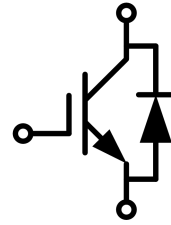


IGBT Discrete with Anti-Parallel Diode

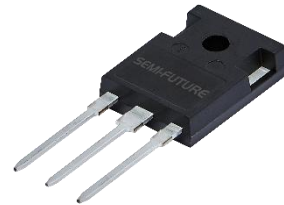
电气特性/ Features and Benefits:

- 700V 沟槽栅/场终止工艺
700V 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:

- 充电桩
Charging station
- OBC
On board charger
- 不间断电源
Uninterruptible power supplies
- 逆变器
Inverters



$V_{CES} = 700V$, $I_{C\ nom} = 40A$ / $I_{CRM} = 120A$

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
SD40R07A6U	700V	40A	1.42V	175°C	TO-247-3L

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}	700	V
连续集电极直流电流 Continuous DC collector current	$T_C=100^\circ C$, $T_{vj\ max}=175^\circ C$	$I_{C\ nom}$	40	A
集电极重复峰值电流 Repetitive peak collector current	$t_p=1\ ms$	I_{CRM}	120	A
栅极-发射极电压 Gate emitter voltage	$t_p \leq 0.5\ \mu s$, $D < 0.001$	V_{GE}	± 20 ± 25	V

Changes of this product data sheet are reserved.
Edited by Semi-Future Technologies, Edition 1.0

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

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	$V_{GE}=15V, I_C=40A$ $V_{GE}=15V, I_C=40A$ $V_{GE}=15V, I_C=40A$	$T_{vj}=25^\circ C$ $T_{vj}=150^\circ C$ $T_{vj}=175^\circ C$	V_{CEsat}	1.42 1.70 1.73	1.80	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=0.4mA, V_{GE}=V_{CE}$	$T_{vj}=25^\circ C$	$V_{GE(th)}$	4.3 4.9	5.5	V
跨导 Transconductance	$V_{CE}=20V, I_C=40A$		G_{fs}	67		S
输入电容 Input capacitance			C_{ies}	5514		pF
输出电容 Output capacitance	$f=100kHz, V_{CE}=25V, V_{GE}=0V$	$T_{vj}=25^\circ C$	C_{oes}	202		pF
反向传输电容 Reverse transfer capacitance			C_{res}	93		pF
门极电荷 Gate charge	$I_C=40A, V_{GE}=15V,$ $V_{CE}=560V$	$T_{vj}=25^\circ C$	Q_G	533		nC
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE}=700V, V_{GE}=0V$	$T_{vj}=25^\circ C$	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}		200	nA
开通延迟时间 Turn-on delay time	$I_C=40A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	$t_{d(on)}$	24 20		ns
上升时间 Rise time	$I_C=40A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	t_r	61 56		ns
关断延迟时间 Turn-off delay time	$I_C=40A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	$t_{d(off)}$	148 172		ns
下降时间 Fall time	$I_C=40A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	t_f	41 77		ns
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=40A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ $di/dt=600A/\mu s(T_{vj}=175^\circ C)$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	E_{on}	1.31 2.83		mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=40A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ $dv/dt=9000V/\mu s(T_{vj}=175^\circ C)$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	E_{off}	0.51 0.74		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	$T_{vj}=25^{\circ}\text{C}$	V_{RRM}	700	V
连续正向直流电流 Continuous DC forward current	$T_C=100^{\circ}\text{C}$, $T_{vj\max}=175^{\circ}\text{C}$	I_F	40	A
正向重复峰值电流 Repetitive peak forward current	$t_p=1\text{ms}$	I_{FRM}	120	A

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=40\text{A}$, $V_{GE}=0\text{V}$ $I_F=40\text{A}$, $V_{GE}=0\text{V}$ $I_F=40\text{A}$, $V_{GE}=0\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	V_F	1.52 1.23 1.19	2.00	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=40\text{A}$, $-di_F/dt=600\text{A}/\mu\text{s}(T_{vj}=175^{\circ}\text{C})$ $V_R=400\text{V}$, $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	I_{RM}	15.36 41.28		A
反向恢复电荷 Reverse Recovered charge	$I_F=40\text{A}$, $-di_F/dt=600\text{A}/\mu\text{s}(T_{vj}=175^{\circ}\text{C})$ $V_R=400\text{V}$, $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	Q_{rr}	0.96 5.39		μC
反向恢复时间 Reverse Recovery Time	$I_F=40\text{A}$, $-di_F/dt=600\text{A}/\mu\text{s}(T_{vj}=175^{\circ}\text{C})$ $V_R=400\text{V}$, $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	t_{rr}	119 200		ns
反向恢复损耗（每脉冲） Reverse recovered energy	$I_F=40\text{A}$, $-di_F/dt=600\text{A}/\mu\text{s}(T_{vj}=175^{\circ}\text{C})$ $V_R=400\text{V}$, $V_{GE}=-15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	E_{rec}	0.22 1.13		mJ

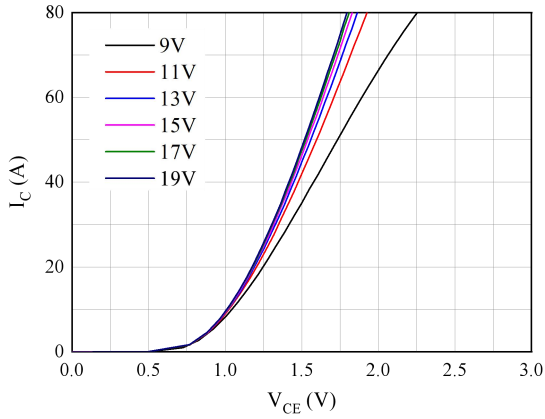


图 1. 典型输出特性 ($T_{vj}=25^{\circ}\text{C}$)
Figure 1. Typical output characteristics ($T_{vj}=25^{\circ}\text{C}$)

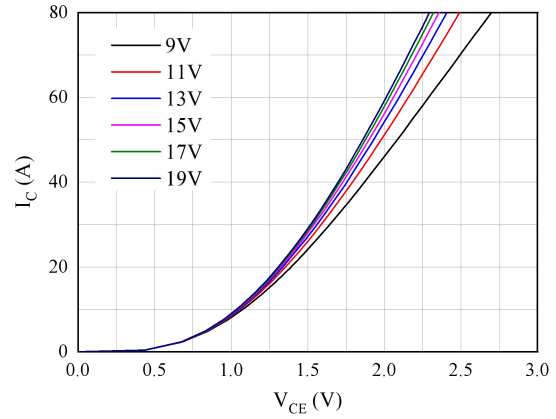


图 2. 典型输出特性 ($T_{vj}=175^{\circ}\text{C}$)
Figure 2. Typical output characteristics ($T_{vj}=175^{\circ}\text{C}$)

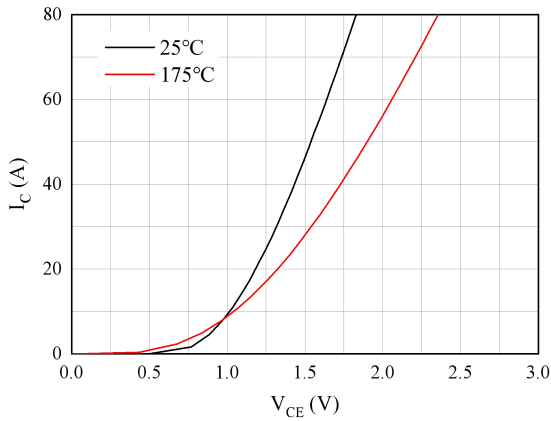


图 3. 典型输出特性 ($V_{ge}=15\text{V}$)
Figure 3. Typical output characteristics ($V_{ge}=15\text{V}$)

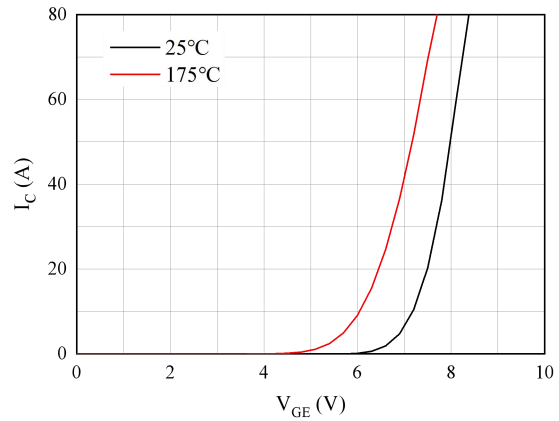


图 4. 典型传输特性 ($V_{ce}=20\text{V}$)
Figure 4. Typical transfer characteristic ($V_{ce}=20\text{V}$)

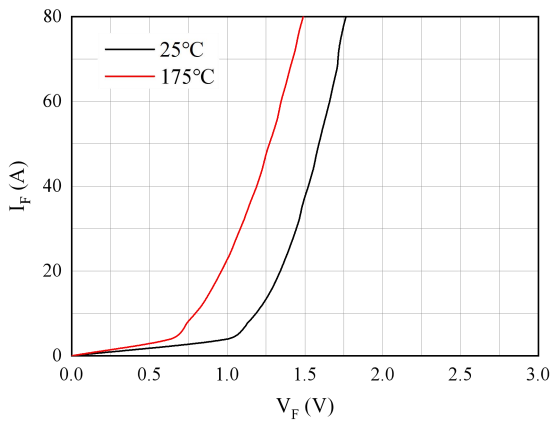


图 5. 正向偏压特性 二极管
Figure 5. Forward characteristic of Diode

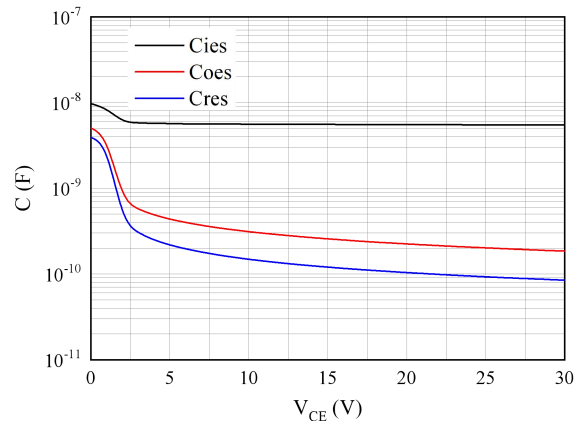


图 6. 电容特性
Figure 6. Capacitance characteristic

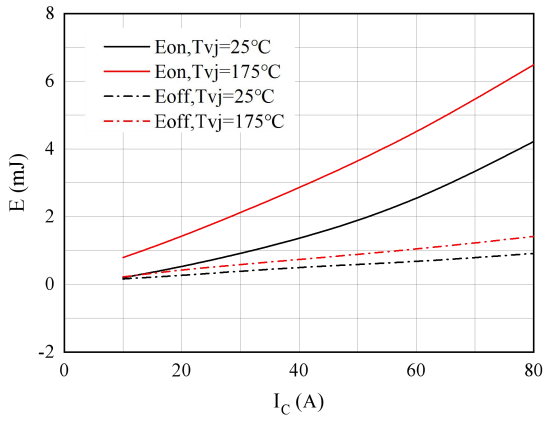


图 7. 开关损耗

Figure 7. Switching losses of IGBT
 $V_{GE} = \pm 15V$, $R_{gon} = 8\Omega$, $R_{goff} = 8\Omega$, $V_{CE} = 400V$

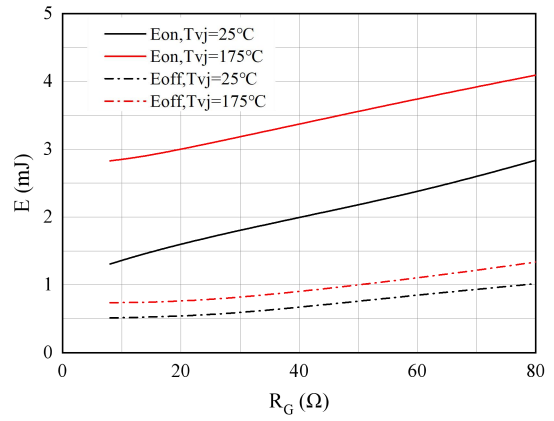


图 8. 开关损耗

Figure 8. Switching losses of IGBT
 $V_{GE} = \pm 15V$, $I_c = 40A$, $V_{CE} = 400V$

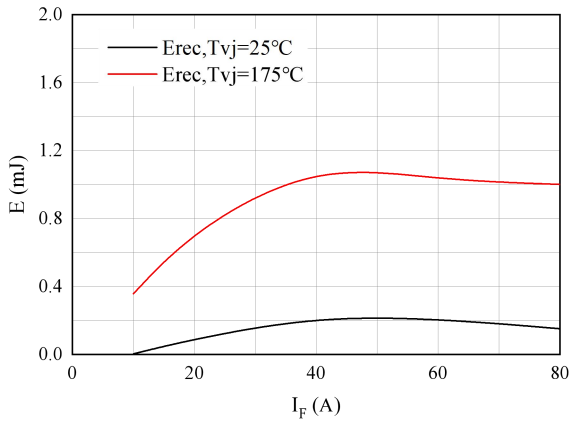


图 9. 开关损耗 二极管

Figure 9. Switching losses of Diode
 $R_{gon} = 8\Omega$, $V_{CE} = 400V$

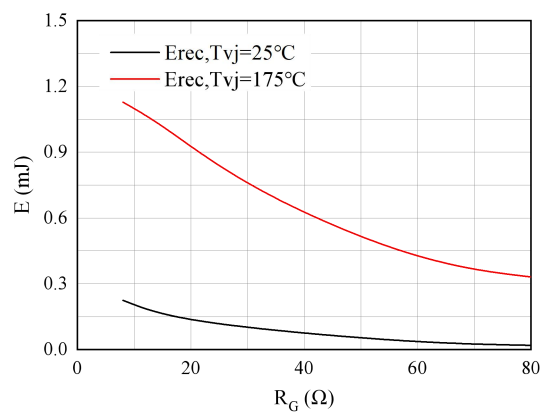
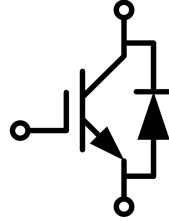


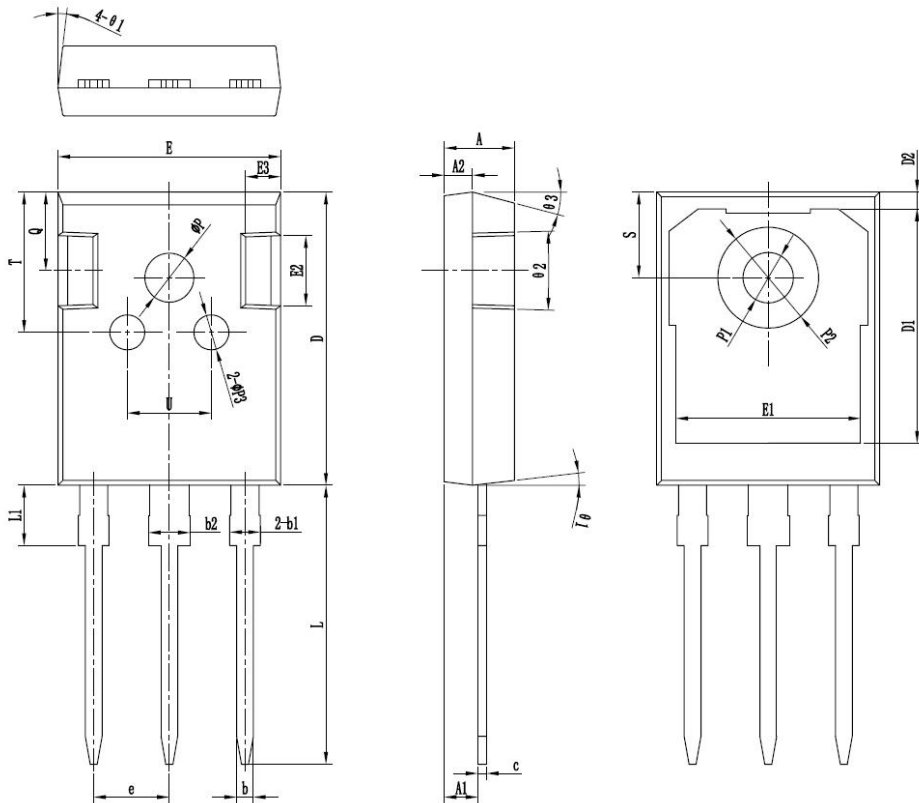
图 10. 开关损耗 二极管

Figure 10. Switching losses of Diode
 $I_F = 40A$, $V_{CE} = 400V$

接线图 / Circuit diagram



封装尺寸 / Package outlines



符号	单位:mm		
	MIN	NOM	MAX
∅A	4.90	5.00	5.10
∅A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
∅B	1.15	1.20	1.25
∅B1	1.95	2.10	2.25
∅B2	2.95	3.10	3.25
∅C	0.55	0.60	0.65
∅D	20.90	21.00	21.10
D1	16.35	16.55	16.75
D2	1.05	1.20	1.35
∅E	15.70	15.80	15.90
E1	13.10	13.25	13.40
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
∅E	5.40	5.44	5.48
∅L	19.80	19.92	20.10
∅L1	-	-	4.30
∅P	3.70	3.80	3.90
∅P1	3.50	3.60	3.70
∅P2	7.00	7.20	7.40
∅P3	2.40	2.50	2.60
Q	5.60	5.80	6.00
∅S	6.05	6.15	6.25
T	9.80	10.00	10.20
U	6.00	6.20	6.40
∅1	5"	7"	9"
∅2	1"	3"	5"
∅3	13"	15"	17"

*为关键管控尺寸