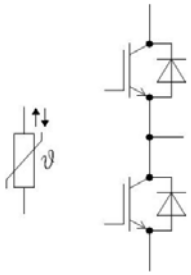
High Speed IGBT in Trench and Fieldstop Technology



Equivalent circuit

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
- High power density
- PressFIT contact technology
- Isolated base plate

Key Performance and Package Parameters

Type	V_{CES}	I_{Cnom}	V_{CEsat}, T_{vj}=25°C	T_{vjmax}	Marking
PM900TA120HS5	1200V	900A	2.0V	150°C	PM900TA120HS5

IGBT/FRD Inverter

Maximum Rated Values at T_{vj}=25°C (unless otherwise specified)

Parameter	Symbols	Value	Units
Collector-emitter voltage	V_{CES}	1200	V
Continuous DC collector current T_C=90°C T_{vjmax}=175°C	I_C	900	A
Repetitive peak collector current tp=1ms	I_{CRM}	1800	A
Total power dissipation T_c=25°C, T_{vjmax}=175°C	P_{tot}	3600	W
Gate-emitter peak voltage	V_{GES}	±20	V

IGBT,Inverter
Characteristic Values at T_{vj}=25°C (unless otherwise specified)

Parameter	Symbols	Conditions		Value			Unit
				Min	Typ	Max	
Collector-emitter saturation voltage	V_{CEsat}	I_C=900A, V_{GE}=15V, T_{vj}=25°C		-	1.65	2.10	V
		I_C=900A, V_{GE}=15V, T_{vj}=125°C		-	1.95	-	
		I_C=900A, V_{GE}=15V, T_{vj}=175°C		-	2.10	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=18mA, V_{CE}=V_{GE}, T_{vj}=25°C		5.2	5.8	6.4	V
Internal gate resistor	R_{Gint}	T_{vj}=25°C		-	0.5	-	Ω
Collector-emitter leakage current	I_{CES}	V_{CE}=1200V, V_{GE}=0V, T_{vj}=25°C		-	-	100	uA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V, T_{vj}=25°C		-	-	100	nA
Input capacitance	C_{ies}	f=1MHz, V_{CE}=25V, V_{GE}=0V		-	140	-	nF
Reverse transfer capacitance	C_{res}	f=1MHz, V_{CE}=25V, V_{GE}=0V		-	0.55	-	nF
Gate Charge	Q_G	V_{GE}=-15V…+15V		-	11.5	-	uC
Turn-on delay time,inuctive load	$t_{d(on)}$	V_{CE}=600V I_C=900A V_{GE}=±15V R_G=0.5Ω /(inductive load)	T_{vj}=25°C	-	409	-	ns
			T_{vj}=125°C	-	435	-	
			T_{vj}=175°C	-	445	-	
Rise time,inuctive load	t_r		T_{vj}=25°C	-	75	-	ns
			T_{vj}=125°C	-	86	-	
			T_{vj}=175°C	-	95	-	
Turn-off delay time,inuctive load	$t_{d(off)}$		T_{vj}=25°C	-	510	-	ns
			T_{vj}=125°C	-	575	-	
			T_{vj}=175°C	-	620	-	
Fall time,inuctive load	t_f		T_{vj}=25°C	-	147	-	ns
			T_{vj}=125°C	-	238	-	
			T_{vj}=175°C	-	295	-	
Turn-on switching loss	E_{on}		T_{vj}=25°C	-	36	-	mJ
			T_{vj}=125°C	-	69	-	
			T_{vj}=175°C	-	93	-	
Turn-off switching loss	E_{off}		T_{vj}=25°C	-	94	-	mJ
			T_{vj}=125°C	-	122	-	
			T_{vj}=175°C	-	139	-	
SC data	Isc	Vcc=800V R_G=20Ω V_{GE}≤15V V_{CEmax}=V_{CE}-L_{SCE} *di/dt	tp≤8μs Tvj=150°C	-	3400	-	A
			tp≤6μs Tvj=175°C	-	3200	-	

Thermal resistance

Parameter	Symbols	Value			Units
		Min	Typ	Max	
Thermal Resistance, Per IGBT Junction to Case	$R_{th(j-c)}$	-	-	0.040	K/W
Temperature under switching conditions	Tvjop	-40	-	175	°C

Maximum Ratings

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
Repetitive peak reverse voltage	V_{RRM}	Tvj=25°C	-	1200	-	V
Continuous DC forward current	I_F		-	900	-	A
Repetitive peak forward current	I_{FRM}	tp=1ms	-	1800	-	A
I²t-value	I²t	tp=10ms ,sin180° ,Tj=125°C	-	30000	-	A^2S

Characteristic Values

Parameter	Symbols	Conditions		Value			Unit
				Min	Typ	Max	
Forward voltage	V_F	I_F=900A, V_{GE}=0V	T_{vj}=25°C	-	2.05	2.35	V
			T_{vj}=125°C	-	2.25	-	
			T_{vj}=175°C	-	2.25	-	
Reverse Recovery Charge	Q_{rr}	I_F=900A,V_R=600V -di$_F$/dt= 7500A/us, V_{GE}= -15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	- - -	85 148 189	- - -	μC
Reverse recovery energy	E_{rec}	I_F=900A,V_R=600V -di$_F$/dt=7500A/us V_{GE}= -15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	- - -	42 68 83	- - -	mJ
Peak reverse recovery current	I_{RM}	I_F=900A,V_R=600V -di$_F$/dt=7500A/us V_{GE}= -15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=175°C	- - -	512 544 556	- - -	A

Characteristic Values

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
Rated resistance	R_{25}	T_{NTC}=25°C	-	5.0	-	KΩ
B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$	-	3375	-	K
B-value	$B_{25/80}$	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$	-	3425	-	K
B-value	$B_{25/100}$	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$	-	3443	-	K

Module

Parameter	Symbols	Conditions	Value			Unit
Isolation voltage	V_{ISOL}	f=50Hz, t=1min, RMS	-	3400	-	V
RTI Elec.	RTI	housing	-	140	-	°C
Internal isolation			-	Al_2O_3	-	
Storage temperature	T_{stg}		-40	-	125	°C
Comparative tracking index	CTI		-	200	-	

Parameter	Symbols	Conditions	Value			Unit
			Min	Typ	Max	
Stray inductance module	L_{SCE}		-	20	-	nH
Mounting torque for module mounting	M		3.0	-	6.0	Nm
Terminal connection torque	M		3.0	-	6.0	Nm
Weight	G		-	357	-	g

Typical Characteristi

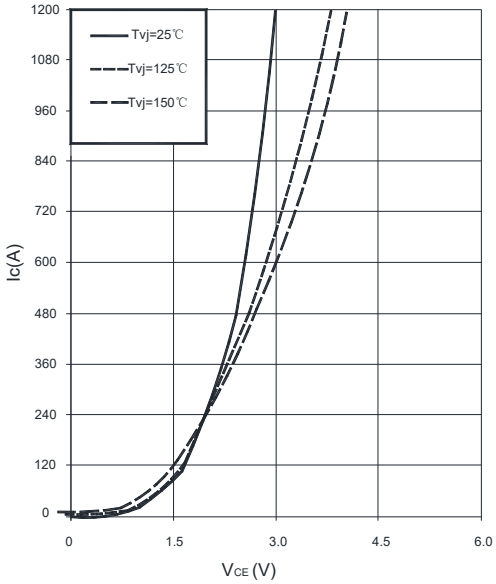


Fig 1. Output characteristic (typical), IGBT, Inverter IGBT, Inverter $I_C = f(V_{CE})$ V_{GE}= 15V

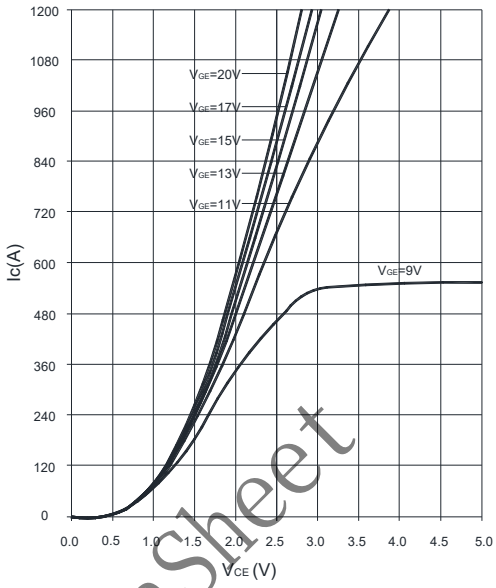


Fig 2. Output characteristic (typical), $I_C = f(V_{CE})$ T_{vj}= 150°C

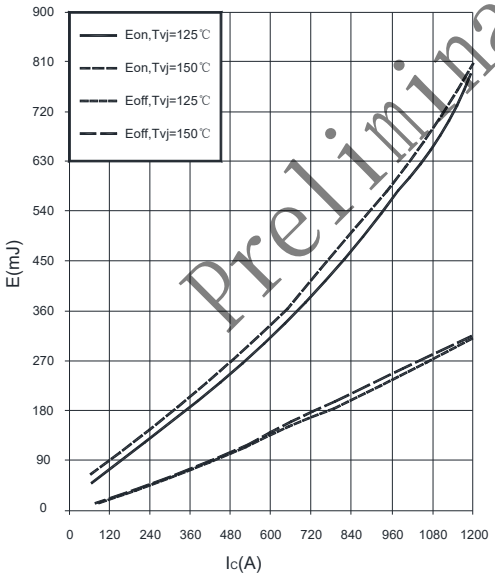


Fig 3. Switching losses (typical), IGBT, Inverter $E = f(I_C)$ R_{Goff}=15Ω, R_{Gon}=15Ω, V_{GE}= ±15V, V_{CC}= 600V

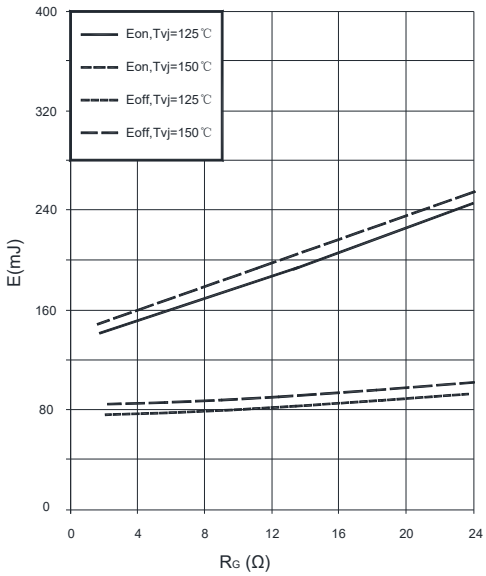


Fig 4. Switching losses (typical), IGBT, Inverter $E = f(R_G)$ V_{GE}=15V, I_C=600A, V_{CC}= 600V

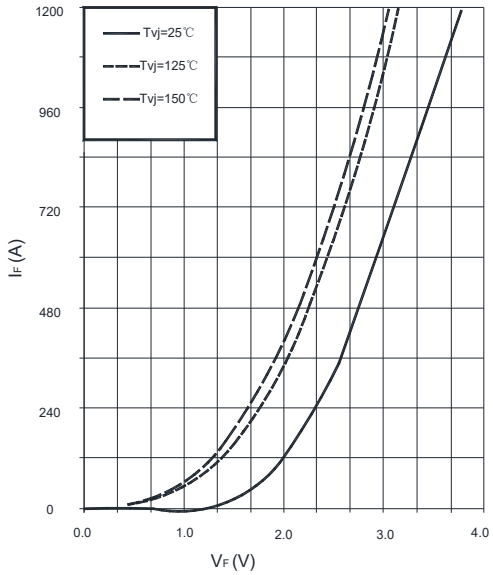


Fig 5. Forward characteristic (typical), Diode, Inverter $I_F=f(V_f)$

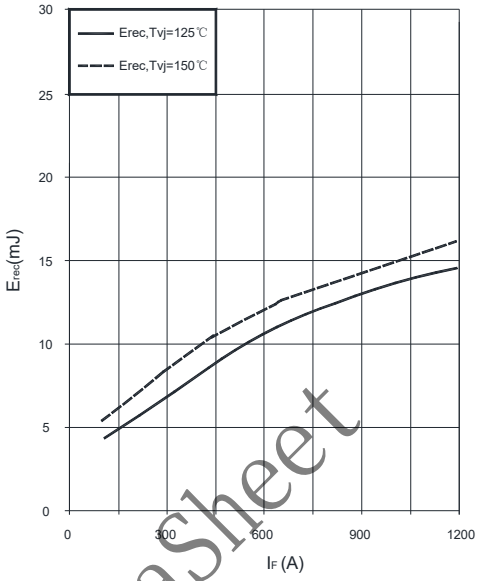


Fig 6. Switching losses (typical), Diode, Inverter $E_{rec}= f(I_F)$ $R_{Gon}=15\Omega$,$V_{CC}=600V$

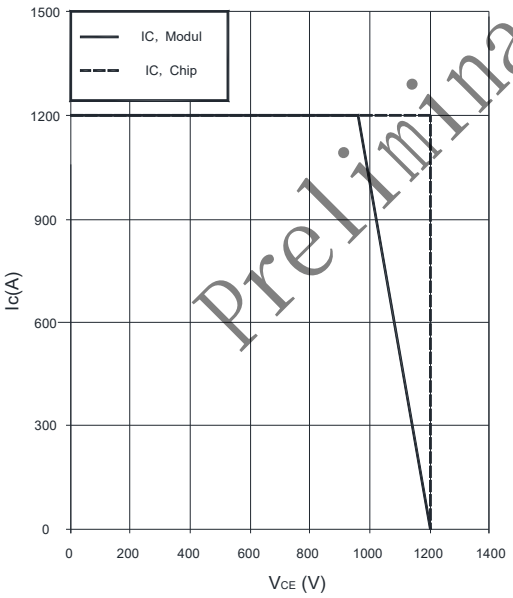
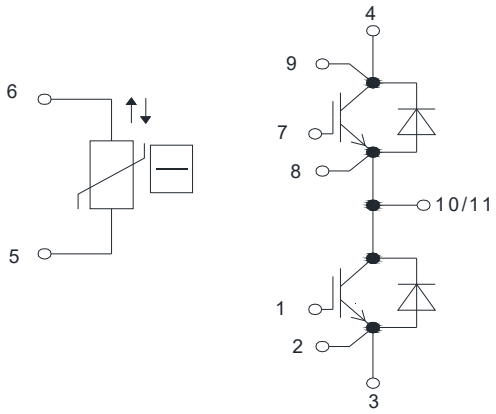
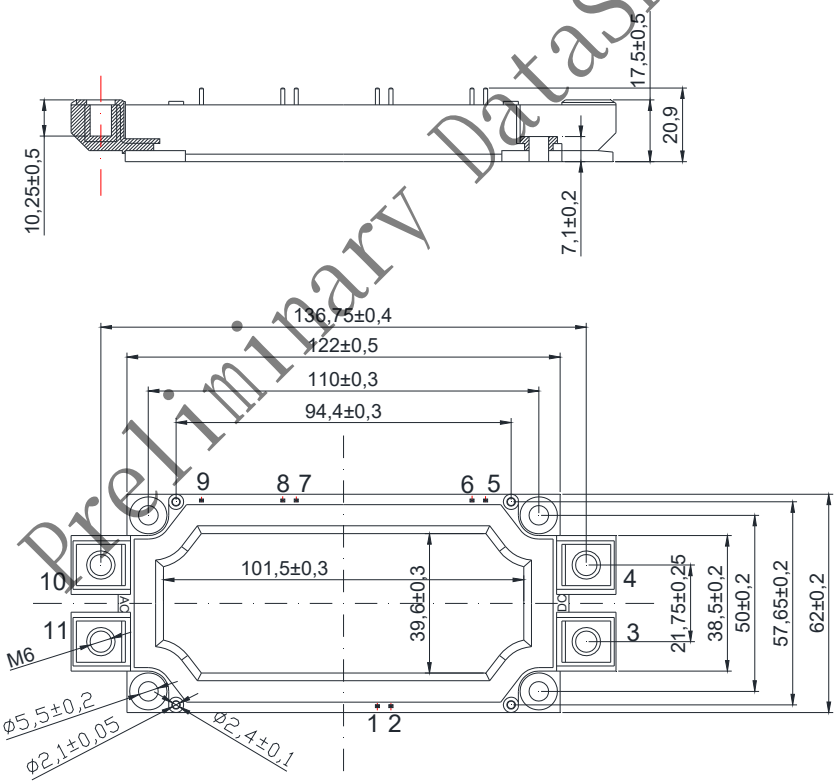


Fig 7. Reverse bias safe operating area (RBSOA), IGBT, Inverter $I_C= f(V_{CE})$ $R_{Goff}=15\Omega$, $V_{GE}=\pm15V$, Tvj=150°C

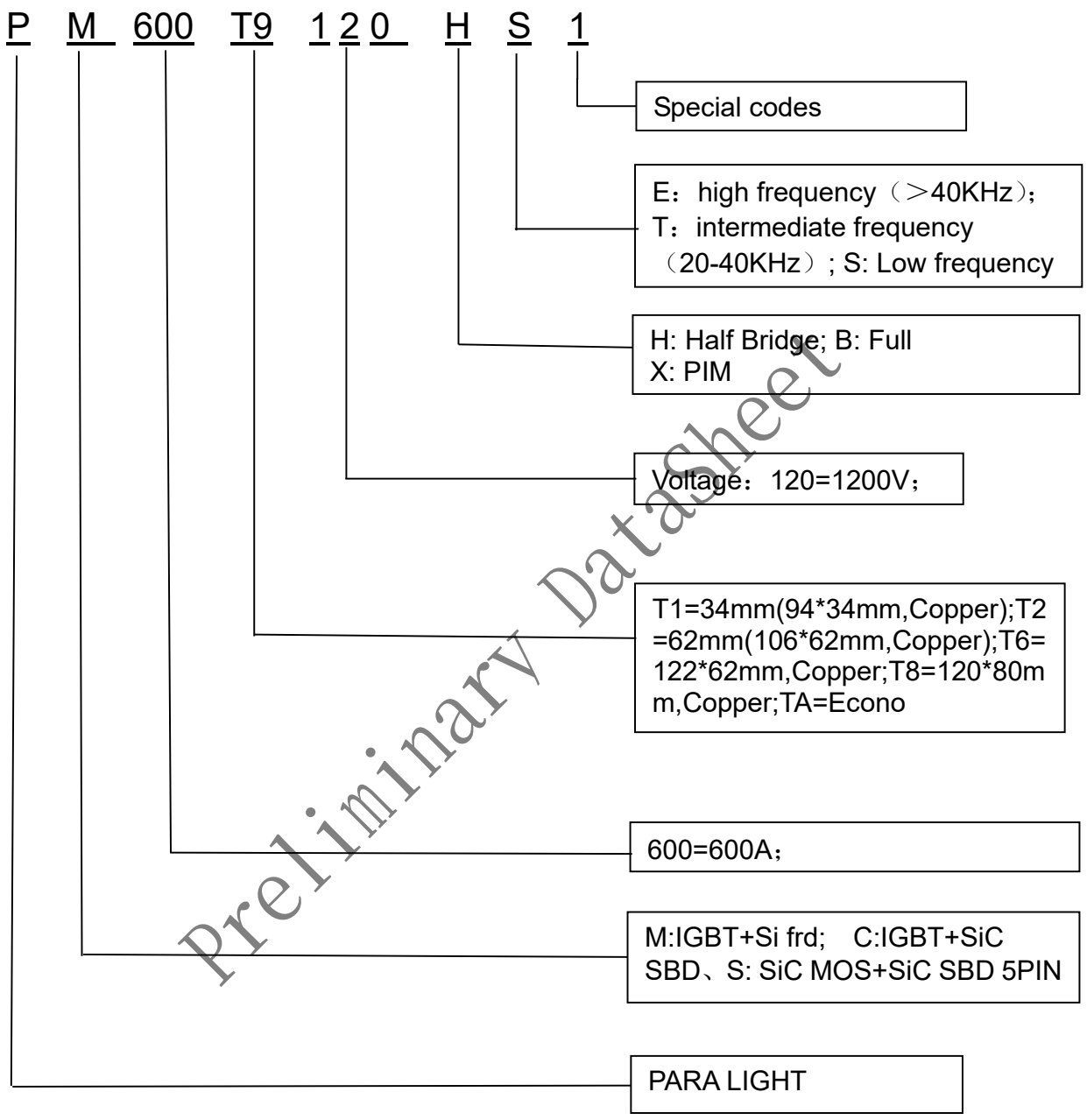
Circuit_diagram_headline



Package outline



PART NO. SYSTEM :



Revision history

Document revision history

Date	Version	Changes
2025.01.22	A / 0	First release.