

# TOPAZ

SEMICONDUCTOR

## VPO104, VPO106 VPO109

### P-CHANNEL ENHANCEMENT-MODE D-MOS POWER FETs

#### ORDERING INFORMATION

TO-226AA (TO-92) Plastic Package	VP0104N3	VP0106N3	VP0109N3
Sorted Chips in Waffle Pack	VP0104ND	VP0106ND	VP0109ND
Description	-40V, 8.0 ohm	-60V, 8.0 ohm	-90V, 8.0 ohm

#### FEATURES

- Gate Standoff Voltage,  $\pm 40V$  min
- Low Output and Transfer Capacitances
- Extended Safe Operating Area
- Complementary N-Channel Devices Available

#### APPLICATIONS

- Complementary Voltage and Current Drivers
- Line Drivers
- Pulse Amplifiers
- Solid-State Relays

#### ABSOLUTE MAXIMUM RATINGS ( $T_A = +25^\circ C$ unless otherwise specified)

##### Drain-Source Voltage

VP0104	-40V
VP0106	-60V
VP0109	-90V

##### Drain-Gate Voltage ( $V_{GS} = 0$ )

VP0104	-40V
VP0106	-60V
VP0109	-90V

##### Gate-Source Voltage

	$\pm 40V$
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##### Continuous Drain Current

TO-92(N3)pkg.	$T_A = +25^\circ C$	$T_C = +25^\circ C$
	-14A	-26A

##### Peak Pulsed Drain Current

	-0.5A
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##### Continuous Device Dissipation

	$T_A = +25^\circ C$	$T_C = +25^\circ C$
TO-92(N3)pkg.	0.30W	1.0W

##### Linear Derating Factor

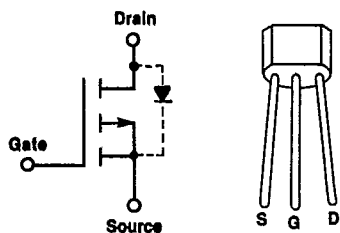
	$T_A = +25^\circ C$	$T_C = +25^\circ C$
TO-92(N3)pkg.	3.0mW/ $^\circ C$	10mW/ $^\circ C$

##### Operating Junction and Storage Temperature

Range  $-55^\circ C$  to  $+150^\circ C$

Lead Temperature (1/16" from mounting surface for 30 sec.)  $+260^\circ C$

#### PIN CONFIGURATION

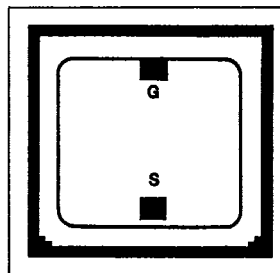


#### PACKAGE DIMENSIONS (TO-92) TO-226A

(See Package 5)

All dimensions in inches and (millimeters)

#### CHIP CONFIGURATION



Dimensions: .054 x .051 x .020 in.  
Drain is backside contact.

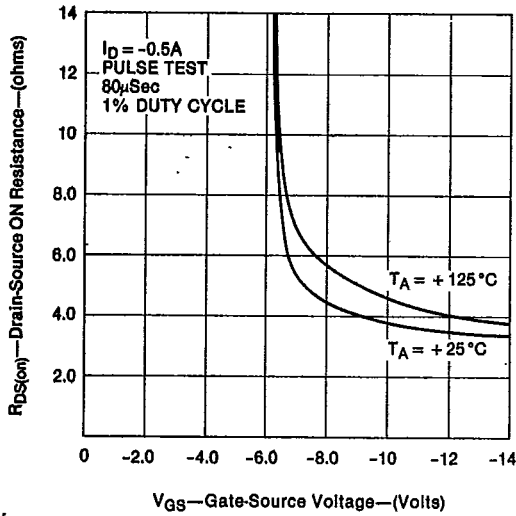
**ELECTRICAL CHARACTERISTICS** ( $T_A = +25^\circ\text{C}$  unless otherwise specified)

#	PARAMETER	VP0104			VP0106			VP0109			UNIT	CONDITIONS		
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX				
1	$BV_{DSS}$ Drain-Source Breakdown Voltage	-40	-60		-60	-90		-90	-105		V	$I_D = -1.0\text{mA}, V_{GS} = 0$		
2	$I_{DSS}$ Drain-Source Off Leakage Current			-1.0							mA	$V_{DS} = -32\text{V}$	$T_A = +125^\circ\text{C}$ $V_{GS} = 0$	
3												$V_{DS} = -48\text{V}$		
4														$V_{DS} = -72\text{V}$
5														$V_{DS} = -40\text{V}$
6	$I_{DSS}$ Drain-Source Off Leakage Current		-0.1	-10							$\mu\text{A}$	$V_{DS} = -80\text{V}$	$V_{GS} = 0$	
7												$V_{DS} = -90\text{V}$		
8														$V_{GS} = 0$
8	$I_{GBS}$ Gate-Body Leakage Current			$\pm 1.0$			$\pm 1.0$		$\pm 1.0$		$\mu\text{A}$	$V_{GS} = \pm 40\text{V}$	$V_{DS} = 0$	
9	$I_{GBS}$ Gate-Body Leakage Current			$\pm 10$			$\pm 10$		$\pm 10$		nA	$V_{GS} = \pm 20\text{V}$		
10	$V_{GS(th)}$ Gate-Source Threshold Voltage	-1.5		-3.5	-1.5		-3.5	-1.5		-3.5	V	$V_{DS} = V_{GS}, I_D = -1.0\text{mA}$		
11	$r_{DS(on)}$ Drain-Source On Resistance		10	15		10	15		10	15	ohms	$V_{GS} = -5\text{V}, I_D = -0.1\text{A}$	(Note 1)	
12	$r_{DS(on)}$ Drain-Source On Resistance		4.0	8.0		4.0	8.0		4.0	8.0		$V_{GS} = -10\text{V}, I_D = -0.5\text{A}$		
13	$I_{D(on)}$ On Drain Current	-0.1	-0.2		-0.1	-0.2		-0.1	-0.2		A	$V_{GS} = -5\text{V}$		
14	$I_{D(on)}$ On Drain Current	-0.5	-1.2		-0.5	-1.2		-0.5	-1.2			$V_{GS} = -10\text{V}$		
15	$g_{fs}$ Common-Source Forward Transcond.	150	275		150	275		150	275		mmhos	$V_{DS} = -25\text{V}, I_D = -0.5\text{A}$ $f = 1\text{KHz}$		
16	$V_{SD}$ Source-Drain Forward Voltage			-2.0			-2.0			-2.0	V	$I_{SD} = -1.0\text{A}, V_{GS} = 0$		
17	$C_{iss}$ Common-Source Input Capacitance			60			60			60	pF	$V_{DS} = -25\text{V}$ $V_{GS} = 0$ $f = 1\text{MHz}$		
18	$C_{oss}$ Common-Source Output Capacitance		11	30		11	30		11	30				
19	$C_{rss}$ Common-Source Reverse Transfer Capacitance		1.5	8.0		1.5	8.0		1.5	8.0				
20	$t_{on}$ Turn ON Time		8.0	16		8.0	16		8.0	16	nS	$V_{DD} = -25\text{V}, V_{G(on)} = -10\text{V}$		
21	$t_{off}$ Turn OFF Time		8.0	15		8.0	15		8.0	15		$R_G = 51\Omega, R_L = 51\Omega$		

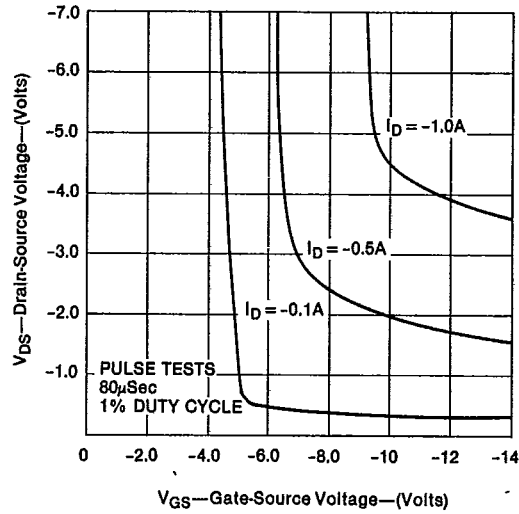
NOTE 1: Pulse Test, 80% Sec, 1% Duty Cycle

**TYPICAL PERFORMANCE CHARACTERISTICS** ( $T_A = +25^\circ\text{C}$  unless otherwise specified)

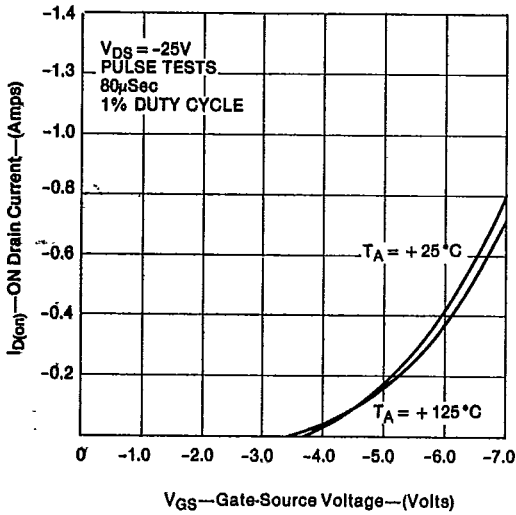
**DRAIN-SOURCE ON RESISTANCE**  
—VS—  
**GATE-SOURCE VOLTAGE**



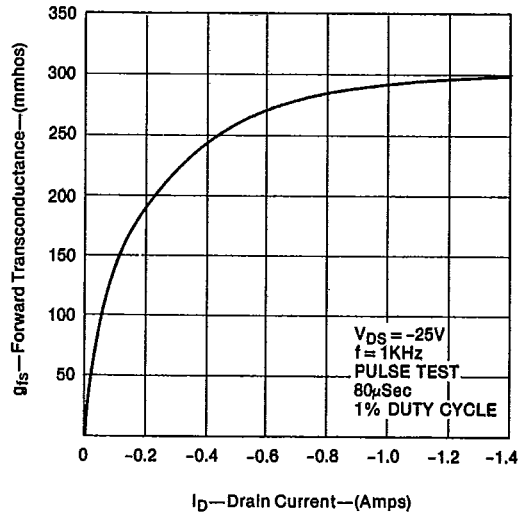
**ON VOLTAGE CHARACTERISTICS**



**ON DRAIN CURRENT**  
—VS—  
**GATE SOURCE VOLTAGE**



**FORWARD TRANSCONDUCTANCE**  
—VS—  
**ON DRAIN CURRENT**





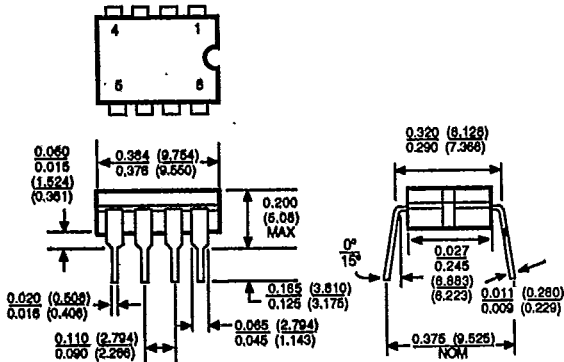


T-90-20  
PACKAGE DATA  
T-91-20

# TOPAZ

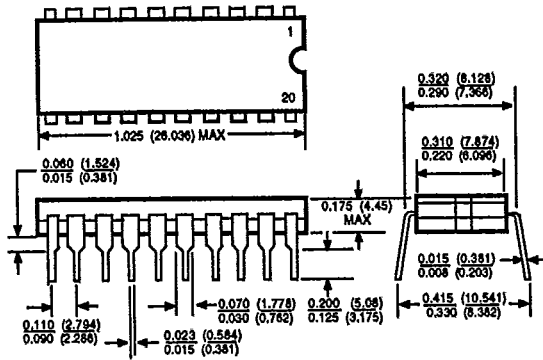
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### Package 13 8-Pin Ceramic Dip



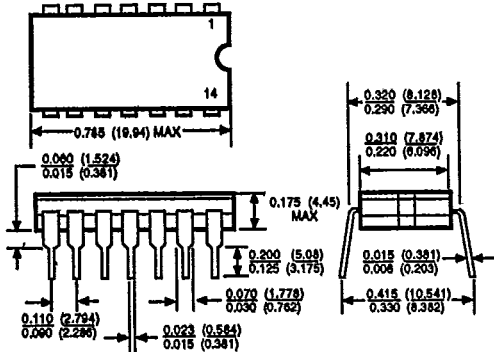
All Dimensions in Inches and (millimeters)

### Package 16 20-Pin Ceramic Dip



All Dimensions in Inches and (millimeters)

### Package 14 (TO-116) 14-Pin Ceramic Dip



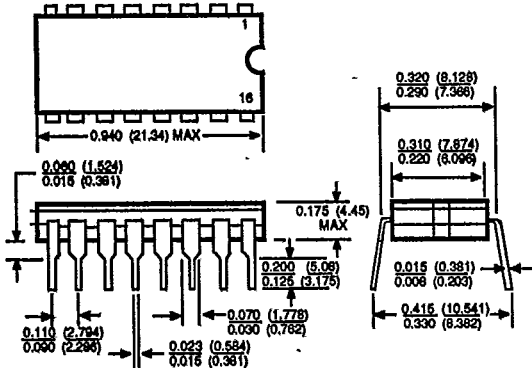
All Dimensions in Inches and (millimeters)

### Package 17

NONE

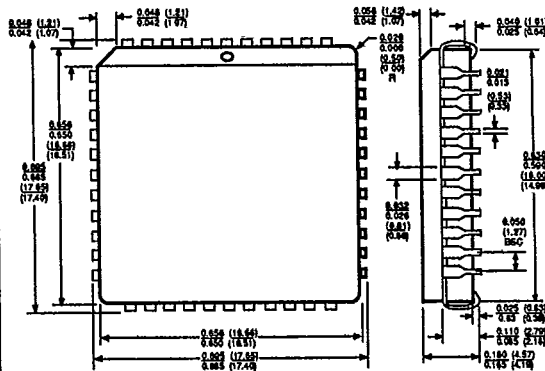
All Dimensions in Inches and (millimeters)

### Package 15 16-Pin Ceramic Dip



All Dimensions in Inches and (millimeters)

### Package 18 PLCC-44

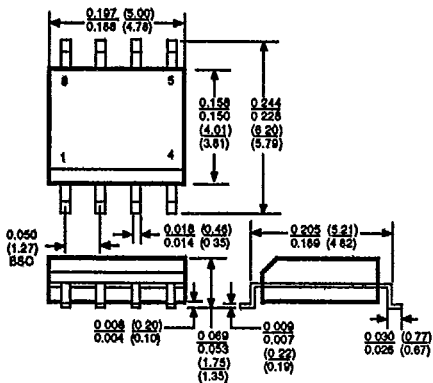


All Dimensions in Inches and (millimeters)

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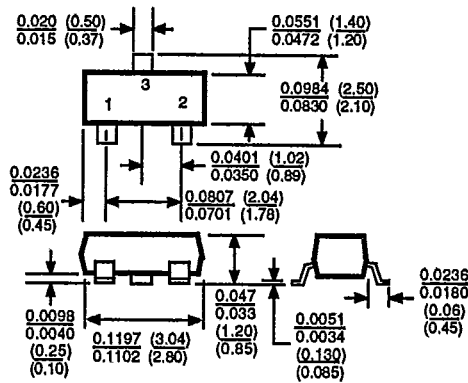
T-90-20 -  
PACKAGE DATA  
T-91-20 -

**Package 19 (SO-8)**



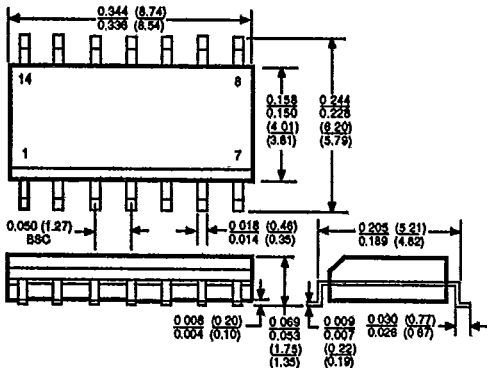
All Dimensions in Inches and (millimeters)

**Package 22 (SOT-23) TO-236AA**



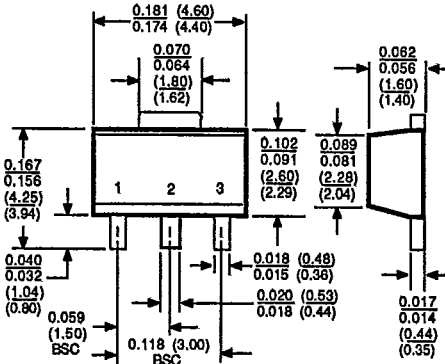
All Dimensions in Inches and (millimeters)

**Package 20 (SO-14)**



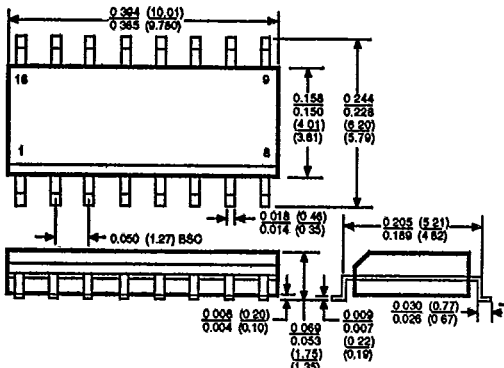
All Dimensions in Inches and (millimeters)

**Package 23 (SOT-89) TO-243AA**



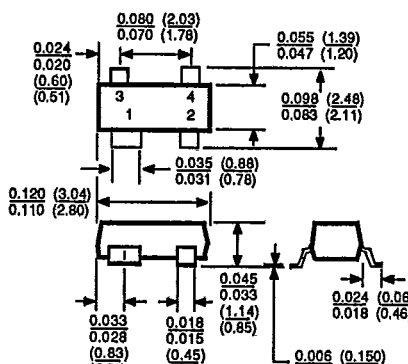
All Dimensions in Inches and (millimeters)

**Package 21 (SO-16)**



All Dimensions in Inches and (millimeters)

**Package 24 (SOT-143)**



All Dimensions in Inches and (millimeters)