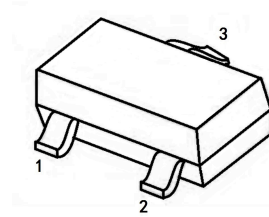**ShenZhen HanKingYuan Electronic Co.,Ltd**

2N7002K

60V N-Channel Mosfet

FEATURES

- $R_{DS(ON)} \leq 2.3\ \Omega\ @V_{GS}=10V$
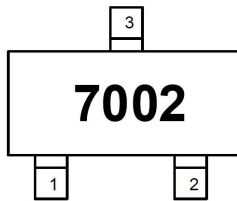- $R_{DS(ON)} \leq 2.7\ \Omega\ @V_{GS}=4.5V$

APPLICATIONS

- Portable appliances

SOT-23

1. GATE
2. SOURCE
3. DRAIN
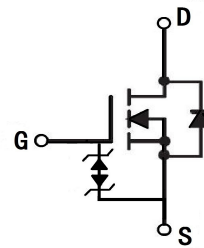
MARKING

7002: Device Code

N-CHANNEL MOSFET

MAXIMUM RATINGS (Ta=25°C unless otherwise noted)

Symbol	Parameter	Max.	Units
V_{DSS}	Drain-Source Voltage	60	V
V_{GSS}	Gate-Source Voltage	±20	V
I_D	Continuous Drain Current	0.34	A
I_{DM}	Pulsed Drain Current	1.7	A
P_D	Power Dissipation	0.83	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	150	℃/W
T_J	Junction Temperature	150	℃
T_{STG}	Storage Temperature Range	-55 to +150	℃

2N7002K

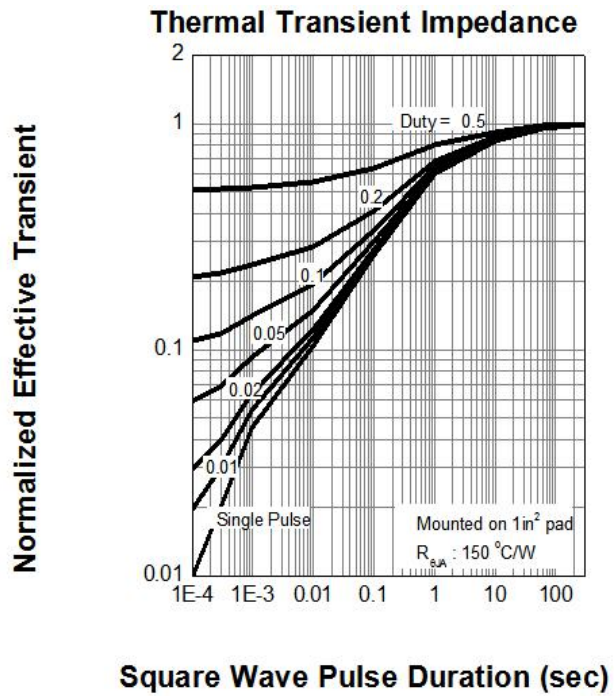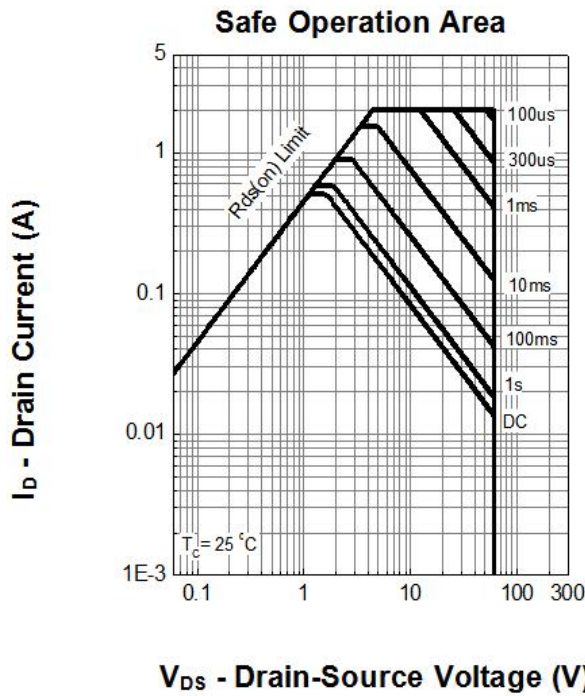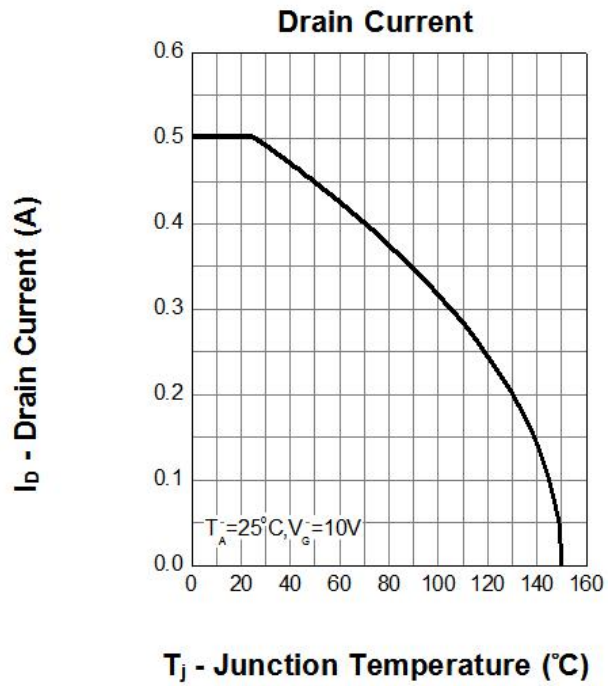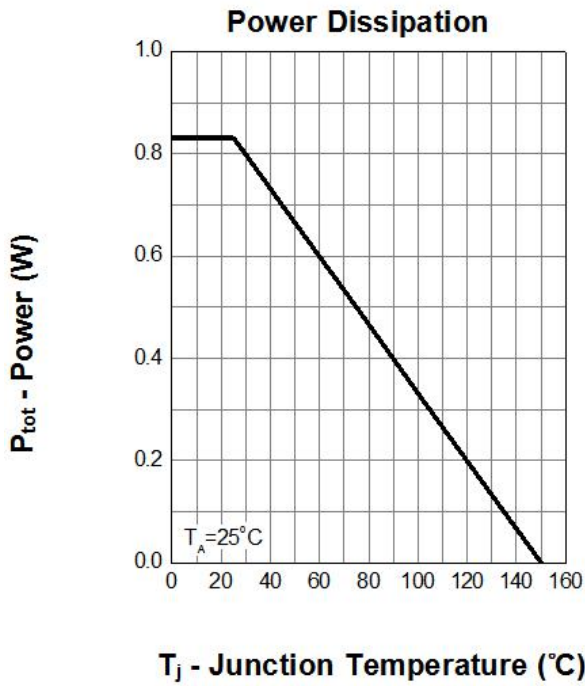**MOSFET ELECTRICAL CHARACTERISTICS Ta=25 °C unless otherwise specified**

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=48V$, $V_{GS}=0V, T_J=25℃$	-	-	1	μA
I_{GSS}	Gate to Body Leakage Current	$V_{GS}=\pm20V, V_{DS}=0V$	-	-	±10	uA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	2.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance note1	$V_{GS}=10V, I_D=0.5A$	-	-	2.3	Ω
		$V_{GS}=4.5V, I_D=0.1A$	-	-	2.7	
Dynamic Characteristics note2						
R_G	Gate Resistance	$V_{GS}=V_{DS}=0V$ f = 1 MHz	-	100	-	Ω
C_{iss}	Input Capacitance	$V_{DS}=25V, V_{GS}=0V$, f = 1.0MHz	-	22.8	-	pF
C_{oss}	Output Capacitance		-	3.5	-	pF
C_{rss}	Reverse Transfer Capacitance		-	2.9	-	pF
Q_g	Total Gate Charge	$V_{DS}=10V, I_D=0.5A$, $V_{GS}=4.5V$	-	280	-	pC
Q_{gs}	Gate-Source Charge		-	82	-	pC
Q_{gd}	Gate-Drain("Miller") Charge		-	201	-	pC
Switching Characteristics note2						
$t_{d(on)}$	Turn-On Delay Time	$V_{GS}=10V, V_{DS}=30V$, $R_G=25\Omega, I_D=0.5A$ $R_L=60\Omega$	-	3.8	-	ns
t_r	Turn-On Rise Time		-	3.4	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	19	-	ns
t_f	Turn-Off Fall Time		-	12	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	0.34	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_{SD}=0.5A$, $T_J=25℃$	-	-	1.3	V
t_{rr}	Reverse Recovery Time	$V_{GS}=0V, I_S=0.5A$, di/dt =100A/μs	-	42	-	ns
Q_{rr}	Reverse Recovery Charge		-	41	-	nC

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%
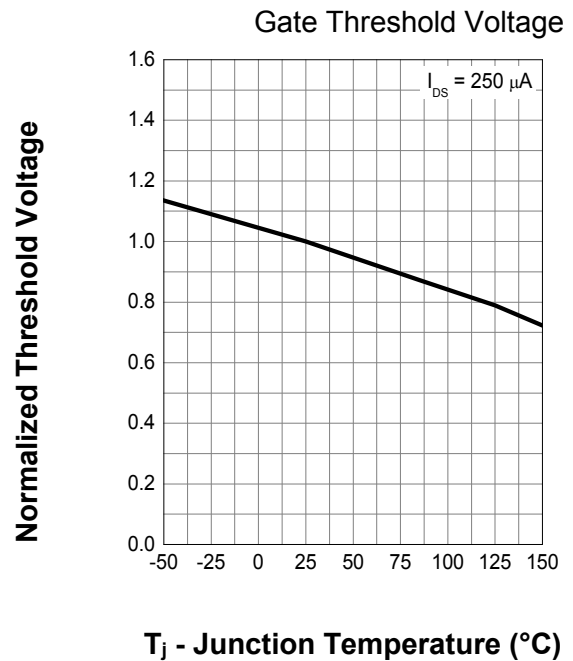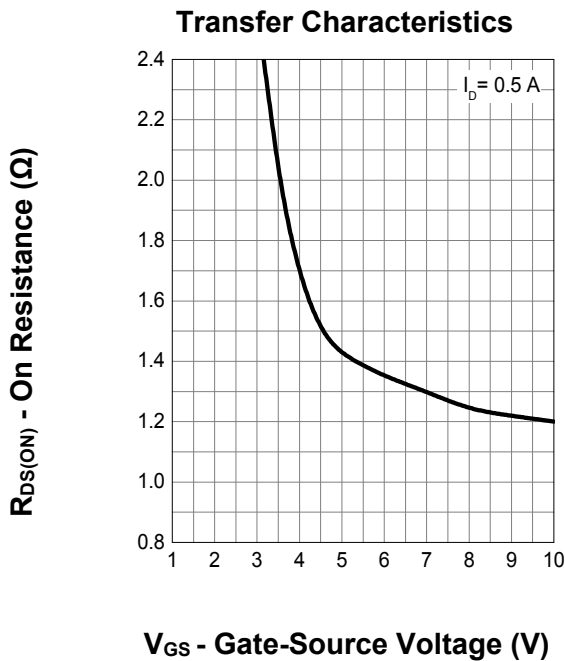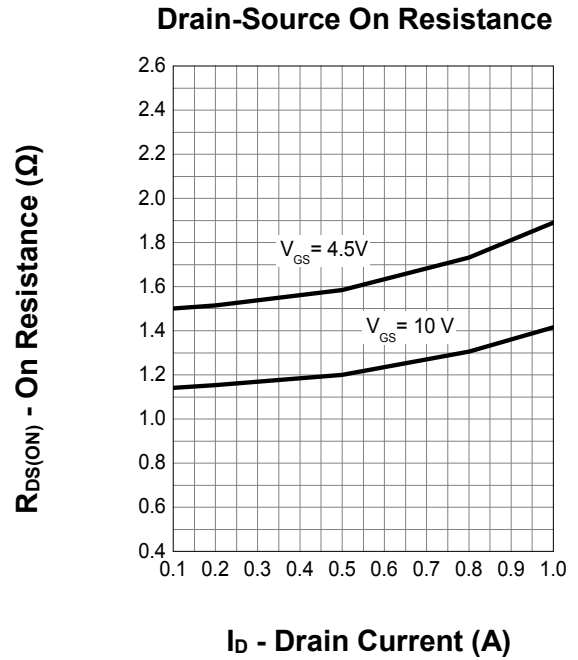
2. Guaranteed by design, not subject to production

TYPICAL PERFORMANCE CHARACTERISTICS

Power Dissipation

$T_A=25^{\circ}C$

P_{tot} - Power (W)

T_j - Junction Temperature (℃)

Drain Current

$T_A=25^{\circ}C, V_G=10V$

I_D - Drain Current (A)

T_j - Junction Temperature (℃)

Safe Operation Area

Rds(on) Limit

100us
300us
1ms
10ms
100ms
1s
DC

$T_C=25^{\circ}C$

I_D - Drain Current (A)

V_{DS} - Drain-Source Voltage (V)

Thermal Transient Impedance

Duty = 0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse

Mounted on 1 in² pad
$R_{\theta JA}$: 150 ℃/W

Normalized Effective Transient

Square Wave Pulse Duration (sec)

TYPICAL PERFORMANCE CHARACTERISTICS (cont.)

Output Characteristics

V_{GS} = 4,5,6,8,10 V

3.0 V

I_D - Drain Current (A)

V_{DS} - **Drain-Source Voltage (V)**

Drain-Source On Resistance

V_{GS} = 4.5V

V_{GS} = 10 V

$R_{DS(ON)}$ - **On Resistance (Ω)**

I_D - **Drain Current (A)**

Transfer Characteristics

I_D = 0.5 A

$R_{DS(ON)}$ - **On Resistance (Ω)**

V_{GS} - **Gate-Source Voltage (V)**

Gate Threshold Voltage

I_{DS} = 250 μA

Normalized Threshold Voltage

T_j - **Junction Temperature (°C)**

TYPICAL PERFORMANCE CHARACTERISTICS (cont.)

Drain-Source On Resistance

$V_{GS} = 10$ V
$I_D = 0.5$ A

Normalized On Resistance

$R_{ON}@T_j = 25\ ^\circ C: 1.2\ \Omega$

T_j - Junction Temperature (°C)

Source-Drain Diode Forward

I_S - Source Current (A)

$T_j = 150\ ^\circ C$
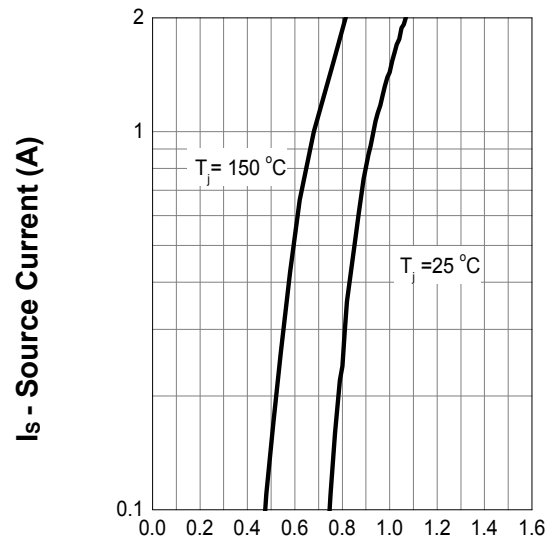
$T_j = 25\ ^\circ C$

V_{SD} - Source-Drain Voltage (V)

Capacitance

Frequency = 1 MHz

C - Capacitance (pF)

Ciss

Coss

Crss
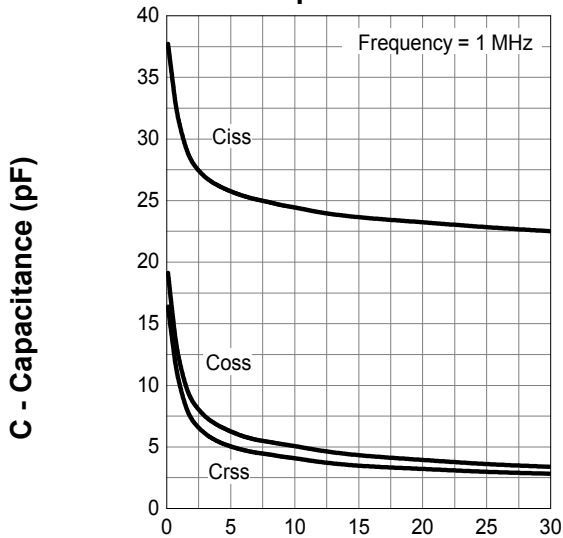
V_{DS} - Drain-Source Voltage (V)

Gate Charge
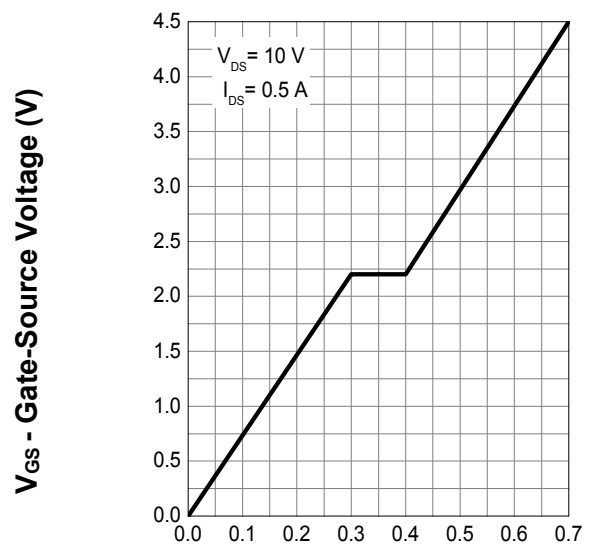
$V_{DS} = 10$ V
$I_{DS} = 0.5$ A

V_{GS} - Gate-Source Voltage (V)

Q_G - Gate Charge (pC)

TYPICAL PERFORMANCE CHARACTERISTICS (cont.)

Drain-Source On Resistance

I_D = 0.5 A

V_{GS} = 4.5 V

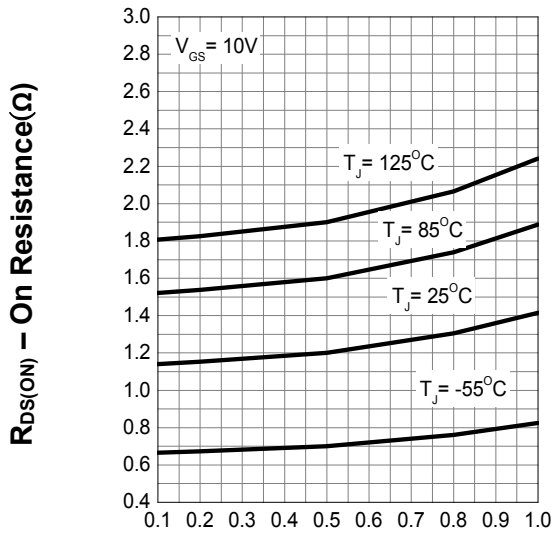V_{GS} = 10 V

R_{ON} @ T_j = 25 ^{o}C: 1.2 Ω

Normalized On Resistance
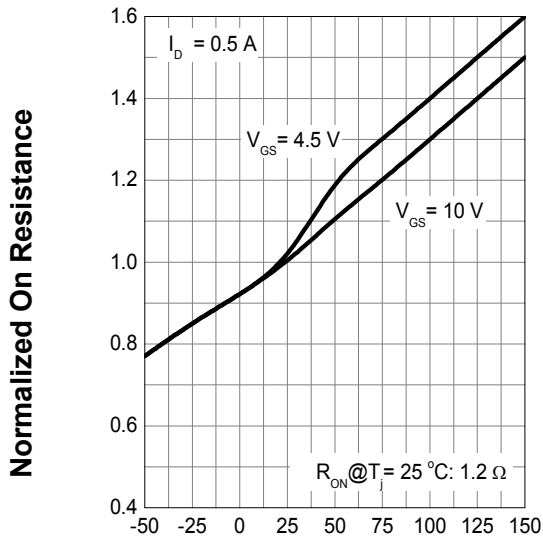
T_j - Junction Temperature (°C)

Drain-Source On Resistance

V_{GS} = 4.5V

T_J= 125°C

T_J= 85°C

T_J= 25°C

T_J= -55°C

$R_{DS(ON)}$ – On Resistance(Ω)
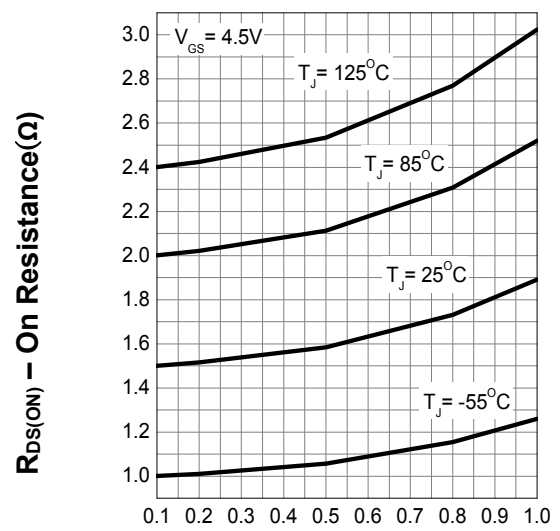
I_D - Drain Current (A)

Drain-Source On Resistance

V_{GS} = 10V

T_J= 125°C

T_J= 85°C

T_J= 25°C

T_J= -55°C

$R_{DS(ON)}$ – On Resistance(Ω)

I_D - Drain Current (A)

T_j=125°C

T_j=25°C

T_j=-55°C

I_D - Drain Current (A)

V_{GS} – Gate Voltage (V)
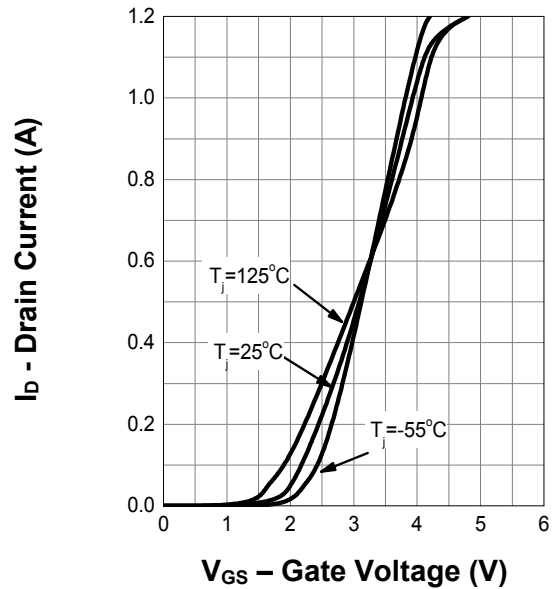
2N7002K

SOT-23 PACKAGE OUTLINE DRAWING
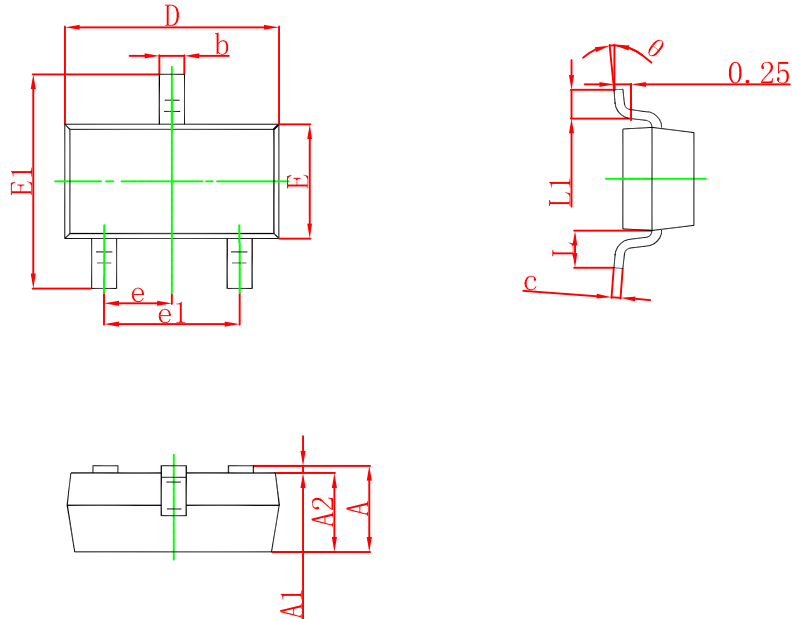
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

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