

1200V 450A CoolFAST™ IGBT7 Power Module

Electrical Features:

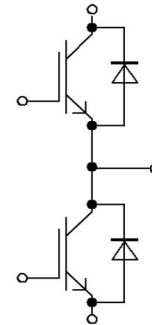
- 1200V 450A, $V_{CE(sat)} = 2.1V@25^{\circ}C$
- High RBSOA Capability
- Trench/FS Technology
- Low Reverse-recovery Losses
- High SC Capability

Applications:

- Motor Drives
- Solar Applications
- UPS Systems
- Commercial Electric Vehicles
- Three-level applications

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	450	A	$T_c = 100^{\circ}C$
Pulsed Collector Current	I_{CP}	900	A	Note *1
Diode Forward Current	I_F	450	A	
Repetitive Peak Forward Current	I_{FRM}	900	A	
Operating Junction Temperature	T_{vj}	$-40 \sim +150$	$^{\circ}C$	
Storage Temperature	T_{stg}	$-40 \sim +125$	$^{\circ}C$	

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}	$V_{CE} = 1200V, V_{GE} = 0V$ $T_{vj} = 25^{\circ}C$			200	μA	
Gate-Emitter Leakage Current	I_{GES}	$V_{CE} = 0V, V = 20V, T_{vj} = 25^{\circ}C$			± 300	nA	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 9.8mA$	5.7	6.2	6.7	V	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15V$ $I_C = 450A$	$T_{vj} = 25^{\circ}C$		2.1	2.6	V
			$T_{vj} = 125^{\circ}C$		2.49		
			$T_{vj} = 150^{\circ}C$		2.58		
Input Capacitance	C_{ies}	$V_{CE} = 25V, V_{GE} = 0V$		106		nF	
Reverse Transfer Capacitance	C_{res}	$f = 1MHz$		880		pF	
Gate Charge	Q_G	$V_{CC} = 600V, V_{GE} = 15V$		2270		nC	
Internal Gate Resistor	R_{Gint}	$T_{vj} = 25^{\circ}C$		1.4		Ω	
Turn-On Delay Time, Inductive load	$t_{d(on)}$		$T_{vj} = 25^{\circ}C$		1.09		μs
			$T_{vj} = 125^{\circ}C$		0.99		
			$T_{vj} = 150^{\circ}C$		0.99		
Rise Time, Inductive load	t_r		$T_{vj} = 25^{\circ}C$		0.50		μs
			$T_{vj} = 125^{\circ}C$		0.51		
			$T_{vj} = 150^{\circ}C$		0.52		
Turn-Off Delay Time, Inductive load	$t_{d(off)}$	$V_{CC} = 600V$ $I_C = 450A$	$T_{vj} = 25^{\circ}C$		1.48		μs
			$T_{vj} = 125^{\circ}C$		1.57		
			$T_{vj} = 150^{\circ}C$		1.59		
Fall Time, Inductive load	t_f	$V_{GE} = 15V$ $R_G = 20\Omega$	$T_{vj} = 25^{\circ}C$		0.11		μs
			$T_{vj} = 125^{\circ}C$		0.11		
			$T_{vj} = 150^{\circ}C$		0.12		
Turn-On Energy	E_{on}		$T_{vj} = 25^{\circ}C$		132.49		mJ
			$T_{vj} = 125^{\circ}C$		161.69		
			$T_{vj} = 150^{\circ}C$		169.26		
Turn-Off Energy	E_{off}		$T_{vj} = 25^{\circ}C$		59.69		mJ
			$T_{vj} = 125^{\circ}C$		66.74		
			$T_{vj} = 150^{\circ}C$		67.86		
SC Data	I_{SC}	$V_{CC} = 600V$ $R_G = 20\Omega$ $V_{GE} \leq 15V$ $V_{CEmax} = V_{CE} - L_{SCE} * di/dt$	$t_p \leq 10\mu s$ $T_{vj} = 150^{\circ}C$		1800		A

Diode, Inverter

Description	Symbols	Conditions	Values			Unit
			Min	Typ	Max	
Forward Voltage	V _F	I _F = 450A V _{GE} = 0V	T _{vj} = 25°C	1.90		V
			T _{vj} = 125°C	1.60		
			T _{vj} = 150°C	1.54		
Recovery Charge	Q _r	I _F = 450A, V _R = 600V -di _F /dt= 1000A/us V _{GE} = -15V	T _{vj} = 25°C	10.90		μC
			T _{vj} = 125°C	41.77		
			T _{vj} = 150°C	52.48		
Reverse Recovery Energy	E _{rec}	I _F = 450A, V _R = 600V -di _F /dt=1000A/us V _{GE} = -15V	T _{vj} = 25°C	4.57		mJ
			T _{vj} = 125°C	10.98		
			T _{vj} = 150°C	13.65		

Thermal resistance

Items	Symbols	Values			Unit
		Min	Typ	Max	
Thermal Resistance, Per IGBT Junction to Case	R _{th(j-c)}			0.09	K/W
Thermal Resistance, Per Diodes Junction to Case	R _{th(j-c)}			0.14	

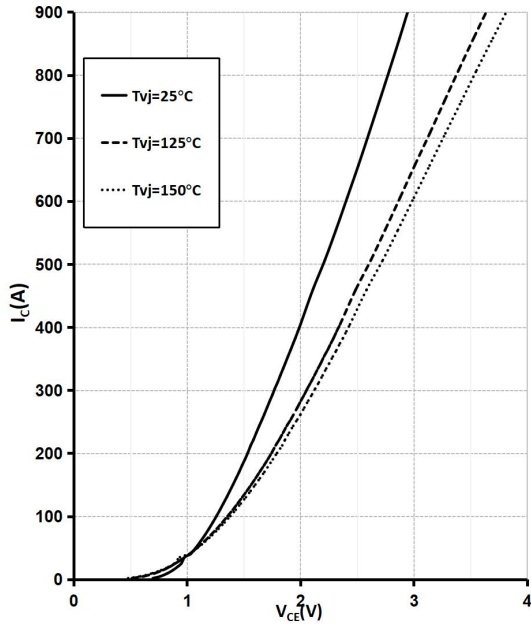
Module

Description	Symbols	Conditions	Values	Unit
Isolation Test Voltage	V _{ISOL}	RMS, f =50Hz, t= 1min	2.7	KV
Material of Module Base plat			Cu	
Internal Isolation			Al ₂ O ₃	
Creepage Distance	d _{creep}	Terminal to heatsink	29.0	mm
		Terminal to terminal	23.0	
Clearance	d _{clear}	Terminal to heatsink	23.0	mm
		Terminal to terminal	11.0	
Storage Temperature	T _{stg}		-40 ~ +125	°C

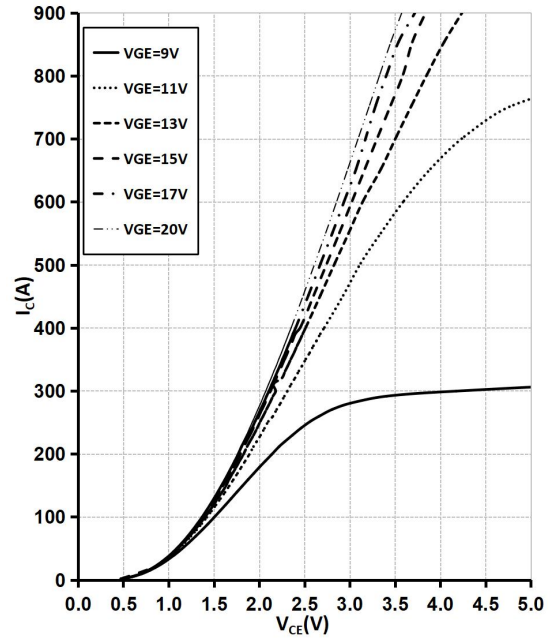
Description	Symbols	Conditions	Values			Unit
			Min	Typ	Max	
Stray Inductance Module	L _{sCE}			35		nH
Terminal Connection Torque	M	Screw M6	3.0		6.0	Nm
Mounting Torque for Module Mounting	M	Screw M6	3.0		6.0	Nm
Weight	G			322		g

Output characteristic (typical), IGBT, Inverter

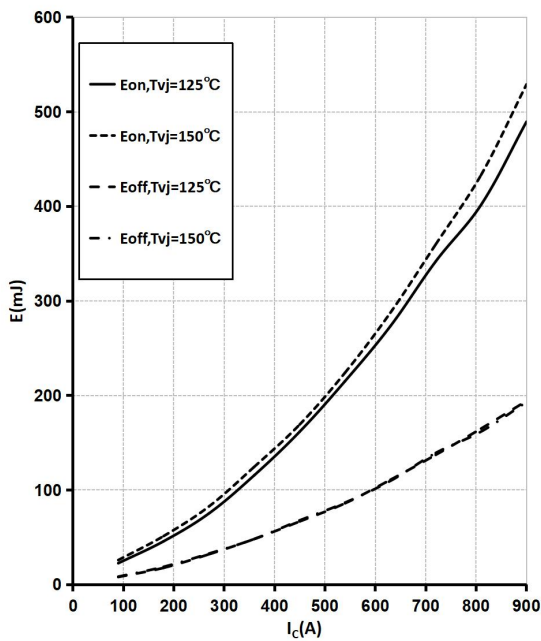
$I_C = f(V_{CE})$

 $V_{GE} = 15V$

Output characteristic (typical), IGBT, Inverter

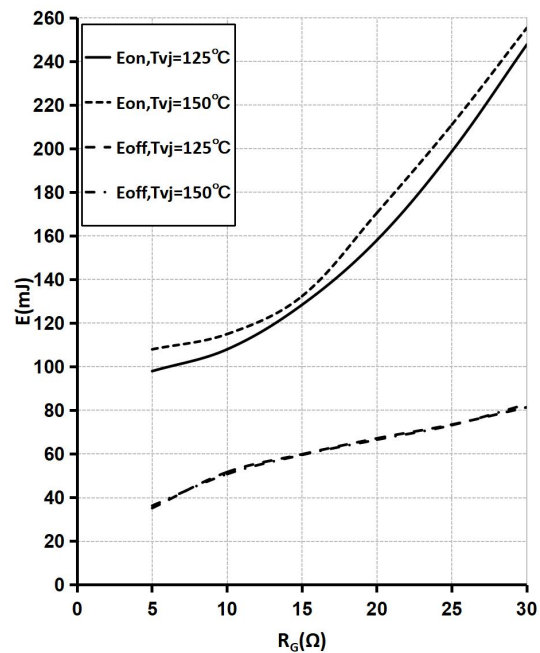
$I_C = f(V_{CE})$

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

Switching losses (typical), IGBT, Inverter

$E = f(I_C)$

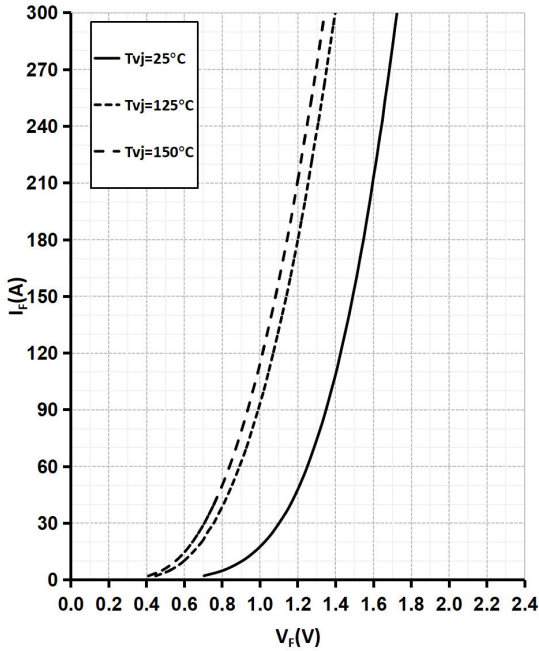
 $R_{Goff} = 20\Omega, R_{Gon} = 20\Omega, V_{GE} = \pm 15V, V_{CC} = 600V$

Switching losses (typical), IGBT, Inverter

$E = f(R_G)$

 $V_{GE} = 15V, I_C = 450A, V_{CC} = 600V$


Forward characteristic (typical), Diode, Inverter

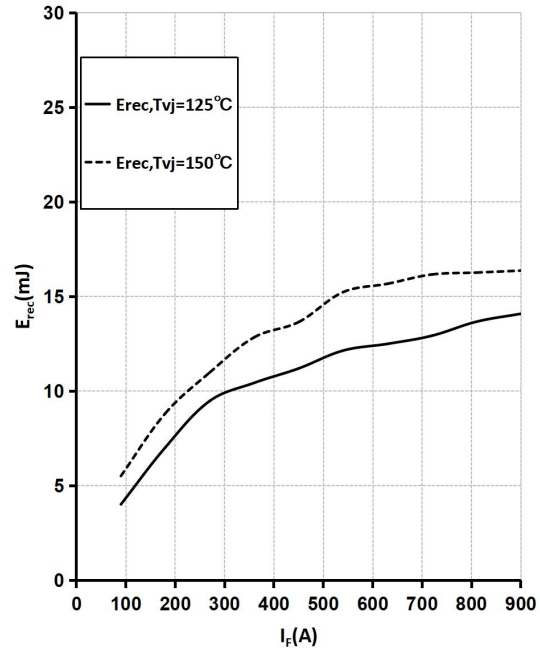
$I_F = f(V_F)$



Switching losses (typical), Diode, Inverter

$E_{rec} = f(I_F)$

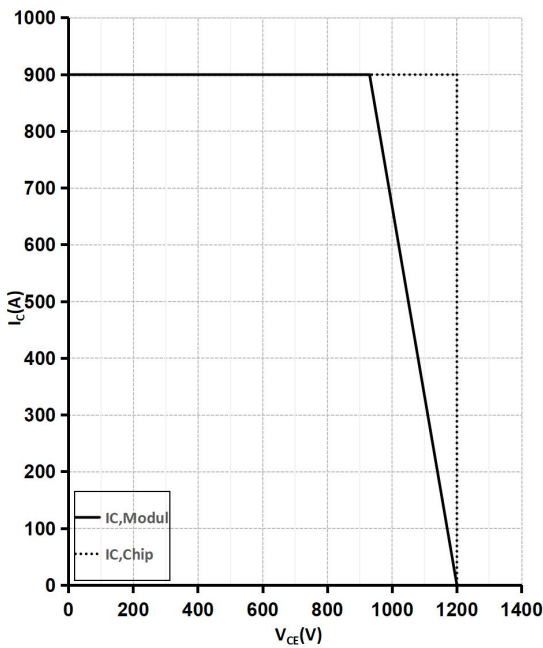
$R_{Gon} = 20\Omega, V_{CC} = 600V$



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

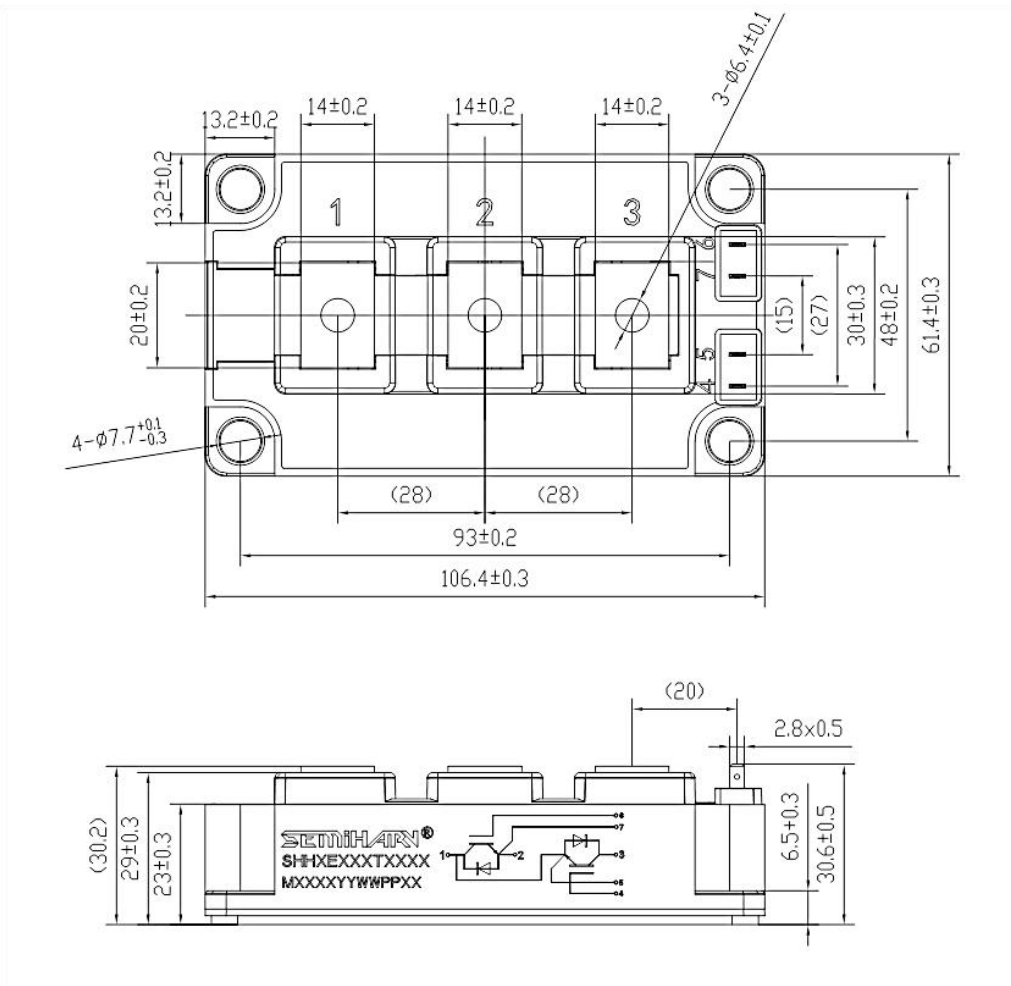
$I_C = f(V_{CE})$

$R_{Goff} = 20\Omega, V_{GE} = \pm 15V, T_{vj} = 150^\circ\text{C}$

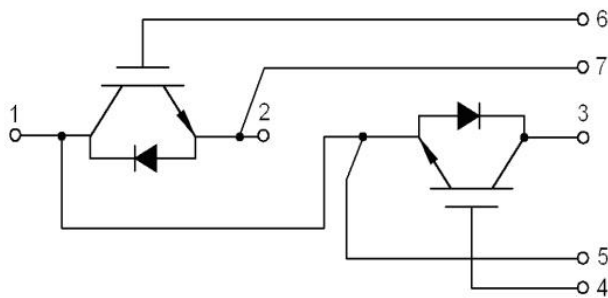


Package Dimension

Dimensions in Millimeters



Internal Circuit



Revision History

Revision	Date	Subjects (major changes since last revision)
0.1	2023-05-11	Preliminary version
1.0	2023-11-23	MP version

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