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

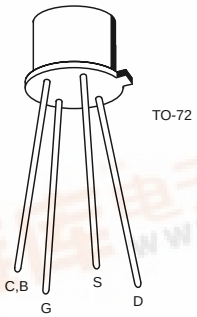
calogic CORPORATION

3N172 / 3N173

FEATURES

- **High Input Impedance**
- **Diode Protected Gate**

PIN CONFIGURATION



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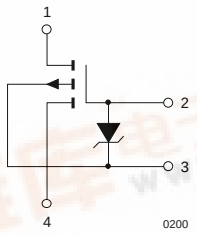
DEVICE SCHEMATIC



ABSOLUTE MAXIMUM RATINGS

(T_A = 25°C unless otherwise specified)

Drain-Source or Drain-Gate Voltage
- 3N172 . . . . . 40V
- 3N173 . . . . . 30V

Drain Current 50mA
Gate Forward Current 10µA
Gate Reverse Current 1mA
Storage Temperature . . . . . -65°C to +200°C
Operating Temperature . . . . . -55°C to +150°C
Lead Temperature (Soldering, 10sec) . . . . . +300°C
Power Dissipation 375mW
Derate above 25°C . . . . . 3.0mW/°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°C to +150°C
X3N172-73	Sorted Chips in Carriers	-55°C to +150°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C and V_{BS} = 0 unless otherwise specified)

SYMBOL	PARAMETER	3N172		3N173		UNITS	TEST CONDITIONS
		MIN	MAX	MIN	MAX		
I_{GSS}	Gate Reverse Current		-200		-500	pA	V_{GS} = -20V
			-0.5		-1.0	µA	T_A = +125°C
BV_{GSS}	Gate Breakdown Voltage	-40	-125	-30	-125	V	I_D = -10µA
BV_{DSS}	Drain-Source Breakdown Voltage	-40		-30		V	I_D = -10µA
BV_{SDS}	Source-Drain Breakdown Voltage	-40		-30		V	I_S = -10µA, V_{DB} = 0
$V_{GS(th)}$	Threshold Voltage	-2.0	-5.0	-2.0	-5.0	V	V_{DS} = V_{GS}, I_D = -10µA
		-2.0	-5.0	-2.0	-5.0	V	V_{DS} = -15V, I_D = -10µA
V_{GS}	Gate Source Voltage	-3.0	-6.5	-2.5	-6.5	V	V_{DS} = -15V, I_D = -500µA
I_{DSS}	Zero Gate Voltage Drain Current		-0.4		-10	nA	V_{DS} = -15V, V_{GS} = 0
I_{SDS}	Zero Gate Voltage Source Current		-0.4		-10	nA	V_{SD} = -15V, V_{DB} = 0, V_{GD} = 0
$r_{DS(on)}$	Drain Source On Resistance		250		350	ohms	V_{GS} = -20V, I_D = -100µA
$I_{D(on)}$	On Drain Current	-5.0	-30	-5.0	-30	mA	V_{DS} = -15V, V_{GS} = -10V

SMALL-SIGNAL ELECTRICAL CHARACTERISTICS $T_A = 25^oC$ and Bulk (substrate) Lead Connected to Source

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

NOISE CHARACTERISTICS

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

SWITCHING CHARACTERISTICS $T_A = 25^oC$ 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} = -15V, $I_{D\ (on)}$ = -10mA
t_r	Rise Time*		24		24		$R_G = R_L$ = 1.4kΩ
t_{off}	Turn-Off Delay Time*		50		50		See Test Circuit Below

*Registered JEDEC Data

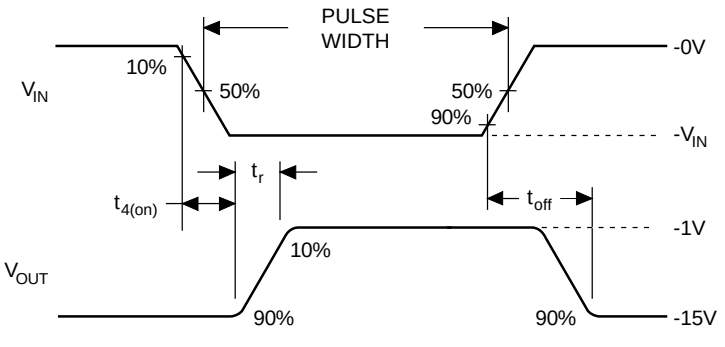
SWITCHING TIME DETAIL

MEASUREMENTS ON SAMPLING OSCILLOSCOPE WITH

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

INPUT PULSE

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



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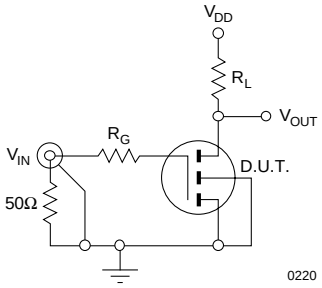

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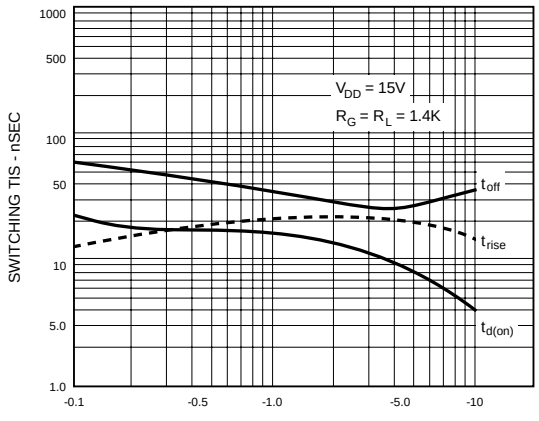
SWITCHING TIMES vs. ON-STATE DRAIN CURRENT



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