

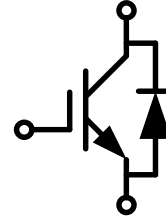


DONGGUAN NANJING ELECTRONICS LTD.,  
**TO-247-3 Plastic-Encapsulate IGBT**

## NJ60R07A6U IGBT Discrete with Anti-Parallel Diode

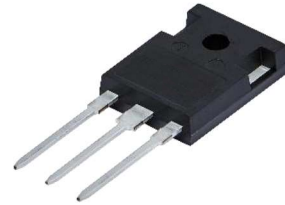
### 电气特性/ Features and Benefits:

- 700V 沟槽栅/场终止工艺  
700V trench gate/field termination process
- 低开关损耗  
Low switching losses
- Vcesat 正温度系数  
Vcesat has a positive temperature coefficient



### 典型应用/ Applications:

- 充电桩  
Charging station
- 不间断电源  
Uninterruptible power supplies
- 逆变器  
Inverters



$V_{CES} = 700V$ ,  $I_{C\ nom} = 60A$  /  $I_{CRM} = 180A$

### 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
NJ60R07A6U	700V	60A	1.47V	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	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	$I_{C\ nom}$	60	A
集电极重复峰值电流 Repetitive peak collector current	$t_p=1\ ms$	$I_{CRM}$	180	A
栅极-发射极电压 Gate emitter voltage		$V_{GE}$	$\pm 20$	V
瞬变栅极-发射极电压 Transient Gate-emitter voltage	$t_p \leq 10\mu s, D < 0.010$	$V_{GE}$	$\pm 25$	V

## Typical Characteristics

总功率损耗 Power dissipation	$T_C=25^\circ\text{C}$ $T_C=100^\circ\text{C}$	$P_{\text{tot}}$	440 220	W
在开关状态下温度 Temperature under switching conditions		$T_{\text{vj op}}$	-40...+175	$^\circ\text{C}$
储存温度 Storage temperature		$T_{\text{stg}}$	-40...+150	$^\circ\text{C}$

### 热特性 / Thermal Characteristics

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
IGBT 热阻, 结-壳 IGBT thermal resistance, junction - case		$R_{\text{th(j-C)}}$		0.34		K/W
二极管热阻, 结-壳 Diode thermal resistance, junction - case		$R_{\text{th(j-C)}}$		0.49		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	$V_{\text{GE}}=15\text{V}, I_{\text{C}}=60\text{A}$ $V_{\text{GE}}=15\text{V}, I_{\text{C}}=60\text{A}$ $V_{\text{GE}}=15\text{V}, I_{\text{C}}=60\text{A}$	$T_{\text{vj}}=25^\circ\text{C}$ $T_{\text{vj}}=150^\circ\text{C}$ $T_{\text{vj}}=175^\circ\text{C}$	$V_{\text{CEsat}}$	1.47 1.81 1.86	1.90	V	
栅极-发射极阈值电压 Gate-Emitter threshold voltage	$I_{\text{C}}=0.6\text{mA}, V_{\text{GE}}=V_{\text{CE}}$	$T_{\text{vj}}=25^\circ\text{C}$	$V_{\text{GE(th)}}$	4.4	5.0	5.6	V
跨导 Transconductance	$V_{\text{CE}}=20\text{V}, I_{\text{C}}=60\text{A}$		$G_{\text{fs}}$	96		S	
输入电容 Input capacitance			$C_{\text{ies}}$	8039		pF	
输出电容 Output capacitance	$f=100\text{kHz}, V_{\text{CE}}=25\text{V}, V_{\text{GE}}=0\text{V}$	$T_{\text{vj}}=25^\circ\text{C}$	$C_{\text{oes}}$	239		pF	
反向传输电容 Reverse transfer capacitance			$C_{\text{res}}$	136		pF	
门极电荷 Gate charge	$I_{\text{C}}=60\text{A}, V_{\text{GE}}=15\text{V}, V_{\text{CE}}=560\text{V}$	$T_{\text{vj}}=25^\circ\text{C}$	$Q_{\text{G}}$	742		nC	
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{\text{CE}}=700\text{V}, V_{\text{GE}}=0\text{V}$	$T_{\text{vj}}=25^\circ\text{C}$	$I_{\text{CES}}$		1	mA	
栅极-发射极漏电流 Gate-emitter leakage current	$V_{\text{CE}}=0\text{V}, V_{\text{GE}}=20\text{V}$	$T_{\text{vj}}=25^\circ\text{C}$	$I_{\text{GES}}$		200	nA	
开通延迟时间 Turn-on delay time	$I_{\text{C}}=60\text{A}, V_{\text{CE}}=400\text{V}$ $V_{\text{GE}}=\pm 15\text{V}, R_{\text{G}}=8\Omega$ (电感负载) / (inductive load)	$T_{\text{vj}}=25^\circ\text{C}$ $T_{\text{vj}}=175^\circ\text{C}$	$t_{\text{d(on)}}$	36 30		ns	
上升时间 Rise time	$I_{\text{C}}=60\text{A}, V_{\text{CE}}=400\text{V}$ $V_{\text{GE}}=\pm 15\text{V}, R_{\text{G}}=8\Omega$ (电感负载) / (inductive load)	$T_{\text{vj}}=25^\circ\text{C}$ $T_{\text{vj}}=175^\circ\text{C}$	$t_{\text{r}}$	112 97		ns	

## Typical Characteristics

关断延迟时间 Turn-off delay time	$I_C=60A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	$t_{d(off)}$	182 212		ns
下降时间 Fall time	$I_C=60A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	$t_f$	49 78		ns
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	$I_C=60A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ $di/dt=600A/\mu s(T_{vj}=175^\circ C)$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	$E_{on}$	2.76 3.53		mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	$I_C=60A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ $dv/dt=10000V/\mu s(T_{vj}=175^\circ C)$ (电感负载) / (inductive load)	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	$E_{off}$	0.75 1.13		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	$T_{vj}=25^\circ C$	$V_{RRM}$	700	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	$I_F=60A, V_{GE}=0V$ $I_F=60A, V_{GE}=0V$ $I_F=60A, V_{GE}=0V$	$T_{vj}=25^\circ C$ $T_{vj}=150^\circ C$ $T_{vj}=175^\circ C$	$V_F$	1.45 1.55 1.52	2.00	V
反向恢复峰值电流 Peak reverse recovery current	$I_F=60A,$ $-di_F/dt=600A/\mu s(T_{vj}=175^\circ C)$ $V_R=400V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	$I_{RM}$	18 30		A
反向恢复电荷 Reverse Recovered charge	$I_F=60A,$ $-di_F/dt=600A/\mu s(T_{vj}=175^\circ C)$ $V_R=400V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	$Q_{rr}$	1.55 3.99		$\mu C$
反向恢复时间 Reverse Recovery Time	$I_F=60A,$ $-di_F/dt=600A/\mu s(T_{vj}=175^\circ C)$ $V_R=400V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	$t_{rr}$	142 210		ns
反向恢复损耗 (每脉冲) Reverse recovered energy	$I_F=60A,$ $-di_F/dt=600A/\mu s(T_{vj}=175^\circ C)$ $V_R=400V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$	$E_{rec}$	0.38 0.97		mJ

# Typical Characteristics

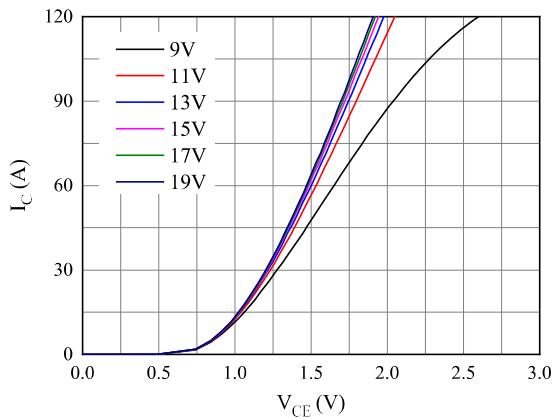


图 1. 典型输出特性 ( $T_{vj}=25^{\circ}\text{C}$ )

Figure 1. Typical output characteristics ( $T_{vj}=25^{\circ}\text{C}$ )

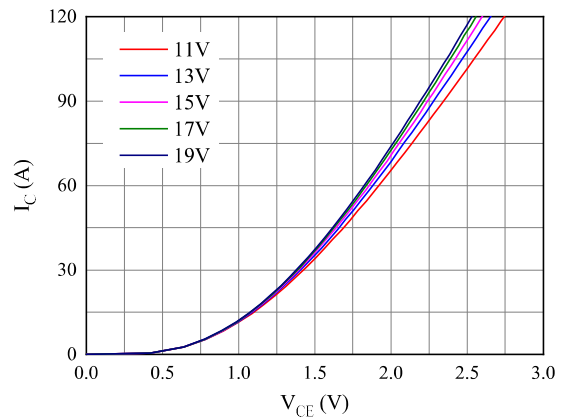


图 2. 典型输出特性 ( $T_{vj}=175^{\circ}\text{C}$ )

Figure 2. Typical output characteristics ( $T_{vj}=175^{\circ}\text{C}$ )

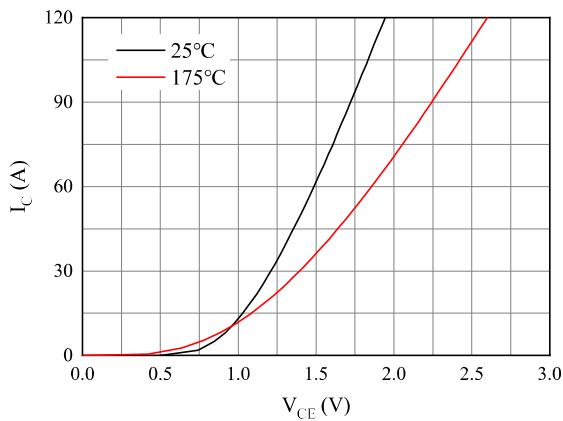


图 3. 典型输出特性 ( $V_{GE}=15\text{V}$ )

Figure 3. Typical output characteristics ( $V_{GE}=15\text{V}$ )

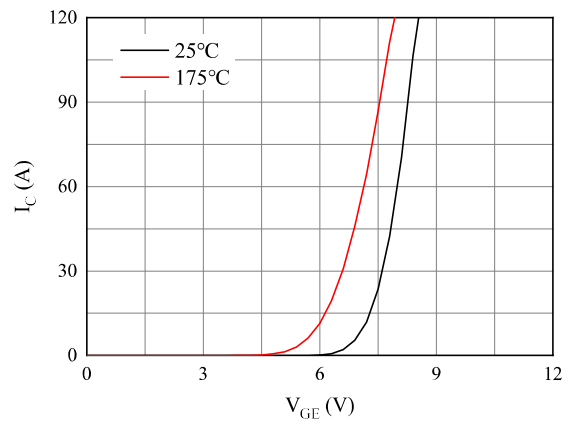


图 4. 典型传输特性 ( $V_{CE}=20\text{V}$ )

Figure 4. Typical transfer characteristic ( $V_{CE}=20\text{V}$ )

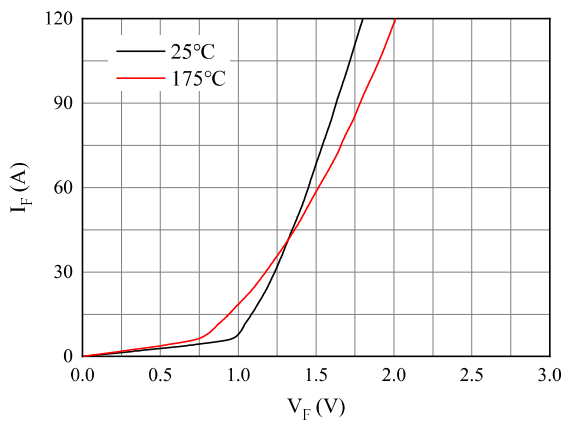


图 5. 正向偏压特性 二极管

Figure 5. Forward characteristic of Diode

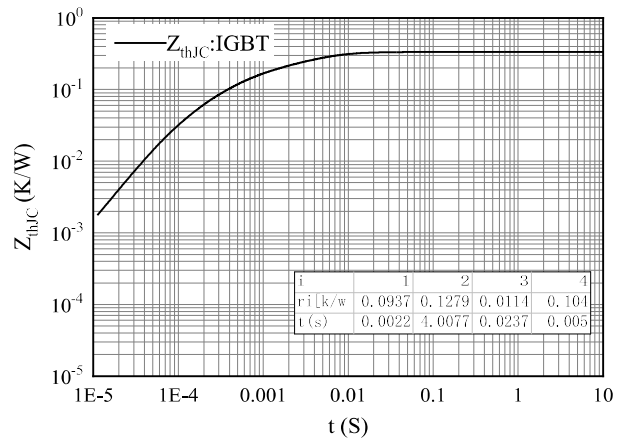


图 6. 瞬态热阻抗 IGBT

Figure 6. Transient thermal impedance IGBT,  $Z_{thJC}=f(t)$

# Typical Characteristics

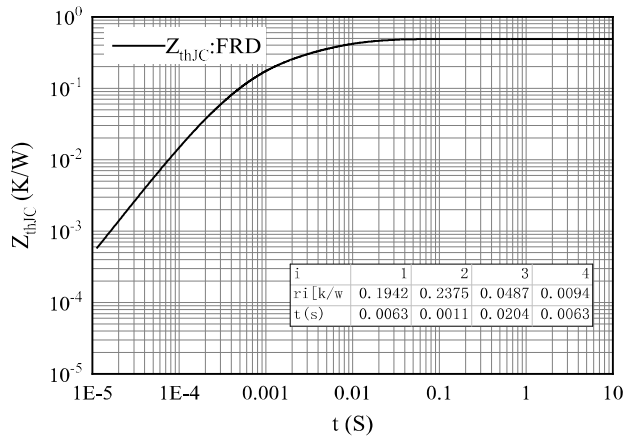


图 7. 瞬态热阻抗 IGBT

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

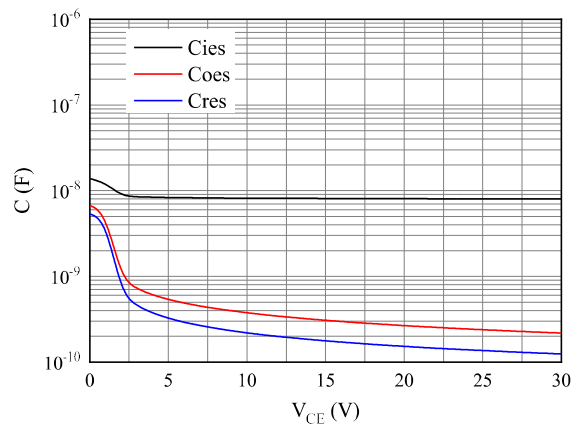


图 8. 电容特性

Figure 8. Capacitance characteristic

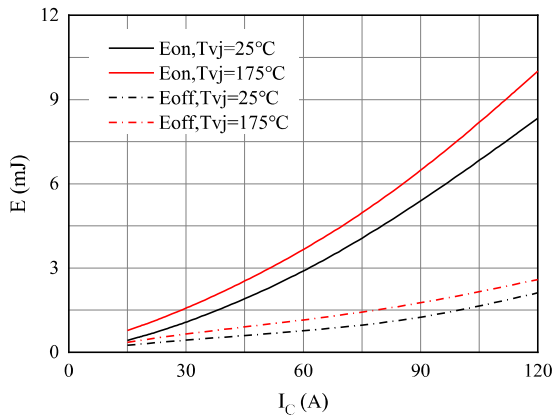


图 9. 开关损耗

Figure 9. Switching losses of IGBT  
 $V_{GE}=\pm 15V, R_{gon}=8\Omega, R_{goff}=8\Omega, V_{CE}=400V$

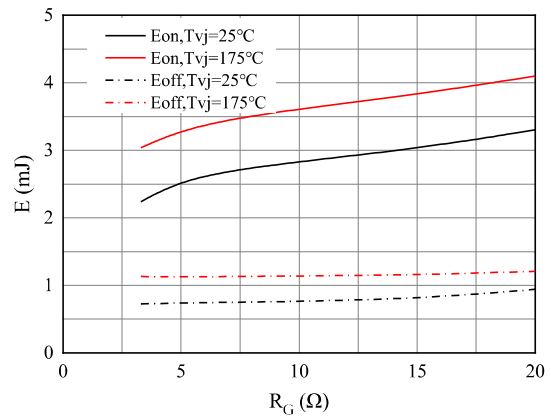


图 10. 开关损耗

Figure 10. Switching losses of IGBT  
 $V_{GE}=\pm 15V, I_C=60A, V_{CE}=400V$

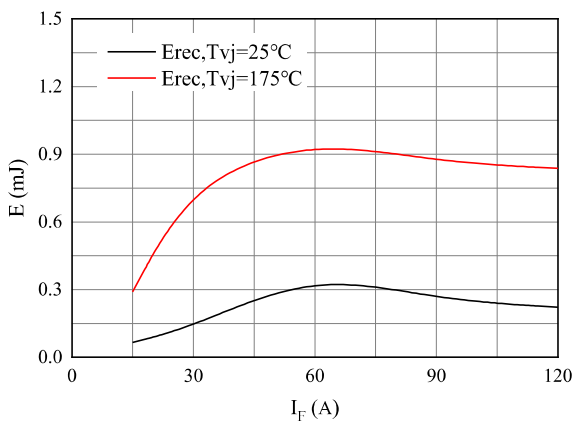


图 11. 开关损耗 二极管

Figure 11. Switching losses of Diode  
 $R_{gon}=8\Omega, V_{CE}=400V$

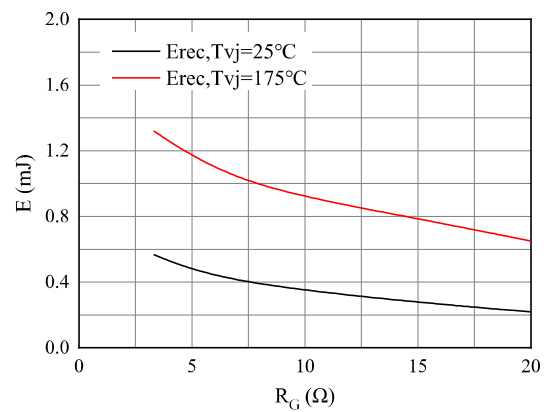
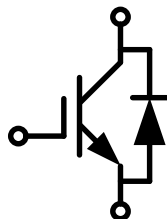


图 12. 开关损耗 二极管

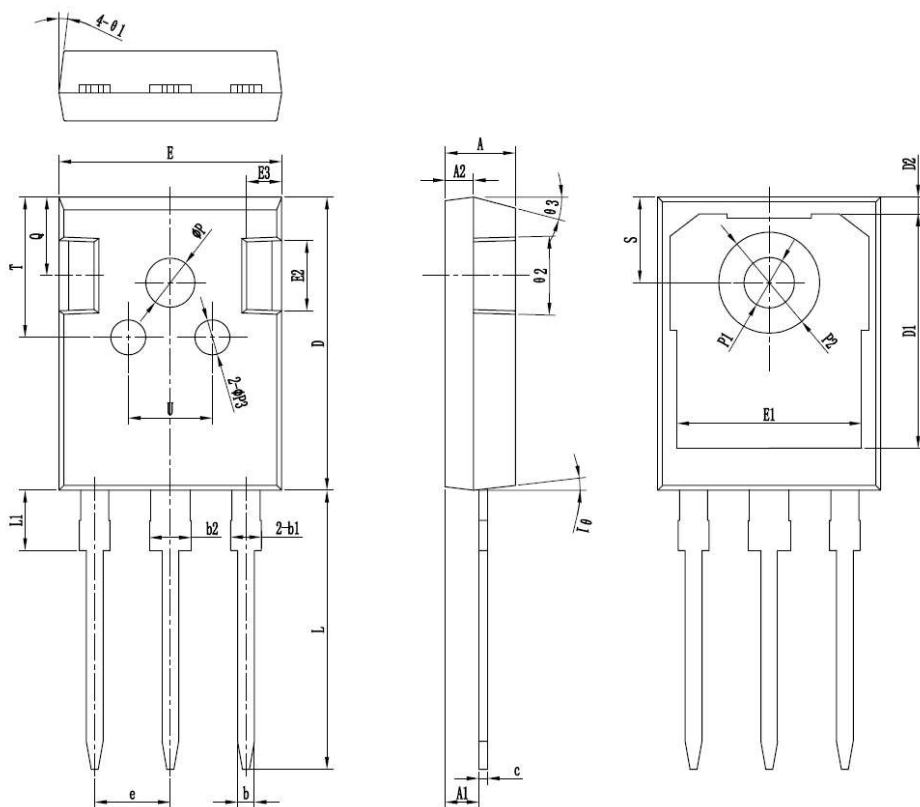
Figure 12. Switching losses of Diode  
 $I_F=60A, V_{CE}=400V$

# Package Outline Dimensions

## 接线图 / Circuit diagram



## 封装尺寸 / Package outlines



序号	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
*L	5.40	5.44	5.48
*L1	19.80	19.92	20.10
*L2	-	-	4.30
*L3	3.70	3.80	3.90
*ΦP1	3.50	3.60	3.70
ΦP2	7.00	7.20	7.40
ΦP3	2.40	2.50	2.60
Q	5.60	5.80	6.00
*R	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