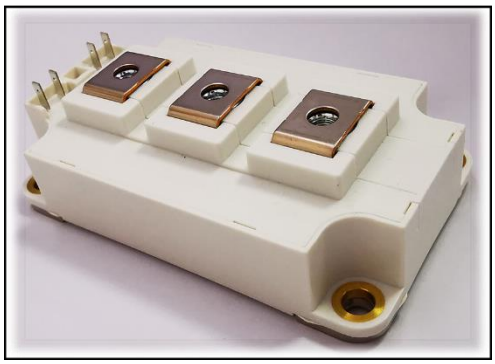
Features

- Low $V_{CE(sat)}$
- Fast Switching
- High Ruggedness
- Short-Circuit Rated

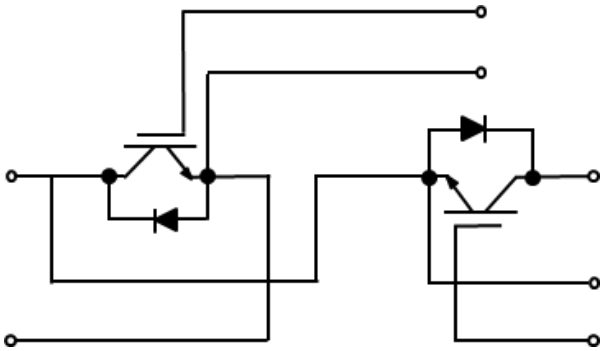
Product Summary	
V_{CES}	1200V
I_C	200A
$V_{CE(sat),typ}$	1.6V



Applications

- General Purpose Inverters
- Frequency Converters
- Industrial Motor Drives
- Servos

Internal Connection



- **IGBT, Inverter**

Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Collector-to-Emitter Voltage	V_{CES}	1200	V
Gate-to-Emitter Voltage	V_{GES}	±20	
Transient Gate-emitter Voltage ($t_p \leq 10\mu s$, $D < 0.010$)		±30	
Continuous DC Collector Current ($T_C = 100°C$, $T_J = 175°C$)	I_{CDC}	200	A
Repetitive Peak Collector Current ($t_p = 1ms$)	I_{CRM}	400	

Electrical Characteristics (1), (2)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-to-Emitter Breakdown Voltage	BV_{CES}	V_{GE} = 0V, I_C = 250μA	1200	-	-	V
Collector-to-Emitter Leakage Current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V	-	-	5	mA
Gate-to-Emitter Leakage Current	I_{GES}	V_{CE} = 0V, V_{GE} = ±20V	-	-	400	nA
Gate Threshold Voltage	$V_{GE(th)}$	V_{CE} = V_{GE} , I_C = 1.5mA	5.5	6.5	7.5	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C = 200A	-	1.6	1.95	
		V_{GE} = 15V, I_C = 200A, T_J = 150°C	-	2.0	-	
		V_{GE} = 15V, I_C = 200A, T_J = 175°C	-	2.1	-	
Total Gate Charge	Q_g	V_{CC} = 600V, V_{GE} = 0/15V, I_C = 200A	-	0.96	-	μC
Internal Gate Resistance	R_{Gint}	-	-	2.0	-	Ω
Input Capacitance	C_{iss}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	19.3	-	nF
Output Capacitance	C_{oss}		-	0.82	-	
Reverse Transfer Capacitance	C_{rss}		-	0.20	-	
Turn-on Delay time	$t_{d(ON)}$	V_{CC} = 600V, V_{GE} = ±15V, R_G = 2Ω, I_C = 200A, L_{load} = 0.82mH, Energy losses include “tail” and diode reverse recovery.	-	150	-	ns
Rise Time	t_r		-	34	-	
Turn-off Delay time	$t_{d(OFF)}$		-	301	-	
Fall Time	t_f		-	172	-	
Turn-On Switching Loss	E_{on}		-	10.9	-	mJ
Turn-Off Switching Loss	E_{off}		-	13.88	-	
IGBT Total Switching Loss	E_{ts}		-	24.78	-	
Turn-on Delay time	$t_{d(ON)}$	V_{CC} = 600V, V_{GE} = ±15V, R_G = 2Ω, I_C = 200A, L_{load} = 0.82mH, Energy losses include “tail” and diode reverse recovery. T_J = 150°C	-	157	-	ns
Rise Time	t_r		-	44	-	
Turn-off Delay time	$t_{d(OFF)}$		-	414	-	
Fall Time	t_f		-	298	-	
Turn-On Switching Loss	E_{on}		-	18.7	-	mJ
Turn-Off Switching Loss	E_{off}		-	23.8	-	
IGBT Total Switching Loss	E_{ts}		-	42.5	-	
Short Circuit Collector Current	$I_{C(SC)}$	V_{GE} = 15V, V_{CC} ≤ 600V, t_{SC} ≤ 10μs	-	790	-	A

• Diode, Inverter

Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	1200	V
Continuous DC Forward Current	I_F	200	A
Repetitive Peak Forward Current (t_P = 1ms)	I_{FRM}	400	

Electrical Characteristics (1)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	I_F = 200A	-	1.95	2.35	V
		I_F = 200A T_J = 150°C	-	1.75	-	
		I_F = 200A T_J = 175°C	-	1.7	-	
Diode Reverse-Recovery Charge	Q_{rr}	V_R = 600V, I_F = 200A, dI_F/dt = - 4200 A/µs	-	14.6	-	µC
Diode Peak Reverse-Recovery Current	I_{rrm}		-	180	-	A
Diode Reverse-Recovery Loss	E_{rr}		-	5.56	-	mJ

• Module

Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Maximum Junction Temperature	T_j	-40 to +175	°C
Operating Junction Temperature	$T_{vj\ op}$	-40 to +150	
Storage Temperature	T_{stg}	-40 to +125	
Isolation Voltage (f = 50 Hz, t = 1 min)	V_{ISO}	4.0	kV

Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Material of Module Baseplate	-	-	Cu	-	-
Internal Isolation	-	-	Al_2O_3	-	-
Creepage Distance, Terminal to Heatsink	-	-	29	-	mm
Creepage Distance, Terminal to Terminal	-	-	23	-	mm
Clearance, Terminal to Heatsink	-	-	23	-	mm

Clearance, Terminal to Terminal	-	-	11	-	mm
Stray Inductance, Module	L_{SCE}	-	20	-	nH
Module Lead Resistance, Terminal to Chip	$R_{CC'+EE'}$	-	0.7	-	mΩ
Junction-to-Case Thermal Resistance, per IGBT, Inverter	$R_{\theta JC}$	-	0.12	-	°C/W
Junction-to-Case Thermal Resistance, per Diode, Inverter		-	0.2	-	
Case-to-Heatsink Thermal Resistance, per IGBT, Inverter	$R_{\theta CH}$	-	0.034	-	°C/W
Case-to-Heatsink Thermal Resistance, per Diode, Inverter		-	0.05	-	
Case-to-Heatsink Thermal Resistance, per Module		-	0.01	-	
Mounting Torque for Module Mounting, Screw M6	M	3.0	-	6.0	Nm
Terminal Connection Torque, Screw M6	M	2.5	-	5.0	Nm
Weight per Module	G	-	320	-	g

(1) T_J = 25°C unless otherwise specified.

(2) t_r: from 10% of Ic to 90% of Ic; t_f: from 90% of Ic to 10% of Ic;

E_{on}: from 10% of V_{GE} to 10% of V_{CE}; E_{off}: from 90% of V_{GE} to 10% of Ic.

• Typical Electrical Characteristics

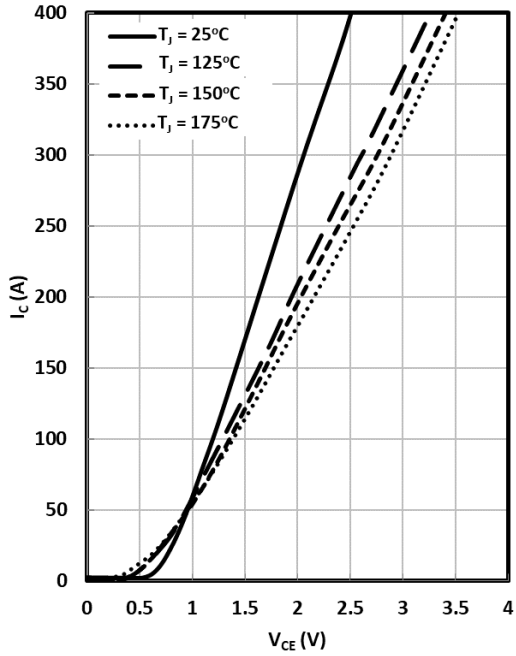


Fig. 1 IGBT (Inverter) Output Characteristics

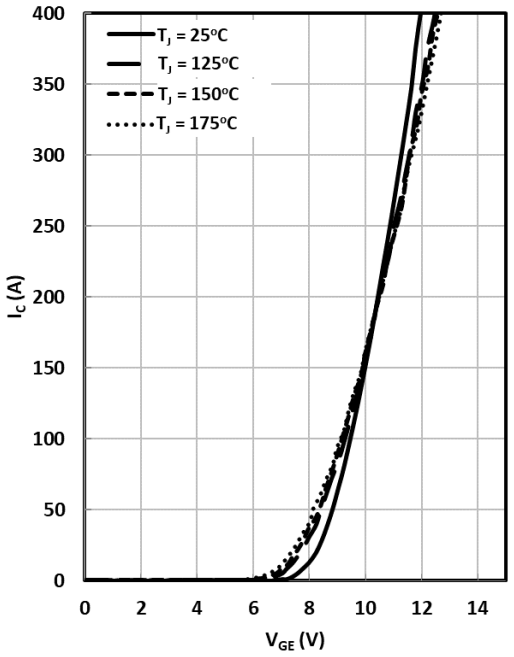


Fig. 2 IGBT (Inverter) Transfer Characteristics

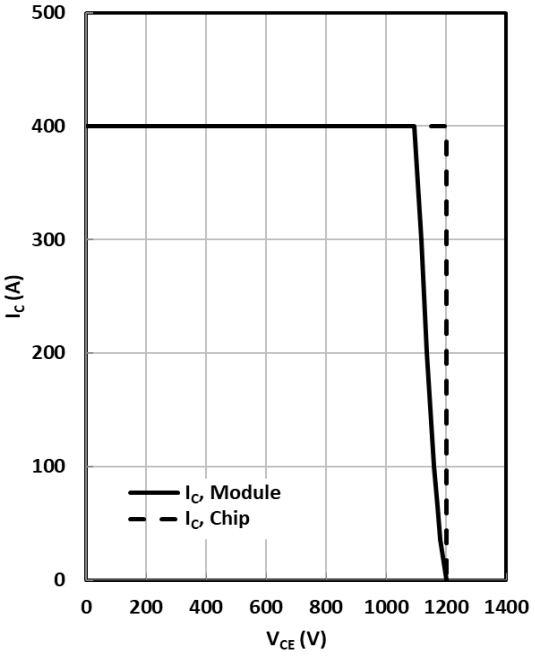


Fig. 3 RBSOA

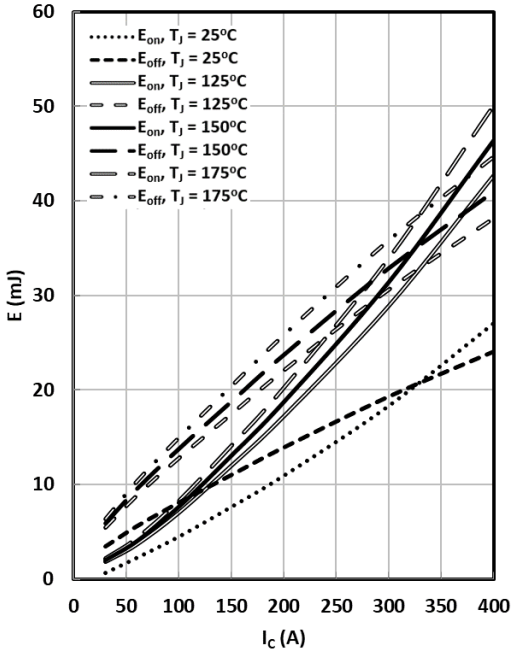


Fig. 4 IGBT Switching Loss vs. I_C
(V_{CC} = 600V, V_{GE} = ±15V, R_G = 2Ω)

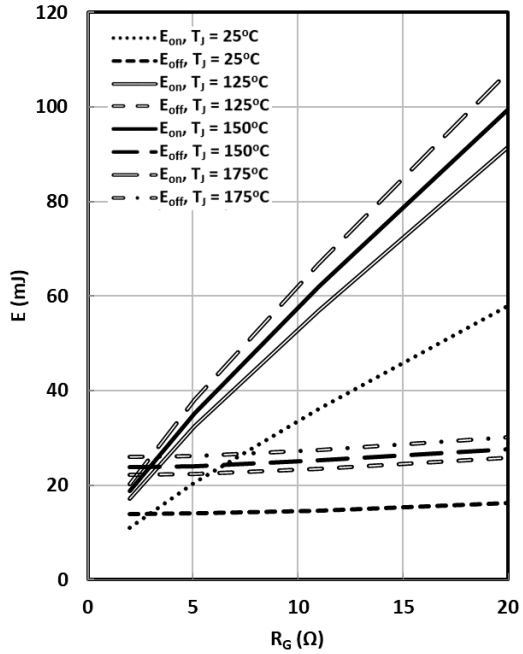


Fig. 5 IGBT Switching Loss vs. R_G

(V_{CC} = 600V, V_{GE} = ±15V, I_C = 200A)

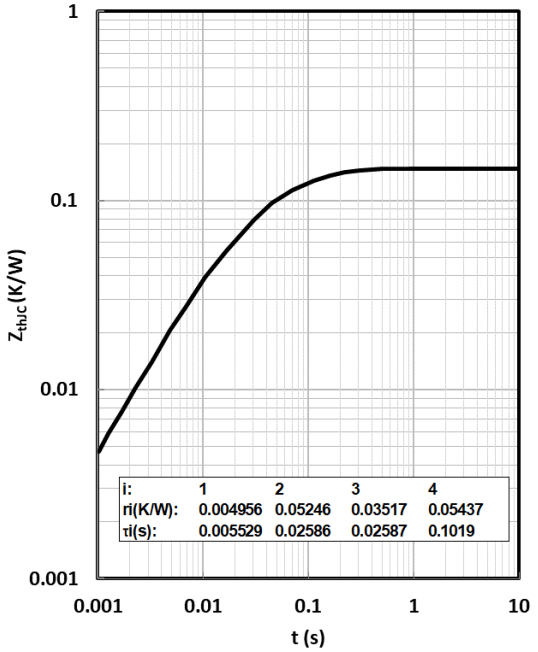


Fig. 6 IGBT (Inverter) Transient Thermal Impedance

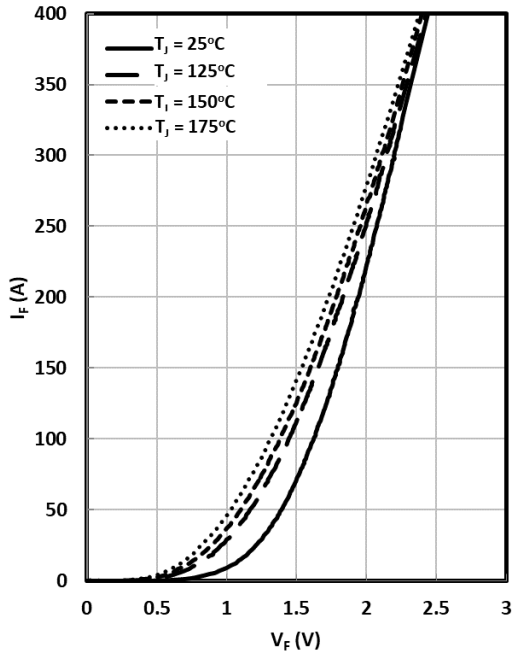


Fig. 7 Diode (Inverter) Forward Characteristics

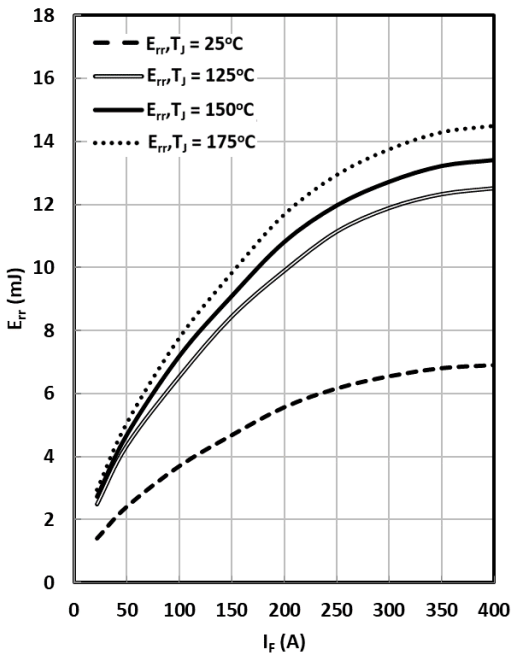


Fig. 8 Diode (Inverter) Switching Loss vs. I_F

(V_{CC} = 600V, R_G = 2Ω)

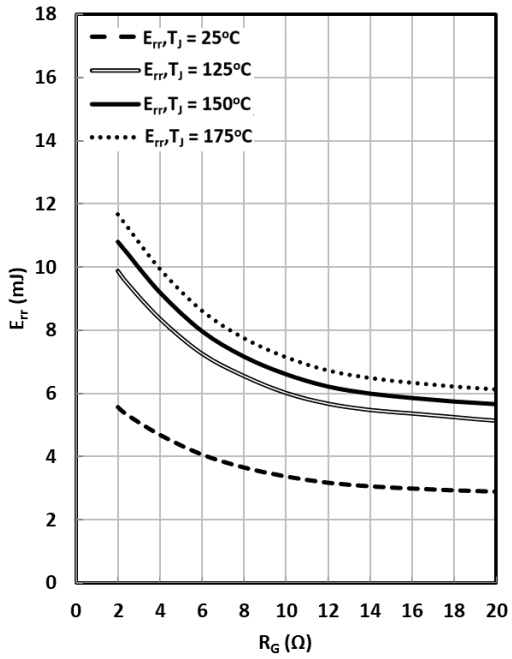


Fig. 9 Diode (Inverter) Switching Loss vs. R_G

(V_{CC} = 600V, I_F = 200A)

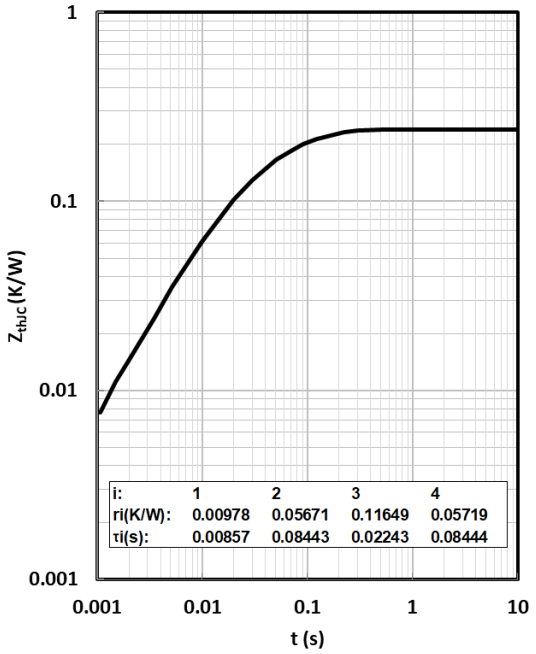
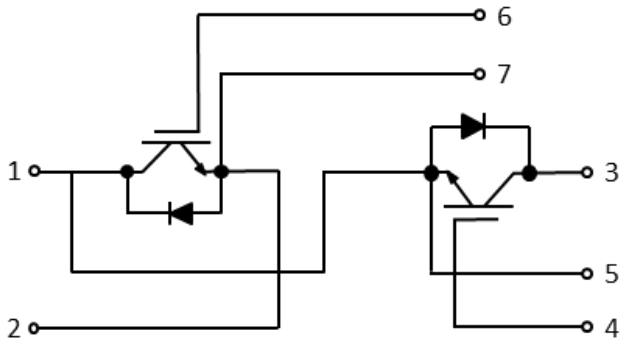
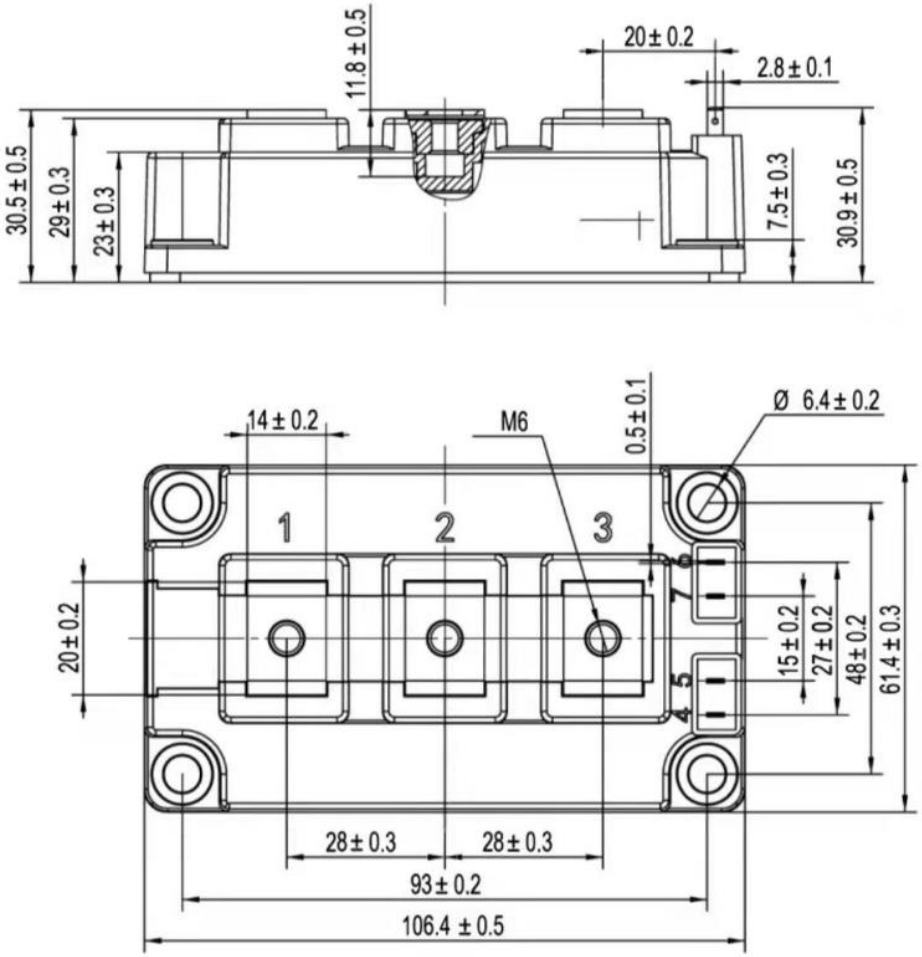


Fig. 10 Diode(Inverter) Transient Thermal Impedance

- **Circuit diagram**



- **Package Dimensions**



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