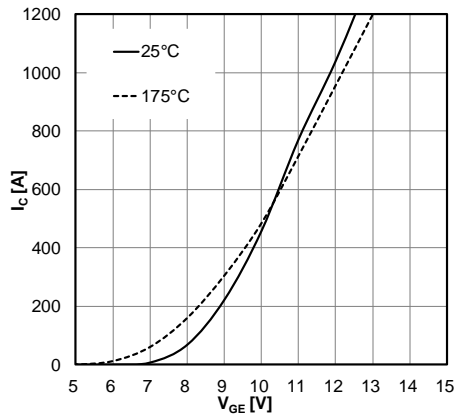


Fig.4 Switching losses, IGBT, Inverter
 $E = f(I_C)$

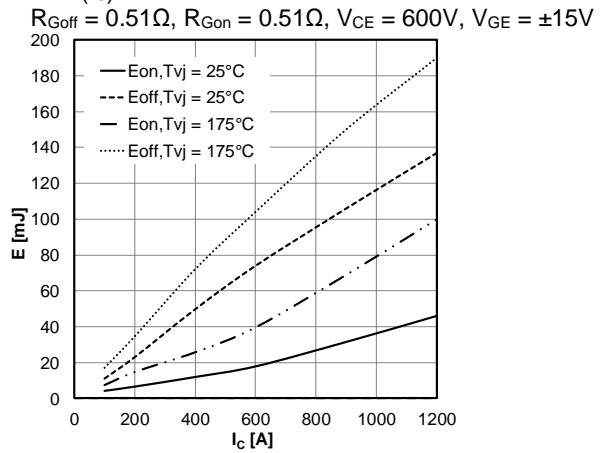


Fig.5 Switching losses, IGBT, Inverter
 $E = f(R_G)$
 $I_C = 600A$, $V_{CE} = 600V$, $V_{GE} = \pm 15V$

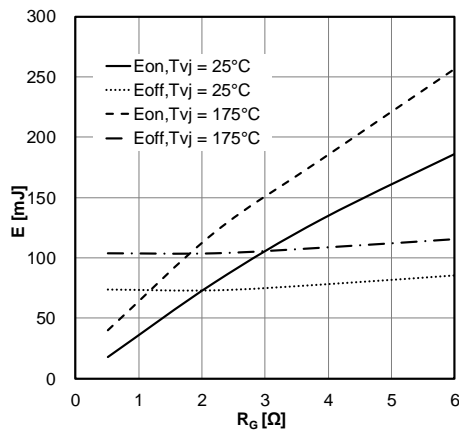
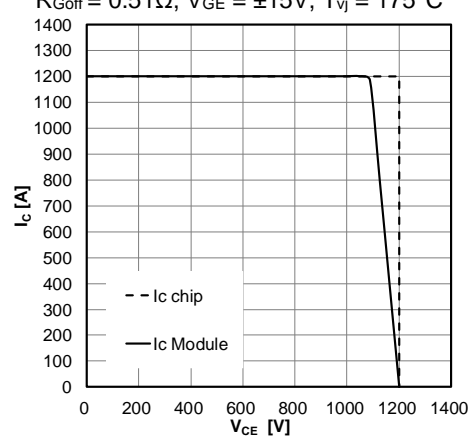


Fig.6 Reverse bias safe operating area(RBOSA), IGBT, Inverter
 $I_C = f(V_{CE})$
 $R_{Goff} = 0.51\Omega$, $V_{GE} = \pm 15V$, $T_{vj} = 175^{\circ}C$



Characteristics Diagrams

Fig.7 Capacity characteristic, IGBT, Inverter
 $C = f(V_{CE})$
 $f = 100\text{KHz}$, $V_{GE} = 0\text{V}$, $T_{vj} = 25^\circ\text{C}$

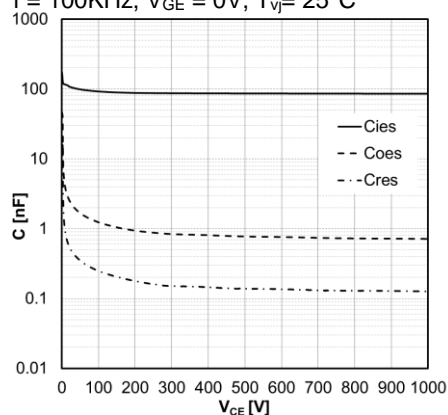


Fig.8 Transient thermal impedance IGBT, Inverter
 $Z_{thJC} = f(t)$

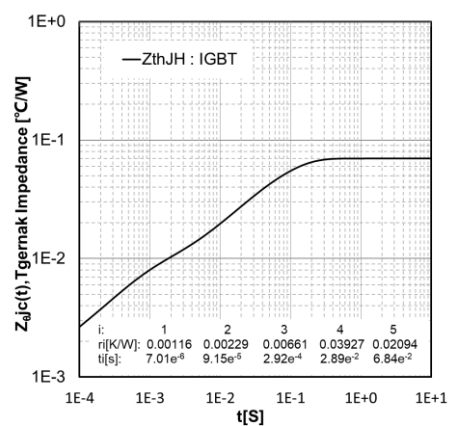


Fig.9 Forward characteristic, Diode, Inverter
 $I_F = f(V_F)$ / (terminal)

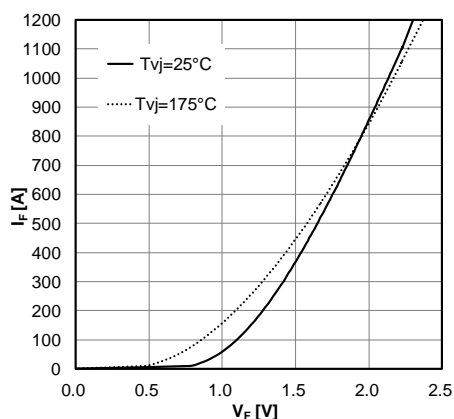


Fig.10 Switching losses, Diode, Inverter
 $E_{rec} = f(I_F)$

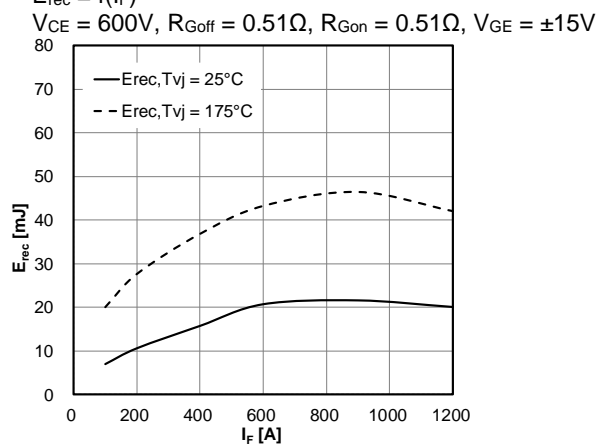


Fig.11 Switching losses, Diode, Inverter
 $E_{rec} = f(R_G)$
 $V_{CE} = 600\text{V}$, $I_F = 600\text{A}$

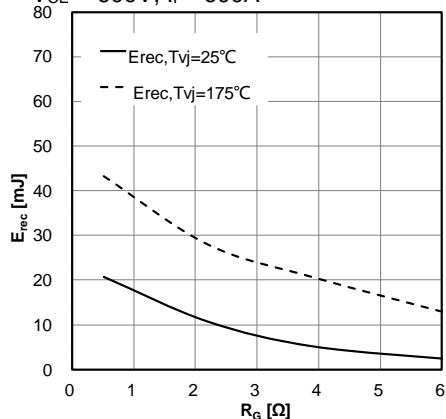
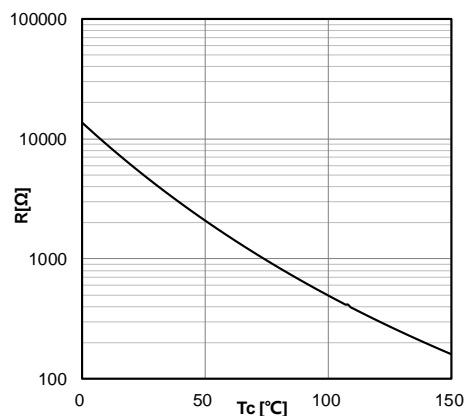


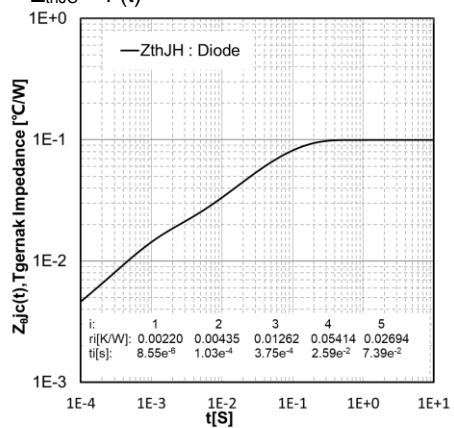
Fig.12 Temperature characteristic, NTC - Thermistor



Characteristics Diagrams

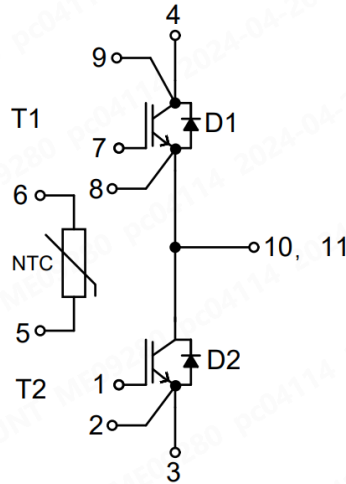
Fig.13 Transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$



Package Information

Circuit Diagram



Package Outlines

