

# HCD90R1K0

## 900V N-Channel Super Junction MOSFET

### Features

- Very Low FOM ( $R_{DS(on)} \times Q_g$ )
- Extremely low switching loss
- Excellent stability and uniformity
- 100% Avalanche Tested
- Built-in ESD Diode

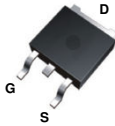
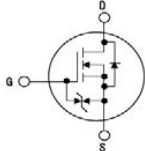
### Application

- Switch Mode Power Supply (SMPS)
- TV power & LED Lighting Power
- AC to DC Converters
- Telecom

### Key Parameters

Parameter	Value	Unit
$BV_{DSS} @ T_{j,max}$	950	V
$I_D$	5.5	A
$R_{DS(on), max}$	1.0	$\Omega$
$Q_g, Typ$	13.7	nC

### Package & Internal Circuit

D-PAK	SYMBOL
	

### Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-Source Voltage	900	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ )	5.5	A
	Drain Current - Continuous ( $T_C = 100^\circ\text{C}$ )	3.5	A
$I_{DM}^{1)}$	Drain Current - Pulsed	16.5	A
$E_{AS}^{2)}$	Single Pulsed Avalanche Energy	77	mJ
$I_{AR}$	Avalanche Current	1.35	A
dv/dt	MOSFET dv/dt ruggedness, $V_{DS}=0\dots 400\text{V}$	50	V/ns
dv/dt	Reverse diode dv/dt, $V_{DS}=0\dots 400\text{V}$ , $I_{DS}\leq I_D$	15	V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	66	W
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

### Thermal Resistance Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	1.9	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	$^\circ\text{C}/\text{W}$

**Electrical Characteristics**  $T_J=25\text{ }^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>On Characteristics</b>						
$V_{GS}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 220\ \mu\text{A}$	2.0	-	4.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\ \text{V}, I_D = 1.35\ \text{A}$	-	0.87	1.0	$\Omega$
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\ \text{V}, I_D = 1\ \text{mA}$	900	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 900\ \text{V}, V_{GS} = 0$	-	-	1	$\mu\text{A}$
		$V_{DS} = 900\ \text{V}, T_C = 150\text{ }^\circ\text{C}$	-	-	100	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage Current	$V_{GS} = \pm 20\ \text{V}, V_{DS} = 0\ \text{V}$	-	-	$\pm 1$	$\mu\text{A}$
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 500\ \text{V}, V_{GS} = 0\ \text{V},$ $f = 1.0\ \text{MHz}$	-	602	-	pF
$C_{oss}$	Output Capacitance		-	13.3	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	2.64	-	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Time	$V_{DS} = 450\ \text{V}, I_D = 2.8\ \text{A},$ $R_G = 25\ \Omega$ (Note 3,4)	-	23	-	ns
$t_r$	Turn-On Rise Time		-	18	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	74	-	ns
$t_f$	Turn-Off Fall Time		-	17	-	ns
$Q_{g()}$	Total Gate Charge	$V_{DS} = 720\ \text{V}, I_D = 2.8\ \text{A},$ $V_{GS} = 10\ \text{V}$ (Note 3,4)	-	13.7	-	nC
$Q_{gs}$	Gate-Source Charge		-	2.9	-	nC
$Q_{gd}$	Gate-Drain Charge		-	4.2	-	nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain-Source Diode Forward Current		-	-	5.5	A
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current		-	-	16.5	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\ \text{V}, I_S = 2.8\ \text{A}$	-	-	1.3	V
$t_{rr}$	Reverse Recovery Time	$V_R = 400\ \text{V}, I_F = 2.8\ \text{A}$ $di_F/dt = 100\ \text{A}/\mu\text{s}$	-	252	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	1.8	-	$\mu\text{C}$

**Notes :**

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $I_{AS}=1.35\text{A}$   $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25\text{ }^\circ\text{C}$
3. Pulse Test : Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$
4. Essentially Independent of Operating Temperature

# Typical Characteristics

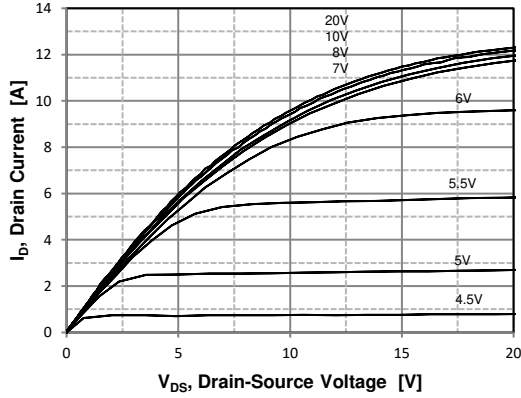


Figure 1. On Region Characteristics

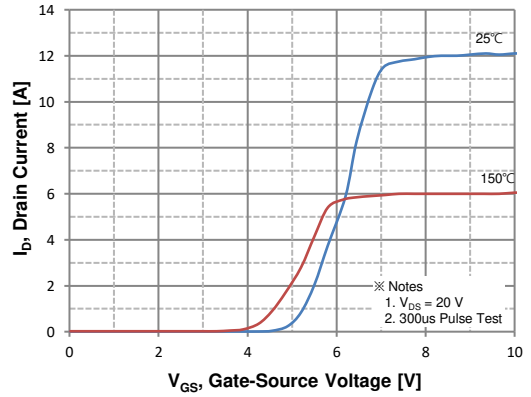


Figure 2. Transfer Characteristics

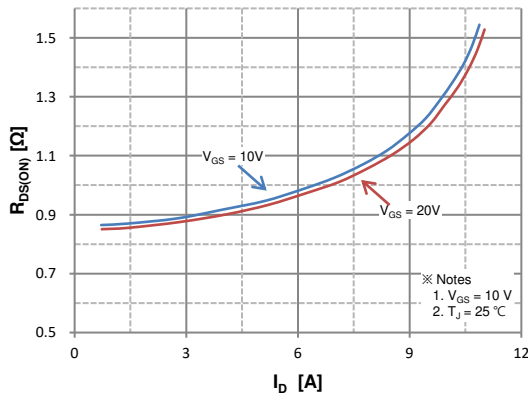


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

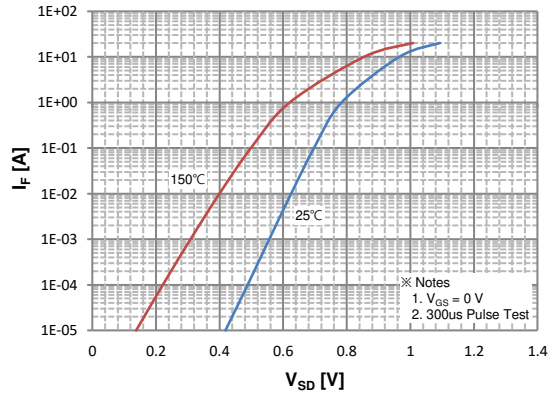


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

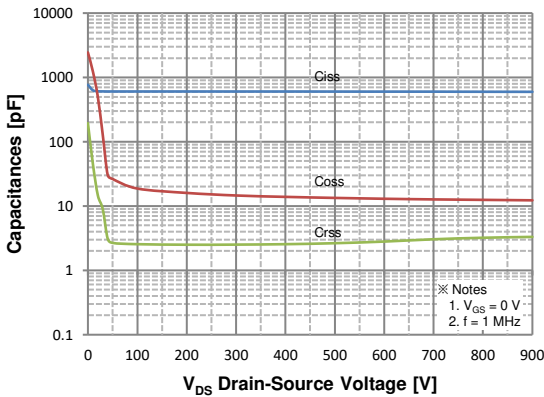


Figure 5. Capacitance Characteristics

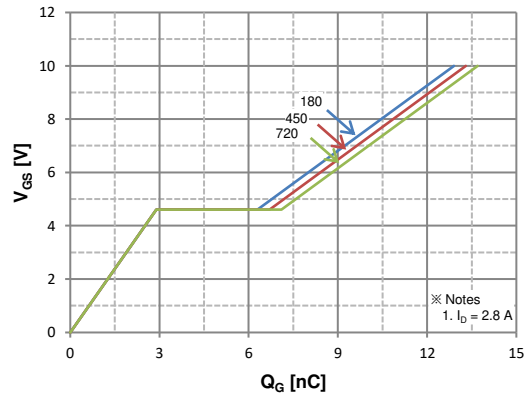
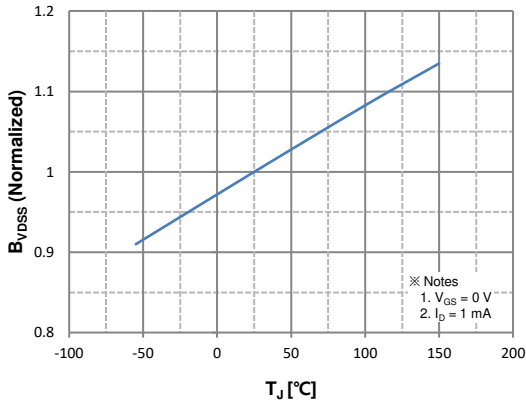
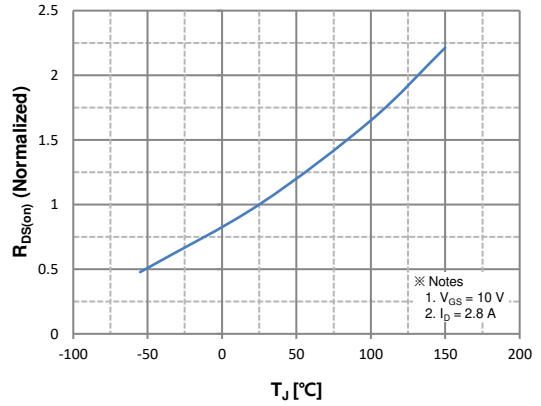


Figure 6. Gate Charge Characteristics

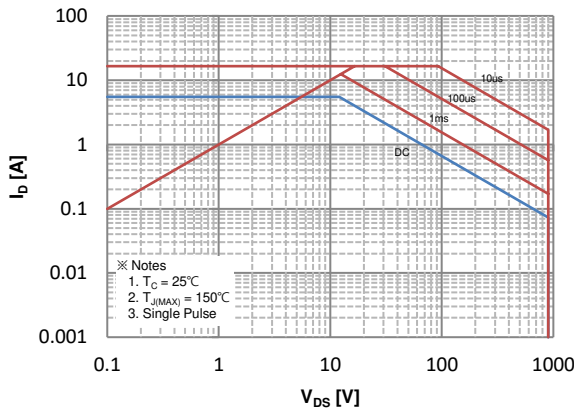
### Typical Characteristics



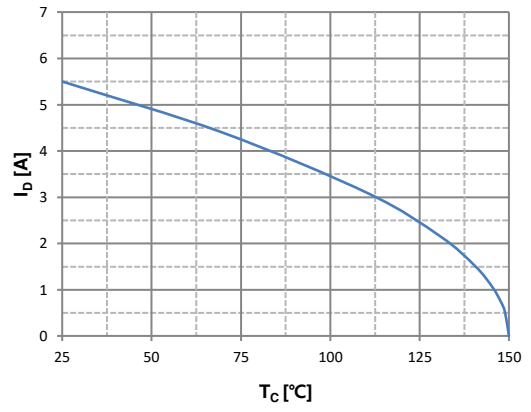
**Figure 7. Breakdown Voltage Variation vs. Temperature**



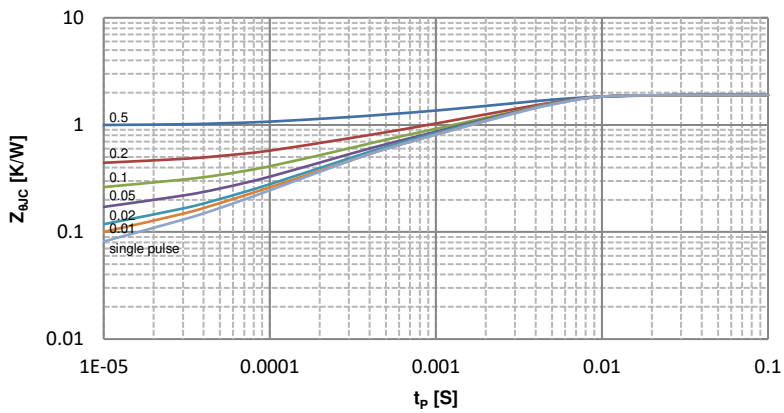
**Figure 8. On-Resistance Variation vs. Temperature**



**Figure 9. Maximum Safe Operating Area**

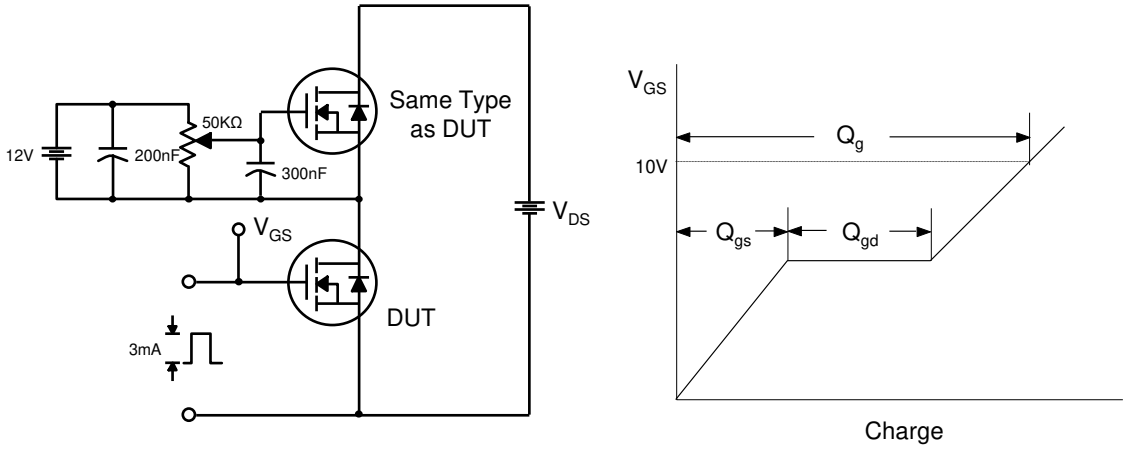


**Figure 10. Maximum Drain Current vs. Case Temperature**

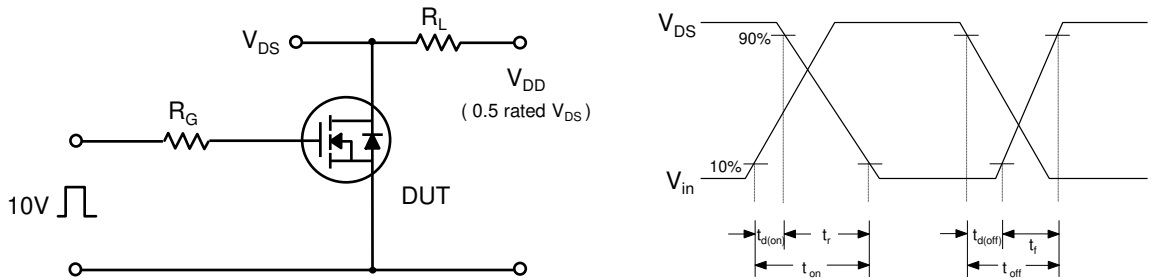


**Figure 11. Transient Thermal Response Curve**

**Fig 12. Gate Charge Test Circuit & Waveform**



**Fig 13. Resistive Switching Test Circuit & Waveforms**



**Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms**

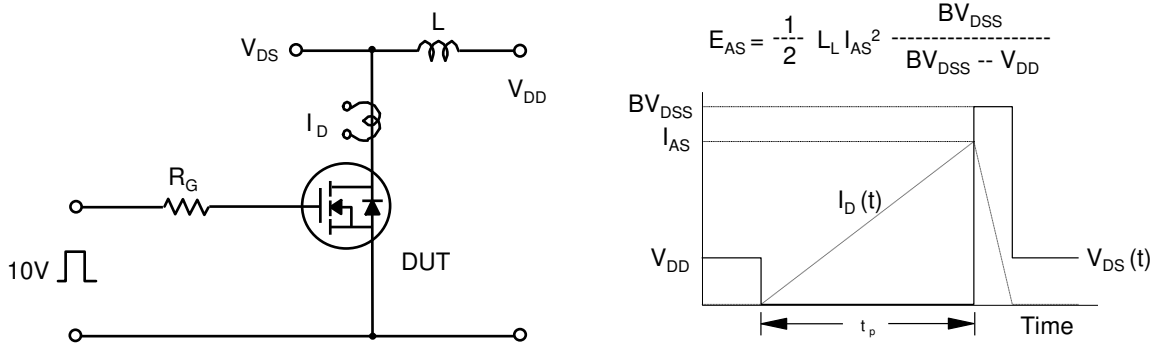
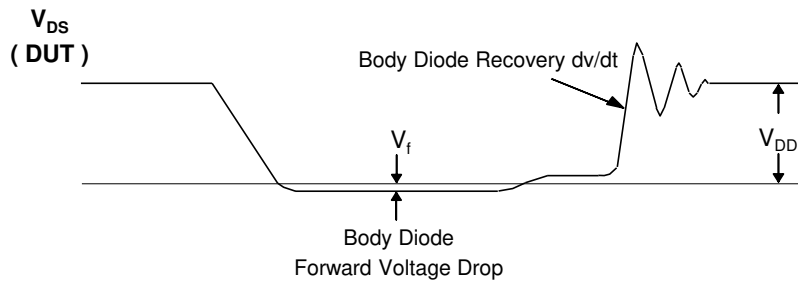
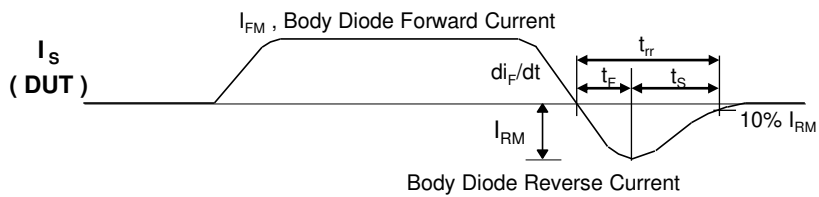
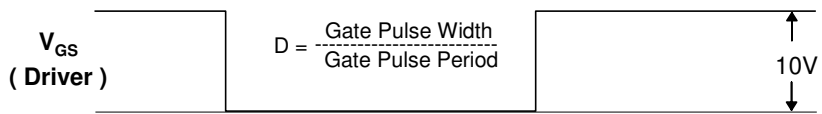
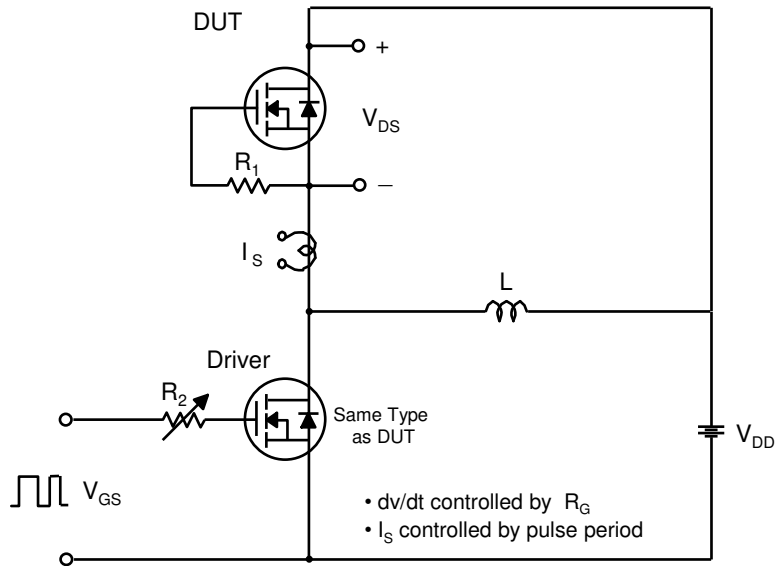


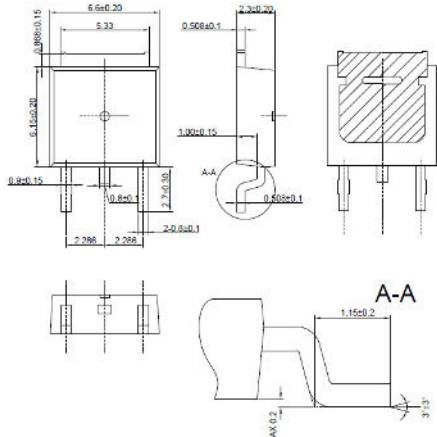
Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimension

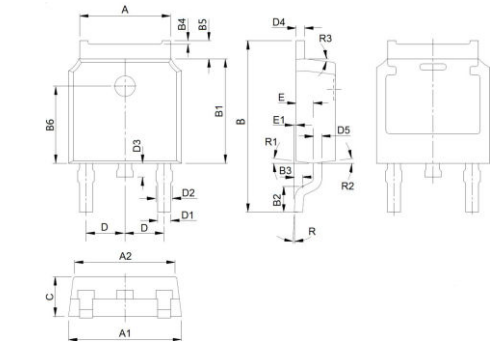
D-PAK (TO-252A)

GZSM



1: 塑封体为光面R=0.2  
2: 未标注公差部分为±0.15mm.

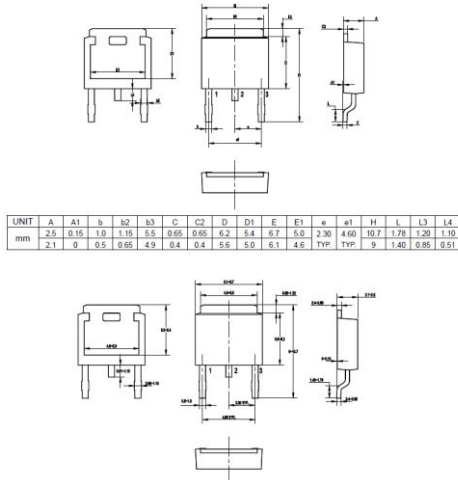
JINTIAN



Symbol	Dimensions (mm)	Symbol	Dimensions (mm)	Symbol	Dimensions (mm)
A	5.7±0.2	B5	0.95±0.1	D5	0.5±0.08
A1	6.6±0.2	B6	4.5±0.15	E	1.01±0.15
A2	5.8±0.2	C	2.3±0.15	E1	0.1±0.05
B	9.9±0.4	D	2.286 (typ.)	R	3° ±3°
B1	6.1±0.2	D1	0.76±0.1	R1	7° (typ.)
B2	1.5±0.15	D2	0.91±0.1	R2	7° (typ.)
B3	0.5±0.1	D3	0.8±0.15	R3	7° (typ.)
B4	0.1 (typ.)	D4	0.5±0.08		

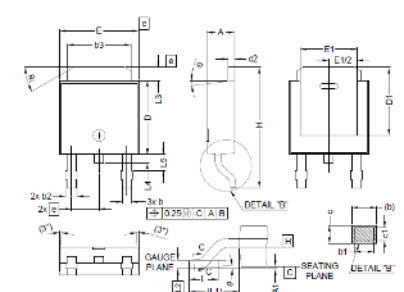
变更前	
D1	0.62±0.15
D2	0.75±0.15

SEMTECH



UNIT	A	A1	b	b2	b3	C	C2	D	D1	E	E1	e	e1	H	L	L3	L4
mm	2.5	0.15	1.0	1.15	5.5	0.65	0.65	6.2	5.4	6.7	5.0	2.30	4.60	10.7	1.78	1.20	1.10
	2.1	0	0.5	0.65	4.9	0.4	0.4	5.6	5.0	6.1	4.5	TYP	TYP	9	1.40	0.85	0.51

ATX



NOTE: 1: 除尺寸标注及公差标注外, 所有尺寸均按 GB/T 194 04 1994  
2: 所有尺寸均以 mm 为单位, 角度均以度表示  
3: 除 A1 外, 所有尺寸均以 mm 为单位  
4: 除 A1 外, 所有尺寸均以 mm 为单位

SYMBOL	MIN	MAX	SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A	2.18	2.59	E	6.35	6.73	81	0°	13°
A1	-	0.13	E1	4.32	-	82	25°	35°
b	0.63	0.89	e	2.29	BSC			
b1	0.64	0.79	H	9.34	10.54			
b2	0.76	1.13	L	1.50	1.78			
b3	4.95	5.46	L1	2.74	REF			
c	0.46	0.61	L2	6.33	BSC			
c1	0.41	0.50	L3	0.89	1.37			
c2	0.46	0.60	L4	-	1.02			
D	3.97	6.22	L5	1.14	1.49			
D1	3.21	-	9	0°	10°			

GEM

