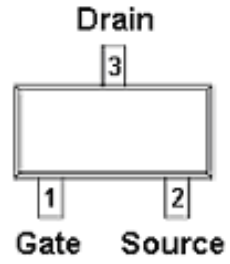
SPN7002
N-Channel Enhancement Mode MOSFET

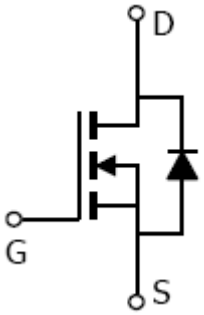
DESCRIPTION
The SPN7002 is the N-Channel enhancement mode field effect transistors are produced using high cell density DMOS technology. These products have been designed to minimize on-state resistance while provide rugged, reliable, and fast switching performance. They can be used in most applications requiring up to 300mA DC and can deliver pulsed currents up to 1.0A. These products are particularly suited for low voltage, low current applications such as small servo motor control, power MOSFET gate drivers, and other switching applications.

APPLICATIONS
- Drivers: Relays, Solenoids, Lamps, Hammers, Display, Memories, Transistors, etc.
- High saturation current capability. Direct Logic-Level Interface: TTL/CMOS
- Battery Operated Systems
- Solid-State Relays

FEATURES
- 60V/0.50A , $R_{DS(ON)}$= 6.0Ω@V_{GS}=10V
- 60V/0.30A , $R_{DS(ON)}$= 7.0Ω@V_{GS}=5V
- Super high density cell design for extremely low $R_{DS(ON)}$
- Exceptional on-resistance and maximum DC current capability
- SOT-23 and SOT-323 package design

PIN CONFIGURATION(SOT-23 , SOT-323)





PART MARKING

Y : Year Code
W : Week Code

SPN7002
N-Channel Enhancement Mode MOSFET

PIN DESCRIPTION

Pin	Symbol	Description
1	G	Gate
2	S	Source
3	D	Drain

ORDERING INFORMATION

Part Number	Package	Part Marking
SPN7002S23RG	SOT-23	S72YW
SPN7002S23RGB	SOT-23	S72YW
SPN7002S32RG	SOT-323	S72YW
SPN7002S32RGB	SOT-323	S72YW

※ Week Code : A ~ Z(1 ~ 26) ; a ~ z(27 ~ 52)
※ SPN7002S23RG : Tape Reel ; Pb – Free
※ SPN7002S23RGB : Tape Reel ; Pb – Free; Halogen – Free
※ SPN7002S32RG : Tape Reel ; Pb – Free
※ SPN7002S32RGB : Tape Reel ; Pb – Free; Halogen – Free

ABSOULTE MAXIMUM RATINGS (T_A=25℃ Unless otherwise noted)

Parameter		Symbol	Typical	Unit
Drain-Source Voltage		V_{DSS}	60	V
Gate –Source Voltage - Continuous		V_{GSS}	±20	V
Gate –Source Voltage - Non Repetitive (t_p < 50μs)		V_{GSS}	±40	V
Continuous Drain Current(T_J=150℃)	T_A=25℃	I_D	0.5	A
Pulsed Drain Current (*)		I_{DM}	1.0	A
Power Dissipation	T_A=25℃	P_D	0.35	W
Operating Junction Temperature		T_J	-55 ~ 150	℃
Storage Temperature Range		T_{STG}	-55 ~ 150	℃
Thermal Resistance-Junction to Ambient		$R_{\theta JA}$	375	℃/W

(*) Pulse width limited by safe operating area

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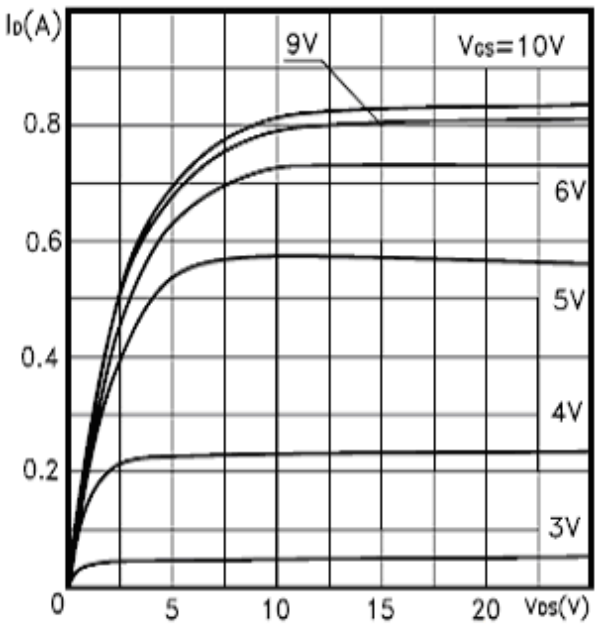
ELECTRICAL CHARACTERISTICS (T_A=25℃ Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V,I_D=250uA	60			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250uA	1.0	1.7	2.5	
Gate Leakage Current	I_{GSS}	V_{DS}=0V,V_{GS}=±20V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=48V,V_{GS}=0V			1	uA
		V_{DS}=48V,V_{GS}=0V T_J=55℃			10	
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS}=10V,I_D=0.50A		2.5	6.0	Ω
		V_{GS}= 5V,I_D=0.30A		3.3	7.0	
Source-drain Current	I_{SD}				0.35	A
Source-drain Current (pulsed)	I_{SDM} (2)				1.4	A
Forward Transconductance	Gfs(1)	V_{DS} = 10 V, I_D = 0.5 A		0.6		S
Diode Forward Voltage	V_{SD}(1)	V_{GS} = 0 V, I_S = 0.12A		0.85	1.5	V
Dynamic						
Total Gate Charge	Q_g	V_{DD} = 30 V, I_D = 1 A, V_{GS} = 5 V		1.4	2.0	nC
Gate-Source Charge	Q_{gs}			0.8		
Gate-Drain Charge	Q_{gd}			0.5		
Input Capacitance	C_{iss}	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0		43	60	pF
Output Capacitance	C_{oss}			20	30	
Reverse Transfer Capacitance	C_{rss}			6	10	
Turn-On Time	$t_{d(on)}$	V_{DD} = 30 V, I_D = 0.5 A R_G = 4.7Ω V_{GS} = 4.5 V		5	20	ns
	t_r			15		
Turn-Off Time	$t_{d(off)}$			7	20	
	t_f			8		

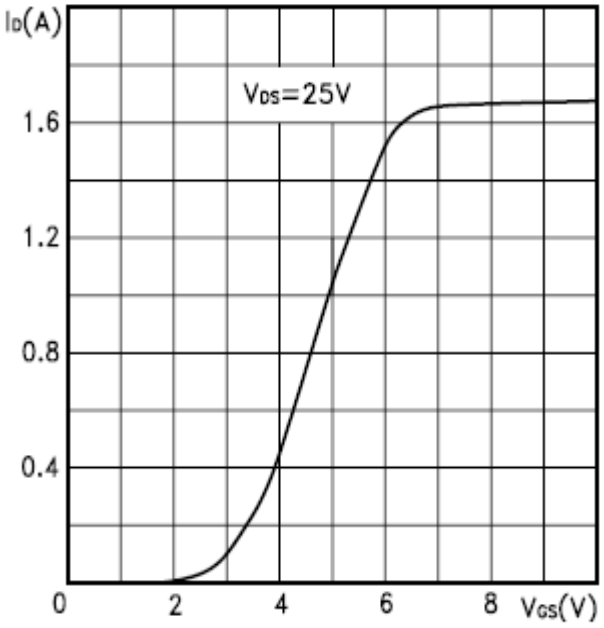
(1) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %.

(2) Pulse width limited by safe operating area.

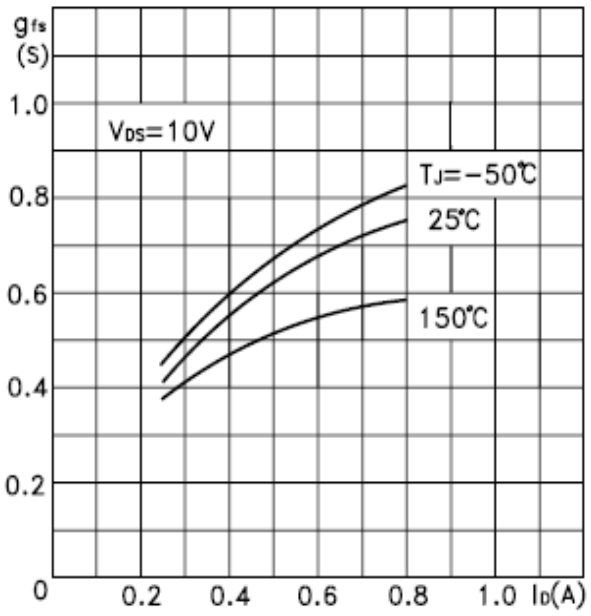
TYPICAL CHARACTERISTICS



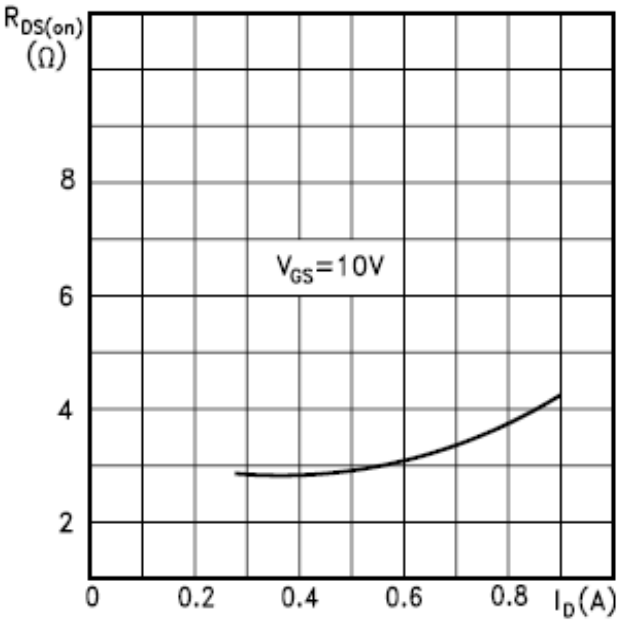
Output Characteristics



Transfer Characteristics

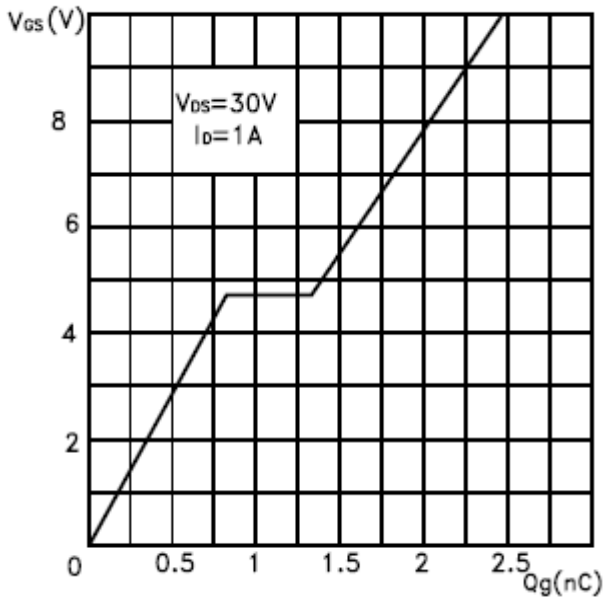


Transconductance

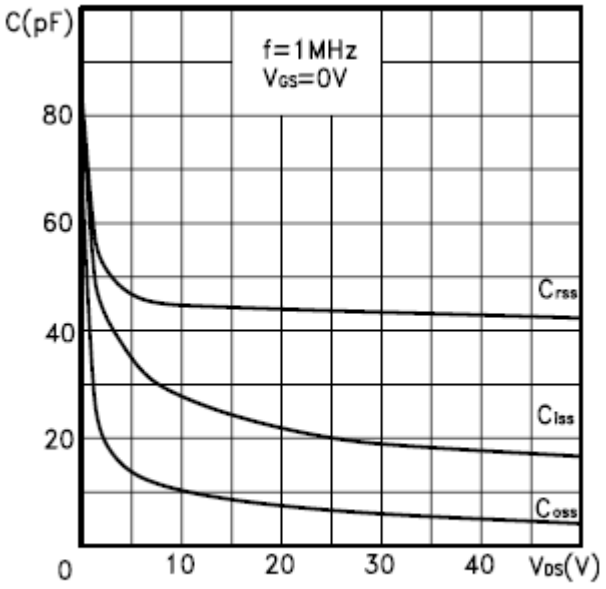


Static Drain-source On Resistance

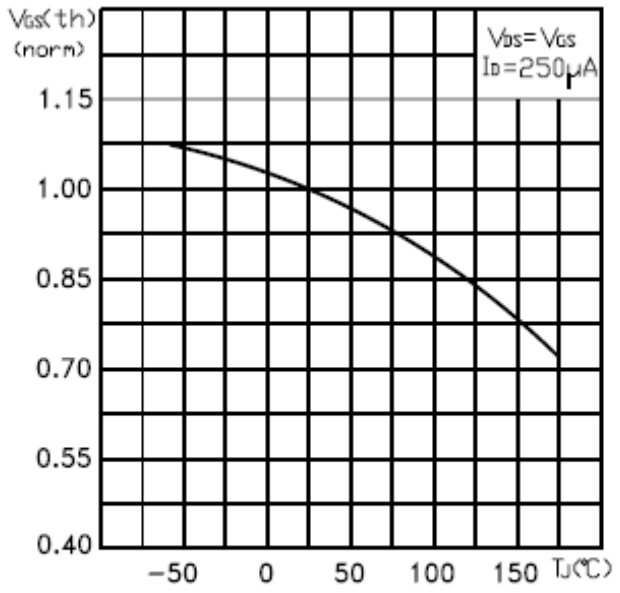
TYPICAL CHARACTERISTICS



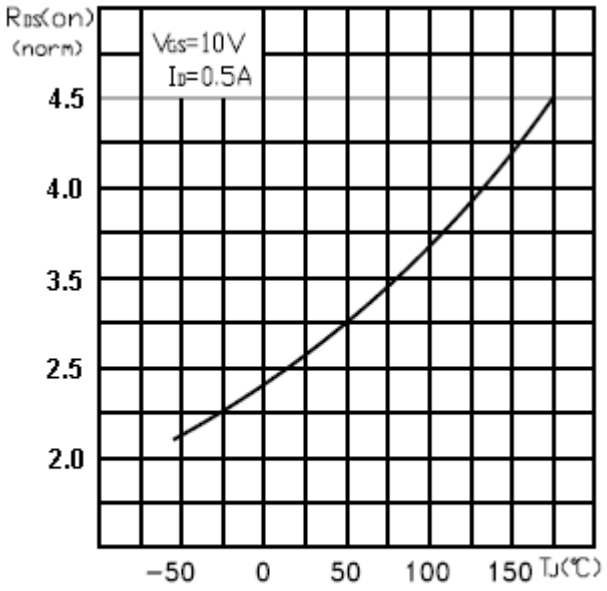
Gate Charge vs Gate-source Voltage



Capacitance Variations

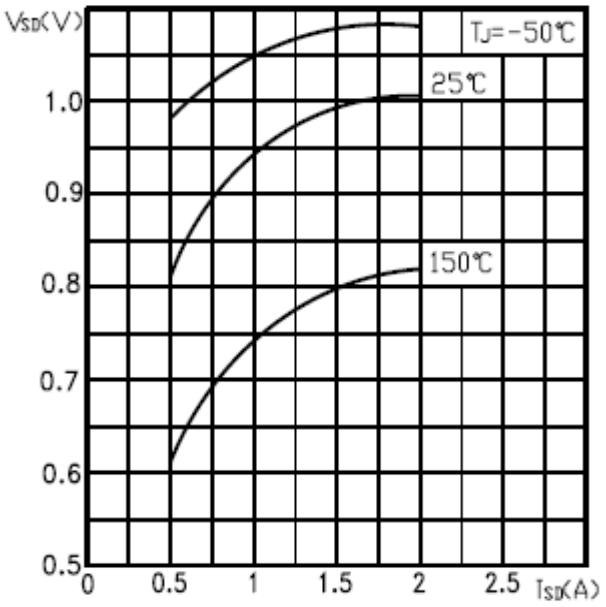


Normalized Gate Threshold Voltage
vs Temperature

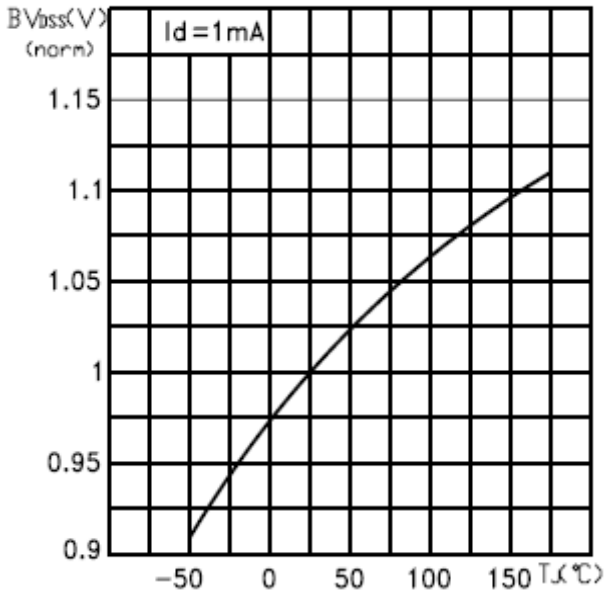


Normalized On Resistance
vs Temperature

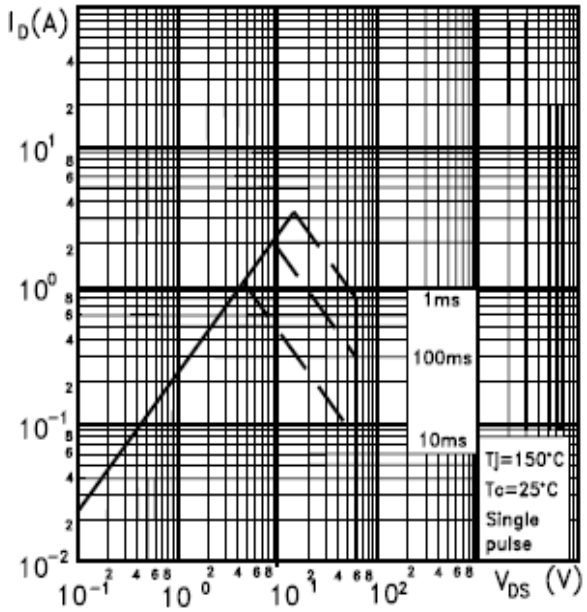
TYPICAL CHARACTERISTICS



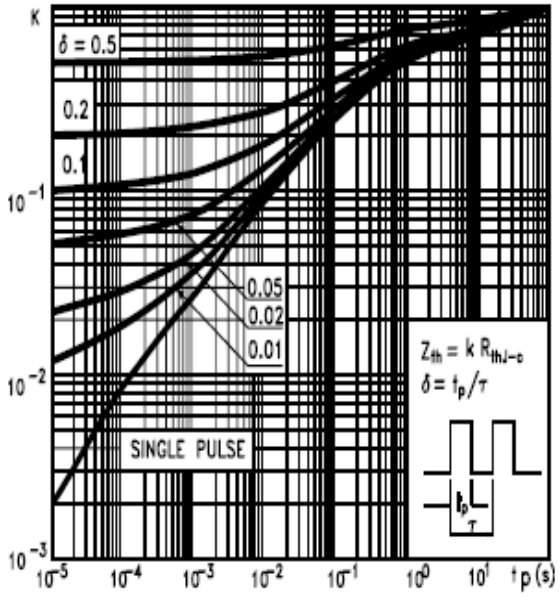
Source-Drain Forward



Normalized BVDSS vs Temperature

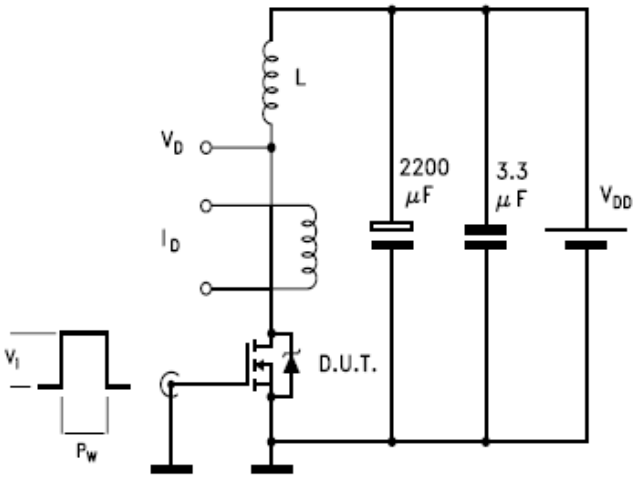


Safe Operating Area

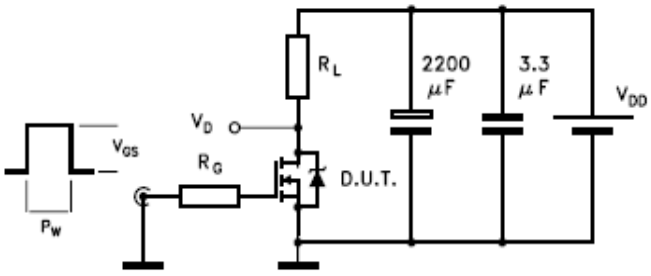


Thermal Impedance

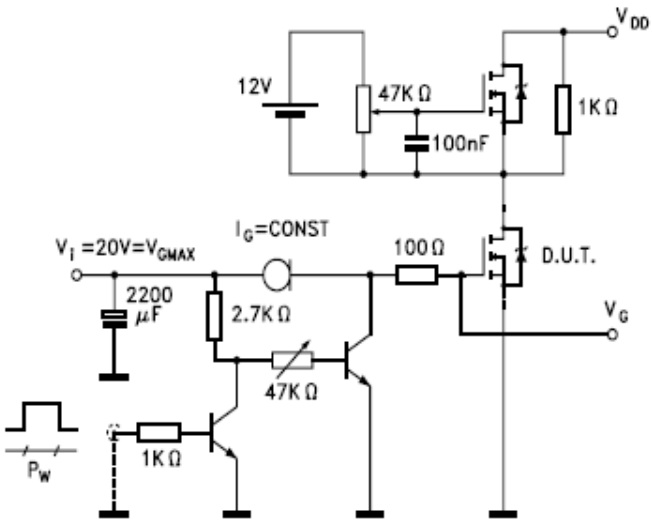
TYPICAL TESTING CIRCUIT



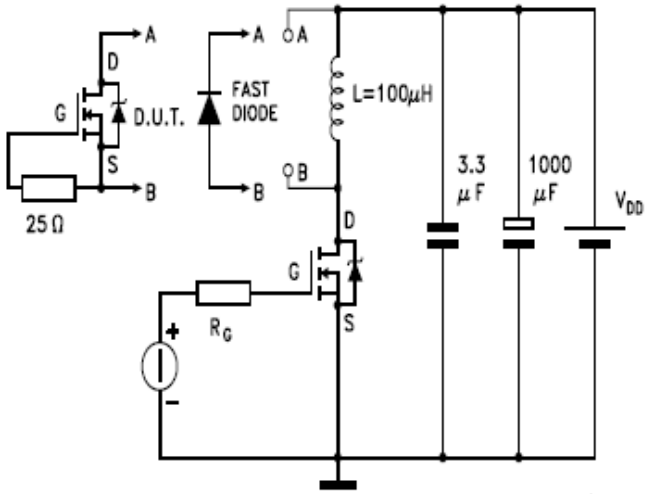
Unclamped Inductive Load Test



Switching Times Test Circuit



Gate Charge Test Circuit



Test Circuit For Inductive Load
Switching and Diode Recovery Times

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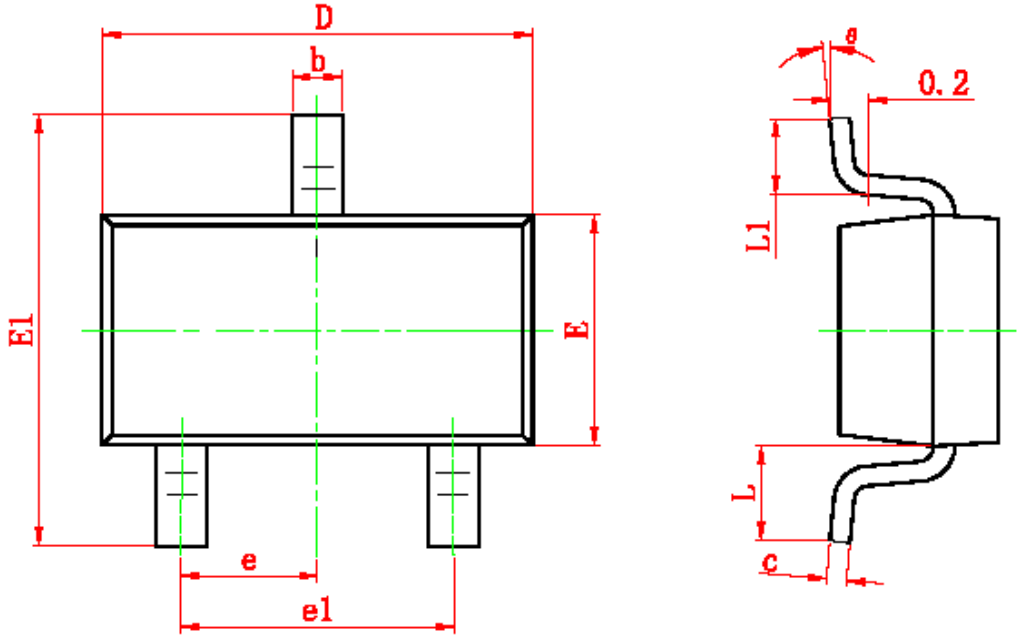
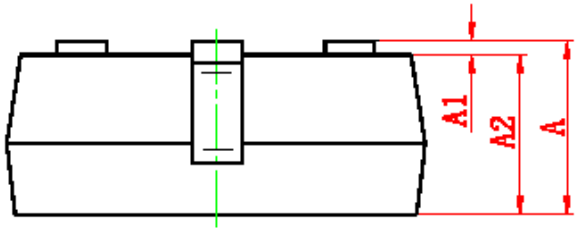
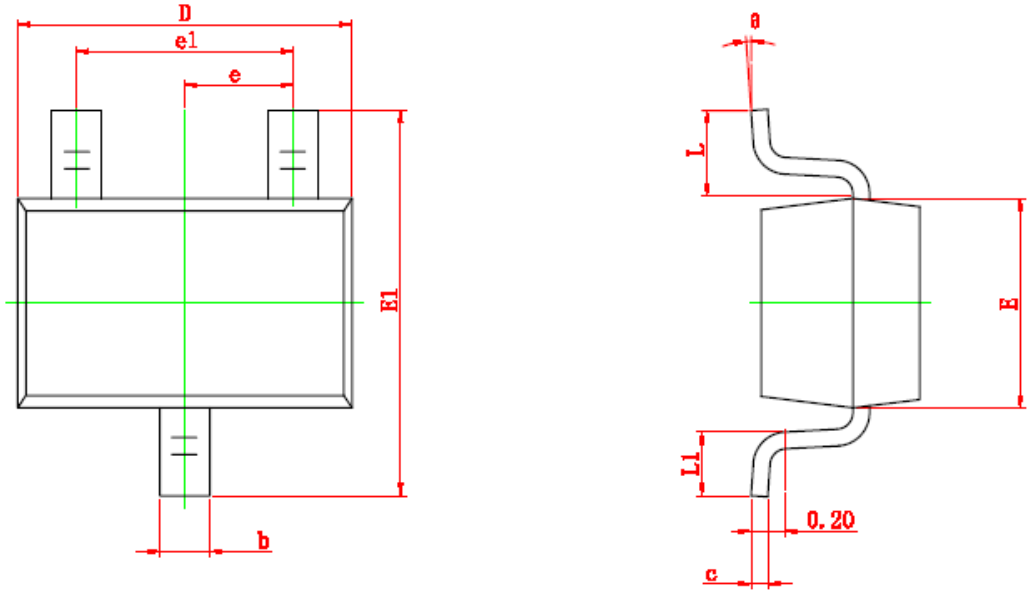
SOT-23 PACKAGE OUTLINE

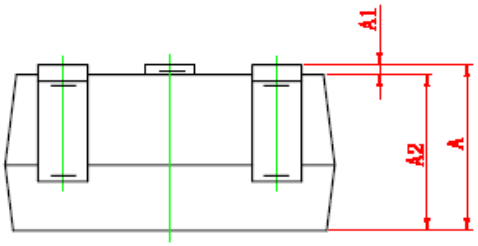




Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.200	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.100	0.035	0.039
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 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°	6°

SOT-323 PACKAGE OUTLINE





Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.200	0.400	0.008	0.016
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650 TYP		0.026 TYP	
e1	1.200	1.400	0.047	0.055
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

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