



N-Channel Enhancement-Mode Vertical DMOS FET

Features

- ▶ Low threshold — 1.6V max.
- ▶ High input impedance
- ▶ Low input capacitance — 140pF typical
- ▶ Fast switching speeds
- ▶ Low on-resistance
- ▶ Free from secondary breakdown
- ▶ Low input and output leakage
- ▶ Complementary N- and P-channel devices

Applications

- ▶ Logic level interfaces – ideal for TTL and CMOS
- ▶ Solid state relays
- ▶ Battery operated systems
- ▶ Photo voltaic drives
- ▶ Analog switches
- ▶ General purpose line drivers
- ▶ Telecom switches

General Description

This low threshold, enhancement-mode (normally-off) transistor utilizes a vertical DMOS structure and Supertex's well-proven, silicon-gate manufacturing process. This combination produces a device with the power handling capabilities of bipolar transistors and the high input impedance and positive temperature coefficient inherent in MOS devices. Characteristic of all MOS structures, this device is free from thermal runaway and thermally-induced secondary breakdown.

Supertex's vertical DMOS FETs are ideally suited to a wide range of switching and amplifying applications where very low threshold voltage, high breakdown voltage, high input impedance, low input capacitance, and fast switching speeds are desired.

The Quad-Array package (20-Lead SOW (WG)) uses four independent DMOS transistors which provide four independent channels.

Ordering Information

BV _{DSS} /BV _{DGS} (V)	R _{DS(ON)} max (Ω)	I _{D(ON)} min (A)	V _{GS(th)} max (V)	Package Options	
				TO-92	20-Lead SOW
40	0.75	4.0	1.6	TN0604N3-G	-
40	1.0	4.0	1.6	-	TN0604WG-G

-G indicates package is RoHS compliant ("Green")



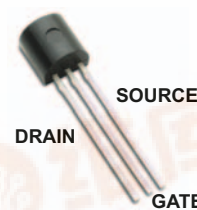
Absolute Maximum Ratings

Parameter	Value
Drain-to-source voltage	BV _{DSS}
Drain-to-gate voltage	BV _{DGS}
Gate-to-source voltage	±20V
Operating and storage temperature	-55°C to +150°C
Soldering temperature*	300°C

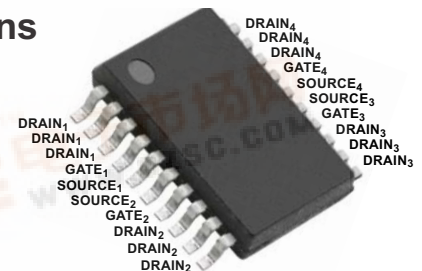
Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. Continuous operation of the device at the absolute rating level may affect device reliability. All voltages are referenced to device ground.

* Distance of 1.6mm from case for 10 seconds.

Pin Configurations



TO-92 (N3)



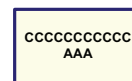
20-Lead SOW (WG)

Product Marking

Top Marking



Bottom Marking



YY = Year Sealed
WW = Week Sealed
L = Lot Number
C = Country of Origin*
A = Assembler ID*
— = "Green" Packaging

*May be part of top marking

Product Marking



YY = Year Sealed
WW = Week Sealed
— = "Green" Packaging

TO-92 (N3)

20-Lead SOW (WG)



Thermal Characteristics

Package	I_D (continuous) ⁽¹⁾ (A)	I_D (pulsed) (A)	Power Dissipation @ $T_A = 25^\circ\text{C}$ (W)	θ_{jc} ($^\circ\text{C/W}$)	θ_{ja} ($^\circ\text{C/W}$)	I_{DR} ⁽¹⁾ (A)	I_{DRM} (A)
TO-92 (N3)	0.7	4.6	0.74	125	170	0.7	4.6
20-Lead SOW (WG)	1.0	4.0	1.5	-	84	1.0	4.0

Notes:

(1) I_D (continuous) is limited by max rated T_j .

Electrical Characteristics (@ 25°C unless otherwise specified)

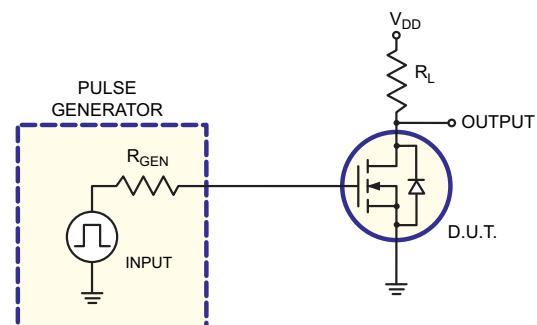
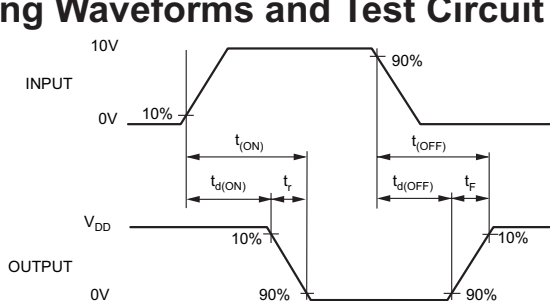
Sym	Parameter	Min	Typ	Max	Units	Conditions
BV_{DSS}	Drain-to-source breakdown voltage	40	-	-	V	$V_{GS} = 0V, I_D = 2.0mA$
$V_{GS(th)}$	Gate threshold voltage	0.6	-	1.6	V	$V_{GS} = V_{DS}, I_D = 1.0mA$
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with temperature	-	-3.8	-4.5	mV/ $^\circ\text{C}$	$V_{GS} = V_{DS}, I_D = 2.5mA$
I_{GSS}	Gate body leakage	-	-	100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
I_{DSS}	Zero gate voltage drain current	-	-	10	μA	$V_{GS} = 0V, V_{DS} = \text{Max Rating}$
		-	-	1.0	mA	$V_{GS} = 0V, V_{DS} = 0.8 \text{ Max Rating}, T_A = 125^\circ\text{C}$
$I_{D(ON)}$	ON-state drain current	1.5	2.1	-	A	$V_{GS} = 5.0V, V_{DS} = 20V$
		4.0	7.0	-		$V_{GS} = 10V, V_{DS} = 20V$
$R_{DS(ON)}$	Static drain-to-source ON-state resistance	TO-92/ 20-Lead SOW		-	Ω	$V_{GS} = 5.0V, I_D = 0.75A$
		TO-92		-		$V_{GS} = 10V, I_D = 1.5A$
		20-Lead SOW		-		
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with temperature	-	0.5	0.75	%/ $^\circ\text{C}$	$V_{GS} = 10V, I_D = 1.5A$
G_{FS}	Forward transductance	0.5	0.8	-	mmho	$V_{DS} = 20V, I_D = 1.5A$
C_{ISS}	Input capacitance	-	140	190	pF	$V_{GS} = 0V,$ $V_{DS} = 20V,$ $f = 1.0MHz$
C_{OSS}	Common source output capacitance	-	75	110		
C_{RSS}	Reverse transfer capacitance	-	25	50		
$t_{d(ON)}$	Turn-ON delay time	-	-	10	ns	$V_{DD} = 20V,$ $I_D = 0.5A,$ $R_{GEN} = 25\Omega$
t_r	Rise time	-	-	6.0		
$t_{d(OFF)}$	Turn-OFF delay time	-	-	25		
t_f	Fall time	-	-	20		
V_{SD}	Diode forward voltage drop	-	1.2	1.8	V	$V_{GS} = 0V, I_{SD} = 1.5A$
t_{rr}	Reverse recovery time	-	300	-	ns	$V_{GS} = 0V, I_{SD} = 1.0A$

Notes:

(1) All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300 μs pulse, 2% duty cycle.)

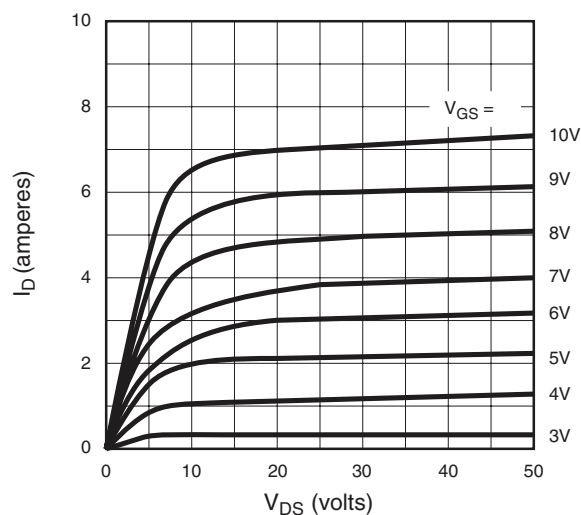
(2) All A.C. parameters sample tested.

Switching Waveforms and Test Circuit

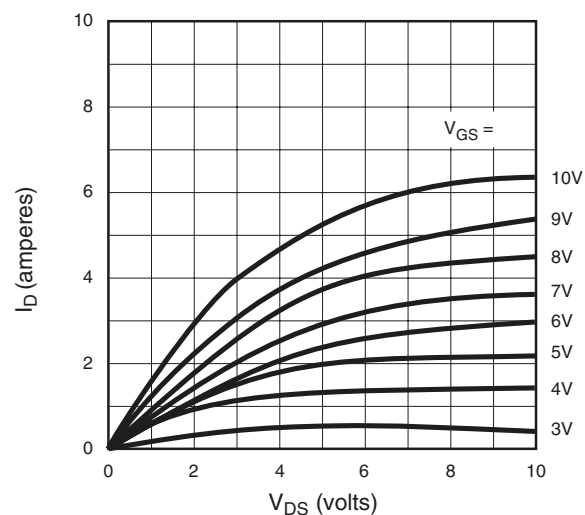


Typical Performance Curves

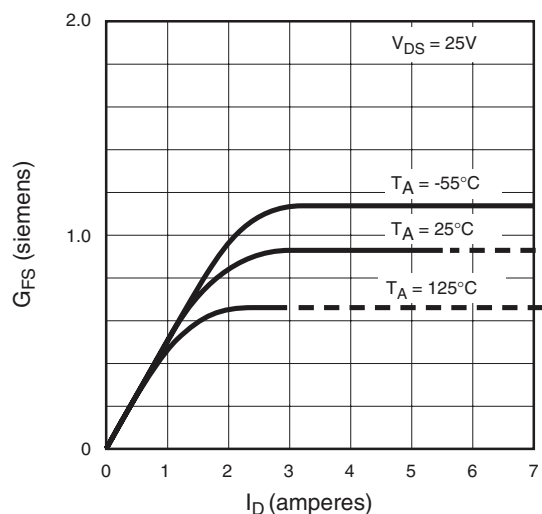
Output Characteristics



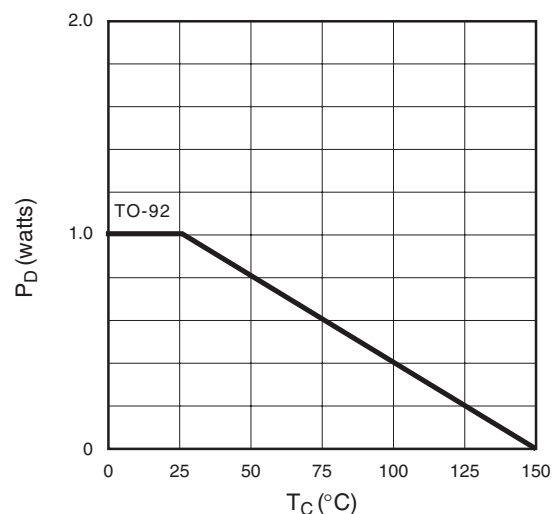
Saturation Characteristics



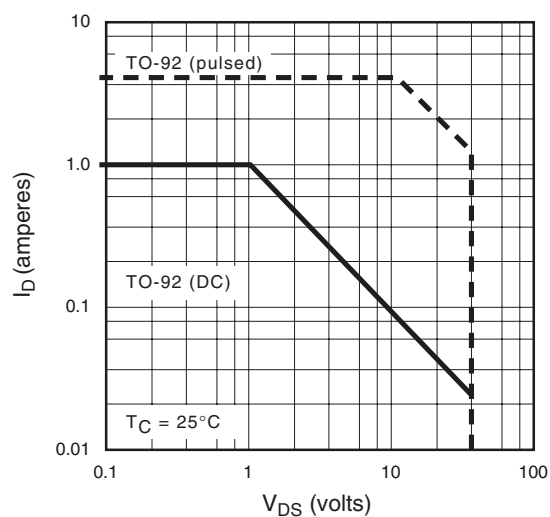
Transconductance vs. Drain Current



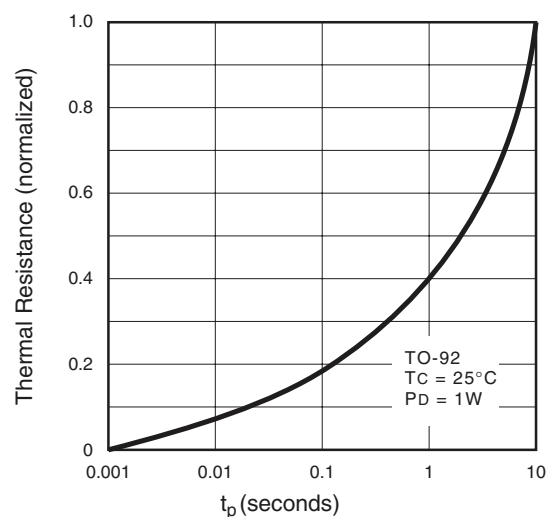
Power Dissipation vs. Case Temperature



Maximum Rated Safe Operating Area

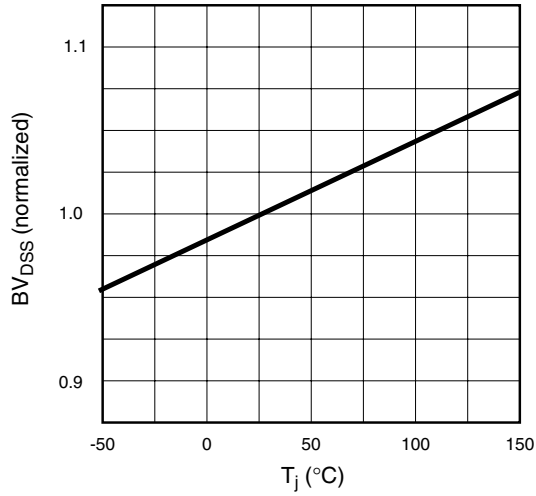


Thermal Response Characteristics

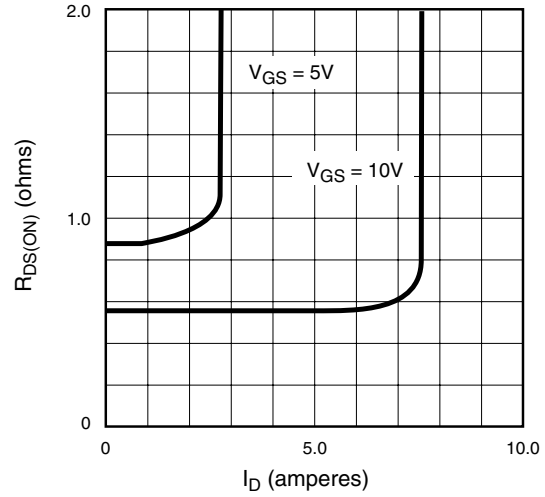


Typical Performance Curves (cont.)

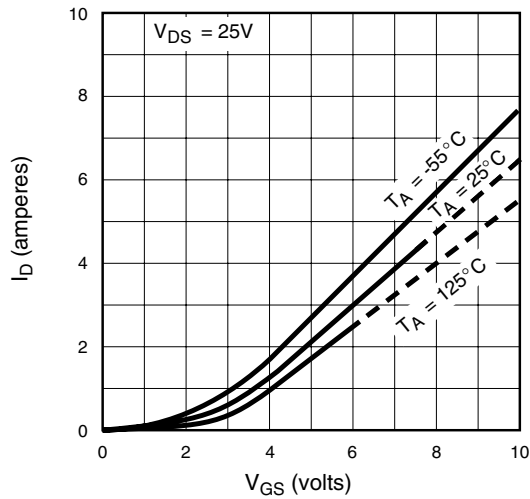
BV_{DSS} Variation with Temperature



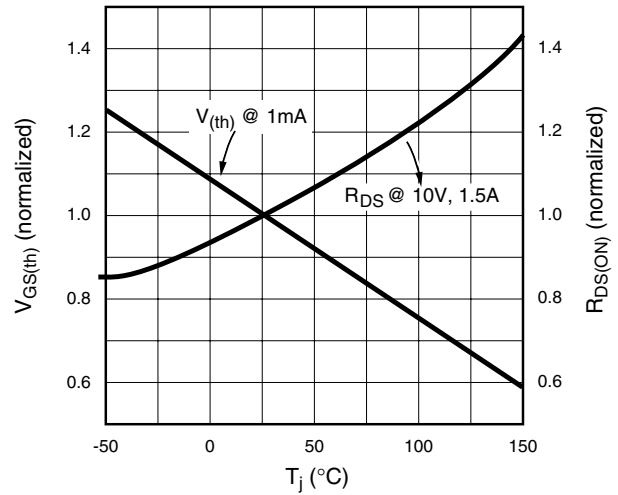
On-Resistance vs. Drain Current



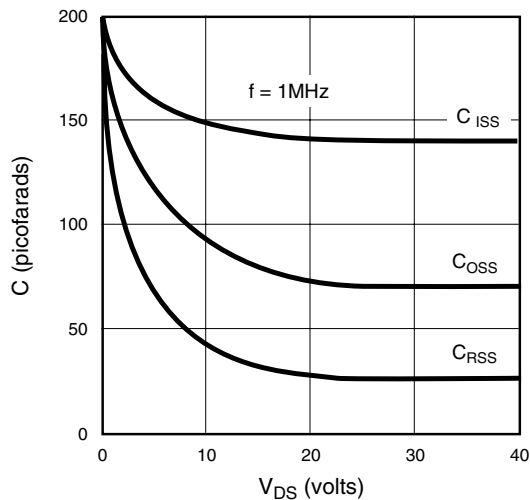
Transfer Characteristics



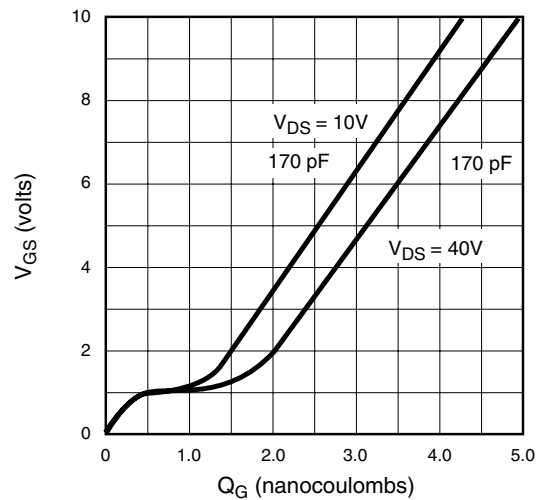
V_(th) and R_{DS} Variation with Temperature



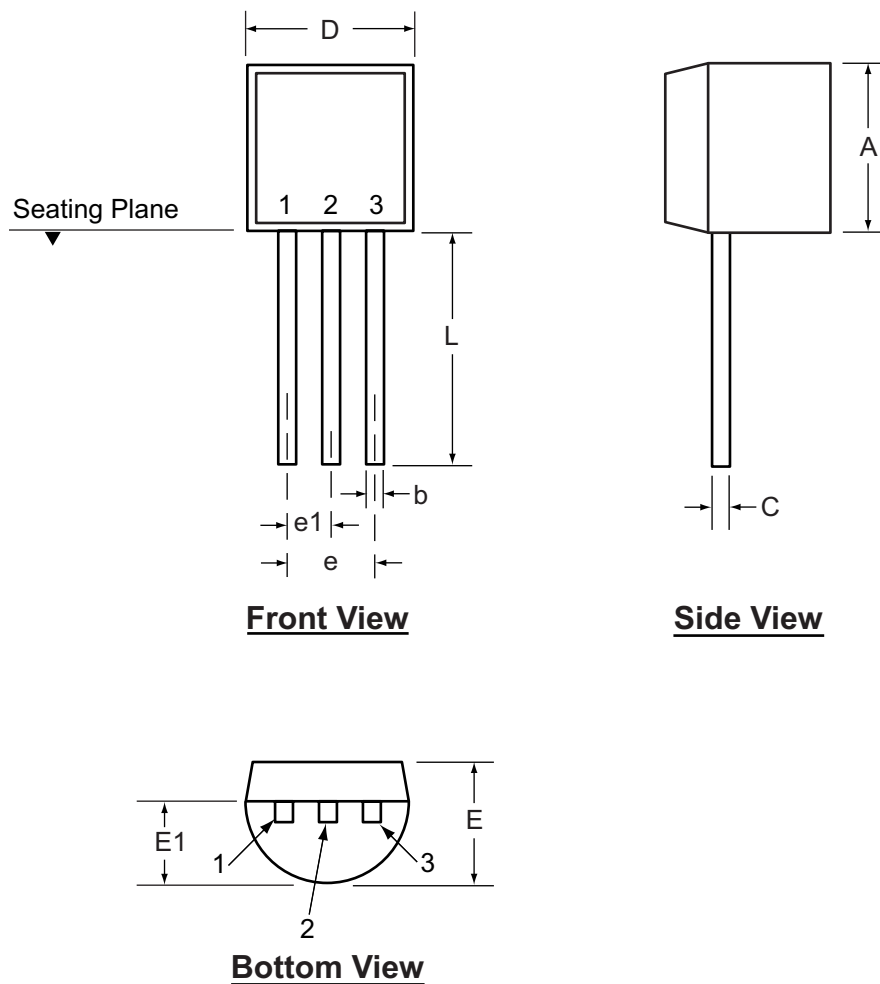
Capacitance vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics



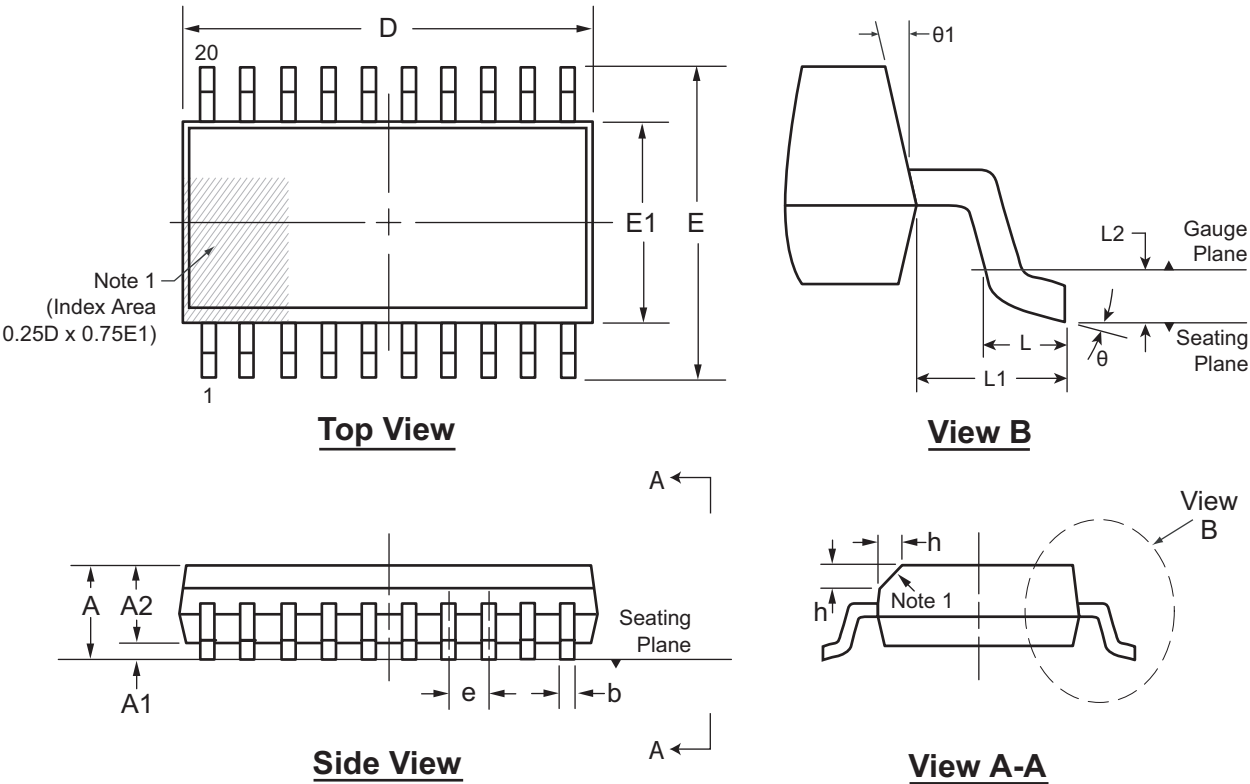
3-Lead TO-92 Package Outline (N3)



Symbol		A	b	C	D	E	E1	e	e1	L
Dimension (inches)	MIN	.170	.014	.014	.175	.125	.080	.095	.045	.500
	NOM	-	-	-	-	-	-	-	-	-
	MAX	.210	.022	.022	.205	.165	.105	.105	.055	-

Drawings not to scale.

20-Lead SOW (Wide Body) Package Outline (WG) 12.80x7.50mm body, 2.65mm height (max), 1.27mm pitch



Note 1:
This chamfer feature is optional. If it is not present, then a Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier may be either a mold, or an embedded metal or marked feature.

Symbol		A	A1	A2	b	D	E	E1	e	h	L	L1	L2	θ	θ1
Dimension (mm)	MIN	2.15	0.10	2.05	0.31	12.60	9.97	7.40	1.27 BSC	0.25	0.40	1.40 REF	0.25 BSC	0°	5°
	NOM	-	-	-	-	12.80	10.30	7.50		-	-			-	-
	MAX	2.65	0.30	2.55	0.51	13.00	10.63	7.60		0.75	1.27			8°	15°

JEDEC Registration MS-013, Variation AC, Issue E, Sep. 2005.
Drawings not to scale.

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to <http://www.supertex.com/packaging.html>.)

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