

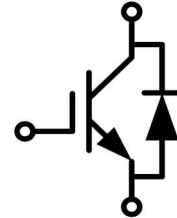


DONGGUAN NANJING ELECTRONICS LTD.,  
**TO-247-3 Plastic-Encapsulate IGBT**

## NJ50R07A6 IGBT Discrete with Anti-Parallel Diode

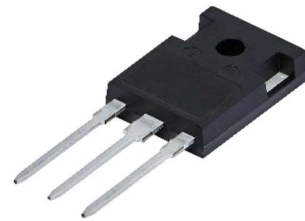
### 电气特性/ Features And Benefits:

- 650V 沟槽栅/场终止工艺  
650V 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



### 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
NJ50R07A6	650V	50A	1.58V	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	$T_{vj}=25^{\circ}C$	$V_{CES}$	650	V
连续集电极直流电流 Continuous DC collector current	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$ $T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	$I_C$	80 50	A

## Typical Characteristics

集电极脉冲电流 Pulsed collector current, tp limited by $T_{vj\max}$		$I_{C\text{puls}}$	200	A
总功率损耗 Total power dissipation	$T_C=25^\circ\text{C}, T_{vj\max}=175^\circ\text{C}$ $T_C=100^\circ\text{C}, T_{vj\max}=175^\circ\text{C}$	$P_{\text{tot}}$	295 150	W
栅极-发射极电压 Gate emitter Voltage	$t_p \leq 10\mu\text{s}, D < 0.010$	$V_{GE}$	$\pm 20$ $\pm 30$	V
在开关状态下温度 Temperature under switching conditions		$T_{vj\text{op}}$	-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.	
热阻, 结-环境 Thermal resistance, junction-ambient		$R_{th(j-a)}$			40	K/W
IGBT 热阻, 结-壳 IGBT thermal resistance, junction - case		$R_{th(j-C)}$		0.51		K/W
二极管热阻, 结-壳 Diode thermal resistance, junction - case		$R_{th(j-C)}$		0.43		K/W

### 特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
击穿电压 Collector-emitter breakdown voltage	$V_{GE}=0\text{V}, I_C=0.25\text{mA}$	$V_{(BR)CES}$	650			V
集电极-发射极饱和电压 Collector-Emitter saturation Voltage	$V_{GE}=15\text{V}, I_C=50\text{A}$ $V_{GE}=15\text{V}, I_C=50\text{A}$ $V_{GE}=15\text{V}, I_C=50\text{A}$	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	$V_{CE\text{sat}}$	1.58 1.87 1.95	2.10	
栅极-发射极阈值电压 Gate-Emitter threshold Voltage	$I_C=0.5\text{mA}, V_{GE}=V_{CE}$	$T_{vj}=25^\circ\text{C}$	$V_{GE(th)}$	4.2 5.0	5.8	
跨导 Transconductance	$V_{CE}=20\text{V}, I_C=50\text{A}$		$G_{fs}$	77		S
输入电容 Input capacitance	$f=100\text{kHz}, V_{CE}=25\text{V}, V_{GE}=0\text{V}$ $T_{vj}=25^\circ\text{C}$			$C_{ies}$	5.46	nF
输出电容 Output capacitance				$C_{oes}$	0.20	
反向传输电容 Reverse transfer capacitance				$C_{res}$	0.10	
门极电荷 Gate charge	$I_C=50\text{A}, V_{GE}=15\text{V}, V_{CE}=520\text{V}$	$T_{vj}=25^\circ\text{C}$	$Q_G$	0.53		$\mu\text{C}$

## Typical Characteristics

集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE}=650V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$ $T_{vj}=175^{\circ}C$	$I_{CES}$		2000	50	$\mu A$
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	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_{don}$		33 21 19		ns
上升时间 Rise time	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_r$		75 67 65		
关断延迟时间 Turn-off delay time	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_{doff}$		21 32 38		
下降时间 Fall time	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_f$		41 62 62		
开通损耗能量（每脉冲） Turn-on energy loss per pulse	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$E_{on}$		2.37 2.88 3.10		
关断损耗能量（每脉冲） Turn-off energy loss per pulse	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$E_{off}$		0.60 0.73 0.76		mJ
开关损耗能量（每脉冲） Total switching energy	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (电感负载) / (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$E_{ts}$		2.97 3.61 3.86		

## 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	$T_{vj}=25^{\circ}C$	$V_{RRM}$	650	V
连续正向直流电流 Continuous DC forward current	$T_C=25^{\circ}C, T_{vj\max}=175^{\circ}C$ $T_C=100^{\circ}C, T_{vj\max}=175^{\circ}C$	$I_F$	100 50	A
二极管脉冲电流 Diode pulsed current, tp limited by $T_{vj\max}$		$I_{Fpuls}$	150	A

### 特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
正向电压 Forward Voltage	$I_F=50A, V_{GE}=0V$ $I_F=50A, V_{GE}=0V$ $I_F=50A, V_{GE}=0V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$V_F$		1.63 1.42 1.37	2.1 V

## Typical Characteristics

反向恢复峰值电流 Peak reverse recovery current	$I_F=50A,$ $-di_F/dt=400A/\mu s(T_{vj}=150^\circ C)$ $V_R=400V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$I_{RM}$		21 29 32		A
反向恢复电荷 Reverse Recovered charge	$I_F=50A,$ $-di_F/dt=400A/\mu s(T_{vj}=150^\circ C)$ $V_R=400V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$Q_{rr}$		1.48 3.26 3.95		$\mu C$
反向恢复时间 Reverse Recovery Time	$I_F=50A,$ $-di_F/dt=400A/\mu s(T_{vj}=150^\circ C)$ $V_R=400V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$t_{rr}$		133 199 218		ns
反向恢复损耗（每脉冲） Reverse recovered energy	$I_F=50A,$ $-di_F/dt=400A/\mu s(T_{vj}=150^\circ C)$ $V_R=400V, V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$E_{rec}$		0.34 0.66 0.78		mJ

# Typical Characteristics

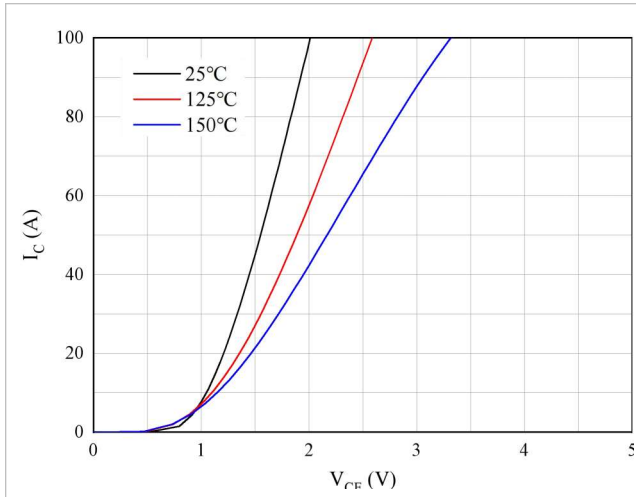


图 1. 典型输出特性 ( $V_{GE}=15V$ )

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

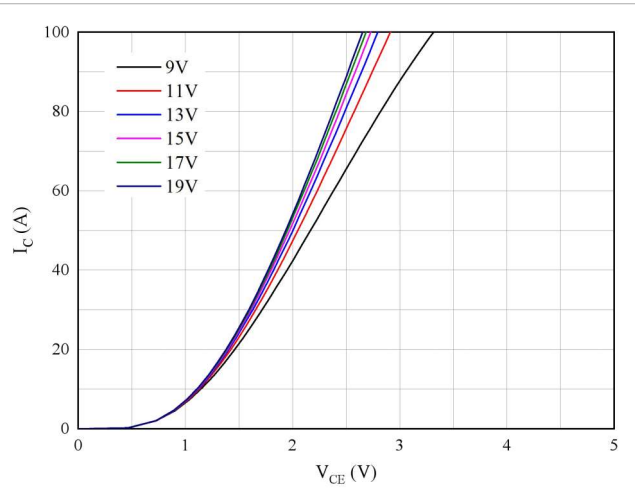


图 2. 典型输出特性 ( $T_{vj}=150^{\circ}C$ )

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

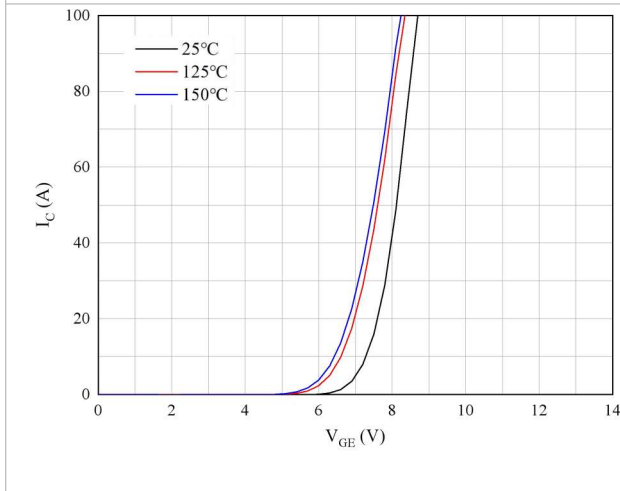


图 3. 典型传输特性 ( $V_{CE}=20V$ )

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

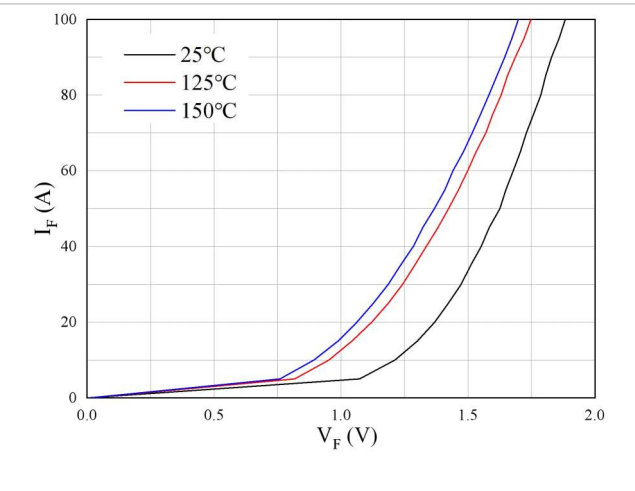


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristic of Diode

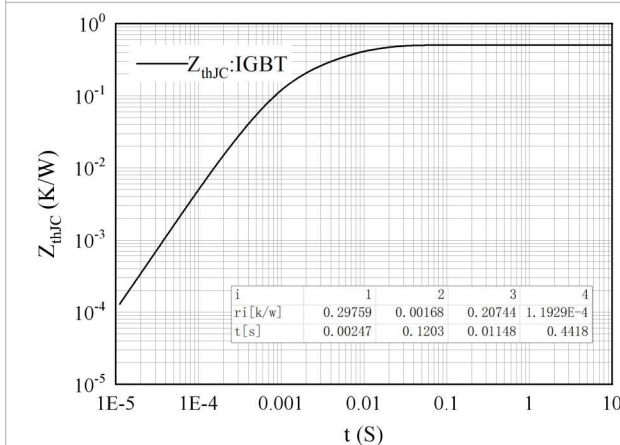


图 5. 瞬态热阻抗 IGBT

Figure 5. Transient thermal impedance IGBT,  
 $Z_{thJC}=f(t)$

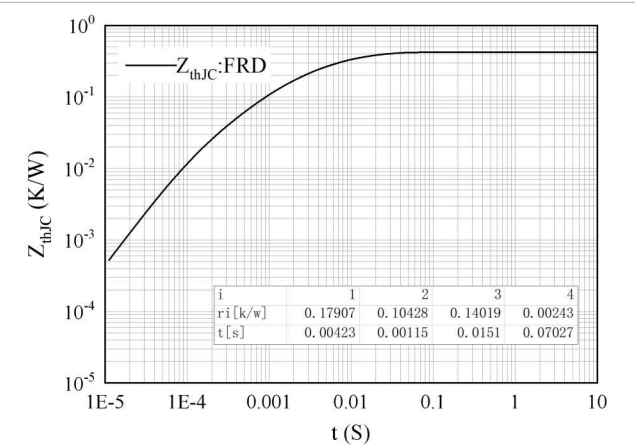


图 6. 瞬态热阻抗 FRD

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

# Typical Characteristics

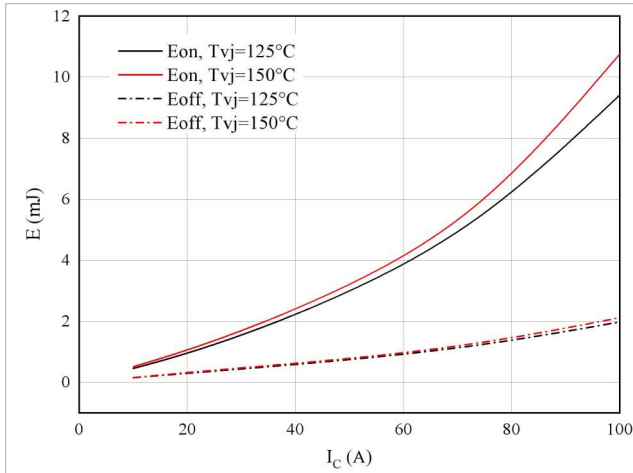


图 7. 开关损耗

Figure 7. Switching losses of IGBT

VGE=±15V, RGon=8Ω, Rgoff=8Ω, VCE=400V

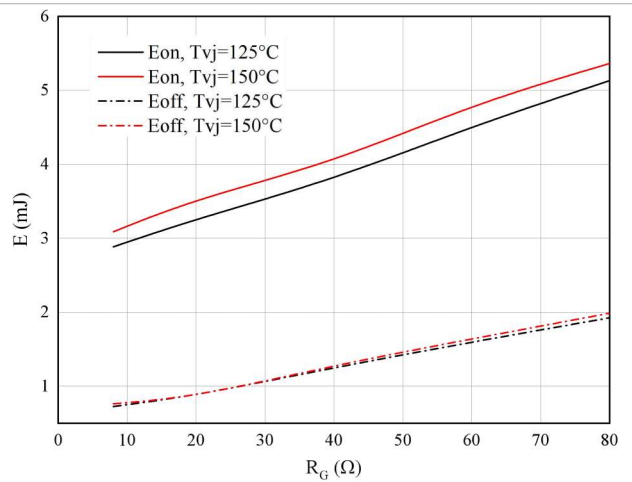


图 8. 开关损耗

Figure 8. Switching losses of IGBT

VGE=±15V, IC=50A, VCE=400V

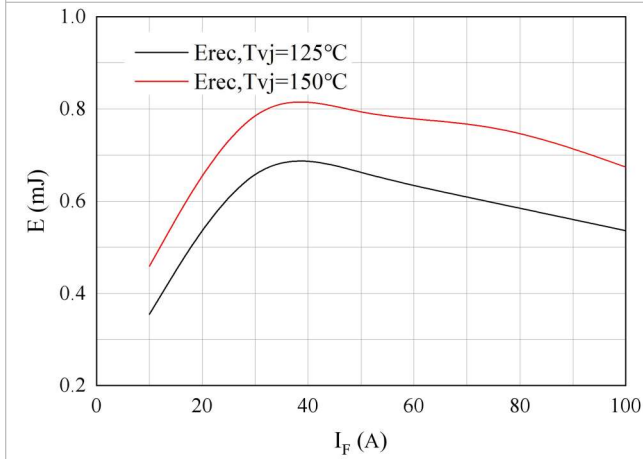


图 9. 开关损耗 二极管

Figure 9. Switching losses of Diode

Rgon=8Ω, VCE=400V

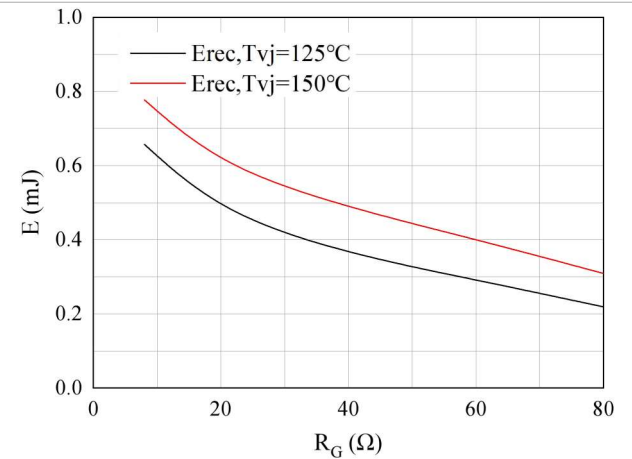


图 10. 开关损耗 二极管

Figure 10. Switching losses of Diode

IF=50A, VCE=400V

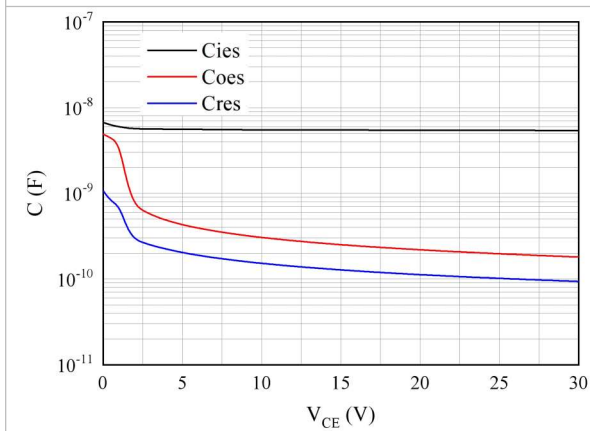
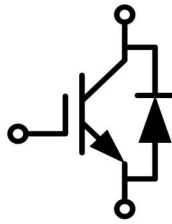


图 11. 电容特性

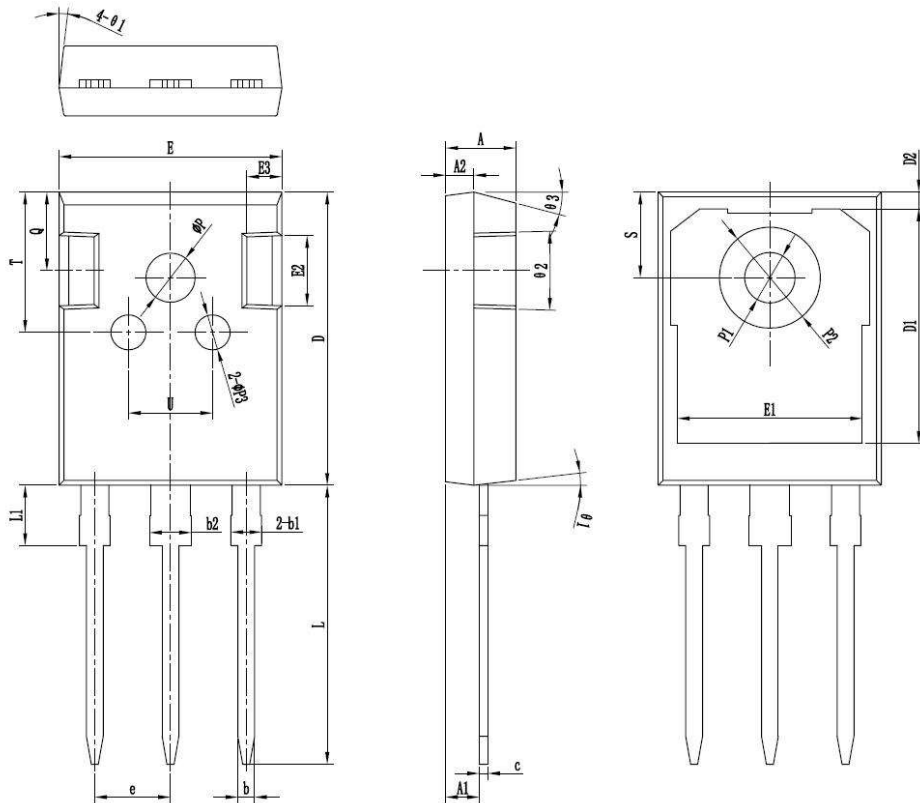
Figure 11. Capacitance characteristic

# Package Outline Dimensions

接线图 / Circuit diagram



封装尺寸 / Package outlines



序号	单位:mm		
	MIN	NOM	MAX
EA	4.90	5.00	5.10
EA1	2.31	2.41	2.51
A2	1.90	2.00	2.10
EB	1.15	1.20	1.25
EB1	1.95	2.10	2.25
EB2	2.95	3.10	3.25
EC	0.55	0.60	0.65
ED	20.90	21.00	21.10
D1	16.35	16.55	16.75
D2	1.05	1.20	1.35
ED	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
EL	5.40	5.44	5.48
EL	19.80	19.92	20.10
EL1	-	-	4.30
EP	3.70	3.80	3.90
EP1	3.50	3.60	3.70
EP2	7.00	7.20	7.40
EP3	2.40	2.50	2.60
Q	5.60	5.80	6.00
QS	6.05	6.15	6.25
T	9.80	10.00	10.20
U	6.00	6.20	6.40
Ø1	5*	7*	9*
Ø2	1*	3*	5*
Ø3	13*	15*	17*

\*为关键管控尺寸