

Features

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



Product Summary

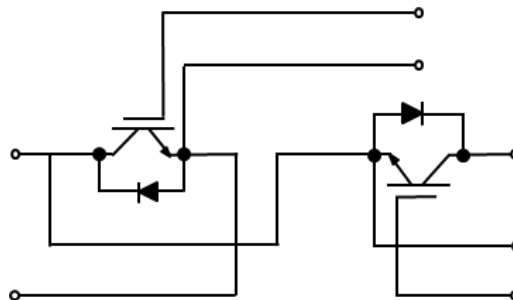
V_{CES}	1200V
I_C	450A
$V_{CE(sat),typ}$	1.55V

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 ($T_c = 100^\circ C$, $T_J = 175^\circ C$)	I_{CDC}	450	A
Repetitive Peak Collector Current ($t_p = 1ms$)	I_{CRM}	900	
Maximum Power Dissipation ($T_c = 25^\circ C$, $T_J = 175^\circ C$)	$P_{D(max)}$	2083	W

Electrical Characteristics ^{(1), (2)}

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-to-Emitter Breakdown Voltage	BV_{CES}	$V_{GE} = 0V, I_C = 250\mu A$	1200	-	-	V
Collector-to-Emitter Leakage Current	I_{CES}	$V_{CE} = 1200V, V_{GE} = 0V$	-	-	5	mA
Gate-to-Emitter Leakage Current	I_{GES}	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	400	nA
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 1.5mA$	4.8	6	7.2	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15V, I_C = 450A$	-	1.55	1.95	
		$V_{GE} = 15V, I_C = 450A,$ $T_J = 150^\circ C$	-	1.9	-	
		$V_{GE} = 15V, I_C = 450A,$ $T_J = 175^\circ C$	-	2.0	-	
Total Gate Charge	Q_g	$V_{CC} = 600V,$ $V_{GE} = \pm 15V,$ $I_C = 450A$	-	4.32	-	μC
Internal Gate Resistance	R_{Gint}	-	-	1	-	Ω
Input Capacitance	C_{iss}	$V_{CE} = 25V,$ $V_{GE} = 0V,$ $f = 1MHz$	-	29.2	-	nF
Output Capacitance	C_{oss}		-	2.03	-	
Reverse Transfer Capacitance	C_{rss}		-	0.39	-	
Turn-on Delay time	$t_{d(ON)}$	$V_{CC} = 600V,$ $V_{GE} = \pm 15V,$ $R_G = 2.2\Omega,$ $I_C = 450A,$ $L_{load} = 0.82mH,$ Energy losses include "tail" and diode reverse recovery.	-	680	-	ns
Rise Time	t_r		-	87	-	
Turn-off Delay time	$t_{d(OFF)}$		-	513	-	
Fall Time	t_f		-	192	-	
Turn-On Switching Loss	E_{on}		-	19.1	-	mJ
Turn-Off Switching Loss	E_{off}	$V_{CC} = 600V,$ $V_{GE} = \pm 15V,$ $R_G = 2.2\Omega,$ $I_C = 450A,$ $L_{load} = 0.82mH,$ Energy losses include "tail" and diode reverse recovery. $T_J = 150^\circ C$	-	40.1	-	
IGBT Total Switching Loss	E_{ts}		-	59.2	-	
Turn-on Delay time	$t_{d(ON)}$		-	703	-	ns
Rise Time	t_r		-	98	-	
Turn-off Delay time	$t_{d(OFF)}$		-	612	-	
Fall Time	t_f		-	363	-	
Turn-On Switching Loss	E_{on}	$V_{CC} = 600V,$ $V_{GE} = \pm 15V,$ $R_G = 2.2\Omega,$ $I_C = 450A,$ $L_{load} = 0.82mH,$ Energy losses include "tail" and diode reverse recovery. $T_J = 150^\circ C$	-	32.3	-	mJ
Turn-Off Switching Loss	E_{off}		-	67.1	-	
IGBT Total Switching Loss	E_{ts}		-	99.4	-	
Short Circuit Collector Current	$I_{C(SC)}$	$V_{GE} = 15V,$ $V_{CC} \leq 600V,$ $t_{SC} \leq 10\mu s$	-	1800	-	A

• Diode, Inverter

Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	1200	V
Continuous DC Forward Current	I_F	450	A
Repetitive Peak Forward Current ($t_p = 1ms$)	I_{FRM}	900	

Electrical Characteristics ⁽¹⁾

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F = 450A$	-	1.95	2.35	V
		$I_F = 450A$ $T_J = 150^{\circ}C$	-	2.1	-	
		$I_F = 450A$ $T_J = 175^{\circ}C$	-	2.15	-	
Diode Reverse-Recovery Charge	Q_{rr}	$V_R = 600V, I_F = 450A,$ $di_F/dt = - 2700 A/\mu s$	-	17	-	μC
Diode Peak Reverse-Recovery Current	I_{rrm}		-	155	-	A
Diode Reverse-Recovery Loss	E_{rr}		-	5.6	-	mJ

• Module

Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Maximum Junction Temperature	T_J	-40 to +175	$^{\circ}C$
Operating Junction Temperature	$T_{vj op}$	-40 to +150	
Storage Temperature	T_{stg}	-40 to +125	
Isolation Voltage (RMS, $f = 50Hz, t = 1min$)	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

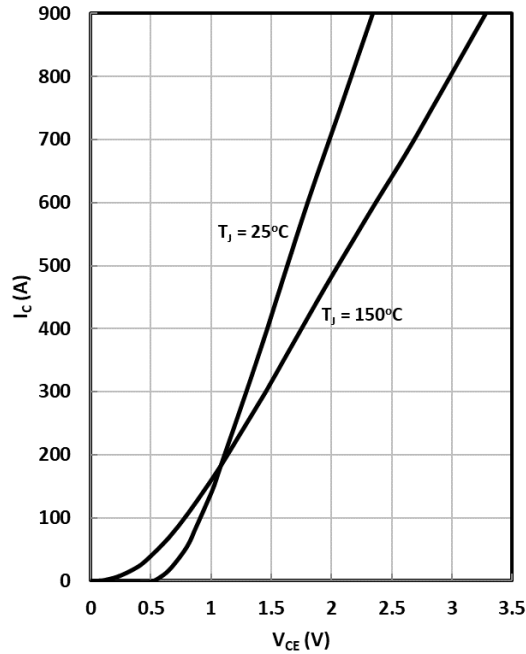
Stray Inductance, Module	L_{SCE}	-	20	-	nH
Module Lead Resistance, Terminal to Chip	$R_{CC'+EE'}$	-	0.7	-	mΩ
Junction-to-Case Thermal Resistance, per IGBT, Inverter	$R_{\theta JC}$	-	0.06	-	°C/W
Junction-to-Case Thermal Resistance, per Diode, Inverter		-	0.1	-	
Case-to-Heatsink Thermal Resistance, per 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) $T_J = 25^\circ\text{C}$ unless otherwise specified

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

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

• **Typical Electrical Characteristics**



1 **Fig. 1 IGBT (Inverter) Output Characteristics**

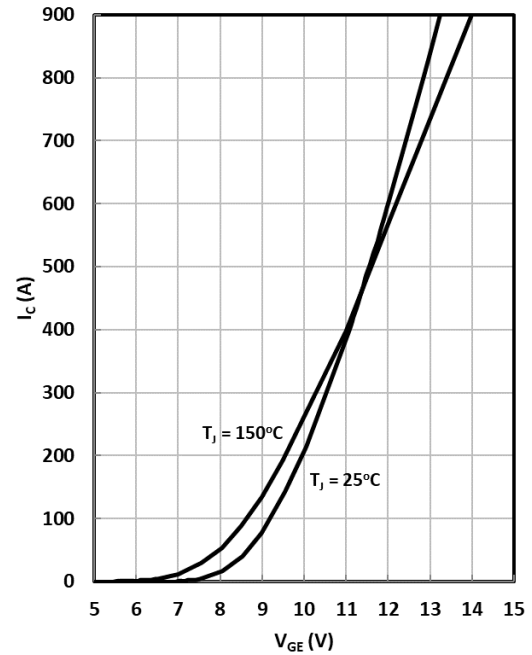


Fig. 2 IGBT (Inverter) Transfer Characteristics

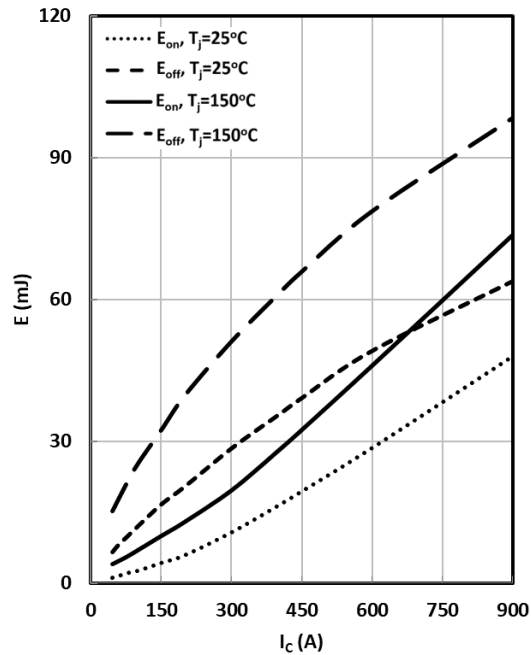


Fig. 3 IGBT Switching Loss VS. I_C
($V_{CC} = 600V$, $V_{GE} = \pm 15V$, $R_g = 2.2\Omega$)

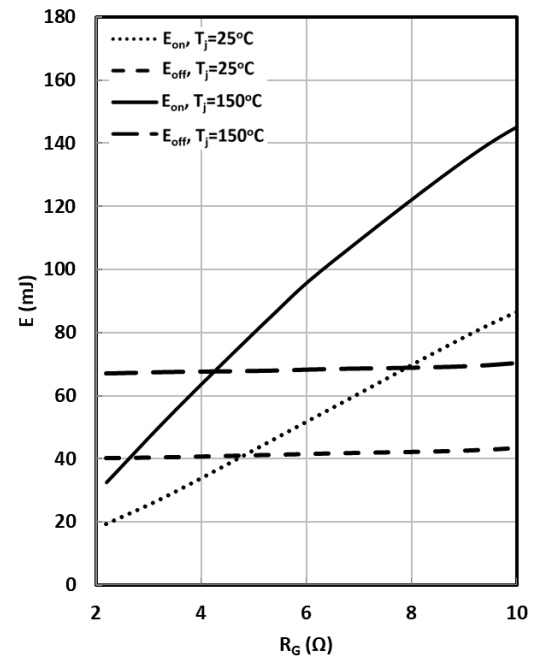


Fig. 4 IGBT Switching Loss VS. R_g
($V_{CC} = 600V$, $V_{GE} = \pm 15V$, $I_C = 450A$)

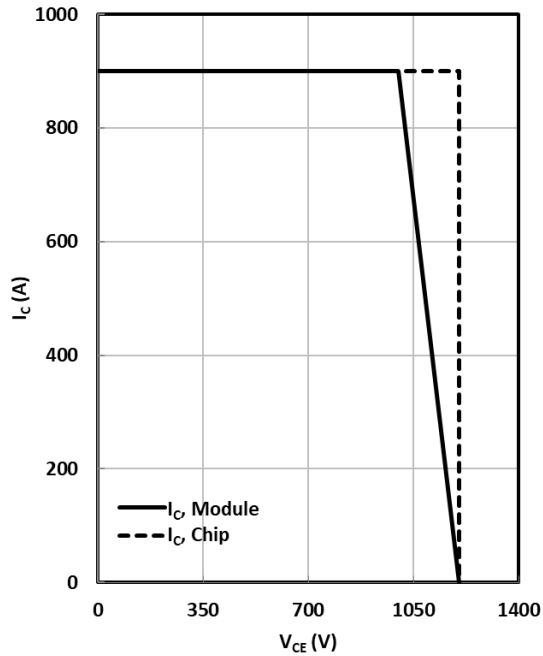


Fig. 5 RBSOA

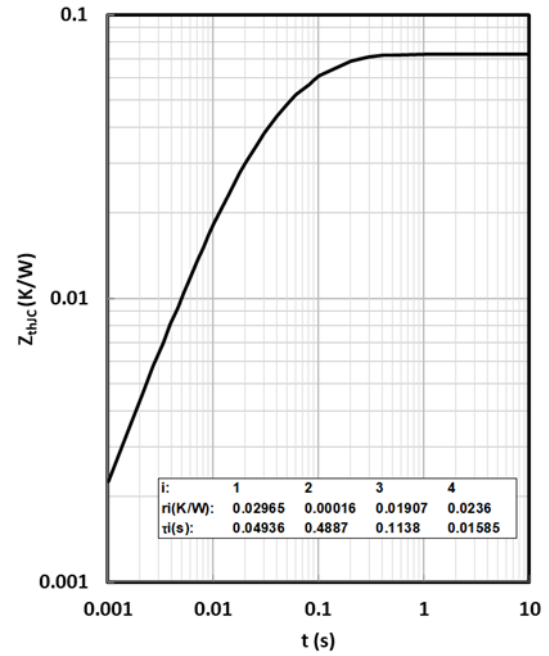


Fig. 6 IGBT (Inverter) Transient Thermal Impedance

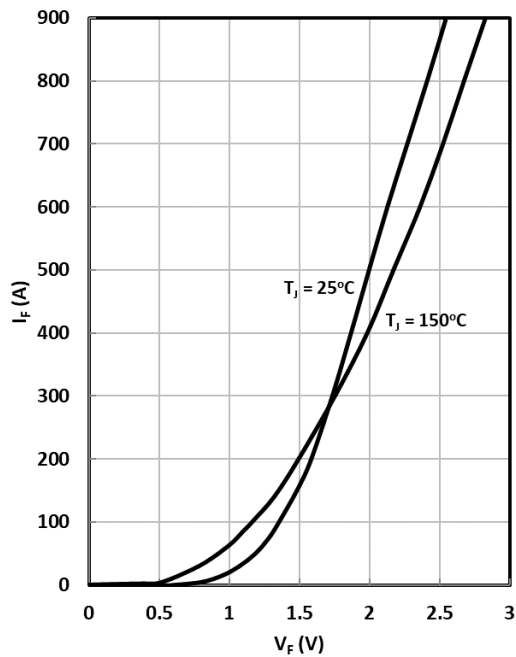
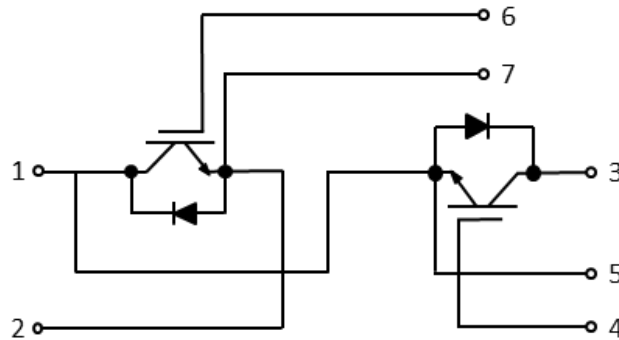
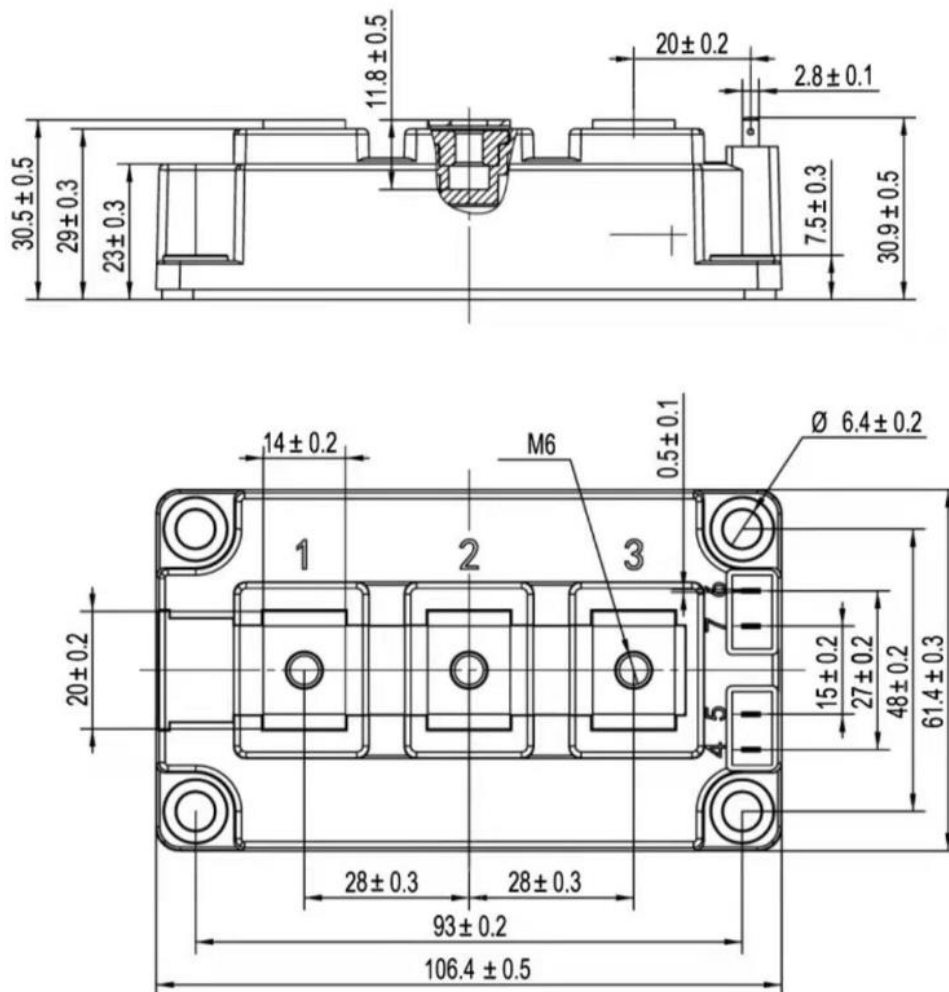


Fig. 7 Diode (Inverter) Forward Characteristics

- Circuit diagram



- Package Dimensions



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