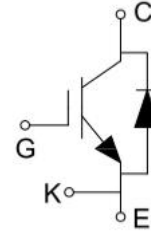


IGBT Discrete with Anti-Parallel Diode

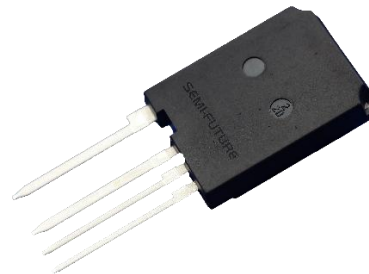
电气特性/ Features and Benefits:

- 1200V 沟槽栅/场终止工艺
1200V trench gate/field termination process
- 低开关损耗
Low switching losses
- V_{cesat} 正温度系数
 V_{cesat} has a positive temperature coefficient



典型应用/ Applications:

- 不间断电源
Uninterruptible power supplies
- 光伏逆变器
Solar inverters



$V_{CES} = 1200V$, $I_{C\ nom} = 120A$ / $I_{CRM} = 360A$

关键性能和程序参数 / Key Performance and Package Parameters

Type	V_{CE}	I_C	$V_{CESat}, T_{vj}=25^\circ C$	T_{vjmax}	Package
SD120R12IA7H	1200V	120A	1.69V	175°C	TO-247PLUS-4L

双极晶体管/IGBT

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}	1200	V
连续集电极直流电流 Continuous DC collector current	$T_C=100^\circ C, T_{vj\ max}=175^\circ C$	$I_{C\ nom}$	120	A
集电极重复峰值电流 Repetitive peak collector current	$t_p=1ms$	I_{CRM}	360	A
栅极-发射极电压 Gate emitter voltage		V_{GE}	± 20	V
瞬态栅极-发射极电压 Transient gate-emitter voltage	$t_p \leq 0.5\mu s, D < 0.001$	V_{GE}	± 25	V
总功率损耗 Power dissipation	$T_C=25^\circ C$ $T_C=100^\circ C$	P_{tot}	1250 625	W

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Edited by Semi-Future Technologies, Edition 1.1

在开关状态下温度 Temperature under switching conditions		$T_{vj\ op}$	-40...+175	°C
储存温度 Storage temperature		T_{stg}	-40...+150	°C

热特性 / Thermal Characteristics

Parameter	Conditions	Symbol	Value	Unit
IGBT 热阻, 结-壳 IGBT thermal resistance, junction - case		$R_{th(j-c)}$	0.12	K/W
二极管热阻, 结-壳 Diode thermal resistance, junction - case		$R_{th(j-c)}$	0.22	K/W

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	$V_{GE}=15V, I_C=120A$ $V_{GE}=15V, I_C=120A$	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	V_{CEsat}	1.69 2.26	2.10	V	
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=2.34mA, V_{GE}=V_{CE}$	$T_{vj}=25^\circ C$	$V_{GE(th)}$	5.0	5.6	6.2	V
跨导 Transconductance	$V_{CE}=20V, I_C=120A$		G_{fs}	108		S	
输入电容 Input capacitance			C_{ies}	16.81		nF	
输出电容 Output capacitance	$f=100kHz, V_{CE}=25V, V_{GE}=0V$	$T_{vj}=25^\circ C$	C_{oes}	0.41		nF	
反向传输电容 Reverse transfer capacitance			C_{res}	0.13		nF	
门极电荷 Gate charge	$I_C=120A, V_{GE}=15V,$ $V_{CE}=960V$	$T_{vj}=25^\circ C$	Q_G	1.03		μC	
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE}=1200V, V_{GE}=0V$	$T_{vj}=25^\circ C$	I_{CES}		40	μA	
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}		100	nA	
开通延迟时间 Turn-on delay time	$I_C=120A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=20\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	$t_{d(on)}$	206 159		ns	
上升时间 Rise time	$I_C=120A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=20\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	t_r	115 145		ns	
关断延迟时间 Turn-off delay time	$I_C=120A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=20\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	$t_{d(off)}$	447 485		ns	

下降时间 Fall time	$I_C=120A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=20\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	t_f	70 137		ns
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=120A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=20\Omega$ $di/dt=700A/\mu s(T_{vj}=175^\circ C)$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	E_{on}	12.47 23.90		mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=120A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=20\Omega$ $dv/dt=7500V/\mu s(T_{vj}=175^\circ C)$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	E_{off}	4.24 6.38		mJ

二极管/Diode

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}	1200	V
连续正向直流电流 Continuous DC forward current	$T_C=100^\circ C, T_{vj\ max}=175^\circ C$	I_F	60	A
正向重复峰值电流 Repetitive peak forward current	$t_p=1ms$	I_{FRM}	180	A

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=60A, V_{GE}=0V$ $I_F=60A, V_{GE}=0V$	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	V_F	1.77 1.44	2.30	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=60A,$ $-di_f/dt=700A/\mu s(T_{vj}=175^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	I_{RM}	30 74		A
反向恢复电荷 Reverse Recovered charge	$I_F=60A,$ $-di_f/dt=700A/\mu s(T_{vj}=175^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	Q_{rr}	4.77 17.53		μC
反向恢复时间 Reverse Recovery Time	$I_F=60A,$ $-di_f/dt=700A/\mu s(T_{vj}=175^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	t_{rr}	368 582		ns
反向恢复损耗 (每脉冲) Reverse recovered energy	$I_F=60A,$ $-di_f/dt=700A/\mu s(T_{vj}=175^\circ C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	E_{rec}	1.63 6.24		mJ

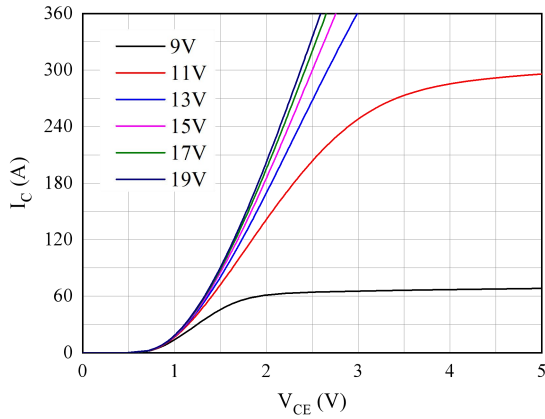


图 1. 典型输出特性 ($T_{vj}=25^{\circ}\text{C}$)
Figure 1. Typical output characteristics ($T_{vj}=25^{\circ}\text{C}$)

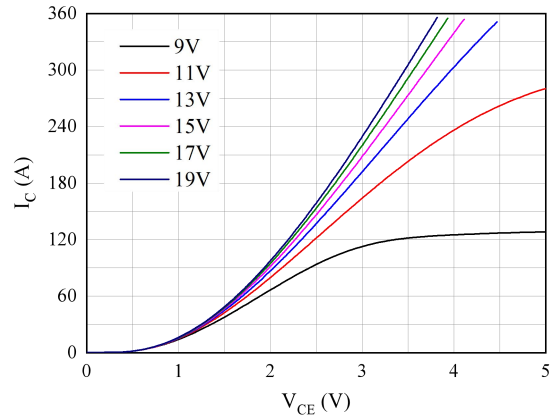


图 2. 典型输出特性 ($T_{vj}=175^{\circ}\text{C}$)
Figure 2. Typical output characteristics ($T_{vj}=175^{\circ}\text{C}$)

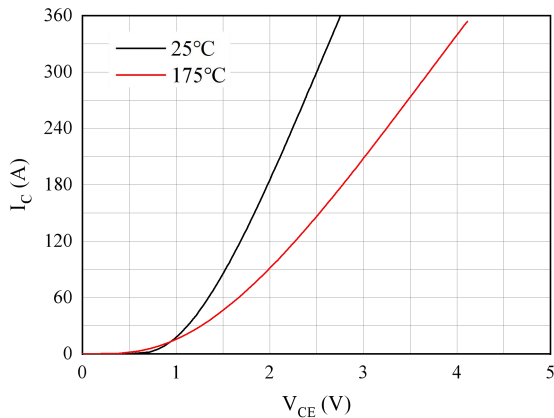


图 3. 典型输出特性 ($V_{GE}=15\text{V}$)
Figure 3. Typical output characteristics ($V_{GE}=15\text{V}$)

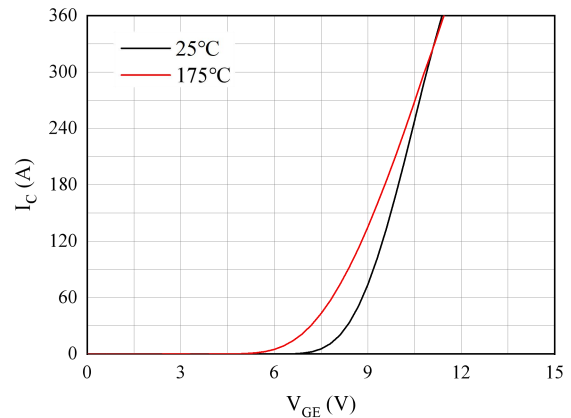


图 4. 典型传输特性 ($V_{CE}=20\text{V}$)
Figure 4. Typical transfer characteristic ($V_{CE}=20\text{V}$)

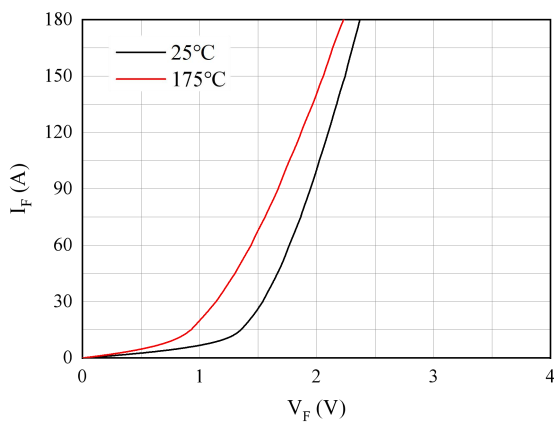


图 5. 正向偏压特性 二极管
Figure 5. Forward characteristic of Diode

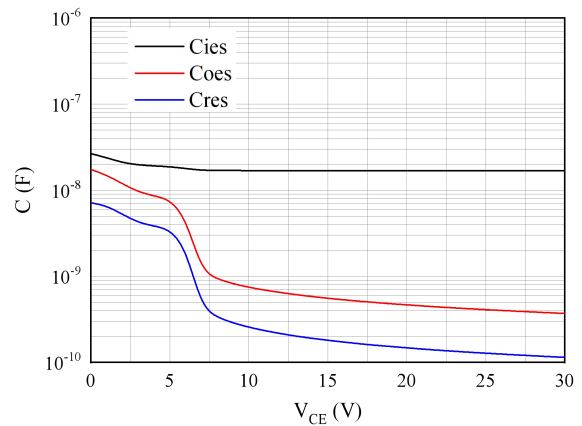


图 6. 电容特性
Figure 6. Capacitance characteristic

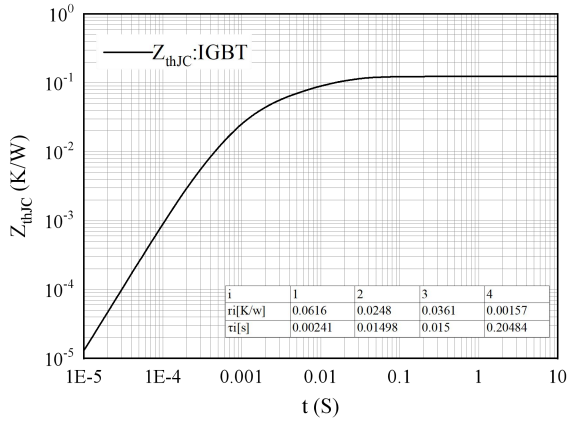


图 7. 瞬态热阻抗 IGBT

Figure 7. Transient thermal impedance IGBT, $Z_{thJC}=f(t)$

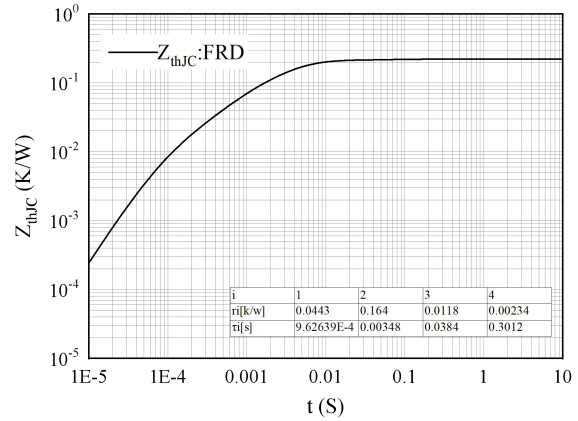


图 8. 瞬态热阻抗 FRD

Figure 8. Transient thermal impedance FRD, $Z_{thJC}=f(t)$

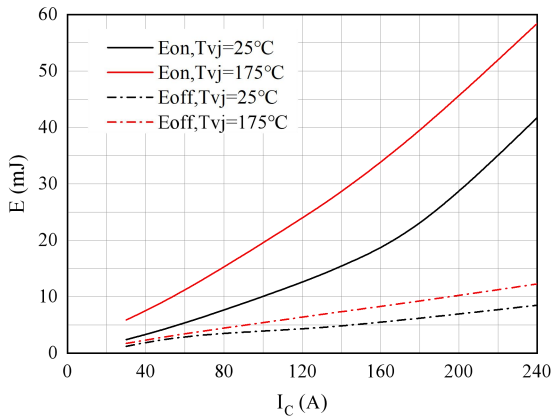


图 9. 开关损耗

Figure 9. Switching losses of IGBT
 $V_{GE}=\pm 15V, R_{gon}=20\Omega, R_{goff}=20\Omega, V_{CE}=600V$

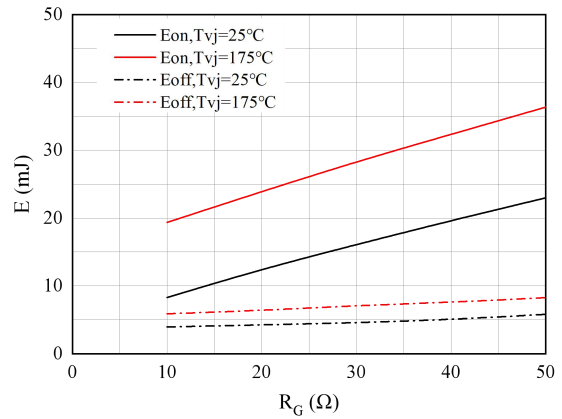


图 10. 开关损耗

Figure 10. Switching losses of IGBT
 $V_{GE}=\pm 15V, I_C=120A, V_{CE}=600V$

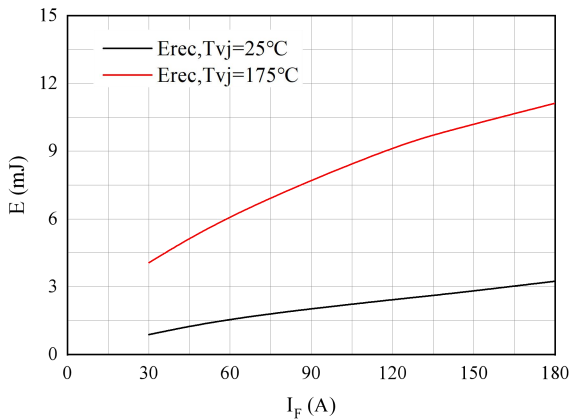


图 11. 开关损耗 二极管

Figure 11. Switching losses of Diode
 $R_{gon}=20\Omega, V_{CE}=600V$

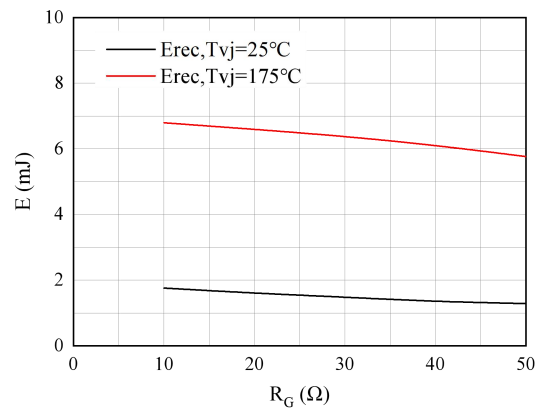
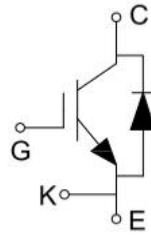


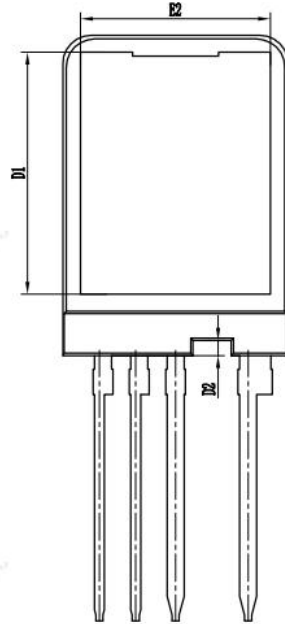
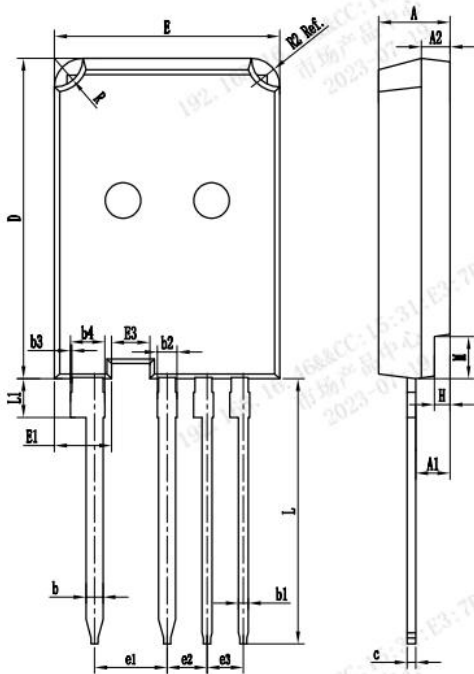
图 12. 开关损耗 二极管

Figure 12. Switching losses of Diode
 $I_F=60A, V_{CE}=600V$

接线图 / Circuit diagram



封装尺寸 / Package outlines



Symbol	Dimensions in Millimeters	
	Min	Max
A	4.900	5.100
A1	2.310	2.510
A2	1.900	2.100
b	1.160	1.290
b1	0.650	0.790
b2	1.360	1.490
b3	0.000	0.200
b4	2.160	2.290
c	0.590	0.660
D	22.300	22.500
D1	16.650	17.250
D2	1.000	1.100
E	15.700	15.900
E1	3.900	4.100
E2	13.100	13.500
E3	2.580	2.780
e1	5.080 BSC	
e2	2.790 BSC	
e3	2.540 BSC	
H	1.000	1.200
L	18.460	18.660
L1	2.620	2.820
M	2.850	3.050
R	1.900	2.100