

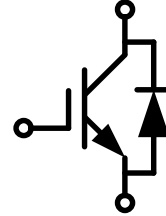


**DONGGUAN NANJING ELECTRONICS LTD.,**  
**TO-247-3 Plastic-Encapsulate IGBT**

**NJ40R12A6 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
- 正温度系数  
Positive temperature coefficient



**典型应用 / Applications:**

- 充电桩  
Charging station
- UPS  
Uninterruptible power supplies
- 逆变器  
Inverters



$V_{CES}=1200V, I_{C\ nom}=40A / I_{CRM}=80A$

**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	$T_C=100^{\circ}C, T_{vj\ max}=175^{\circ}C$	$I_{C\ nom}$	40	A
集电极重复峰值电流 Repetitive peak collector current	$t_p=1\ ms$	$I_{CRM}$	80	A
总功率损耗 Total power dissipation	$T_C=25^{\circ}C, T_{vj\ max}=175^{\circ}C$	$P_{tot}$	270	W
栅极-发射极电压 Gate emitter voltage		$V_{GE}$	$\pm 20$	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	$V_{GE}=15V, I_C=40A$ $V_{GE}=15V, I_C=40A$ $V_{GE}=15V, I_C=40A$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$V_{CESat}$	1.60 1.90 2.00	2.20	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_C=0.5mA, V_{GE}=V_{CE}$	$T_{vj}=25^{\circ}C$	$V_{GE(th)}$	4.8 5.5	6.2	
跨导 Transconductance	$V_{CE}=20V, I_C=40A$		$G_{fs}$	27		S

## Typical Characteristics

输入电容 Input capacitance	$f=1\text{ MHz}, V_{CE}=25\text{ V}, V_{GE}=0\text{ V}$ $T_{vj}=25^\circ\text{C}$	$C_{ies}$	2.56	nF
输出电容 Output capacitance		$C_{oes}$	0.16	
反向传输电容 Reverse transfer capacitance		$C_{res}$	0.12	
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE}=1200\text{ V}, V_{GE}=0\text{ V}$ $T_{vj}=25^\circ\text{C}$	$I_{CES}$	1	mA
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE}=0\text{ V}, V_{GE}=20\text{ V}$ $T_{vj}=25^\circ\text{C}$	$I_{GES}$	200	nA
开通延迟时间 Turn-on delay time	$I_C=40\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}, R_G=12\Omega$ (电感负载) / (inductive load) $T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$t_{d\ on}$	84 80 76	ns
上升时间 Rise time	$I_C=40\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}, R_G=12\Omega$ (电感负载) / (inductive load) $T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$t_r$	50 60 60	
关断延迟时间 Turn-off delay time	$I_C=40\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}, R_G=12\Omega$ (电感负载) / (inductive load) $T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$t_{d\ off}$	264 298 304	
下降时间 Fall time	$I_C=40\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}, R_G=15\Omega$ (电感负载) / (inductive load) $T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$t_f$	203 297 283	mJ
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=40\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}, R_G=12\Omega$ (电感负载) / (inductive load) $T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$E_{on}$	2.50 4.15 4.50	
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=40\text{ A}, V_{CE}=600\text{ V}$ $V_{GE}=\pm 15\text{ V}, R_G=12\Omega$ (电感负载) / (inductive load) $T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$E_{off}$	1.50 1.95 2.10	
结-外壳热阻 IGBT thermal resistance, junction		$R_{thJC}$	0.38	K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\ op}$	-40	150 °C

## 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	$T_{vj}=25^\circ\text{C}$	$V_{RRM}$	1200	V
连续正向直流电流 Continuous DC forward current	$T_C=100^\circ\text{C}, T_{vj\ max}=175^\circ\text{C}$	$I_F$	8	A
正向重复峰值电流 Repetitive peak forward current	$t_p=1\text{ ms}$	$I_{FRM}$	16	A

## Typical Characteristics

### 特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward voltage	$I_F=8A, V_{GE}=0V$ $I_F=8A, V_{GE}=0V$ $I_F=8A, V_{GE}=0V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$V_F$	1.73 1.53 1.48	2.8	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=8A,$ $-di_F/dt=356A/\mu s(T_{vj}=150^{\circ}C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$I_{RM}$	18 22 25		A
反向恢复电荷 Reverse Recovered charge	$I_F=8A,$ $-di_F/dt=356A/\mu s(T_{vj}=150^{\circ}C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$Q_{RR}$	2.45 3.38 3.73		$\mu C$
反向恢复时间 Reverse Recovery Time	$I_F=8A,$ $-di_F/dt=356A/\mu s(T_{vj}=150^{\circ}C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_{rr}$	186 207 218		ns
反向恢复损耗（每脉冲） Reverse recovered energy	$I_F=8A,$ $-di_F/dt=356A/\mu s(T_{vj}=150^{\circ}C)$ $V_R=600V, V_{GE}=-15V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$E_{rec}$	0.65 0.88 0.95		mJ
结-外壳热阻 Diode thermal resistance, junction			$R_{thJC}$	0.45		K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj op}$	-40	175	$^{\circ}C$

# Typical Characteristics

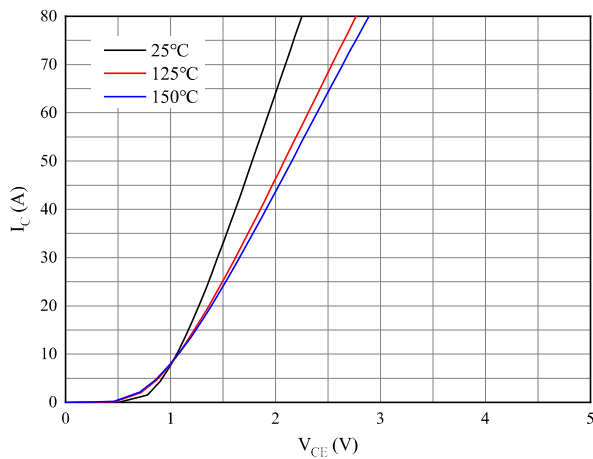


图 1. 典型输出特性 ( $V_{GE}=15V$ )

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

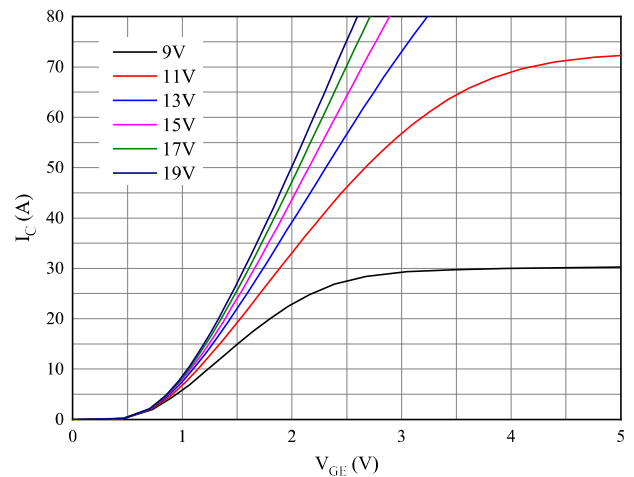


图 2. 典型输出特性 ( $T_{vj}=150^{\circ}C$ )

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

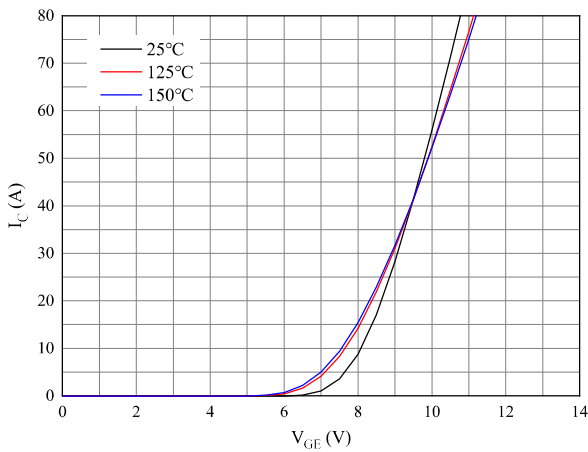


图 3. 典型传输特性 ( $V_{CE}=20V$ )

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

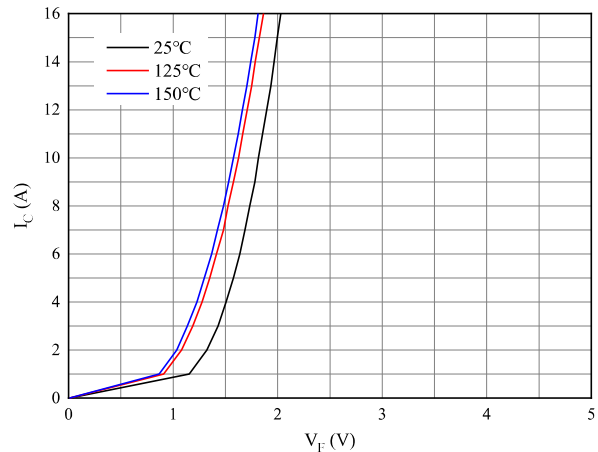


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristic of Diode

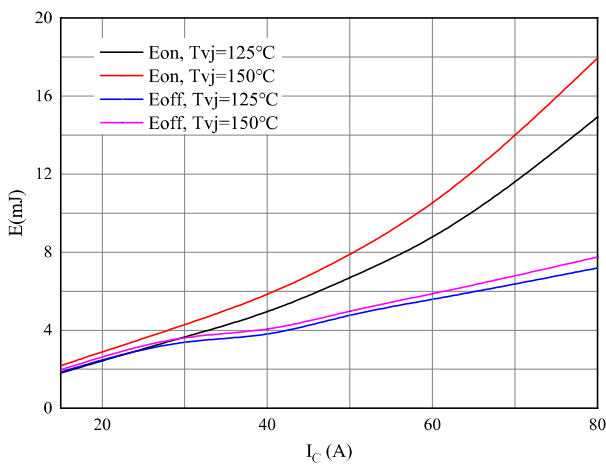


图 5. 开关损耗

Figure 5. Switching losses of IGBT

$V_{GE}=\pm 15V, R_{Gon}=12\Omega, R_{Goff}=12\Omega, V_{CE}=600V$

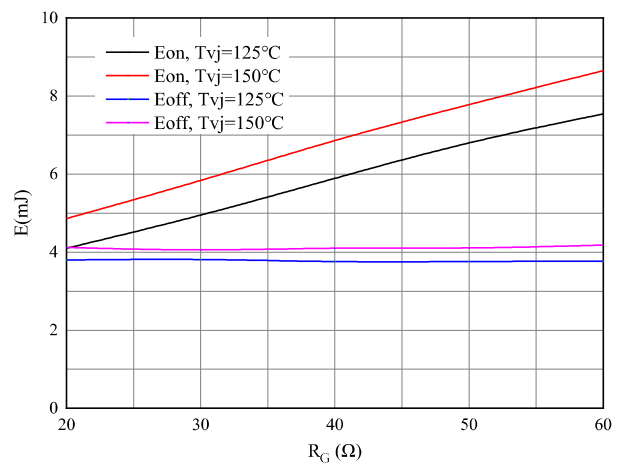


图 6. 开关损耗

Figure 6. Switching losses of IGBT

$V_{GE}=\pm 15V, I_C=8A, V_{CE}=600V$

# Typical Characteristics

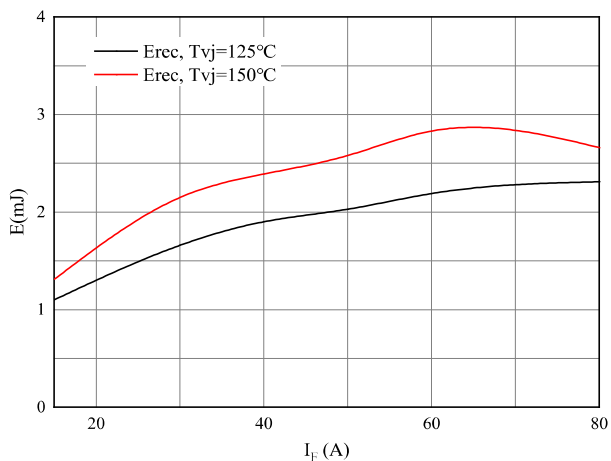


图 7. 开关损耗 二极管

Figure 7. Switching losses of Diode

$R_{gon}=12\Omega, V_{CE}=600V$

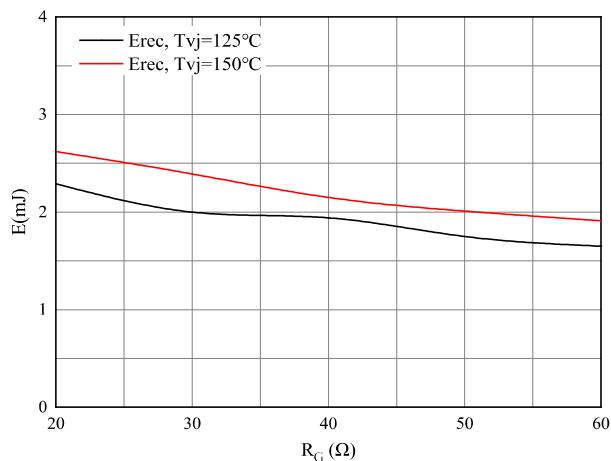


图 8. 开关损耗 二极管

Figure 8. Switching losses of Diode

$I_F=8A, V_{CE}=600V$

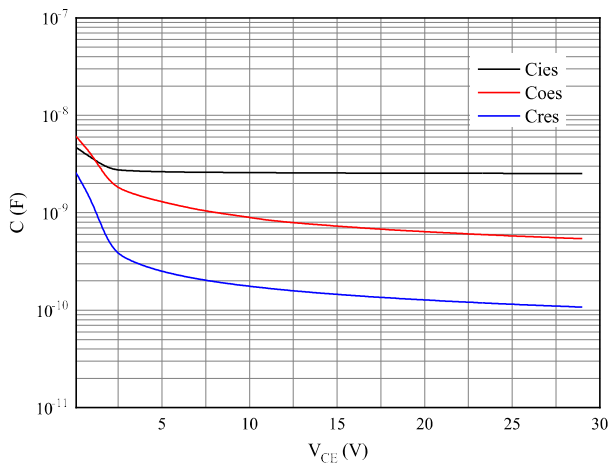
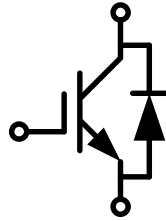


图 9. 电容特性

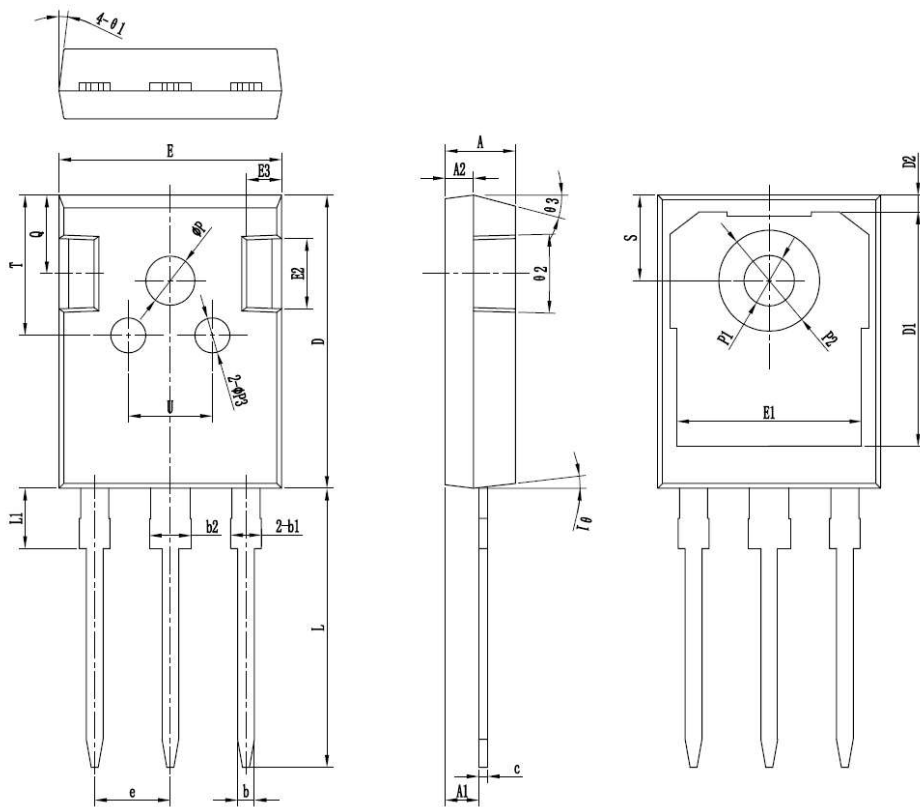
Figure 9. Capacitance characteristic

# Package Outline Dimensions

## 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	0.65	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
θ1	5°	7°	9°
θ2	1°	3°	5°
θ3	13°	15°	17°

\*为关键管控尺寸