

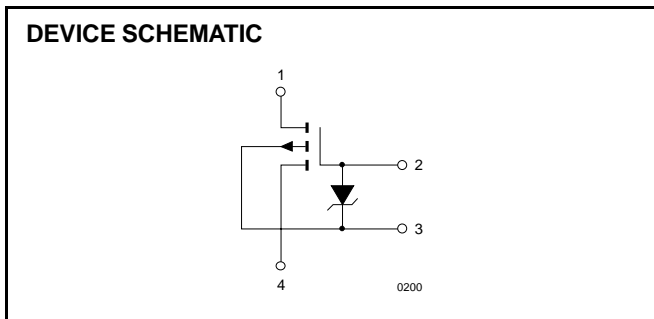
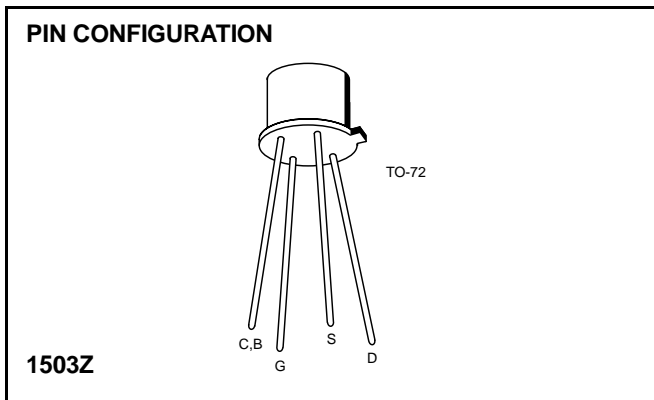
# Diode Protected P-Channel Enhancement Mode MOSFET General Purpose Amplifier/Switch



## 3N172 / 3N173

### FEATURES

- High Input Impedance
- Diode Protected Gate



### ABSOLUTE MAXIMUM RATINGS

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

Drain-Source or Drain-Gate Voltage	
3N172.....	40V
3N173.....	30V
Drain Current.....	50mA
Gate Forward Current.....	10 $\mu$ A
Gate Reverse Current.....	1mA
Storage Temperature.....	-65 $^\circ\text{C}$ to +200 $^\circ\text{C}$
Operating Temperature.....	-55 $^\circ\text{C}$ to +150 $^\circ\text{C}$
Lead Temperature (Soldering, 10sec).....	+300 $^\circ\text{C}$
Power Dissipation.....	375mW
Derate above 25 $^\circ\text{C}$ .....	3.0mW/ $^\circ\text{C}$

**NOTE:** Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### ORDERING INFORMATION

Part	Package	Temperature Range
3N172-73	Hermetic TO-72	-55 $^\circ\text{C}$ to +150 $^\circ\text{C}$
X3N172-73	Sorted Chips in Carriers	-55 $^\circ\text{C}$ to +150 $^\circ\text{C}$

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ and $V_{BS} = 0$ unless otherwise specified)

SYMBOL	PARAMETER	3N172		3N173		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
I <sub>GSS</sub>	Gate Reverse Current		-200		-500	pA	V <sub>GS</sub> = -20V T <sub>A</sub> = +125 $^\circ\text{C}$
			-0.5		-1.0	$\mu$ A	
BV <sub>GSS</sub>	Gate Breakdown Voltage	-40	-125	-30	-125	V	I <sub>D</sub> = -10 $\mu$ A
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	-40		-30			I <sub>S</sub> = -10 $\mu$ A
BV <sub>S<sub>DS</sub></sub>	Source-Drain Breakdown Voltage	-40		-30			I <sub>S</sub> = -10 $\mu$ A, V <sub>DB</sub> = 0
V <sub>GS(th)</sub>	Threshold Voltage	-2.0	-5.0	-2.0	-5.0		V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -10 $\mu$ A
		-2.0	-5.0	-2.0	-5.0		V <sub>DS</sub> = -15V, I <sub>D</sub> = -10 $\mu$ A
V <sub>GS</sub>	Gate Source Voltage	-3.0	-6.5	-2.5	-6.5	V <sub>DS</sub> = -15V, I <sub>D</sub> = -500 $\mu$ A	
I <sub>DSS</sub>	Zero Gate Voltage Drain Current		-0.4		-10	nA	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0
I <sub>S<sub>DS</sub></sub>	Zero Gate Voltage Source Current		-0.4		-10		V <sub>SD</sub> = -15V, V <sub>DB</sub> = 0, V <sub>GD</sub> = 0
r <sub>DS(on)</sub>	Drain Source On Resistance		250		350	ohms	V <sub>GS</sub> = -20V, I <sub>D</sub> = -100 $\mu$ A
I <sub>D(on)</sub>	On Drain Current	-5.0	-30	-5.0	-30	mA	V <sub>DS</sub> = -15V, V <sub>GS</sub> = -10V

### SMALL-SIGNAL ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$ and Bulk (substrate) Lead Connected to Source

SYMBOL	PARAMETER	3N172		3N173		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
$ Y_{fs} $	Magnitude of Small-Signal, Common-Source, Short-Circuit, Forward Transadmittance*	1500	4000	1000	4000	$\mu\text{S}$	$V_{DS} = -15\text{V}$ , $I_D = -10\text{mA}$ , $f = 1\text{kHz}$
$ Y_{os} $	Magnitude of Small-Signal, Common-Source, Short-Circuit, Output Admittance*		250		250	$\mu\text{S}$	$V_{DS} = -15\text{V}$ , $I_D = -10\text{mA}$ , $f = 1\text{kHz}$
$C_{iss}$	Small-Signal, Common-Source, Short-Circuit, Input Capacitance*		3.5		3.5	$\text{pF}$	$V_{DS} = -15\text{V}$ , $I_D = -10\text{mA}$ , $f = 1\text{MHz}$
$C_{rss}$	Small-Signal, Common-Source, Short-Circuit, Reverse Transfer Capacitance*		1.0		1.0	$\text{pF}$	$V_{DS} = -15\text{V}$ , $I_D = -10\text{mA}$ , $f = 1\text{MHz}$
$C_{oss}$	Small-Signal, Common-Source, Short-Circuit, Output Capacitance*		3.0		3.0	$\text{pF}$	$V_{DS} = -15\text{V}$ , $I_D = -10\text{mA}$ , $f = 1\text{MHz}$

### NOISE CHARACTERISTICS

SYMBOL	PARAMETER	TYPICAL	UNITS	TEST CONDITIONS
NF	Common-Source Spot Noise Figure	1.0	dB	$V_{DS} = -15\text{V}$ , $I_D = -1\text{mA}$ , $f = 1\text{kHz}$ , $R_G = 1\text{M}\Omega$

### SWITCHING CHARACTERISTICS $T_A = 25^\circ\text{C}$ Bulk (substrate) Lead Connected to Source

SYMBOL	PARAMETER	3N172		3N173		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
$t_{d(on)}$	Turn-On Delay Time*		12		12	ns	$V_{DD} = -15\text{V}$ , $I_{D(on)} = -10\text{mA}$
$t_r$	Rise Time*		24		24		$R_G = R_L = 1.4\text{k}\Omega$
$t_{off}$	Turn-Off Delay Time*		50		50		See Test Circuit Below

\*Registered JEDEC Data

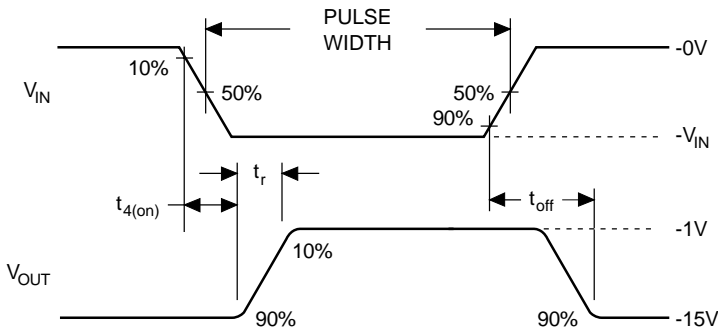
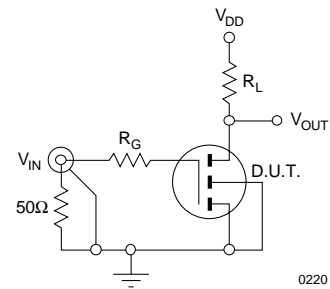
### SWITCHING TIME DETAIL

#### MEASUREMENTS ON SAMPLING OSCILLOSCOPE WITH

$t_{rise} \leq 0.2\text{ns}$   
 $C_{in} \leq 2.0\text{pF}$   
 $R_{in} \geq 10\text{M}\Omega$

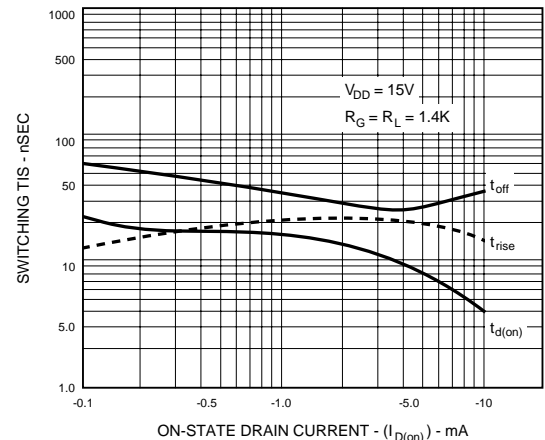
#### INPUT PULSE

$t_{rise} \leq 2\text{ns}$   
 PULSE WIDTH  $\geq 200\text{ns}$



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SWITCHING TIMES vs. ON-STATE DRAIN CURRENT



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