

1200V 100A CoolFAST™ IGBT7 Power Module

Electrical Features:

- 1200V 100A, $V_{CE(sat)} = 1.7V@25^{\circ}C$
- High RBSOA Capability
- Trench/FS Technology
- Low Reverse-recovery Losses
- High SC Capability

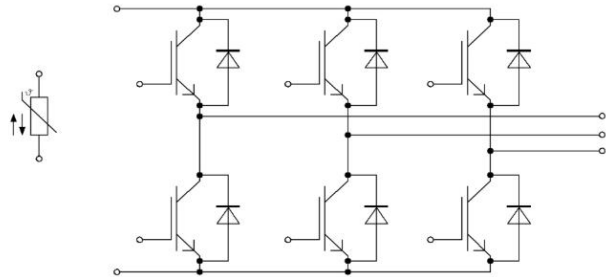
Applications:

- Motor Drives
- Servo Drives
- Auxiliary Inverters
- Uninterruptible Power Supply



Mechanical Features:

- High Power and Thermal Cycling Capability
- Maximum Junction Temperature $175^{\circ}C$
- High Power Density
- PressFIT Contact Technology
- Isolated Base Plate



Equivalent circuit

Maximum Ratings and Characteristics

Absolute Maximum Ratings at $T_c = 25^{\circ}C$ (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	100	A	$T_c = 100^{\circ}C$
Repetitive Peak Collector Current	I_{RM}	200	A	$t_p = 1ms$
Diode Forward Current	I_F	100	A	
Repetitive Peak Forward Current	I_{FRM}	200	A	
Operating Junction Temperature	T_{vj}	-40 ~ +150	$^{\circ}C$	
Storage Temperature	T_{stg}	-40 ~ +125	$^{\circ}C$	

Electrical characteristics (unless otherwise specified)
IGBT, Inverter

Description	Symbols	Conditions	Values			Unit	
			Min	Typ	Max		
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE}= 1200V, V_{GE}= 0V$ $T_{vj}= 25^{\circ}C$			200	μA	
Gate-Emitter Leakage Current	I_{GES}	$V_{CE}= 0V, V= 20V, T_{vj}= 25^{\circ}C$			± 300	nA	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{CE}= V_{GE}, I_C= 100mA$	5.5	6.1	6.7	V	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}= 15V$ $I_C= 100A$	$T_{vj}= 25^{\circ}C$		1.7	2.2	V
			$T_{vj}= 125^{\circ}C$		2.08		
			$T_{vj}= 150^{\circ}C$		2.23		
Input Capacitance	C_{ies}	$V_{CE}= 25V, V_{GE}= 0V$		21		nF	
Reverse Transfer Capacitance	C_{res}	$f= 1MHz$		0.12		nF	
Gate Charge	Q_G	$V_{CC}= 600V, V_{GE}= 15V$		1.80		μC	
Internal Gate Resistor	R_{Gint}	$T_{vj}= 25^{\circ}C$		3.0		Ω	
Turn-On Delay Time, Inductive load	$t_{d(on)}$		$T_{vj}= 25^{\circ}C$		0.36	μs	
			$T_{vj}= 125^{\circ}C$		0.34		
			$T_{vj}= 150^{\circ}C$		0.33		
Rise Time, Inductive load	t_r		$T_{vj}= 25^{\circ}C$		0.09	μs	
			$T_{vj}= 125^{\circ}C$		0.10		
			$T_{vj}= 150^{\circ}C$		0.11		
Turn-Off Delay Time, Inductive load	$t_{d(off)}$	$V_{CC}= 600V$ $I_C= 100A$	$T_{vj}= 25^{\circ}C$		0.39	μs	
			$T_{vj}= 125^{\circ}C$		0.41		
			$T_{vj}= 150^{\circ}C$		0.44		
Fall Time, Inductive load	t_f	$V_{GE}= 15V$ $R_G= 10\Omega$	$T_{vj}= 25^{\circ}C$		0.08	μs	
			$T_{vj}= 125^{\circ}C$		0.10		
			$T_{vj}= 150^{\circ}C$		0.15		
Turn-On Energy	E_{on}		$T_{vj}= 25^{\circ}C$		12.92	mJ	
			$T_{vj}= 125^{\circ}C$		16.08		
			$T_{vj}= 150^{\circ}C$		21.09		
Turn-Off Energy	E_{off}		$T_{vj}= 25^{\circ}C$		5.35	mJ	
			$T_{vj}= 125^{\circ}C$		6.19		
			$T_{vj}= 150^{\circ}C$		7.34		
SC Data	I_{sc}	$V_{CC}= 600V$ $R_G= 20\Omega$ $V_{GE}\leq 15V$ $V_{CEmax}=V_{CE-L_{SCE}}*di/dt$	$t_p\leq 10\mu s$ $T_{vj}= 150^{\circ}C$		400	A	

Diode, Inverter

Description	Symbols	Conditions	Values			Unit
			Min	Typ	Max	
Forward Voltage	V _F	I _F = 100A V _{GE} = 0V	T _{vj} = 25°C	1.49	2.0	V
			T _{vj} = 125°C	1.38		
			T _{vj} = 150°C	1.36		
Recovery Charge	Q _r	I _F = 100A, V _R = 600V -di _F /dt= 1200A/us V _{GE} = -15V	T _{vj} = 25°C	7.90		μC
			T _{vj} = 125°C	16.77		
			T _{vj} = 150°C	22.31		
Reverse Recovery Energy	E _{rec}	I _F = 100A, V _R = 600V -di _F /dt=1200A/us V _{GE} = -15V	T _{vj} = 25°C	3.17		mJ
			T _{vj} = 125°C	6.41		
			T _{vj} = 150°C	8.91		

Thermal resistance

Items	Symbols	Values			Unit
		Min	Typ	Max	
Thermal Resistance, Per IGBT Junction to Case	R _{th(j-c)}			0.20	K/W
Thermal Resistance, Per Diodes Junction to Case	R _{th(j-c)}			0.44	
Thermal Resistance, Case to Heatsink (IGBT+FRD) With 1 W/(m·K) thermal grease	R _{th(c-s)}		0.05		

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 ₂ O ₃	
Creepage Distance	d _{Creep}	Terminal to terminal	10.0	mm
Clearance	d _{Clear}	Terminal to terminal	7.5	mm
Comparative Tracking Index	CTI		200	

Description	Symbols	Conditions	Values			Unit
			Min	Typ	Max	
Stray Inductance Module	L _{sCE}			35.2		nH
Module Lead Resistance , Terminals-Chip	R _{CC'+EE'}	T _C = 25°C, Per switch		4.3		mΩ
Mounting Torque for Module Mounting	M	Screw M5	3.0		6.0	Nm
Weight	G			180		g

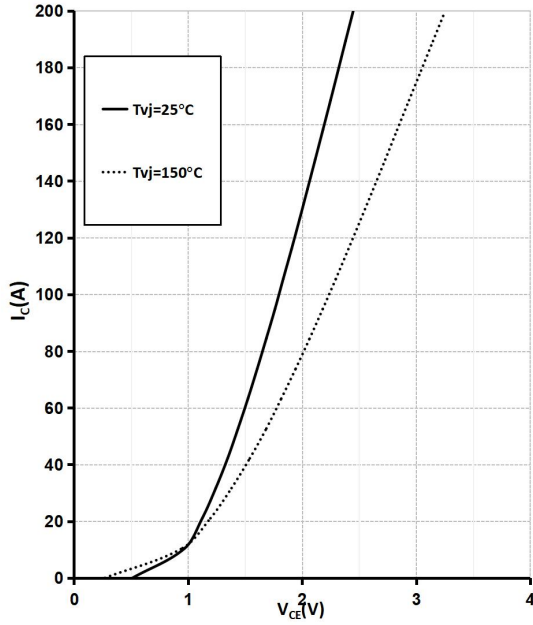
NTC Characteristics

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}	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3388		K
B-value	B _{25/80}	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$		3454		K
B-value	B _{25/100}	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$		3485		K

Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

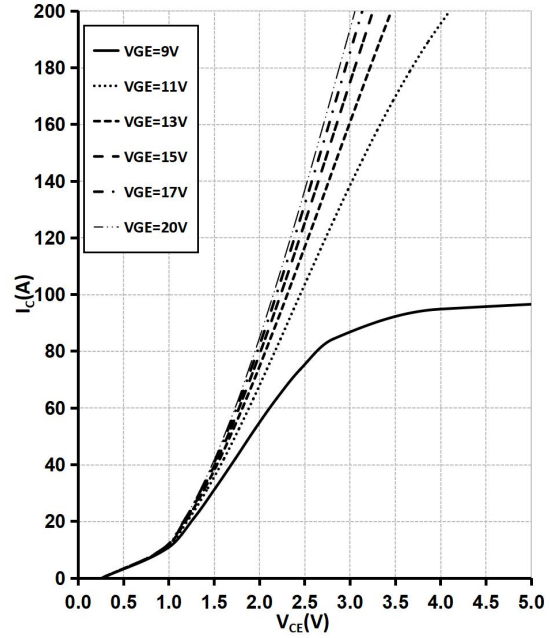
$V_{GE} = 15V$



Output characteristic (typical), IGBT, Inverter

$I_C = f(V_{CE})$

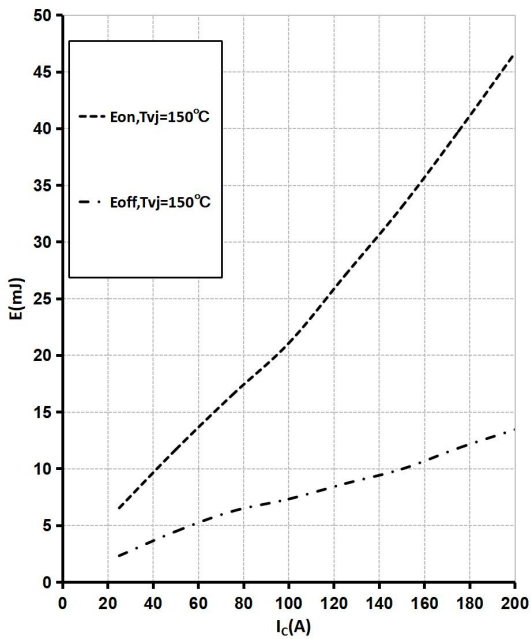
$T_{vj} = 150^\circ C$



Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

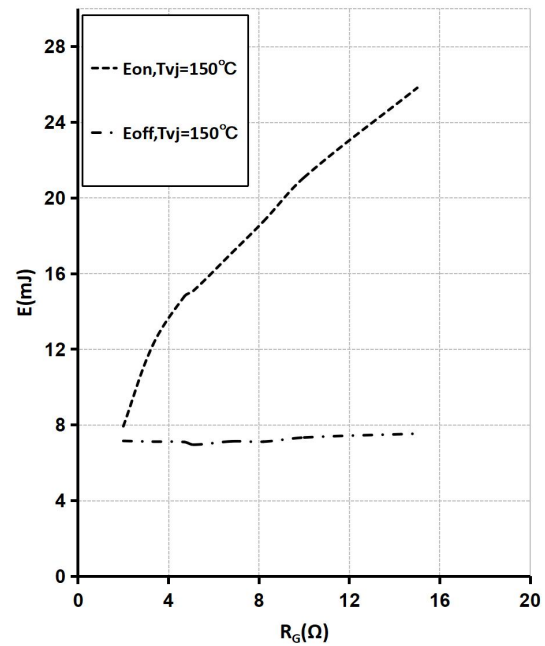
$R_{Goff} = 10\Omega, R_{Gon} = 10\Omega, V_{GE} = \pm 15V, V_{CC} = 600V$



Switching losses (typical), IGBT, Inverter

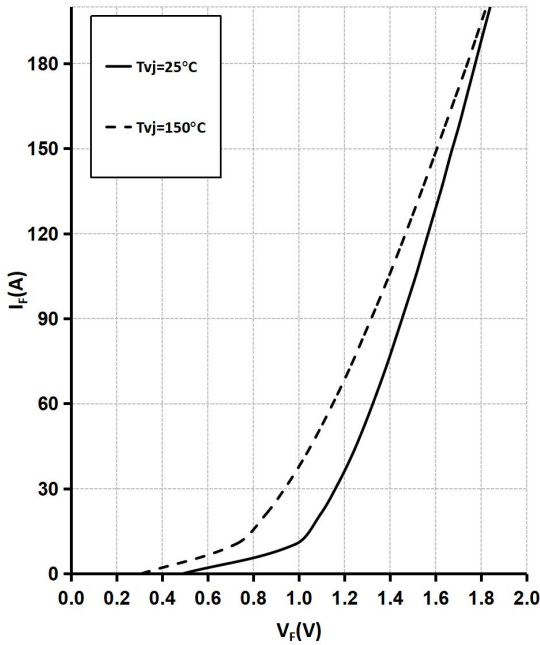
$E = f(R_G)$

$V_{GE} = 15V, I_C = 100A, V_{CC} = 600V$



Forward characteristic (typical), Diode, Inverter

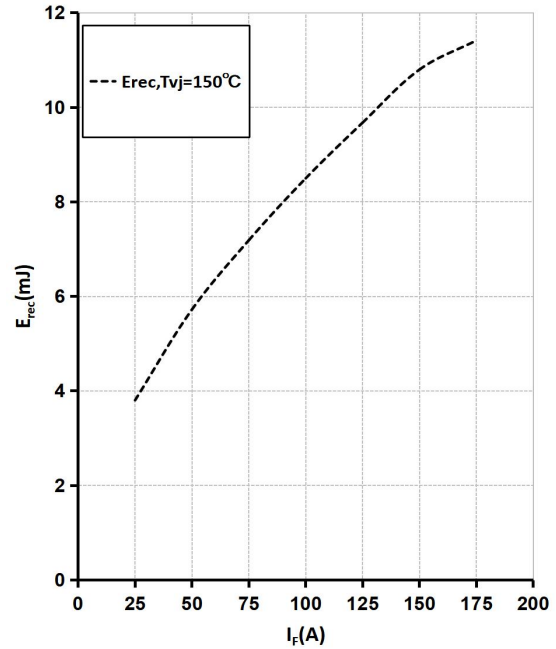
$I_F = f(V_F)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

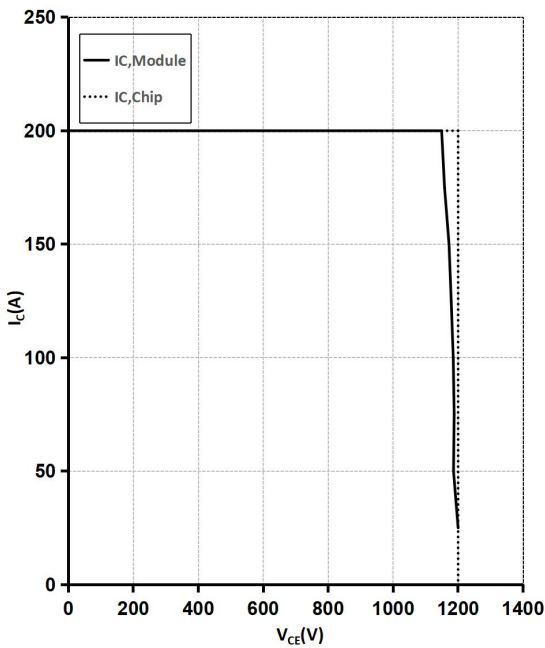
$R_{Gon} = 10\Omega, V_{CC} = 600V$



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

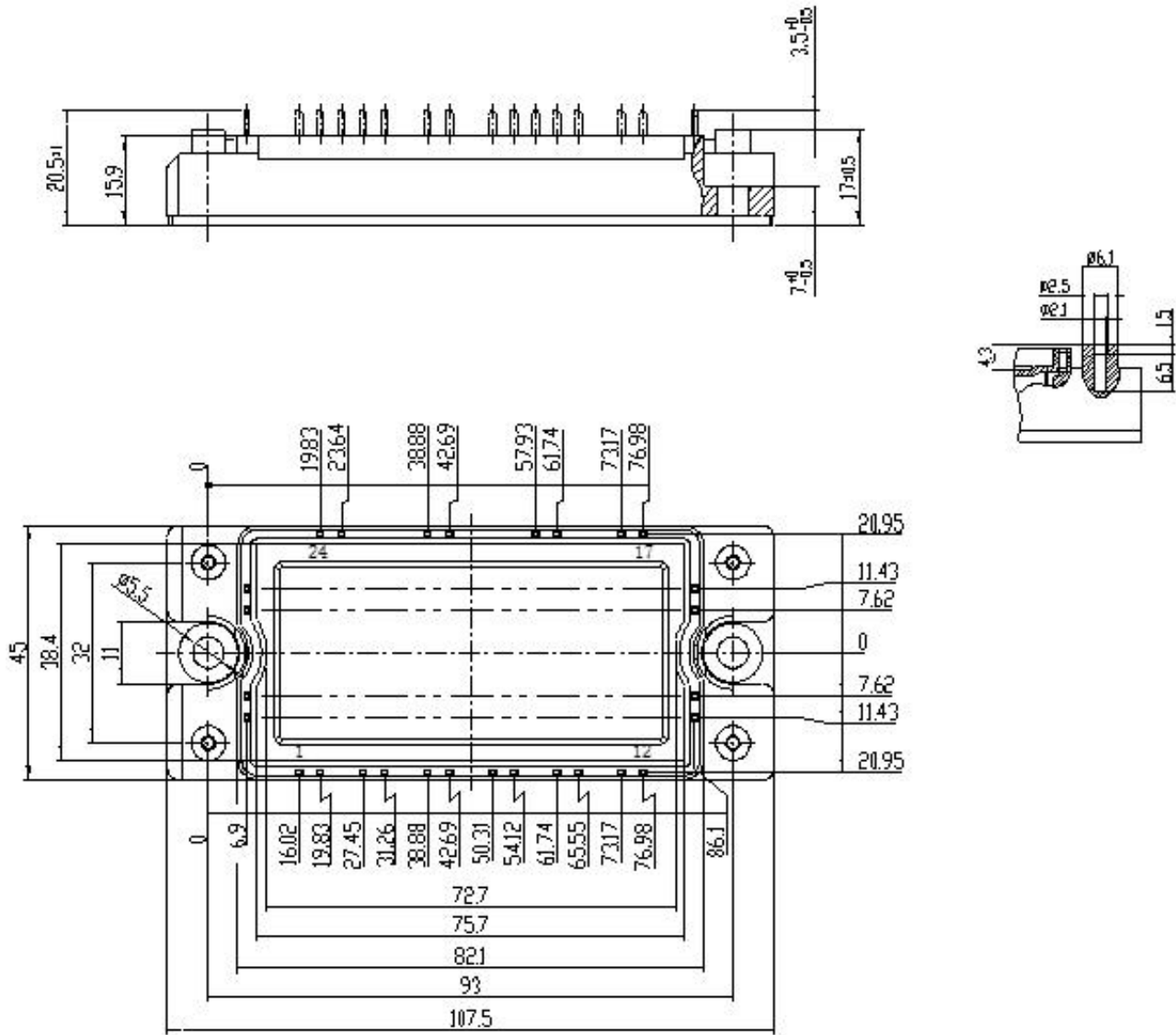
$I_C = f(V_{CE})$

$R_{Goff} = 10\Omega, V_{GE} = \pm 15V, T_{vj} = 150^\circ C$

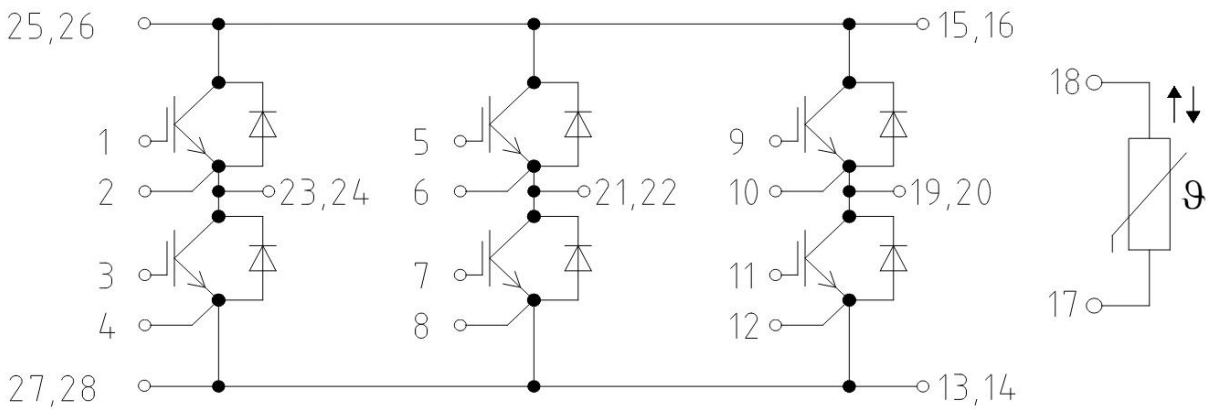


Package Dimension

Dimensions in Millimeters



Internal Circuit



Revision History

Revision	Date	Subjects (major changes since last revision)
0.1	2023-05-23	Preliminary version
1.0	2023-06-19	MP version

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