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STN1NK60Z-VB Datasheet

Power MOSFET

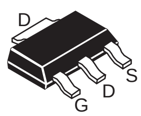
PRODUCT SUMMARY		
V_{DS} (V)	650	
$R_{DS(on)}$ (Ω)	V_{GS} = 10 V	8.4
Q_g (Max.) (nC)	18	
Q_{gs} (nC)	3.0	
Q_{gd} (nC)	8.9	
Configuration	Single	

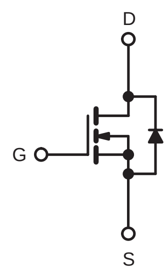
FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Available in Tape and Reel
- Fast Switching
- Ease of Paralleling
- Compliant to RoHS Directive 2002/95/EC

Pb Available
RoHS* COMPLIANT
HALOGEN FREE Available

SOT-223





N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_C = 25 °C, unless otherwise noted					
PARAMETER			**SYMBOL**	**LIMIT**	**UNIT**
Drain-Source Voltage			V_{DS}	650	V
Gate-Source Voltage			V_{GS}	± 20	
Continuous Drain Current	V_{GS} at 10 V	T_C = 25 °C	I_D	1.2	A
		T_C = 100 °C		0.8	
Pulsed Drain Current[a]			I_{DM}	4.8	
Linear Derating Factor				0.33	W/°C
Linear Derating Factor (PCB Mount)[e]				0.020	
Single Pulse Avalanche Energy[b]			E_{AS}	74	mJ
Repetitive Avalanche Current[a]			I_{AR}	2.0	A
Repetitive Avalanche Energy[a]			E_{AR}	4.2	mJ
Maximum Power Dissipation	T_C = 25 °C		P_D	3	W
Maximum Power Dissipation (PCB Mount)[e]	T_A = 25 °C			0.02	
Peak Diode Recovery dV/dt[c]			dV/dt	3.0	V/ns
Operating Junction and Storage Temperature Range			T_J, T_{stg}	- 55 to + 150	°C
Soldering Recommendations (Peak Temperature)	for 10 s			260[d]	

Notes

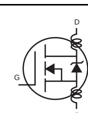
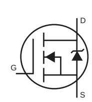
a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
b. V_{DD} = 50 V, starting T_J = 25 °C, L = 37 mH, R_g = 25 Ω, I_{AS} = 2.0 A (see fig. 12).
c. $I_{SD} \leq$ 2.0 A, dI/dt ≤ 40 A/μs, $V_{DD} \leq V_{DS}$, $T_J \leq$ 150 °C.
d. 1.6 mm from case.
e. When mounted on 1" square PCB (FR-4 or G-10 material).

* Pb containing terminations are not RoHS compliant, exemptions may apply

THERMAL RESISTANCE RATINGS					
PARAMETER	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Maximum Junction-to-Ambient	R_{thJA}	-	-	110	°C/W
Maximum Junction-to-Ambient (PCB Mount)[a]	R_{thJA}	-	-	50	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	-	3.0	

Note

a. When mounted on 1" square PCB (FR-4 or G-10 material).

SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 μA	650	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 1 mA	-	0.88	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	2.0	-	4.0	V
Gate-Source Leakage	I_{GSS}	V_{GS} = ± 20 V	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 600 V, V_{GS} = 0 V	-	-	100	μA
		V_{DS} = 480 V, V_{GS} = 0 V, T_J = 125 °C	-	-	500	
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 1.2 A[b]	-	8.4	-	Ω
Forward Transconductance	g_{fs}	V_{DS} = 50 V, I_D = 1.2 A	1.4	-	-	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = - 25 V, f = 1.0 MHz, see fig. 5	-	350	-	pF
Output Capacitance	C_{oss}		-	48	-	
Reverse Transfer Capacitance	C_{rss}		-	8.6	-	
Total Gate Charge	Q_g	V_{GS} = 10 V, I_D = 2.0 A, V_{DS} = 360 V, see fig. 6 and 13[b]	-	-	18	nC
Gate-Source Charge	Q_{gs}		-	-	3.0	
Gate-Drain Charge	Q_{gd}		-	-	8.9	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 300 V, I_D = 2.0 A, R_g = 18 Ω, R_D = 135 Ω, see fig. 10[b]	-	10	-	ns
Rise Time	t_r		-	23	-	
Turn-Off Delay Time	$t_{d(off)}$		-	30	-	
Fall Time	t_f		-	25	-	
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact 	-	4.5	-	nH
Internal Source Inductance	L_S		-	7.5	-	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	2.0	A
Pulsed Diode Forward Current[a]	I_{SM}		-	-	8.0	
Body Diode Voltage	V_{SD}	T_J = 25 °C, I_S = 2.0 A, V_{GS} = 0 V[b]	-	-	1.6	V
Body Diode Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = 2.0 A, dI/dt = 100 A/μs[b]	-	290	580	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	0.67	1.3	μC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)				

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).

b. Pulse width ≤ 300 μs; duty cycle ≤ 2 %.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

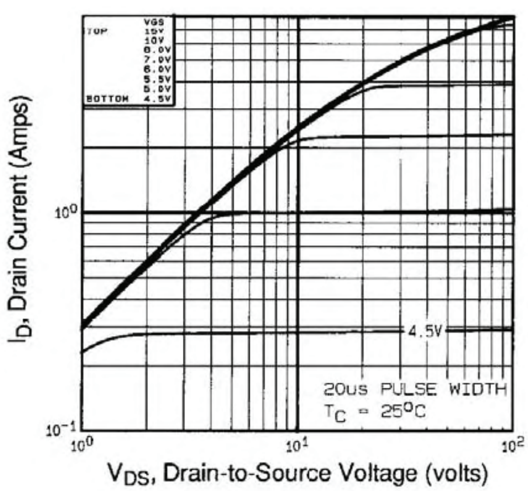


Fig. 1 - Typical Output Characteristics, T_C = 25 °C

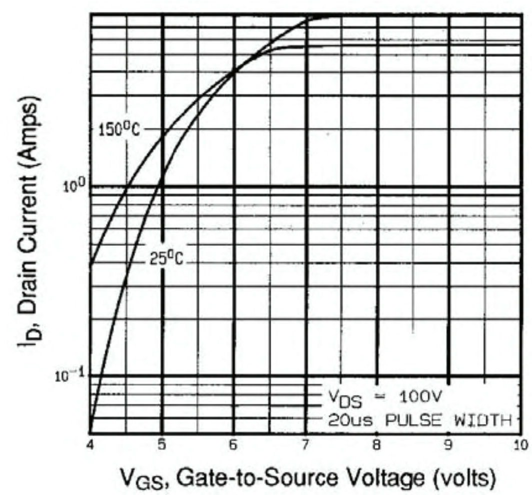


Fig. 3 - Typical Transfer Characteristics

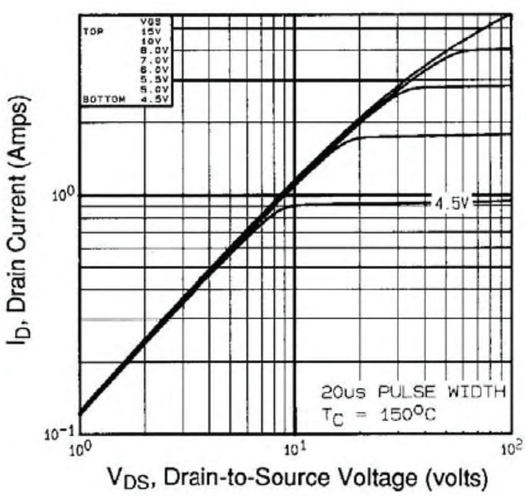


Fig. 2 - Typical Output Characteristics, T_C = 150 °C

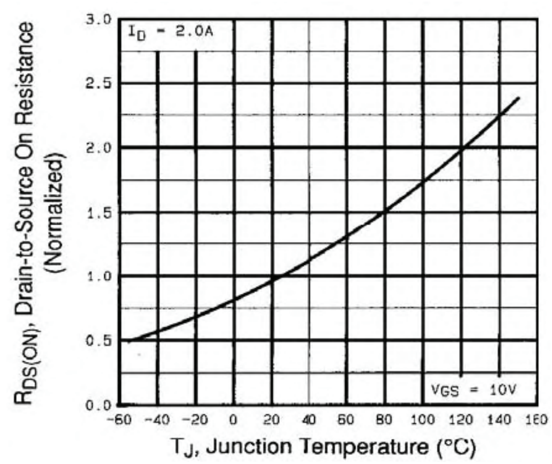


Fig. 4 - Normalized On-Resistance vs. Temperature

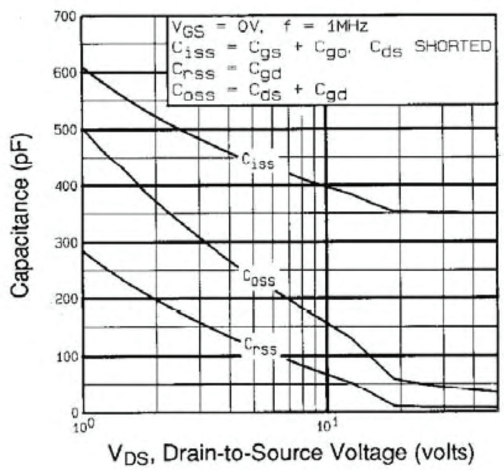


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

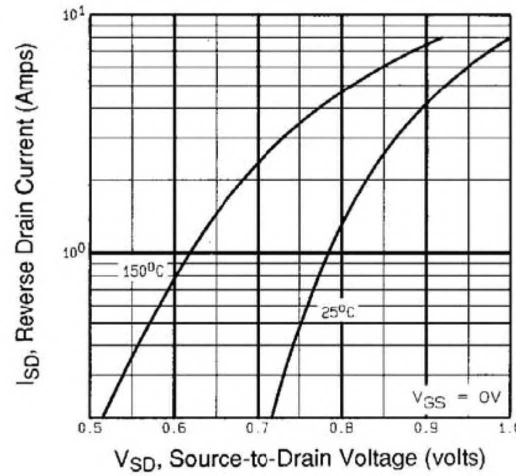


Fig. 7 - Typical Source-Drain Diode Forward Voltage

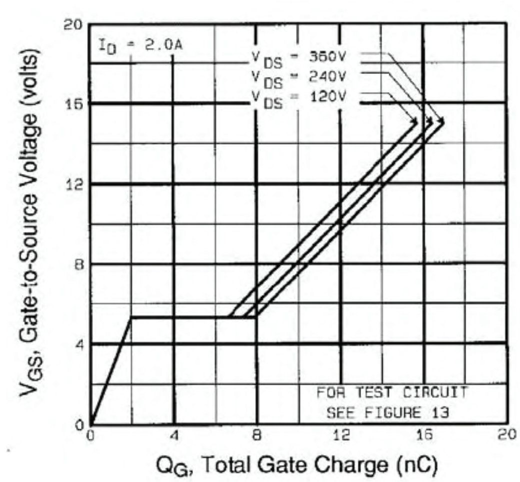


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

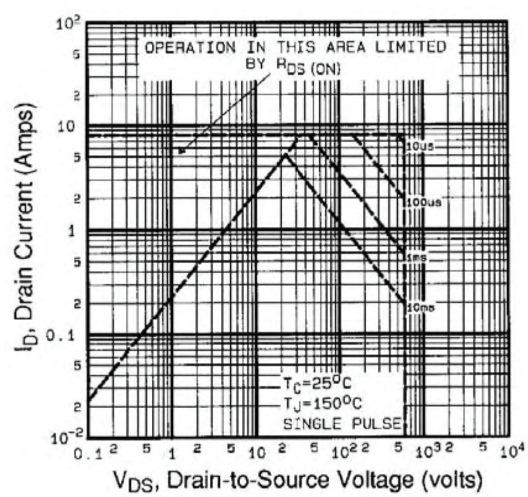


Fig. 8 - Maximum Safe Operating Area

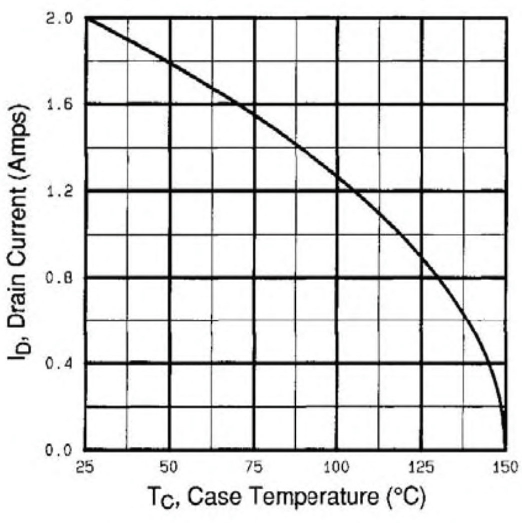


Fig. 9 - Maximum Drain Current vs. Case Temperature

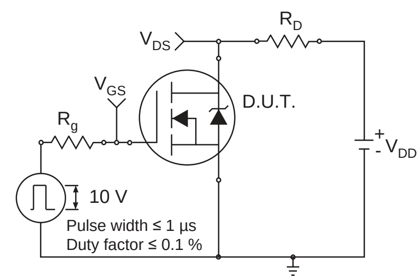


Fig. 10a - Switching Time Test Circuit

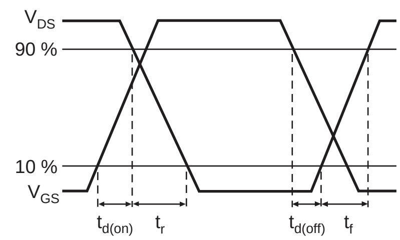


Fig. 10b - Switching Time Waveforms

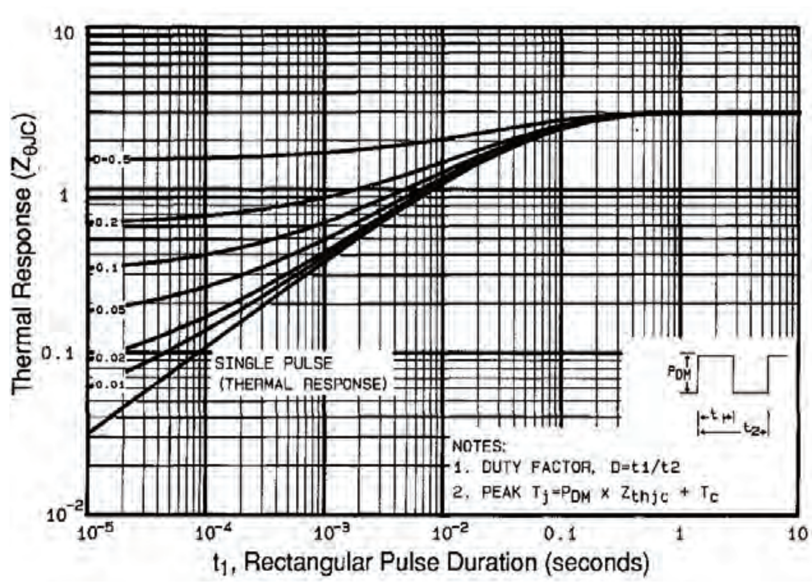


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

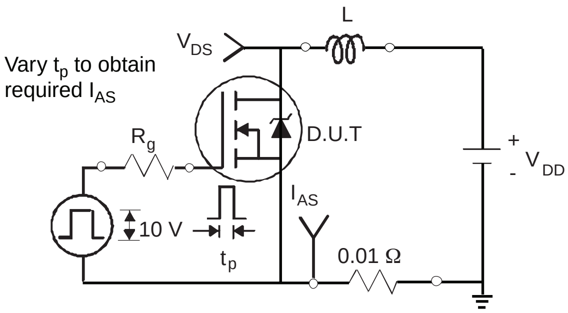


Fig. 12a - Unclamped Inductive Test Circuit

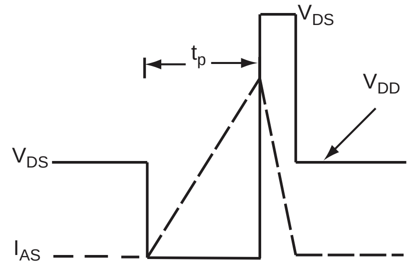


Fig. 12b - Unclamped Inductive Waveforms

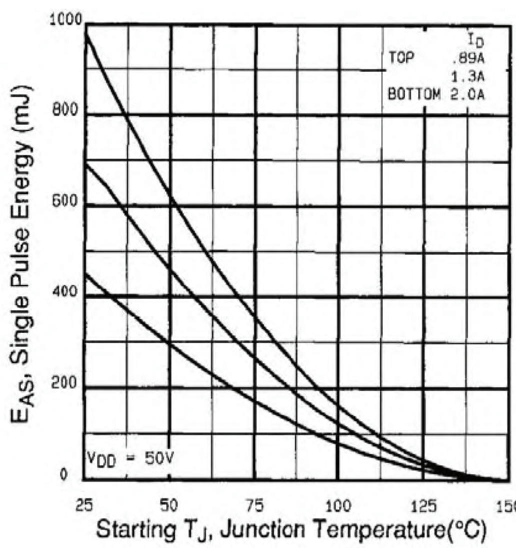


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

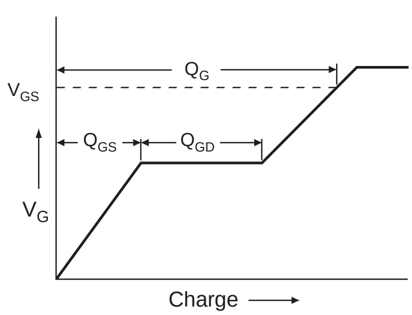


Fig. 13a - Basic Gate Charge Waveform

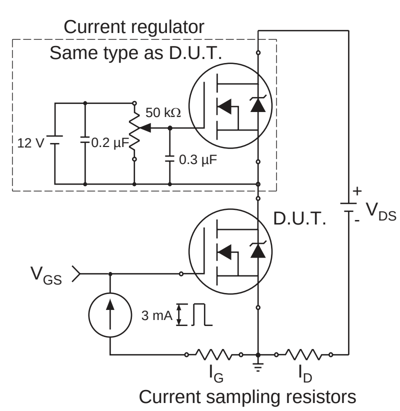
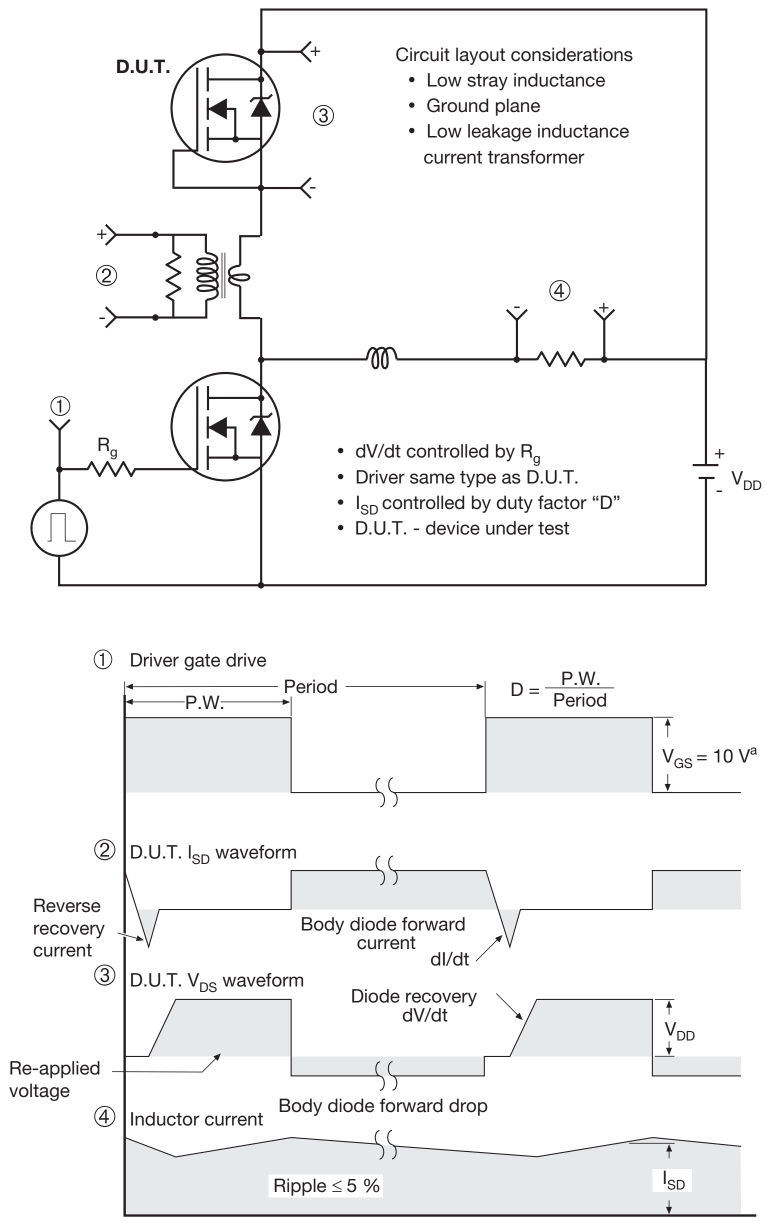


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit

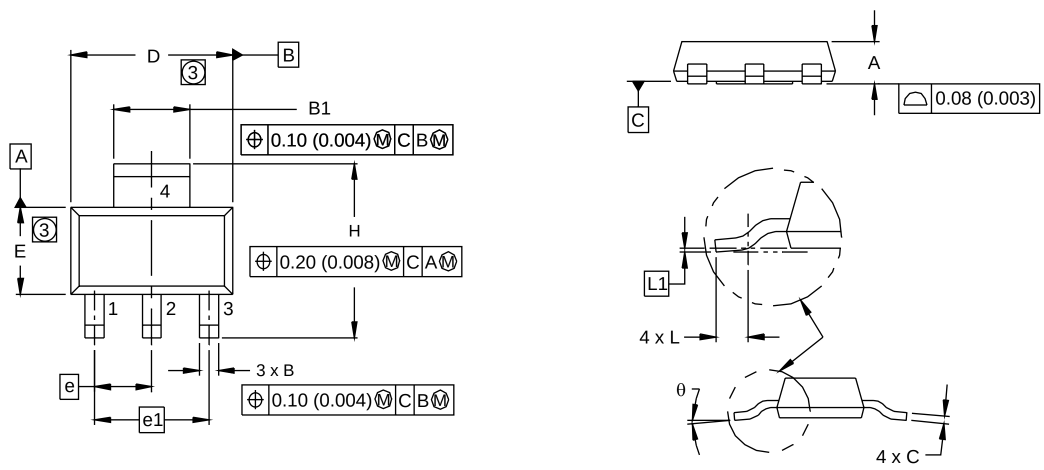


Note

a. V_{GS} = 5 V for logic level devices

Fig. 14 - For N-Channel

SOT-223 (HIGH VOLTAGE)



	MILLIMETERS		INCHES	
DIM.	**MIN.**	**MAX.**	**MIN.**	**MAX.**
A	1.55	1.80	0.061	0.071
B	0.65	0.85	0.026	0.033
B1	2.95	3.15	0.116	0.124
C	0.25	0.35	0.010	0.014
D	6.30	6.70	0.248	0.264
E	3.30	3.70	0.130	0.146
e	2.30 BSC		0.0905 BSC	
e1	4.60 BSC		0.181 BSC	
H	6.71	7.29	0.264	0.287
L	0.91	-	0.036	-
L1	0.061 BSC		0.0024 BSC	
θ	-	10'	-	10'

ECN: S-82109-Rev. A, 15-Sep-08
DWG: 5969

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension do not include mold flash.
4. Outline conforms to JEDEC outline TO-261AA.

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