TF15012H3SL1

IGBT 模块　规格书 Rev 1.0

TF15012H3SL1 是 150A，1200V 高可靠性 34mm IGBT 模块，采用高速沟槽栅/场终止 IGBT 和发射极控制二极管。

典型应用:

- 逆变焊机
- 工业感应加热
- 高频开关逆变器

外观:

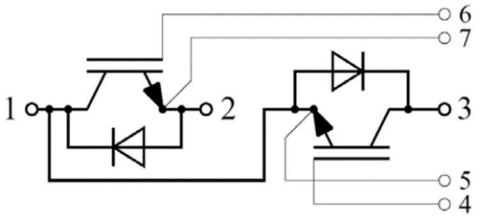
电气特性:

- 低 $V_{CE(sat)}$
- 低导通损耗
- 内置快恢复二极管
- $T_{vj\ op}$=150°C
- $V_{CE(sat)}$带正温度系数

机械特性:

- 高功率循环和温度循环能力
- 铜基板提高坚固性
- 标准封装

接线图:



极限参数 (除非另有说明 , T_j = 25ºC)

IGBT 极限参数(T_j = 25ºC, 除非另有说明)

IGBT Maximum Rated Values (T_j = 25ºC, unless otherwise noted)

符号 Symbol	参数 Parameter	参数范围 Ratings	单位 Units
V_{CES}	集电极—发射极电压 Collector-emitter voltage	1200	V
V_{GES}	栅极-发射极电压 Gate-emitter peak voltage	±20	V
I_C	连续集电极电流 (T_C=85℃ ,Tvj max=175°C) Continuous DC collector current	150	A
I_{CRM}	集电极重复峰值电流 (tp=1ms) Repetitive peak collector current (tp=1ms)	300	A
P_{tot}	耗散功率(Tc=25°C, Tvj max=175°C) Total power dissipation	1083	W

FRD 极限参数(T_j = 25ºC, 除非另有说明)

FRD Maximum Rated Values (T_j = 25ºC, unless otherwise noted)

符号 Symbol	参数 Parameter	参数范围 Ratings	单位 Units
V_{RRM}	反向重复峰值电压 Repetitive peak reverse voltage	1200	V
I_F	连续正向直流电流 Continuous DC forward current	150	A
I_{FRM}	正向重复峰值电流 Repetitive peak forward current	300	A
I^2t	I^2t 值 I^2t-Value	3100	A^2S

模块极限参数(T_j = 25ºC, 除非另有说明)

Module Maximum Rated Values (T_j = 25ºC, unless otherwise noted)

符号 Symbol	参数 Parameter	参数范围 Ratings	单位 Units
T_{jmax}	最大结温 Max junction temperature	175	℃
T_{jop}	工作结温 Operation temperature	-40 to +150	℃
T_{stg}	存储温度 Storage temperature	-40 to +125	℃
V_{ISO}	绝缘耐压(RMS f=50Hz,t=1min) Isolation test voltage	2500	V

IGBT 电气特性参数(除非另有说明 , T_j = 25ºC)

IGBT Electrical Characteristics (T_j = 25ºC, unless otherwise noted)

符号 Symbol	参数 Parameter	最小 Min.	典型 Typ.	最大 Max.	单位 Units.	测试条件 Test condition
B_{VCES}	集射极击穿电压 Collector- emitter breakdown voltage	1200	---	---	V	V_{GE}=0V, I_C=100uA
I_{CES}	集射漏电流 Collector-emitter cut-off current	---	---	1	mA	V_{CE}=1200V,V_{GE}=0V, Tvj=25℃
I_{GES}	栅射漏电流 Gate-emitter leakage current	---	---	100	nA	V_{GE}=20V,V_{CE}=0V, Tvj=25℃

符号 Symbol	参数 Parameter	最小 Min.	典型 Typ.	最大 Max.	单位 Units	测试条件 Test condition
$V_{GE(th)}$	栅极开启阈值电压 Gate-emitter threshold voltage	5.2	6.0	6.4	V	I_C=3.0mA, V_{CE}=V_{GE}
$V_{CE(sat)}$	导通饱和压降 Collector-emitter saturation voltage	---	1.95	2.25	V	I_C=150A, V_{GE}=15V
		---	2.20	---		I_C =150A, V_{GE}=15V, T_{vj}=125°C
		---	2.41	---		I_C =150A, V_{GE}=15V, T_{vj}=150°C
C_{ies}	输入电容 Input capacitance	---	16.0	---	nF	V_{CE}=25V V_{GE}=0V f=1MHz T_{vj}=25°C
C_{oes}	输出电容 Output capacitance	---	0.45	---		
C_{res}	反向传输电容 Reverse transfer capacitance	---	0.92	---		
Qg	栅电荷 Gate charge	---	0.98	---	μC	I_C=150A, V_{CE} =600V $V_{GE(on)}$=15V Tvj=25°C
Rg	栅极内部电阻 Internal gate resistor	---	1.4	---	Ω	---
td on	开通延迟时间(电感负载) Turn-on delay time (Inductive load)	---	0.09	---	μs	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{gon}=10Ω Tvj=25°C
		---	0.13	---	μs	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{gon}=10Ω Tvj=125°C
		---	0.15	---	μs	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{gon}=10Ω Tvj=150°C
tr	上升时间(电感负载) Rise time (Inductive load)	---	0.06	---	μs	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{gon}=10Ω Tvj=25°C
		---	0.08	---	μs	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{gon}=10Ω Tvj=125°C
		---	0.08	---	μs	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_G=10Ω Tvj=150°C

符号 Symbol	参数 Parameter	最小 Min.	典型 Typ.	最大 Max.	单位 Units	测试条件 Test condition
td off	关断延迟时间(电感负载) Turn-off delay time (Inductive load)	---	0.53	---	μs	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{goff}=10Ω Tvj=25°C
		---	0.55	---	μs	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{goff}=10Ω Tvj=125°C
		---	0.55	---	μs	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{goff}=10Ω Tvj=150°C
tf	下降时间(电感负载) Fall time (Inductive load)	---	0.03	---	μs	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{goff}=10Ω Tvj=25°C
		---	0.05	---	μs	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{goff}=10Ω Tvj=125°C
		---	0.10	---	μs	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{goff}=10Ω Tvj=150°C
Eon	开通损耗能量(每脉冲) Turn-on energy loss	---	12.5	---	mJ	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{gon}=10Ω Tvj=25°C
		---	18.9	---	mJ	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{gon}=10Ω Tvj=125°C
		---	20.3	---	mJ	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{gon}=10Ω Tvj=150°C
Eoff	关断损耗能量(每脉冲) Turn-off energy loss	---	5.1	---	mJ	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{goff}=10Ω Tvj=25°C
		---	7.3	---	mJ	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{goff}=10Ω Tvj=125°C
		---	7.9	---	mJ	I_C=150A, V_{CE} = 600V V_{GE}=±15V,R_{goff}=10Ω Tvj=150°C
Isc	短路电流 Short circuit current	---	892	---	A	V_{CC} = 600V,V_{GE}≤15V tp≤10μs,Tvj=125°C
R_{thJC}	结-外壳热阻 Thermal resistance, junction to case	---	---	0.56	K/W	每个IGBT
R_{thCH}	外壳-散热器热阻 Thermal resistance, case to heatsink	---	0.09	---	K/W	每个IGBT
$T_{vj\ op}$	开关工作温度范围 Temperature under switching conditions	-40	---	+150	°C	

FRD 电气特性参数(T_j = 25°C, 除非另有说明)

FRD Electrical Characteristics (T_j = 25°C, unless otherwise noted)

符号 Symbol	参数 Parameter	最小 Min.	典型 Typ.	最大 Max.	单位 Units	测试条件 Test condition
V_F	正向电压 Forward voltage	---	2.5	2.8	V	I_F=150A,V_{GE}=0V Tvj=25°C
		---	2.1	---	V	I_F=150A,V_{GE}=0V Tvj=125°C
		---	1.9	---	V	I_F=150A,V_{GE}=0V Tvj=150°C
I_{RM}	反向恢复峰值电流 Peak reverse recovery current	---	67	---	A	Ic=150A,Vcc=600V Tvj=25°C
		---	103	---	A	Ic=150A,Vcc=600V Tvj=125°C
		---	116	---	A	Ic=150A,Vcc=600V Tvj=150°C
I_R	反向截止电流 Reverse cut off current	---	---	100	μA	Tvj=25°C,V_R=1200V
Qrr	反向恢复电荷 Recovered charge	---	2.77	---	μC	Ic=150A,Vcc=600V Tvj=25°C
		---	6.80	---	μC	I_F=150A, Vcc=600V Tvj=125°C
		---	8.27	---	μC	I_F=150A, Vcc=600V Tvj=150°C
E_{rec}	反向恢复损耗能量(每脉冲) Reverse recovery energy	---	2.529	---	mJ	Ic=150A,Vcc=600V Tvj=25°C
		---	5.05	---	mJ	Ic=150A,Vcc=600V Tvj=125°C
		---	6.27	---	mJ	Ic=150A,Vcc=600V Tvj=150°C
R_{thJC}	结-外壳热阻 Thermal resistance, junction to case	---	---	0.25	K/W	每个二极管
R_{thCH}	外壳-散热器热阻 Thermal resistance, case to heatsink	---	0.06	---	K/W	每个二极管
$T_{vj\ op}$	开关工作温度范围 Temperature under switching conditions	-40	---	+125	°C	

模块(除非另有说明 , T_j = 25ºC)

Module (T_j = 25ºC, unless otherwise noted)

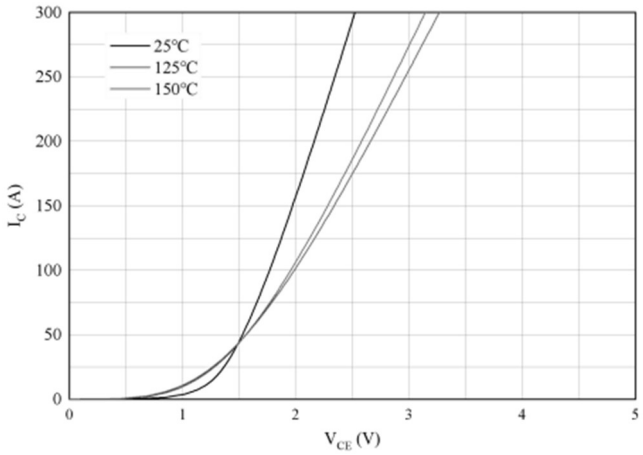
符号 Symbol	参数 Parameter	最小 Min.	典型 Typ.	最大 Max.	单位 Units	测试条件 Test condition
V_{ISOL}	绝缘测试电压 Isolation test voltage	---	2.50	---	KV	RMS,f=50Hz,t=1min
	模块基板材料 Material of module baseplate	---	Cu	---	---	---
	内部绝缘介质 Internal isolation	---	Al_2O_3	---		基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)
	爬电距离 Creepage distance	---	29	---	mm	端子-散热器 Terminal to heatsink
			23			端子-端子 Terminal to terminal
	电气间隙 Clearance	---	23	---	mm	端子-散热器 Terminal to heatsink
			11			端子-端子 Terminal to terminal
L_{sCE}	杂散电感 Stray inductance	---	22	---	nH	
R_{cc+EE}	模块引线电阻(端子-芯片) Module lead resistance, terminals - chip	---	0.79	---	mΩ	
M	模块安装的安装扭矩 Mounting torque for module mounting	3.0	---	6.0	Nm	螺丝M6根据相应的应用手册进行安装
M	端子联接扭矩 Terminal connection torque	2.5		5.0	Nm	螺丝M6根据相应的应用手册进行安装
G	重量 Weight	---	161	---	g	

典型特性曲线图(除非另有说明 , T_j = 25°C)

输出特性 IGBT, 逆变器(典型)

output characteristic IGBT, Inverter (typical)

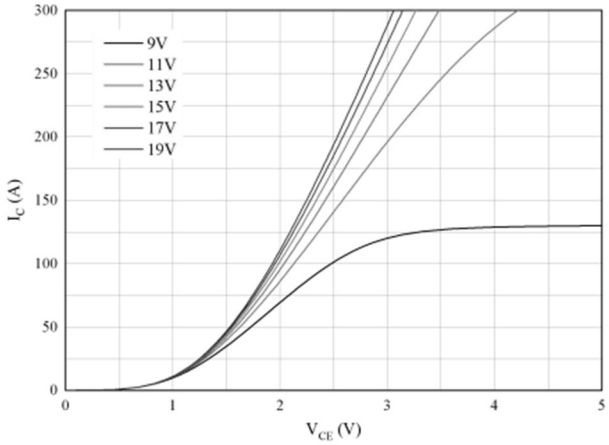
$I_C = f(T)$, Tvj = 25°C



传输特性 IGBT, 逆变器(典型)

transfer characteristic IGBT, Inverter (typical)

$I_C = f(V_{GE})$, V_{CE}=20V

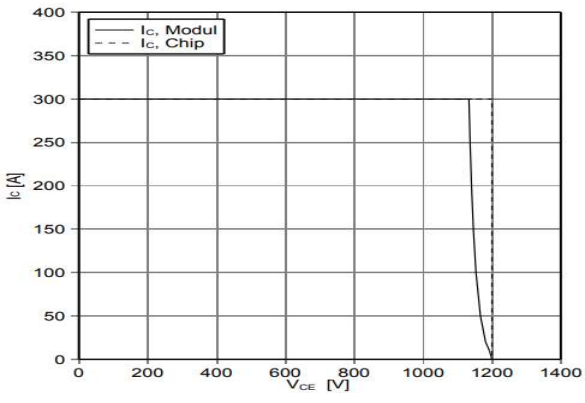


反偏安全工作区 IGBT, 逆变器(RBSOA)

reverse bias safe operating area IGBT , Inverter (typical)

$I_C = f(V_{CE})$, Tvj = 25°C

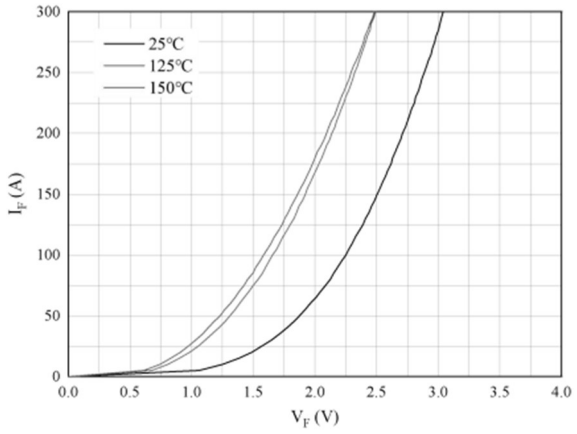
V_{GE} =±15V, Rg=10Ω



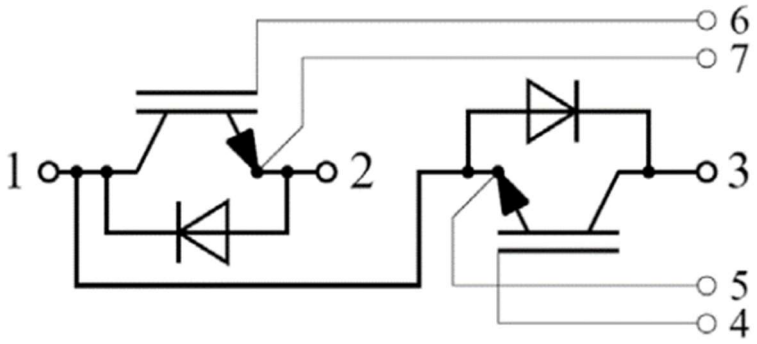
正向偏压特性 FRD, 逆变器(典型)

Forward characteristic FRD, Inverter (typical)

$I_F = f(V_F)$



接线图



封装信息：