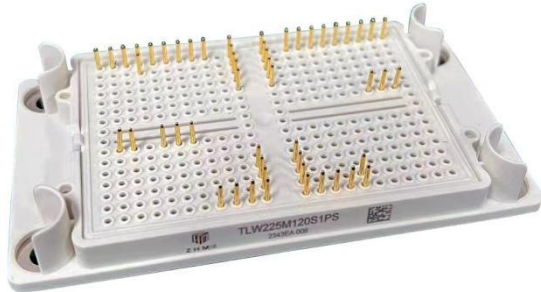


TLW225M120S1PS

➤ 产品外观 / Appearance



$V_{CES} = 1200V$

$I_{C\ nom} = 225\ A / I_{CRM} = 450\ A$

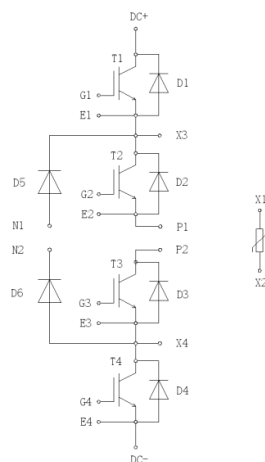
➤ 特性 / Features

- | | |
|--|--------------|
| a. Neutral Point Clamped 3-Level Inverter Module | 中性点钳位三电平逆变模块 |
| b. Low switching losses | 低开关损耗 |
| c. Low Inductive Layout | 低杂散电感布局 |
| d. Integrated NTC temperature sensor | 集成 NTC 温度传感器 |

➤ 用途 / Applications

- | | |
|-----------------------------|--------|
| a. Solar Inverters | 光伏逆变器 |
| b. Energy Storage System | 能源储能系统 |
| c. Three Level Applications | 三电平应用 |

➤ 电路拓扑 / Circuit Topology



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IGBT (Q1, Q4)

最大额定值/ Maximum Rated Values

集电极-发射极电压 Collector-Emitter voltage	$T_J = 25^\circ\text{C}$	V_{CES}	1200	V
连续集电极直流电流 Continuous DC collector current	$T_C = 100^\circ\text{C}, T_J \text{ max} = 175^\circ\text{C}$	$I_{C \text{ nom}}$	225	A
集电极重复峰值电流 Repetitive peak collector current	$T_P = 1\text{ms}$	I_{CRM}	450	A
栅极-发射极峰值电压 Gate-emitter peak voltage		V_{GES}	+/-30	V

电特性/ Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit	
集电极-发射极饱和电压 Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{ V},$ $I_C = 225\text{ A}$	$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ $V_{CE(sat)}$		2.10 2.75 2.85		V	
栅极-发射极阈值电压 Gate-Emitter Threshold Voltage	$V_{GE} = V_{CE}, I_C = 7.8\text{ mA}$	$V_{GE(th)}$		5.75		V	
总栅极电荷 Total Gate Charge	$V_{CC} = 600\text{ V}$	Q_g		1.15		nC	
内部栅极电阻 Internal gate resistor	$T_J = 25^\circ\text{C}$	R_{Gint}		NONE		Ω	
输入电容 Input Capacitance	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	C_{ies}		7700		pF	
输出电容 Output Capacitance	$f = 1\text{ MHz}$	C_{res}		130			
集电极-发射极截止电流 Collector-Emitter Cut-off Current	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}$	I_{CES}			1.0	mA	
栅极峰值电流 Gate Leakage Current	$V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$	I_{GES}			500	nA	
开通延迟时间 Turn-on Delay Time	$V_{CE} = 600\text{ V},$ $I_C = 225\text{ A},$ $V_{GE} = \pm 15\text{ V},$ $R_G = 10\Omega,$ Inductive Load	$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ $t_{d(on)}$		215 175 170		ns	
上升时间 Rise Time		$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ t_r		180 180 185			
关断延迟时间 Turn-off Delay Time		$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ $t_{d(off)}$		435 460 460			
下降时间 Fall Time		$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ t_f		95 115 120			
开通损耗能量 Turn-on Switching Loss per Pulse		$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ E_{on}		27.5 31.5 33.0			mJ
关断损耗能量 Turn off Switching Loss per Pulse		$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ E_{off}		9.10 10.5 11.5			
芯片 - 外壳热阻 Thermal Resistance - chip-to-case		每个 IGBT / per IGBT	R_{thJC}				0.102
开关状态下温度 Temperature under switching		T_{jop}	-40		150	$^\circ\text{C}$	

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二极管 / Diode (D1, D4, D5, D6)

最大额定值/Maximum Rated Values

反向重复峰值电压 Repetitive peak reverse voltage	$T_j = 25^\circ\text{C}$	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	300	A
正向重复峰值电流 Repetitive peak forward current	$t_p = 1\text{ ms}$	I_{FRM}	600	A

电特性/ Electrical Characteristics ($T_j = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
二极管正向电压 Diode Forward Voltage	$I_F = 300\text{ A}, V_{GE} = 0\text{ V}$	$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$ $T_j = 150^\circ\text{C}$ V_F		1.70 1.95 2.00		V
反向恢复电荷 Reverse Recovery Charge		$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$ $T_j = 150^\circ\text{C}$ I_{RM}		151 176 183		A
反向恢复峰值电流 Peak Reverse Recovery Current	$V_{CE} = 600\text{ V},$ $I_C = 300\text{ A},$ $V_{GE} = -15\text{ V},$	$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$ $T_j = 150^\circ\text{C}$ Q_r		25 45 51		μC
反向恢复能量 Reverse Recovery Energy		$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$ $T_j = 150^\circ\text{C}$ E_{rec}		7.85 15.1 17.3		mJ
芯片 - 外壳热阻 Thermal Resistance - chip-to-case	每个二极管 / per diode	R_{thJC}			0.086	$^\circ\text{C}/\text{W}$
在开关状态下温度 Temperature under switching		$T_{j\text{op}}$	-40		150	$^\circ\text{C}$

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中恒微半导体
IGBT&SiC | Power to create

IGBT (Q2, Q3)

最大额定值/ Maximum Rated Values

集电极-发射极电压 Collector-Emitter voltage	$T_J = 25^\circ\text{C}$	V_{CES}	1200	V
连续集电极直流电流 Continuous DC collector current	$T_C = 100^\circ\text{C}, T_J \text{ max} = 175^\circ\text{C}$	$I_{C \text{ nom}}$	225	A
集电极重复峰值电流 Repetitive peak collector current	$T_P = 1\text{ms}$	I_{CRM}	450	A
栅极-发射极峰值电压 Gate-emitter peak voltage		V_{GES}	+/-30	V

电特性/ Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit	
集电极-发射极饱和电压 Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{ V},$ $I_C = 225\text{ A}$	$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ $V_{CE(sat)}$		2.10 2.75 2.85		V	
栅极-发射极阈值电压 Gate-Emitter Threshold Voltage	$V_{GE} = V_{CE}, I_C = 7.8\text{ mA}$	$V_{GE(th)}$		5.75		V	
总栅极电荷 Total Gate Charge	$V_{CC} = 600\text{ V}$	Q_g		1.15		nC	
内部栅极电阻 Internal gate resistor	$T_J = 25^\circ\text{C}$	R_{Gint}		NONE		Ω	
输入电容 Input Capacitance	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	C_{ies}		7700		pF	
输出电容 Output Capacitance	$f = 1\text{ MHz}$	C_{res}		130			
集电极-发射极截止电流 Collector-Emitter Cut-off Current	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}$	I_{CES}			1.0	mA	
栅极峰值电流 Gate Leakage Current	$V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$	I_{GES}			500	nA	
开通延迟时间 Turn-on Delay Time	$V_{CE} = 600\text{ V},$ $I_C = 225\text{ A},$ $V_{GE} = \pm 15\text{ V},$ $R_G = 10\Omega,$ Inductive Load	$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ $t_{d(on)}$		215 175 170		ns	
上升时间 Rise Time		$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ t_r		180 180 185			
关断延迟时间 Turn-off Delay Time		$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ $t_{d(off)}$		435 460 460			
下降时间 Fall Time		$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ t_f		95 115 120			
开通损耗能量 Turn-on Switching Loss per Pulse		$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ E_{on}		27.5 31.5 33.0			mJ
关断损耗能量 Turn off Switching Loss per Pulse		$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ $T_J = 150^\circ\text{C}$ E_{off}		9.10 10.5 11.5			
芯片 - 外壳热阻 Thermal Resistance - chip-to-case		每个 IGBT / per IGBT	R_{thJC}				0.204
开关状态下温度 Temperature under switching		T_{jop}	-40		150	$^\circ\text{C}$	

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二极管 / Diode (D2, D3)

最大额定值/Maximum Rated Values

反向重复峰值电压 Repetitive peak reverse voltage	$T_j = 25^\circ\text{C}$	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	200	A
正向重复峰值电流 Repetitive peak forward current	$t_p = 1\text{ ms}$	I_{FRM}	400	A

电特性/ Electrical Characteristics ($T_j = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
二极管正向电压 Diode Forward Voltage	$I_F = 200\text{ A}, V_{GE} = 0\text{ V}$	$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$ $T_j = 150^\circ\text{C}$ V_F		1.96 1.98 1.92		V
反向恢复电荷 Reverse Recovery Charge		$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$ $T_j = 150^\circ\text{C}$ I_{RM}		100 110 115		A
反向恢复峰值电流 Peak Reverse Recovery Current	$V_{CE} = 600\text{ V},$ $I_C = 200\text{ A},$ $V_{GE} = -15\text{ V},$	$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$ $T_j = 150^\circ\text{C}$ Q_r		14.2 27.1 33.2		μC
反向恢复能量 Reverse Recovery Energy		$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$ $T_j = 150^\circ\text{C}$ E_{rec}		4.55 9.00 11.0		mJ
芯片 - 外壳热阻 Thermal Resistance - chip-to-case	每个二极管 / per diode	R_{thJC}			0.176	$^\circ\text{C}/\text{W}$
在开关状态下温度 Temperature under switching		$T_{j\text{op}}$	-40		150	$^\circ\text{C}$

负温度系数热敏电阻 / NTC-Thermistor

特征值 / Characteristic Values

Parameter		Symbol	Min	Typ	Max	Unit
额定阻值 Rated resistance	$T_C = 25^\circ\text{C}$	R_{25}		5.00		$\text{k}\Omega$
阻值误差 Deviation of R100	$T_C = 100^\circ\text{C}, R_{100} = 465\ \Omega$	$\Delta R/R$	-5		5	%
功率损耗 Power dissipation	$T_C = 25^\circ\text{C}$	P_{25}			10.0	mW
B 值 / B - value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15\text{K}))]$	$B_{25/50}$		3375		K
B 值 / B - value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298.15\text{K}))]$	$B_{25/80}$		3425		K
B 值 / B - value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298.15\text{K}))]$	$B_{25/100}$		3443		K

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模块 / Module

绝缘配置 / Insulation Coordination

Parameter	Test Conditions	Symbol	Typ.	Unit
隔离试验电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min	V_{ISOL}	3.2	kV
模块基板材料 Material of module baseplate			Cu	
内部隔离 Internal Isolation	基本绝缘 (class 1, IEC61140) Basic insulation (class 1, IEC61140)		Al_2O_3	
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal	dCreep	9.0 9.0	mm
间距 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal	dClear	4.5 4.5	mm
相对漏电起痕指数 Comparative tracking index		CTI	> 200	

特征值 / Characteristic Values

Parameter	Symbol	Min	Typ	Max	Unit
杂散电感, 模块 Stray inductance module	L_{sCE}		8		nH
储存温度 Storage temperature	T_{stg}	-40		125	°C
夹具的安装力 Mounting force per clamp	M	20		50	N
重量 Weight	G		188		g

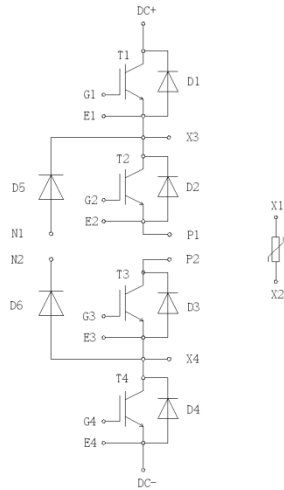
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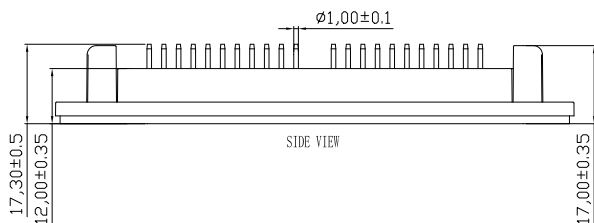
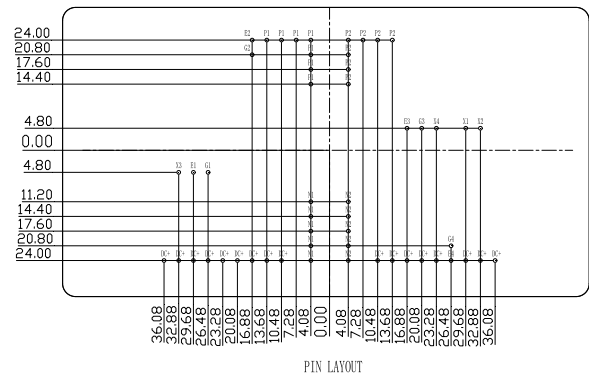
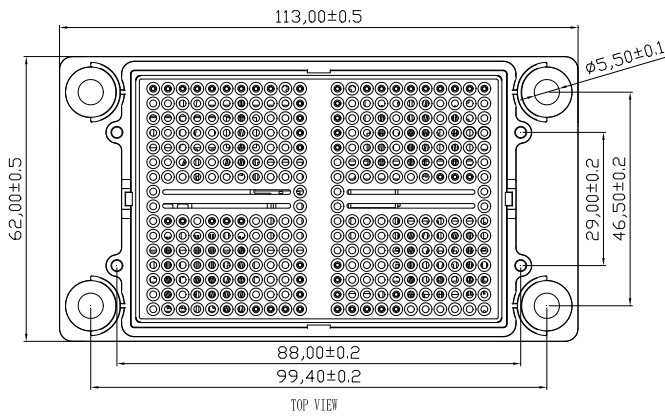
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封装/Package

电路拓扑/Circuit Topology



封装尺寸 / Package outlines



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