1200V 600A CoolFAST™ IGBT7 Power Module

Electrical Features:

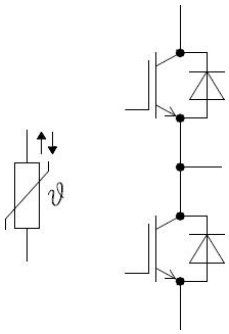
- 1200V 600A, $V_{CE(sat)}$ =2.0V@25°C
- High RBSOA Capability
- Trench/FS Technology
- Low Reverse-recovery Losses
- High SC Capability

Applications:

- Motor Drives
- Solar Applications
- UPS Systems
- Commercial Electric Vehicles
- Wind Turbines

Mechanical Features:

- High Power and Thermal Cycling Capability
- Maximum Junction Temperature 175℃
- High Power Density
- PressFIT Contact Technology
- Isolated Base Plate



Equivalent circuit

Maximum Ratings and Characteristics

Absolute Maximum Ratings at Tc= 25°C (unless otherwise specified)

Items	Symbols	Values	Units	Remarks
Collector-Emitter voltage	V_{CES}	1200	V	
Gate-Emitter voltage	V_{GES}	±30	V	
DC Collector Current	I_C	600	A	T_C= 100°C
Pulsed Collector Current	I_{CP}	1200	A	Note *1
Diode Forward Current	I_F	600	A	
Repetitive Peak Forward Current	I_{FRM}	1200	A	
Operating Junction Temperature	T_{vj}	-40 ~ +150	°C	
Storage Temperature	T_{stg}	-40 ~ +125	°C	

Note *1 : Pulse width limited by T_{vjmax}.

Electrical characteristics (unless otherwise specified)

IGBT, Inverter

Description	Symbols	Conditions		Values			Unit
				Min	Typ	Max	
Zero Gate Voltage Collector Current	I_{CES}	V_{CE}= 1200V, V_{GE}= 0V T_{vj}= 25°C				200	μA
Gate-Emitter Leakage Current	I_{GES}	V_{CE}= 0V, V= 20V,T_{vj}= 25°C				±300	nA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{CE}= V_{GE}, I_C= 600mA		6.2	6.7	7.2	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}= 15V I_C= 600A	T_{vj}= 25°C		2.0	2.4	V
			T_{vj}= 125°C		2.5		
			T_{vj}= 150°C		2.7		
Input Capacitance	C_{ies}	V_{CE}= 25V, V_{GE}= 0V f= 1MHz			128.8		nF
Reverse Transfer Capacitance	C_{res}				0.76		nF
Gate Charge	Q_G	V_{CC}= 600V, V_{GE}= 15V			2270		nC
Internal Gate Resistor	R_{Gint}	T_{vj}= 25°C			1.50		Ω
Turn-On Delay Time, Inductive load	$t_{d(on)}$	V_{CC}= 600V I_C= 600A V_{GE}= 15V R_G= 15Ω	T_{vj}= 25°C		1.09		μs
			T_{vj}= 125°C		1.02		
			T_{vj}= 150°C		0.98		
Rise Time, Inductive load	t_r		T_{vj}= 25°C		0.53		μs
			T_{vj}= 125°C		0.55		
			T_{vj}= 150°C		0.57		
Turn-Off Delay Time, Inductive load	$t_{d(off)}$		T_{vj}= 25°C		1.60		μs
			T_{vj}= 125°C		1.65		
			T_{vj}= 150°C		1.67		
Fall Time, Inductive load	t_f		T_{vj}= 25°C		0.12		μs
			T_{vj}= 125°C		0.12		
			T_{vj}= 150°C		0.13		
Turn-On Energy	E_{on}		T_{vj}= 25°C		171		mJ
			T_{vj}= 125°C		210		
			T_{vj}= 150°C		223		
Turn-Off Energy	E_{off}		T_{vj}= 25°C		87		mJ
			T_{vj}= 125°C		95		
			T_{vj}= 150°C		97		
SC Data	I_{SC}	V_{CC}= 600V R_G= 20Ω V_{GE}≤ 15V V_{CEmax}=V_{CE}-L_{SCE}*di/dt	t_P≤ 10μs T_{vj}= 150°C		2400		A

Diode, Inverter

Description	Symbols	Conditions		Values			Unit
				Min	Typ	Max	
Forward Voltage	V_F	I_F= 600A V_{GE}= 0V	T_{vj}= 25°C		2.9	3.5	V
			T_{vj}= 125°C		2.25		
			T_{vj}= 150°C		2.15		
Recovery Charge	Q_r	I_F= 600A,V_R= 600V -di_F/dt= 1000A/us, V_{GE}= -8V	T_{vj}= 25°C		20.1		µC
			T_{vj}= 125°C		36.9		
			T_{vj}= 150°C		48.5		
Reverse Recovery Energy	E_{rec}	I_F=600A, V_R=600V -di_F/dt=1000A/us V_{GE}= -8V	T_{vj}= 25°C		3.9		mJ
			T_{vj}= 125°C		10.6		
			T_{vj}= 150°C		12.7		

NTC Characteristics

Description	Symbols	Conditions	Values			Unit
			Min	Typ	Max	
Rated Resistance	R_{25}	T_{NTC}=25°C		5.0		KΩ
Deviation of R_{100}	ΔR/R	T_{NTC}=100°C, R_{100}=493Ω	-5		5	%
Power Dissipation	P_{25}				20	mW
B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3380		K
B-value	$B_{25/80}$	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$		3468		K
B-value	$B_{25/100}$	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$		3523		K

Module

Description	Symbols	Conditions	Values	Unit
Isolation Test Voltage	V_{ISOL}	RMS, f =50Hz, t= 1min	4.0	KV
Material of Module Base plat			Cu	
Internal Isolation			Al_2O_3	
Creepage Distance	d_{Creep}	Terminal to heatsink Terminal to terminal	14.5 12.8	mm
Clearance	d_{Clear}	Terminal to heatsink Terminal to terminal	12.5 10.1	mm
Comparative Tracking Index	CTI		200	

Description	Symbols	Conditions	Values			Unit
			Min	Typ	Max	
Stray Inductance Module	L_{sCE}			19		nH
Module Lead Resistance，Terminals-Chip	$R_{CC'+EE'}$	T_C= 25°C，Per switch		1.05		mΩ
Mounting Torque for Module Mounting	M	Screw M5	3.0		6.0	Nm
Weight	G			348		g

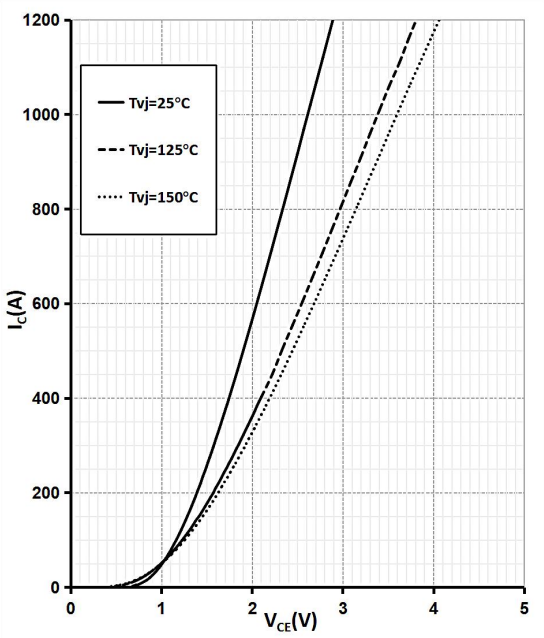
Thermal resistance

Items	Symbols	Values			Unit
		Min	Typ	Max	
Thermal Resistance, Per IGBT Junction to Case	$R_{th(j-c)}$			0.081	K/W
Thermal Resistance, Per Diodes Junction to Case	$R_{th(j-c)}$			0.136	

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

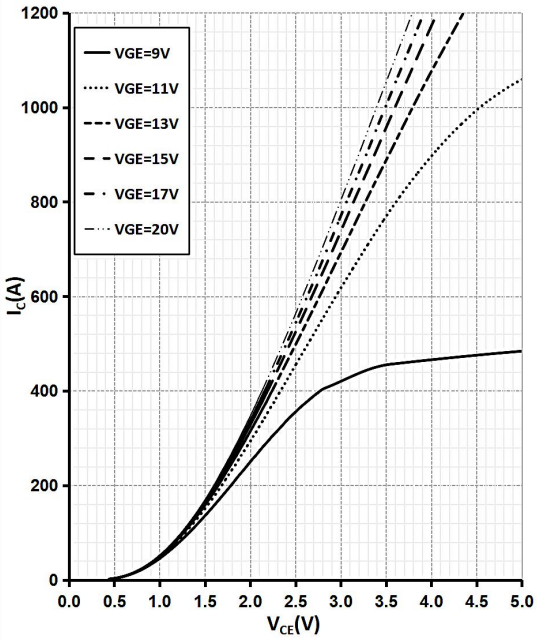
V_{GE}= 15V



Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

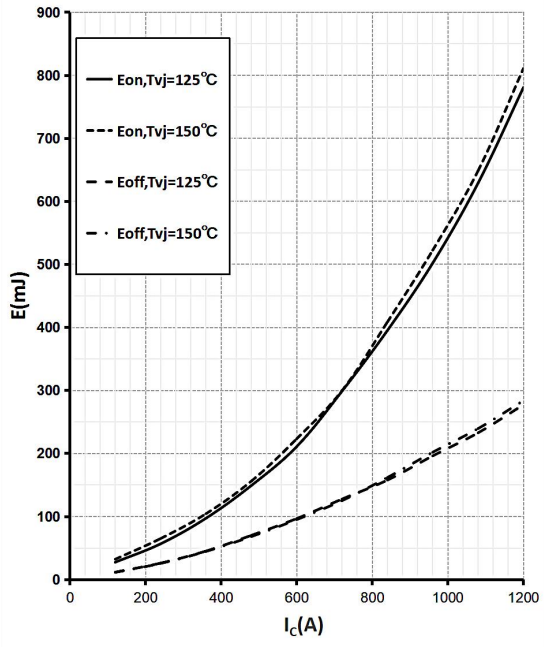
T_{vj}= 150°C



Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

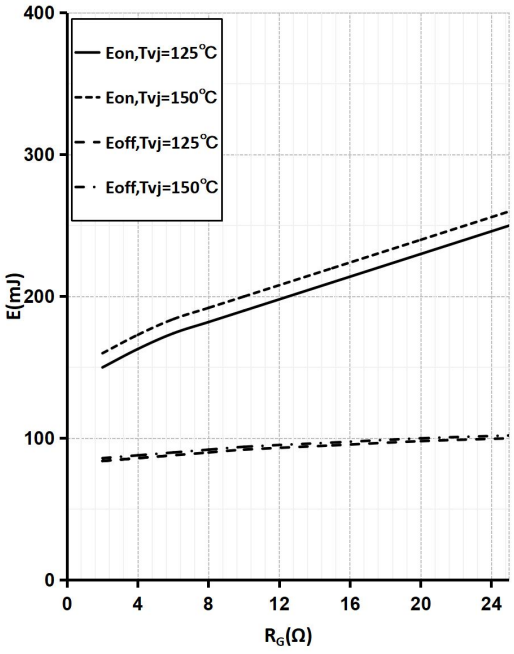
R_{Goff}= 15Ω, R_{Gon}=15Ω, V_{GE}= ±15V, V_{CC}= 600V



Switching losses (typical), IGBT, Inverter

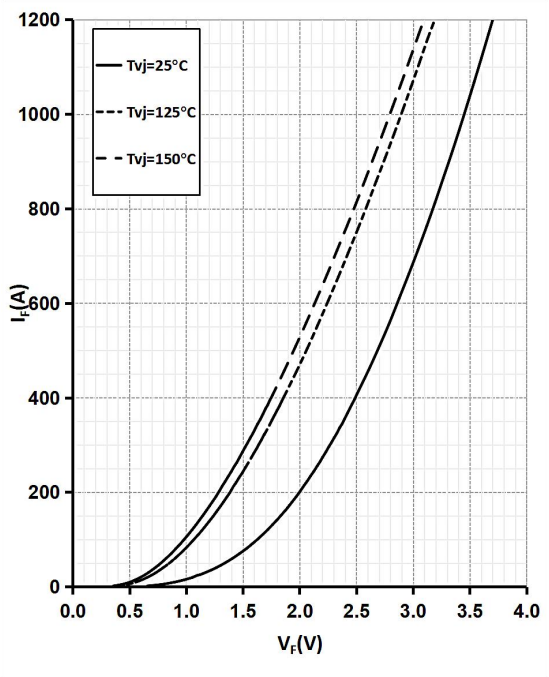
$E = f(R_G)$

V_{GE}= 15V, I_C= 600A, V_{CC}= 600V



Forward characteristic (typical), Diode, Inverter

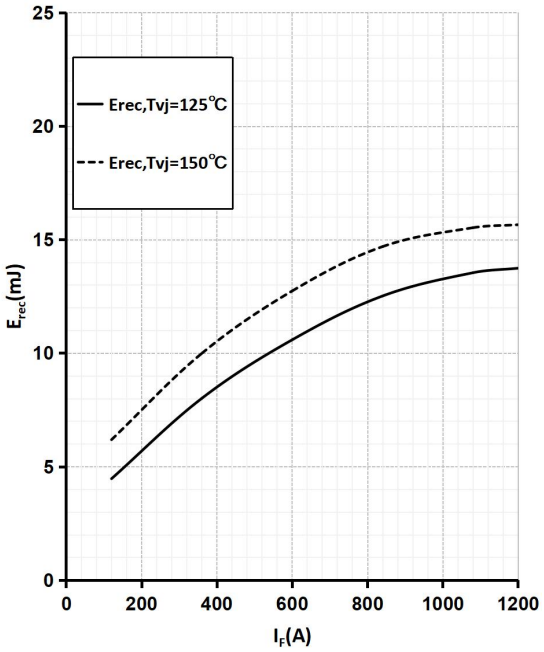
$I_F = f(V_f)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

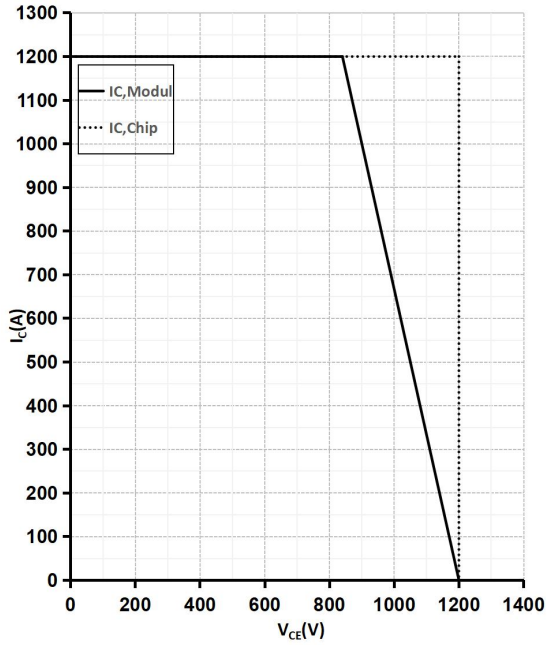
R_{Gon}= 15Ω, V_{CC}= 600V



Reverse bias safe operating area (RBSOA), IGBT, Inverter

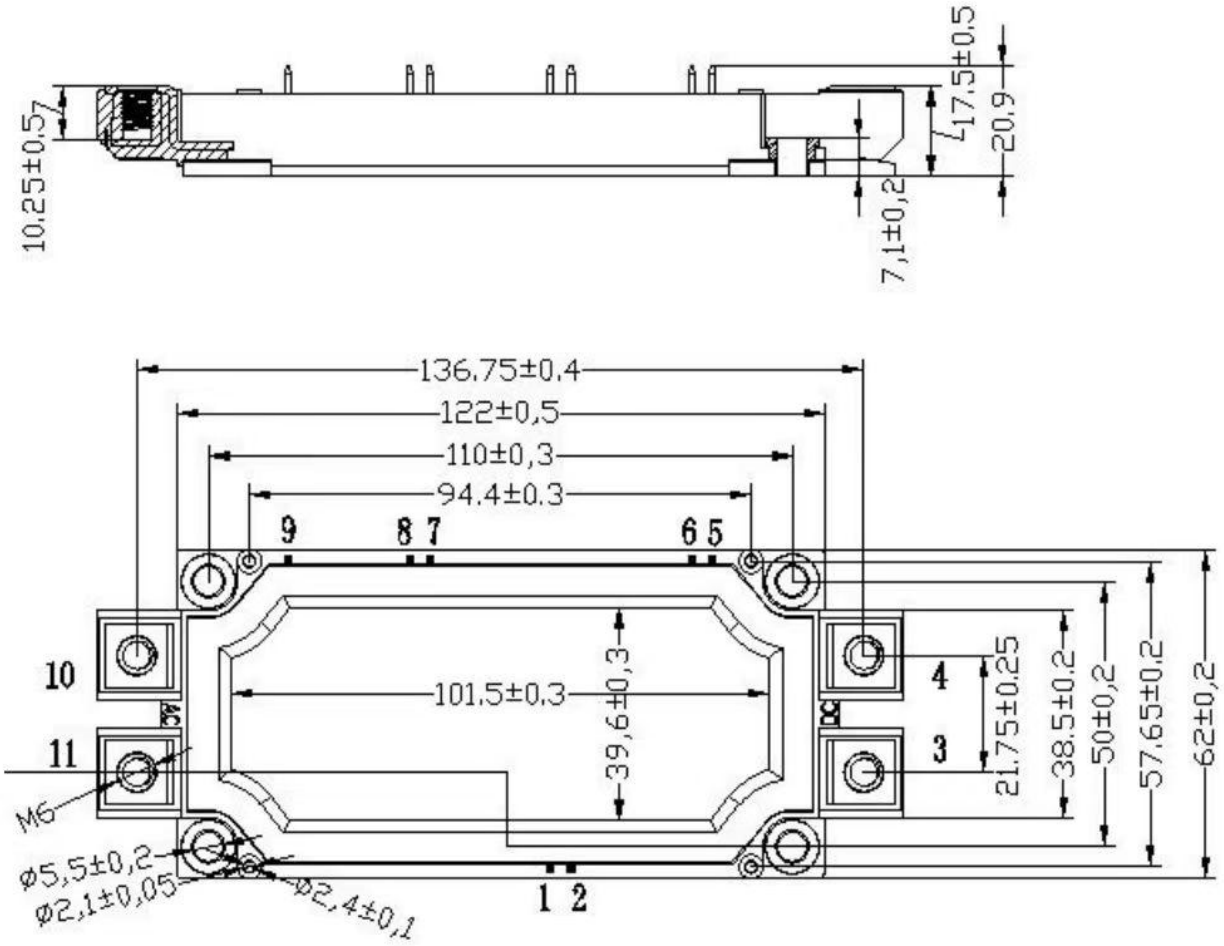
$I_C = f(V_{CE})$

R_{Goff}= 15Ω, V_{GE}= ±15V, T_{vj}= 150°C

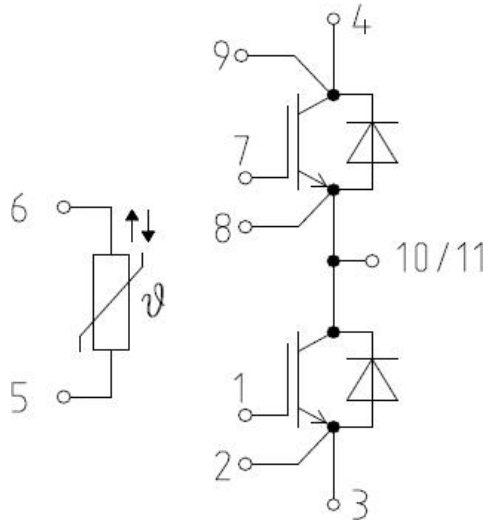


Package Dimension

Dimensions in Millimeters



Internal Circuit



Revision History

Revision	Date	Subjects (major changes since last revision)
0.1	2023-04-09	Preliminary version
1.0	2023-11-23	MP version

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