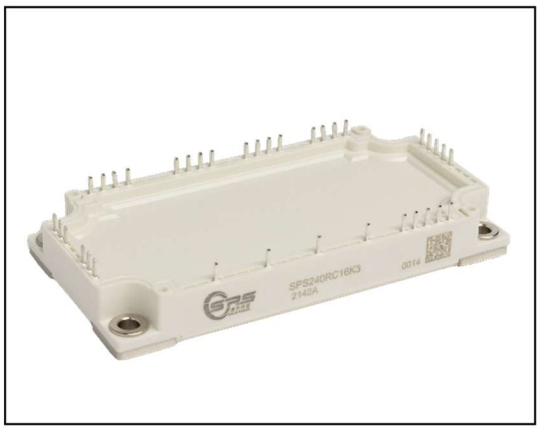
1600V 240A 3-Phase Half Controlled + IGBT Braking Chopper Module

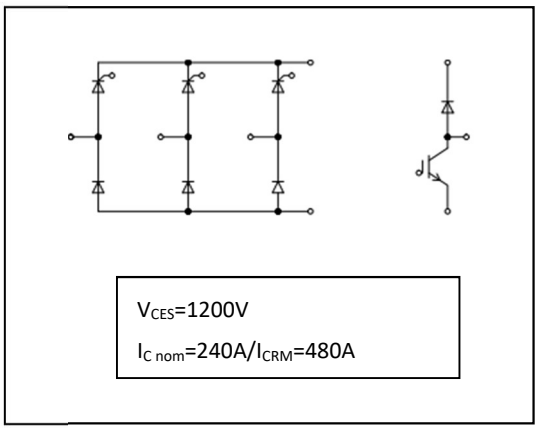
1600V 240A 三相半控 + IGBT 刹车斩波模块

General Description / 概述

SOLID POWER IGBT Half Controlled Power Module with Brake Chopper for a more compact converter design.

索力德普 IGBT 带制动单元的三相桥半控模块，可以实现更紧凑的转换器设计。





Features：

- Low Thermal Resistance Al_2O_3 Substrate
- High Power Density
- Compact design

产品特性：

- 低热阻的三氧化二铝衬底
- 高功率密度
- 紧凑型设计

Typical Applications：

- Active Rectifier
- Half Controlled B6-bridge

典型应用：

- 有源整流器
- 三相半控整流桥

Diode , Rectifier / 二极管, 整流器

Maximum Rated Value / 最大额定值

Item	Symbol	Conditions	Value	Units
反向重复峰值电压 Peak repetitive reverse voltage	V_{RRM}	T_{vj}=25°C, I_R=0.1mA	1600	V
最大正向均方根电流(每芯片) Maximum RMS forward current per chip	I_{FRMSM}	T_C=80°C, T_{vj}=150°C	170	A
最大整流器输出均方根电流 Maximum RMS current at rectifier output	I_{RMSM}	T_C=80°C	240	A
正向浪涌电流 Surge forward current	I_{FSM}	t_p=10ms, T_{vj}=25°C t_p=10ms, T_{vj}=150°C	1440 1200	A A
I^2t-值 I^2t-value	I^2t	t_p=10ms, T_{vj}=25°C t_p=10ms, T_{vj}=150°C	10368 7200	A^2s

Characteristic Values / 特征值

Item	Symbol	Conditions	Min.	Typ.	Max.	Units
正向电压 Forward voltage	V_F	T_{vj}=25°C, I_F=170A T_{vj}=150°C, I_F=170A		1.10 1.00	1.30	V V
阈值电压 Threshold voltage	V_{TO}	T_{vj}=150°C			0.79	V
斜率电阻 Slope resistance	r_T	T_{vj}=150°C			1.4	mΩ
反向电流 Reverse current	I_R	T_{vj}=150°C, V_R=1600V			2	mA
结－外壳热阻 Thermal resistance, junction to case	R_{thJC}	Per diode / 每个二极管			0.25	K/W

Thyristor-rectifier / 晶闸管, 整流器

Maximum Rated Values /最大额定值

Item	Symbol	Conditions	Value	Units
反向重复峰值电压 Peak repetitive reverse voltage	V_{RRM}	T_{vj}=25°C	1600	V
最大正向均方根电流(每芯片) Maximum RMS forward current per chip	I_{FRMSM}	T_C=80°C	165	A
最大整流器输出均方根电流 Maximum RMS current at rectifier output	I_{RMSM}	T_C=80°C	240	A
正向浪涌电流 Surge forward current	I_{FSM}	t_p=10ms, T_{vj}=25°C	2250	A
I^2t -值 I^2t-value	I^2t	t_p=10ms, T_{vj}=25°C	25000	A^2s
通态电流临界上升率 Critical rate of rise of on-state current	(di/dt) cr	T_{vj} = 25°C	150	A/µs
通态电压临界上升率 Critical rate of rise of on-state voltage	(dv/dt) cr	T_{vj} = 130°C, V_D=2/3V_{DRM}	1500	V/µs

Characteristic Values / 特征值

Item	Symbol	Conditions	Min.	Typ.	Max.	Units
正向电压 Forward voltage	V_{TM}	T_{vj} = 130 °C, I_T = 165 A			1.20	V
阈值电压 Threshold voltage	$V_{(TO)}$	T_{vj}=130°C			0.85	V
斜率电阻 Slope resistance	r_T	T_{vj}=130°C			2.20	mΩ
门极触发电流 Gate trigger current	I_{GT}	T_{vj}=25°C, V_D=12V, R_L=33Ω			80	mA
门极触发电压 Gate trigger voltage	V_{GT}	T_{vj}=25°C, V_D=12V, R_L=33Ω			1.50	V
门极不触发电流 Gate non-trigger current	I_{GD}	T_{vj}=130°C, V_D=6V T_{vj}=130°C, V_D=0.5 V_{DRM}	6.0 3.0			mA
门极不触发电压 Gate non-trigger voltage	V_{GD}	T_{vj}=130°C, V_D=V_{DRM}	0.2			V
维持电流 Holding current	I_H	T_{vj}=25°C, I_T=1A			160	mA
擎住电流 Latching current	I_L	T_{vj}=25°C, I_G=1.2I_{GT}			250	mA
门极控制延迟时间 Gate controlled delay time	t_{gd}	DIN IEC 747-6 T_{vj}=25°C, i_{GM}=0.6A, di_G/dt=0.6A/µs			1.2	µs
换流关断时间 Circuit commutated turn-off time	t_q	T_{vj} = 130°C, i_{TM} = 50 A V_{RM} = 100 V, V_{DM} = 2/3 V_{DRM} d_{VD}/dt = 20 V/µs, $-di_T/dt$ = 10 A/µs		150		µs
反向电流 Reverse current	I_R I_D	T_{vj}=125°C, V_R=1600V			20	mA
结－外壳热阻 Thermal resistance, junction to case	R_{thJC}	Per Thyristor / 每个晶闸管			0.19	K/W

IGBT Brake-Chopper / IGBT 制动-斩波器

Maximum Rated Values / 最大额定值

Item	Symbol	Conditions	Value	Units
集电极－发射极电压 Collector-emitter voltage	V_{CES}	T_{vj}=25°C	1200	V
连续集电极直流电流 Continuous DC collector current	$I_{C\ nom}$ I_C	T_C=80°C, T_{vj}=175°C T_C=25°C, T_{vj}=175°C	150 230	A A
集电极重复峰值电流 Peak repetitive collector current	I_{CRM}	T_C=80°C	300	A
总功率损耗 Total power dissipation	P_{tot}	T_C=25°C, T_{vj}=175°C	750	W
栅极－发射极峰值电压 Maximum gate-emitter voltage	V_{GES}		±20	V

Characteristic Values / 特征值

Item	Symbol	Conditions		Min.	Typ.	Max.	Units
集电极－发射极饱和电压 Collector-emitter saturation voltage	$V_{CE（sat）}$	I_C=150A,V_{GE}=15V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C		1.75 2.00 2.05	2.20	V V V
栅极阈值电压 Gate threshold voltage	$V_{GE(th)}$	I_C=6mA, V_{CE}=V_{GE}, T_{vj}=25°C		5.0	5.8	6.80	V
栅极电荷 Gate charge	Q_G	V_{GE}=-15V…+15V			0.8		µC
内部栅极电阻 Internal gate resistor	R_{Gint}	T_{vj}=25°C			5		Ω
输入电容 Input capacitance	C_{ies}	f=100kHz, T_{vj}=25°C, V_{CE}=25V, V_{GE}=0V			12.6		nF
反向传输电容 Reverse transfer capacitance	C_{res}	f=100kHz, T_{vj}=25°C, V_{CE}=25V, V_{GE}=0V			0.45		nF
集电极-发射极截止电流 Collector-emitter cut-off current	I_{CES}	V_{CE}=1200V, V_{GE}=0V, T_{vj}=25°C				1.00	mA
栅极-发射极漏电流 Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V, T_{vj}=25°C				400	nA
开通延迟时间(电感负载) Turn-on delay time, inductive load	$t_{d（on）}$	I_C=150A, V_{CE}=600V V_{GE}=±15V R_{Gon}=3.3 Ω R_{Goff}=3.3 Ω	T_{vj}=25°C		110		ns
上升时间(电感负载) Rise time, inductive load	t_r		T_{vj}=25°C		36		ns
关断延迟时间(电感负载) Turn-off delay time, inductive load	$t_{d（off）}$		T_{vj}=25°C		230		ns
下降时间(电感负载) Fall time, inductive load	t_f		T_{vj}=25°C		105		ns
开通损耗能量(每脉冲) Turn-on energy loss per pulse	E_{on}		T_{vj}=25°C		16.0		mJ
关断损耗能量(每脉冲） Turn-off energy loss per pulse	E_{off}		T_{vj}=25°C		8.3		mJ
短路数据 SC data	I_{SC}	V_{GE}≤15V, V_{CC}=800V V_{CEmax}=V_{CES}-L_{sCE}·di/dt, t_p=10µs, T_{vj}=150°C			600		A
结－外壳热阻 Thermal resistance, junction to case	R_{thJC}	Per IGBT / 每个 IGBT				0.2	K/W

Diode, Brake-Chopper / 二极管，制动-斩波器

Maximum Rated Values /最大额定值

Item	Symbol	Conditions	Value	Units
反向重复峰值电压 Peak repetitive reverse voltage	V_{RRM}	T_{vj}=25°C	1200	V
连续正向直流电流 Continuous DC forward current	I_F		75	A
正向重复峰值电流 Peak repetitive forward current	I_{FRM}	t_p=1ms	150	A
I^2t -值 I^2t-value	I^2t	V_R=0V, t_p=10ms, T_{vj}=150°C	925	A^2s

Characteristic Values / 特征值

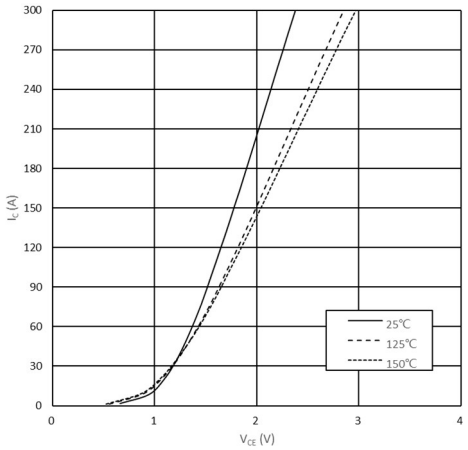
Item	Symbol	Conditions		Min.	Typ.	Max.	Units
正向电压 Forward voltage	V_F	I_F=75A	T_{vj}=25°C T_{vj}=150°C		2.1 2.1	2.4	V V
反向恢复峰值电流 Peak reverse recovery current	I_{RM}	I_F=75A di_F/dt_{off}=3600A/µs V_R = 600 V V_{GE}=-15V	T_{vj}=150°C		125		A
反向恢复时间 Reverse recovery time	T_{rr}		T_{vj}=150°C		110		ns
恢复电荷 Reverse recovery charge	Q_r		T_{vj}=150°C		15.4		µC
反向恢复损耗（每脉冲） Reverse recovery energy (per pulse)	E_{rec}		T_{vj}=150°C		5.1		mJ
结－外壳热阻 Thermal resistance, junction to case	R_{thJC}	Per diode / 每个二极管				0.5	K/W

Module / 模块

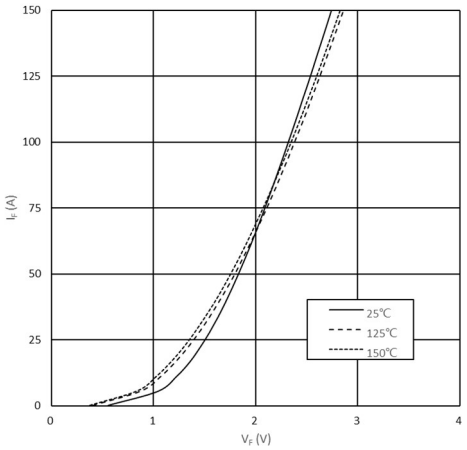
Item	Symbol	Conditions	Value	Units
绝缘测试电压 Isolation test voltage	V_{ISOL}	RMS, f=50Hz, t=1min	2.5	kV
模块基板材料 Material of module baseplate			Cu	
内部绝缘 Internal isolation		基本绝缘 (class 1, IEC 61140) Basic insulation (class 1, IEC 61140)	Al_2O_3	
爬电距离 Creepage distance		端子-散热片 / terminal to heatsink 端子-端子/terminal to terminal	10.0	mm
电气间隙 Clearance		端子-散热片 / terminal to heatsink 端子-端子/terminal to terminal	7.5	mm
相对电痕指数 Comperative tracking index	CTI		> 200	

Item	Symbol	Conditions	Min.	Typ.	Max.	Units
杂散电感，模块 Stray inductance module	L_{sCE}			50		nH
最大结温 Maximum junction temperature	$T_{vj(max)}$	逆变器，制动-斩波器 /inverter, brake-chopper 整流器/rectifier			175 130	°C °C
在开关状态下温度 Temperature under switching conditions	$T_{vj(op)}$	逆变器，制动-斩波器 /inverter, brake-chopper 整流器/rectifier	-40 -40		150 130	°C °C
储存温度 Storage temperature	T_{stg}		-40		125	°C
模块安装的安装扭距 Mounting torque for module mounting	M		3.00		6.00	Nm
重量 Weight	G			300		g

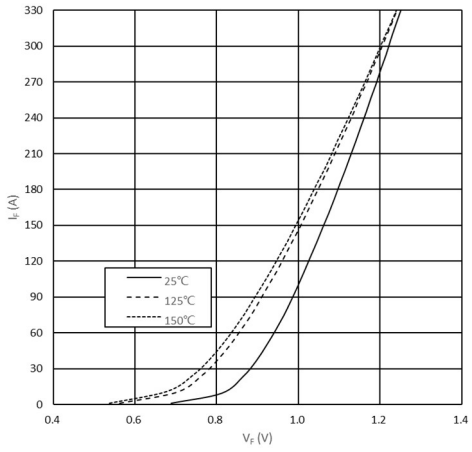
输出特性 IGBT,制动-斩波器（典型)
Output characteristic IGBT, Brake-Chopper(typical)
$I_C=f(V_{CE})$
$V_{GE}=15V$



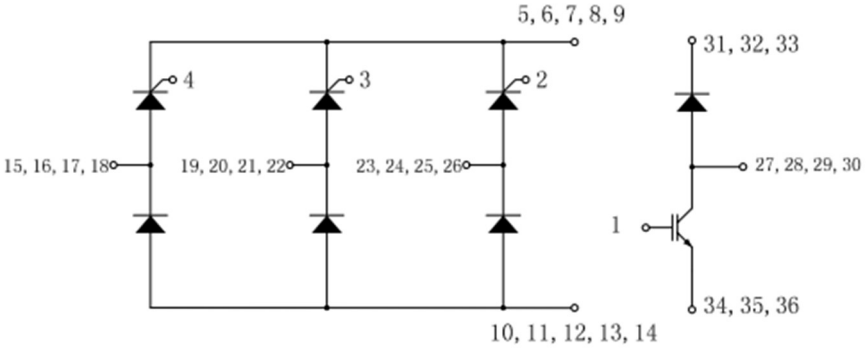
正向偏压特性二极管，制动-斩波器（典型)
Forward characteristic of Diode, Brake-Chopper(typical)
$I_F=f(V_F)$



正向偏压特性二极管，二极管,整流器（典型)
Forward characteristic of Diode, Rectifier (typical)
$I_F=f(V_F)$



Circuit diagram headline / 接线图



Package outlines / 封装尺寸