DN2530

N-Channel, Depletion-Mode, Vertical DMOS FET

Features

- High-input impedance
- Low-input capacitance
- Fast switching speeds
- Low on-resistance
- Free from secondary breakdown
- Low input and output leakage

Applications

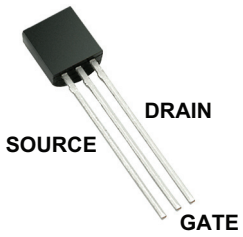
- Normally-on switches
- Solid state relays
- Converters
- Linear amplifiers
- Constant current sources
- Power supply circuits
- Telecom

Description

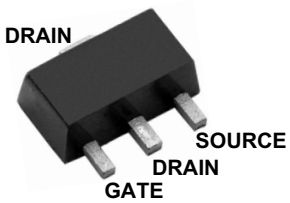
The DN2530 is a low-threshold, depletion-mode, normally-on transistor that utilizes an advanced vertical DMOS structure and a well-proven silicon-gate manufacturing process. This combination produces a device with the power-handling capabilities of bipolar transistors, plus the high-input impedance and positive-temperature coefficient inherent in Metal-Oxide Semiconductor (MOS) devices. Characteristic of all MOS structures, this device is free from thermal runaway and thermally-induced secondary breakdown.

Vertical DMOS Field-Effect Transistors (FETs) are ideally suited to a wide range of switching and amplifying applications where high breakdown-voltage, high-input impedance, low-input capacitance, and fast switching speeds are desired.

Package Types



TO-92



TO-243AA (SOT-89)

See Table 2-1 for pin information

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1.0 ELECTRICAL CHARACTERISTICS

ABSOLUTE MAXIMUM RATINGS†

Drain-to-source voltage ..... BV_{DSX}
Drain-to-gate voltage ..... BV_{DGX}
Gate-to-source voltage ..... ±20V
Operating and Storage Temperature ..... -55 to 150 °C

† Notice: Stresses above those listed under “Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

DC AND AC CHARACTERISTICS

Electrical Specifications: Unless otherwise specified, for all specifications T_A = +25°C

Parameter	Symbol	Min	Typ	Max	Units	Conditions
DC Parameters (Note 1, unless otherwise stated)						
Drain-to-source breakdown voltage	BV_{DSX}	300	-	-	V	V_{GS}= -5.0V, I_D= 100 µA
Gate-to-source off voltage	$V_{GS(OFF)}$	-1.0	-	-3.5	V	V_{DS}= 25V, I_D= 10 µA
$V_{GS(OFF)}$ change with temperature	$\Delta V_{GS(OFF)}$	-	-	-4.5	mV/°C	V_{DS}= 25V, I_D= 10 µA(Note 2)
Gate body leakage current	I_{GSS}	-	-	100	nA	V_{GS}= ±20V, V_{DS}= 0V
Drain-to-source leakage current	$I_{D(OFF)}$	-	-	10	µA	V_{DS}= Max rating, V_{GS}= -10V
		-	-	1.0	mA	V_{DS}= 0.8 Max Rating, V_{GS}= -10V, T_A= 125°C (Note 2)
Saturated drain-to-source current	I_{DSS}	200	-	-	mA	V_{GS}= 0V, V_{DS}= 25V
Static drain-to-source on-state resistance	$R_{DS(ON)}$	-	-	12	Ω	V_{GS}= 0V, I_D= 150 mA
Change in $R_{DS(ON)}$ with temperature	$\Delta R_{DS(ON)}$	-	-	1.1	%/°C	V_{GS}= 0V, I_D= 150 mA(Note 2)
AC Parameters (Note 2)						
Forward transconductance	G_{FS}	300	-	-	mmho	V_{DS}= 10V, I_D= 150 mA
Input capacitance	C_{ISS}	-	-	300	pF	V_{GS}= -10V, V_{DS}= 25V, f = 1 MHz
Common source output capacitance	C_{OSS}	-	-	30		
Reverse transfer capacitance	C_{RSS}	-	-	5		
Turn-on delay time	$t_{d(ON)}$	-	-	10	ns	V_{DD}= 25V, I_D= 150 mA, R_{GEN}= 25Ω,
Rise time	t_r	-	-	15		
Turn-off delay time	$t_{d(OFF)}$	-	-	15		
Fall time	t_f	-	-	20		
Diode Parameters						
Diode forward voltage drop	V_{SD}	–	–	1.8	V	V_{GS} = -10V, I_{SD}= 150 mA (Note 1)
Reverse recovery time	t_{rr}	–	600	–	ns	V_{GS} = -10V, I_{SD}= 1.0A (Note 2)

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

2: Specification is obtained by characterization and is not 100% tested.

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TEMPERATURE SPECIFICATIONS

Electrical Specifications: Unless otherwise specified, for all specifications $T_A = T_J$ = +25°C						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Conditions**
Temperature Ranges						
Operating and Storage Temperature	T_A	-55	–	150	°C	
Package Thermal Resistances						
Thermal Resistance, TO-92	θ_{ja}	–	132	–	°C/W	
Thermal Resistance, TO-243AA	θ_{ja}	–	133	–	°C/W	

THERMAL CHARACTERISTICS

Package	**I_D(1) continuous (mA)**	**I_D pulsed (mA)**	**Power Dissipation @T_A = 25°C (W)**	**I_{DR}(1) (mA)**	**I_{DRM} (mA)**
TO-92	175	500	0.74	175	500
TO-243AA (SOT-89)	200	500	1.6 (2)	200	500

Note 1: I_D continuous is limited by max rated T_J

2: Mounted on FR4 board, 25mm x 25mm x 1.57 mm

2.0 PIN DESCRIPTION

The locations of the pins are listed in Package Types and Packaging Information.

TABLE 2-1: PIN DESCRIPTION

Pin # TO-92	**Pin # TO-243AA**	**Function**
2	1	GATE
3	2, 4	DRAIN
1	3	SOURCE

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3.0 FUNCTIONAL DESCRIPTION

Figure 3-1 shows the switching waveform and test circuit for DN2530. Figure 3-2 and Figure 3-3 provide typical performance curves.

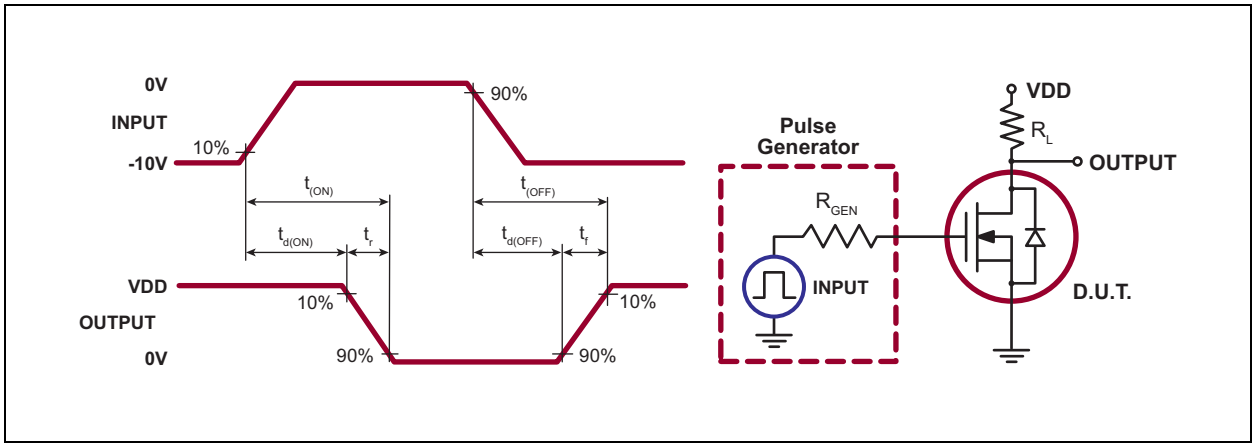

FIGURE 3-1: *Switching Waveforms and Test Circuit*

Product Summary

BV_{DSX}/BV_{DGX} (V)	$R_{DS(ON)}$ (max) (Ω)	I_{DSS} (min) (mA)
300	12	200

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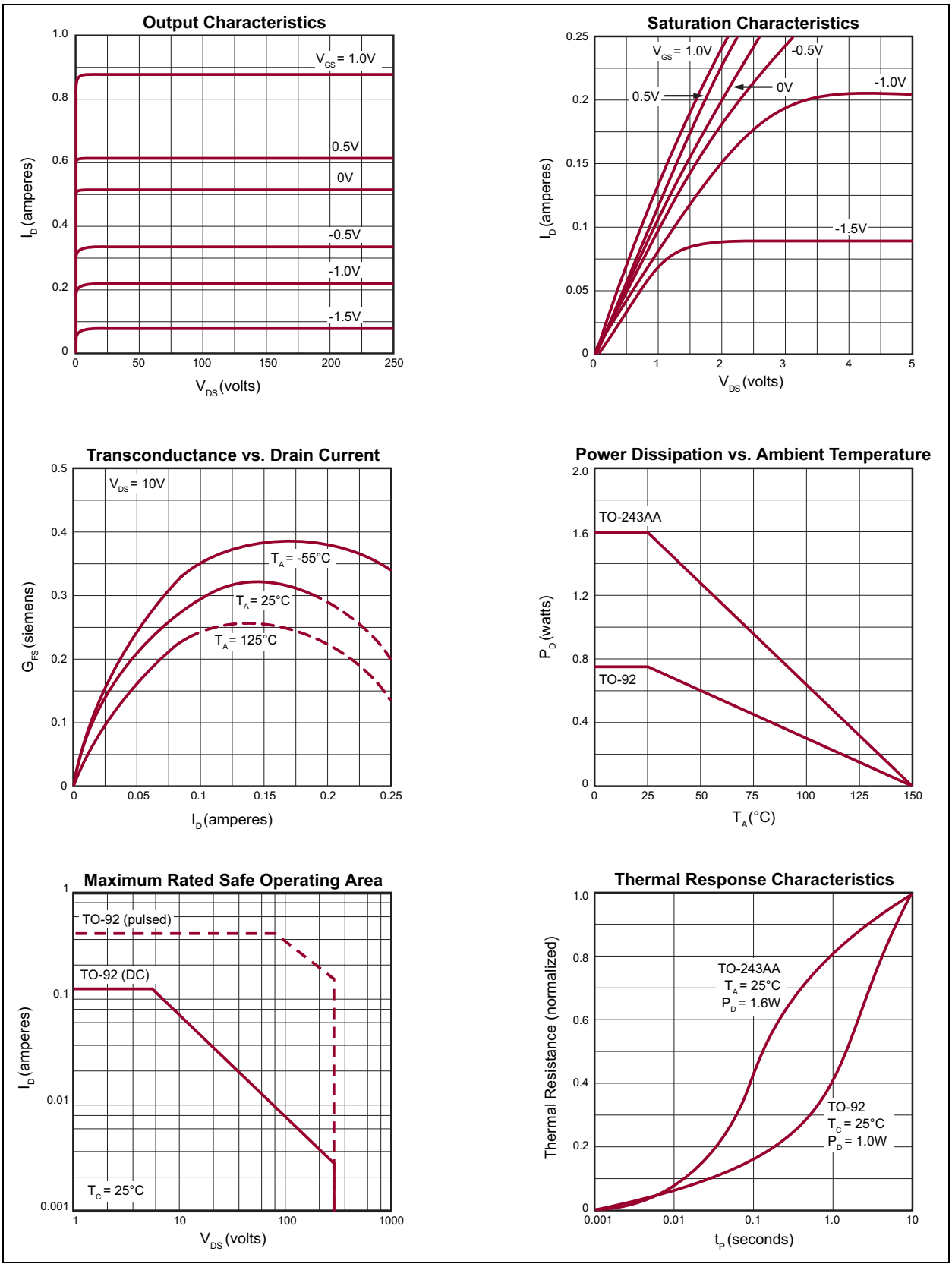

FIGURE 3-2: *Typical Performance Curves*

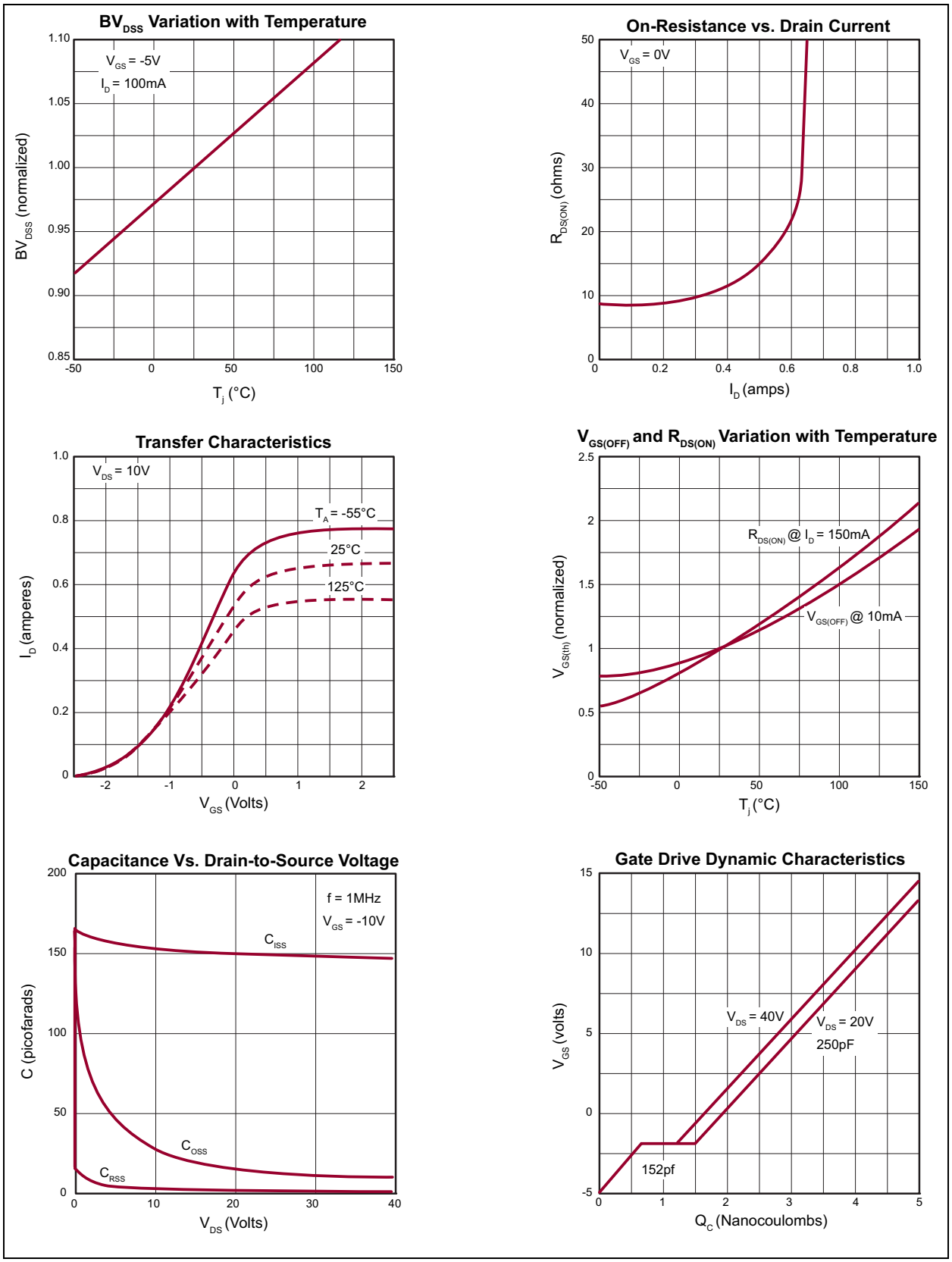

FIGURE 3-3: *Typical Performance Curves (continued)*

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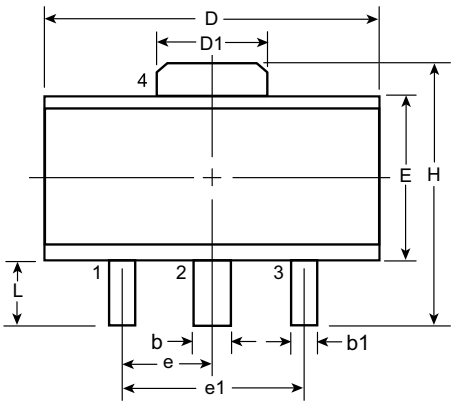
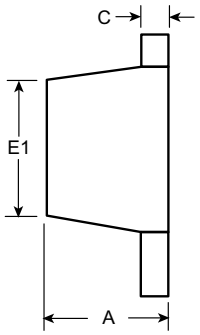
3-Lead TO-243AA (SOT-89) Package Outline (N8)



Top View



Side View

Note: For the most current package drawings, see the Microchip Packaging Specification at www.microchip.com/packaging.

Symbol		A	b	b1	C	D	D1	E	E1	e	e1	H	L
Dimensions (mm)	MIN	1.40	0.44	0.36	0.35	4.40	1.62	2.29	2.00†	1.50 BSC	3.00 BSC	3.94	0.73†
	NOM	-	-	-	-	-	-	-	-			-	-
	MAX	1.60	0.56	0.48	0.44	4.60	1.83	2.60	2.29			4.25	1.20

JEDEC Registration TO-243, Variation AA, Issue C, July 1986.
***†** This dimension differs from the JEDEC drawing*
***Drawings not to scale**.*

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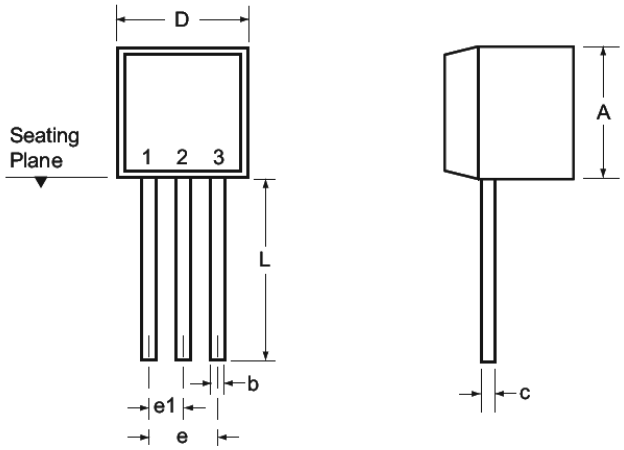
3-Lead TO-92 Package Outline (L/LL/N3)



Note: For the most current package drawings, see the Microchip Packaging Specification at www.microchip.com/packaging.

Symbol		A	b	c	D	E	E1	e	e1	L
Dimensions (inches)	MIN	.170	.014†	.014†	.175	.125	.080	.095	.045	.500
	NOM	-	-	-	-	-	-	-	-	-
	MAX	.210	.022†	.022†	.205	.165	.105	.105	.055	.610*

JEDEC Registration TO-92.
** This dimension is not specified in the JEDEC drawing.*
† This dimension differs from the JEDEC drawing.
Drawings not to scale.

APPENDIX A: REVISION HISTORY

Revision A (January 2016)

- Converted Supertex Doc #DSFP-DN2530 to Microchip DS20005451A.
- Removed 2000/Reel option for TO-92 package.

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PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

PART NO.	XX	-	X	-	X
Device	Package Options		Environmental		Media Type

Device:	DN2530 =	N-Channel, Depletion-Mode, Vertical DMOS FET
Package:	N3 =	TO-92, 3-lead
	N8 =	TO-243AA (SOT-89), 3-lead
Environmental	G =	Lead (Pb)-free/ROHS-compliant package
Media Type:	(blank) =	1000/Reel for N3 packages
	=	2000/Reel for N8 packages

Examples:

a) DN2530N3-G — TO-92 package, 1000/reel

b) DN2530N8-G — TO-243AA package, 2000/reel

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