



SF400R17E6 62mm Half Bridge IGBT Module

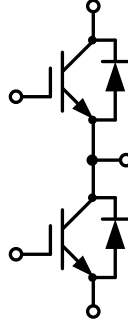
电气特性 / Features and Benefits:

• 1700V 沟槽栅/场终止工艺
1700V Trench Gate / Field Termination Process

- 低开关损耗
Low Switching Losses
- 正温度系数
Positive Temperature Coefficient

典型应用 / Application:

- 高压变频器
High Voltage Frequency Converter
- UPS
Uninterruptible Power Supply
- 伺服
Servo
- 逆变器
Inverter



$V_{CES} = 1700V$, $I_{C\ nom} = 400A$ / $I_{CRM} = 800A$

IGBT, 逆变器 / IGBT, Inverter

最大额定值 / Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
集电极-发射极电压 Collector-Emitter voltage	$T_{vj} = 25^{\circ}C$	V_{CES}	1700	V
连续集电极直流电流 Continuous DC collector current	$T_C = 80^{\circ}C$, $T_{vj\ max} = 150^{\circ}C$	$I_{C\ nom}$	400	A
集电极重复峰值电流 Repetitive peak collector current	$t_p = 1\ ms$	I_{CRM}	800	A
栅极-发射极电压 Gate emitter voltage		V_{GE}	± 20	V

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
集电极-发射极饱和电压 Collector-Emitter saturation voltage	$V_{GE} = 15V$, $I_C = 400A$ $V_{GE} = 15V$, $I_C = 400A$ $V_{GE} = 15V$, $I_C = 400A$	$T_{vj} = 25^{\circ}C$ $T_{vj} = 125^{\circ}C$ $T_{vj} = 150^{\circ}C$	V_{CESat}	2.08 2.49 2.57	2.50	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C = 18mA$, $V_{GE} = V_{CE}$	$T_{vj} = 25^{\circ}C$	$V_{GE(th)}$	5.2	5.85	6.4
内部栅极电阻 Internal gate resistor			R_{Gint}	1.6		Ω
输入电容 Input capacitance	$f = 1MHz$, $V_{CE} = 25\ V$, $V_{GE} = 0\ V$	$T_{vj} = 25^{\circ}C$	C_{ies}	33.93		nF
反向传输电容 Reverse Transmission Capacitor			C_{res}	1.27		

Typical Characteristics

Reverse transfer capacitance						
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE}=1700V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$	I_{CES}		1	mA
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE}=0V, V_{GE}=20V$	$T_{vj}=25^{\circ}C$	I_{GES}		400	nA
开通延迟时间 Turn-on delay time	$I_C=400A, V_{CE}=900V$ $V_{GE}=\pm 15V, R_G=1\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$	t_{don}		231 242	
上升时间 Rise time	$I_C=400A, V_{CE}=900V$ $V_{GE}=\pm 15V, R_G=1\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$	t_r		92 105	
关断延迟时间 Turn-off delay time	$I_C=400A, V_{CE}=900V$ $V_{GE}=\pm 15V, R_G=1\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$	t_{doff}		474 531	ns
下降时间 Fall time	$I_C=400A, V_{CE}=900V$ $V_{GE}=\pm 15V, R_G=1\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$	t_f		211 306	
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=400A, V_{CE}=900V$ $V_{GE}=\pm 15V, R_G=1\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$	E_{on}		74.95 104.30	mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=400A, V_{CE}=900V$ $V_{GE}=\pm 15V, R_G=1\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$	E_{off}		61.39 77.19	
短路数据 SC data	$V_{GE}\leq 15V, V_{ce}=1000V$ $V_{CEmax}=V_{CES}-L_{sCE}\cdot di/dt \quad t_p\leq 10\mu s, T_{vj}=125^{\circ}C$		I_{sc}		2200	A
结-外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		R_{thJC}		0.06	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj op}$	-40	125	$^{\circ}C$

二极管, 逆变器 / Diode, Inverter

最大额定值 / Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
反向重复峰值电压 Repetitive peak reverse voltage	$T_{vj}=25^{\circ}C$	V_{RRM}	1700	V
连续正向直流电流 Continuous DC forward current		I_F	400	A
正向重复峰值电流 Repetitive peak forward current	$t_p=1ms$	I_{FRM}	800	A
I^2t 值 I^2t -value	$t_p=10ms, \sin 180^{\circ}, T_j=125^{\circ}C$	I^2t	44000	A^2s

Typical Characteristics

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=400A, V_{GE}=0V$ $T_{vj}=25^{\circ}C$ $I_F=400A, V_{GE}=0V$ $T_{vj}=125^{\circ}C$ $I_F=400A, V_{GE}=0V$ $T_{vj}=150^{\circ}C$	V_F		2.09 2.33 2.29	2.6	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=400A$ $-di_F/dt=3059A/\mu s(T_{vj}=125^{\circ}C)$ $V_R=900V, V_{GE}=-15V$ $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$	I_{RM}		282 307		A
恢复电荷 Recovered charge	$I_F=400A$ $-di_F/dt=3059A/\mu s(T_{vj}=125^{\circ}C)$ $V_R=900V, V_{GE}=-15V$ $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$	Q_r		55.24 91.88		μC
反向恢复损耗（每脉冲） Reverse recovered energy	$I_F=400A$ $-di_F/dt=3059A/\mu s(T_{vj}=125^{\circ}C)$ $V_R=900V, V_{GE}=-15V$ $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$	E_{rec}		30.70 52.99		mJ
结-外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode	R_{thJC}			0.11	K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj op}$	-40		125	$^{\circ}C$

模块 / Module

Parameter	Conditions	Symbol	Value			Unit
绝缘测试电压 Isolation test voltage	RMS, $f=50Hz, t=1min$	V_{ISOL}		4000		V
内部绝缘 Internal isolation				Al_2O_3		
储存温度 Storage temperature		T_{stg}	-40		125	$^{\circ}C$
模块安装的扭矩 Mounting torque for modul mounting		M	3.0		6.0	Nm
重量 Weight		W		308		g

Typical Characteristics

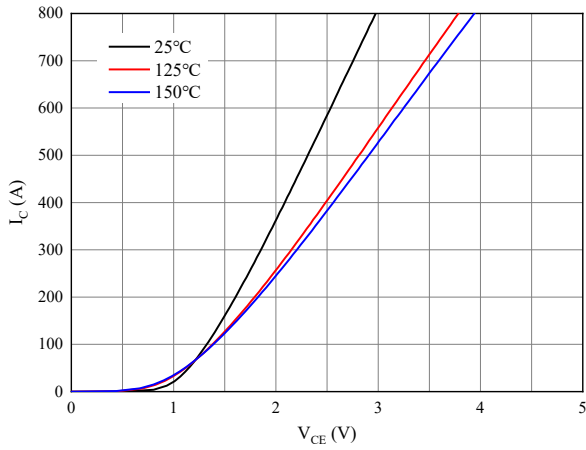


图 1. 典型输出特性 ($V_{GE}=15V$)

Figure 1. Typical output characteristics ($V_{GE}=15V$)

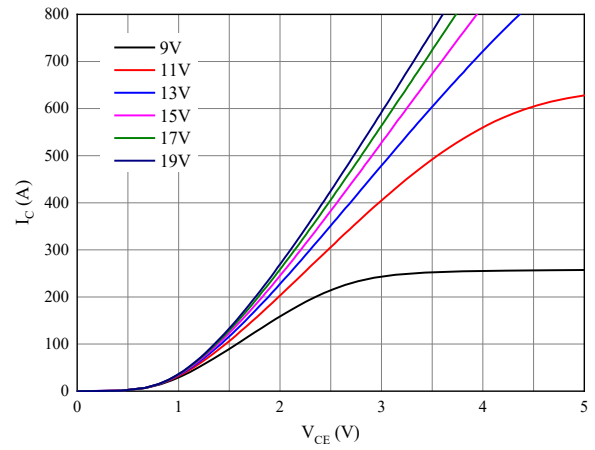


图 2. 典型输出特性 ($T_{vj}=150^{\circ}C$)

Figure 2. Typical output characteristics ($T_{vj}=150^{\circ}C$)

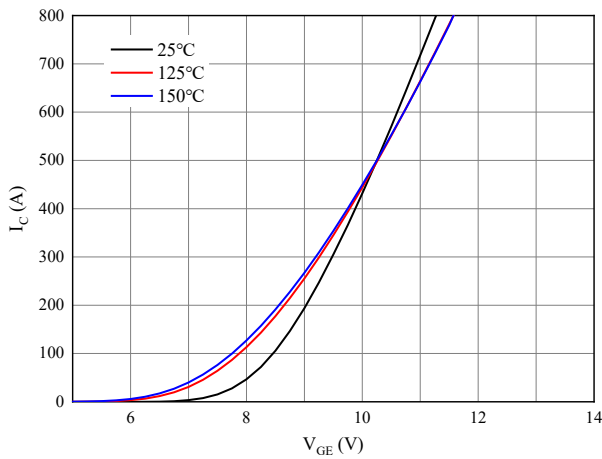


图 3. 典型传输特性 ($V_{CE}=20V$)

Figure 3. Typical transfer characteristic ($V_{CE}=20V$)

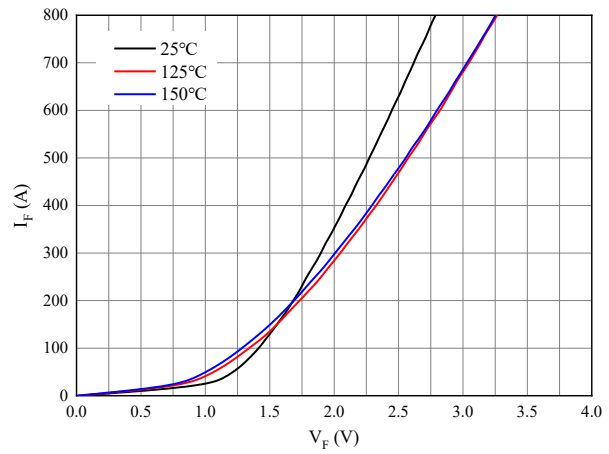


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristic of Diode

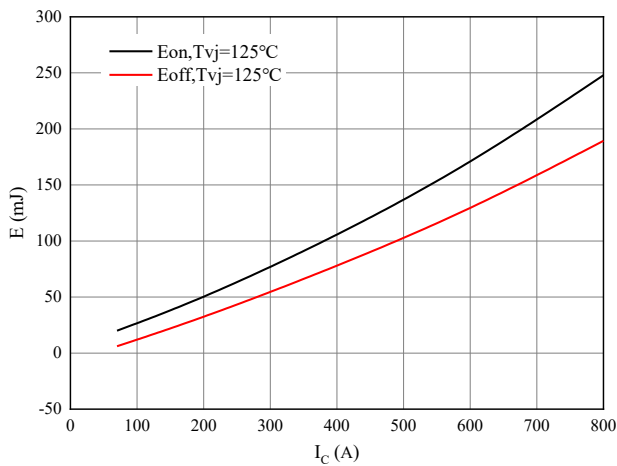


图 5. 开关损耗 逆变器

Figure 5. Switching losses of IGBT
 $V_{GE}=\pm 15V, R_{Gon}=1\Omega, R_{Goff}=1\Omega, V_{CE}=900V$

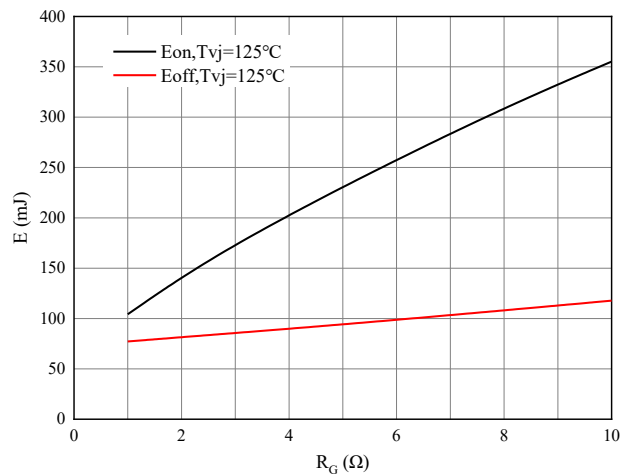


图 6. 开关损耗 逆变器

Figure 6. Switching losses of IGBT
 $V_{GE}=\pm 15V, I_C=400A, V_{CE}=900V$

Typical Characteristics

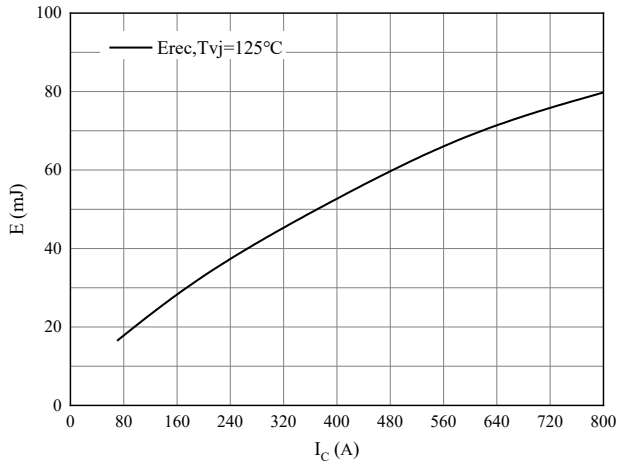


图 7. 开关损耗 二极管

Figure 7. Switching losses of Diode
 $R_{Gon}=1\Omega, V_{CE}=900V$

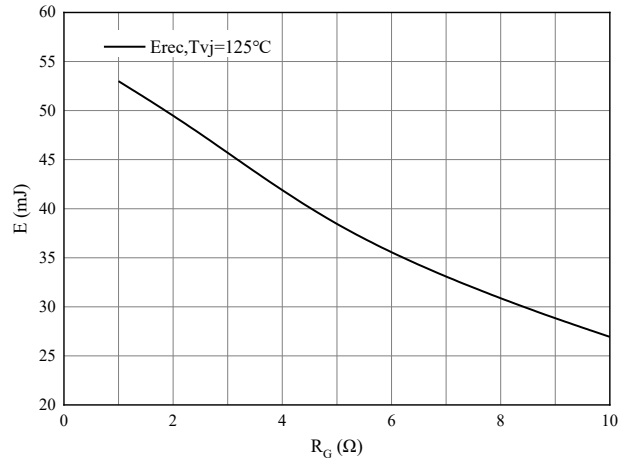


图 8. 开关损耗 二极管

Figure 8. Switching losses of Diode
 $I_F=400A, V_{CE}=900V$

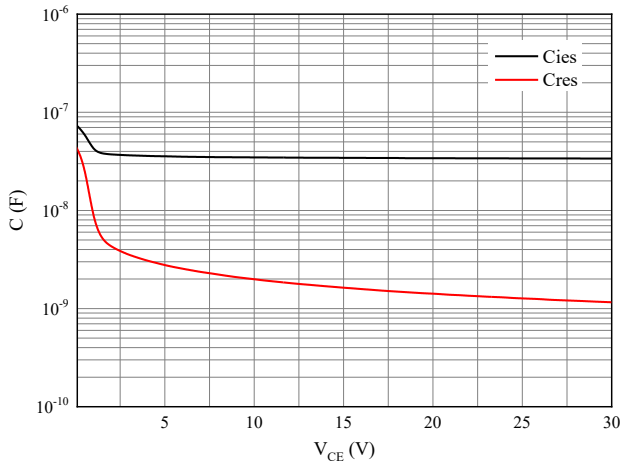
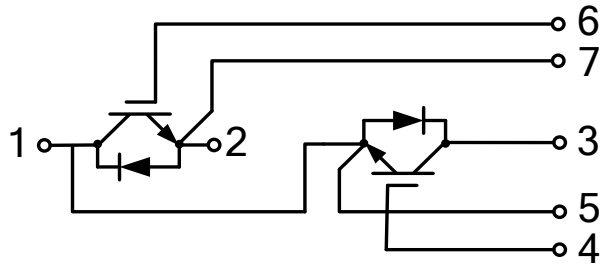


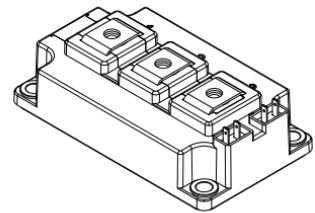
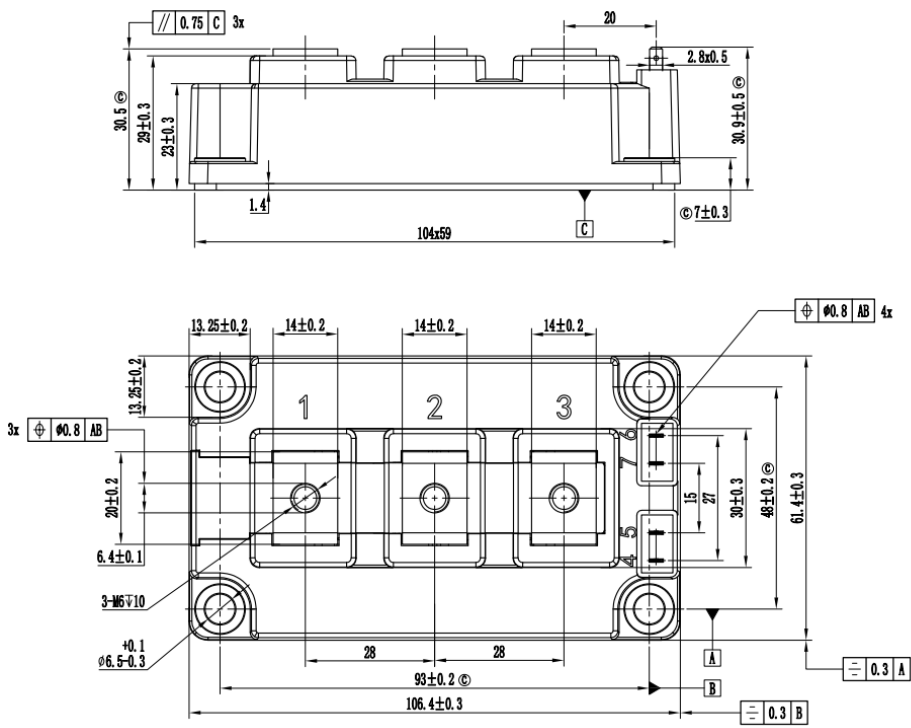
图 9. 电容特性

Figure 9. Capacitance characteristic

接线图 / Circuit diagram



封装尺寸 / Package outlines



注: 1. © 尺寸为关键管控尺寸
2. 未标注公差按GB/T1804-m执行

Dimensions in (mm)