



**MOTOROLA**

# Dual EIA-423/EIA-232D Line Driver

The MC3488A dual is single-ended line driver has been designed to satisfy the requirements of EIA standards EIA-423 and EIA-232D, as well as CCITT X.26, X.28 and Federal Standard FIDS1030. It is suitable for use where signal wave shaping is desired and the output load resistance is greater than 450 ohms. Output slew rates are adjustable from 1.0  $\mu$ s to 100  $\mu$ s by a single external resistor. Output level and slew rate are insensitive to power supply variations. Input undershoot diodes limit transients below ground and output current limiting is provided in both output states.

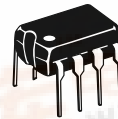
The MC3488A has a standard 1.5 V input logic threshold for TTL or NMOS compatibility.

- PNP Buffered Inputs to Minimize Input Loading
- Short Circuit Protection
- Adjustable Slew Rate Limiting
- MC3488A Equivalent to 9636A
- Output Levels and Slew Rates are Insensitive to Power Supply Voltages
- No External Blocking Diode Required for  $V_{EE}$  Supply
- Second Source  $\mu$ A9636A

## MC3488A

### DUAL EIA-423/EIA-232D DRIVER

#### SEMICONDUCTOR TECHNICAL DATA

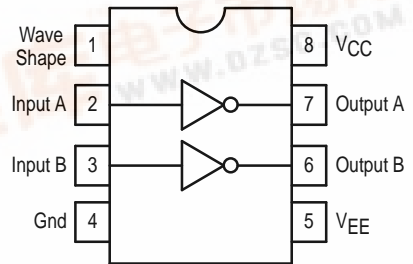


**P1 SUFFIX**  
PLASTIC PACKAGE  
CASE 626

**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751  
(SO-8)



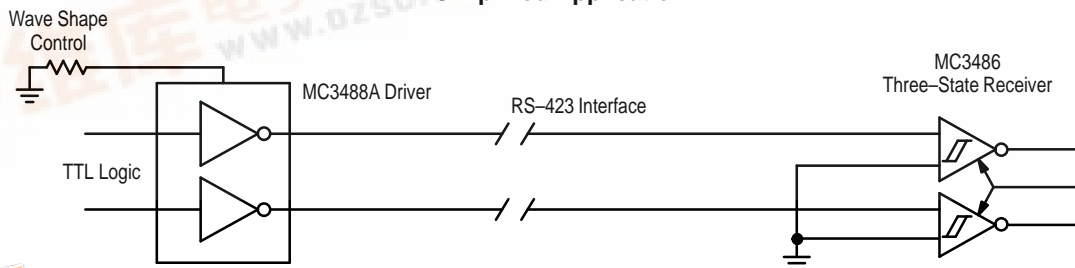
#### PIN CONNECTIONS



#### ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC3488AP1	$T_A = 0$ to $+70^\circ\text{C}$	Plastic DIP
MC3488AD		SO-8

#### Simplified Application



# MC3488A

## MAXIMUM RATINGS (Note 1)

Rating	Symbol	Value	Unit
Power Supply Voltages	$V_{CC}$ $V_{EE}$	+ 15 – 15	V
Output Current Source Sink	$I_{O+}$ $I_{O-}$	+ 150 – 150	mA
Operating Ambient Temperature	$T_A$	0 to + 70	°C
Junction Temperature Range	$T_J$	150	°C
Storage Temperature Range	$T_{stg}$	– 65 to + 150	°C

## RECOMMENDED OPERATING CONDITIONS

Characteristic	Symbol	Min	Typ	Max	Unit
Power Supply Voltages	$V_{CC}$ $V_{EE}$	10.8 – 13.2	12 – 12	13.2 – 10.8	V
Operating Temperature Range	$T_A$	0	25	70	°C
Wave Shaping Resistor	RWS	10	–	1000	k $\Omega$

## TARGET ELECTRICAL CHARACTERISTICS (Unless otherwise noted, specifications apply over recommended operating conditions)

Characteristic	Symbol	Min	Typ	Max	Unit
Input Voltage – Low Logic State	$V_{IL}$	–	–	0.8	V
Input Voltage – High Logic State	$V_{IH}$	2.0	–	–	V
Input Current – Low Logic State ( $V_{IL} = 0.4$ V)	$I_{IL}$	– 80	–	–	$\mu$ A
Input Current – High Logic State ( $V_{IH} = 2.4$ V) ( $V_{IH} = 5.5$ V)	$I_{IH1}$ $I_{IH2}$	– –	– –	10 100	$\mu$ A
Input Clamp Diode Voltage ( $I_{IK} = -15$ mA)	$V_{IK}$	– 1.5	–	–	V
Output Voltage – Low Logic State ( $R_L = \infty$ ) EIA–423 ( $R_L = 3.0$ k $\Omega$ ) EIA–232D ( $R_L = 450$ $\Omega$ ) EIA–423	$V_{OL}$	– 6.0 – 6.0 – 6.0	– – –	– 5.0 – 5.0 – 4.0	V
Output Voltage – High Logic State ( $R_L = \infty$ ) EIA–423 ( $R_L = 3.0$ k $\Omega$ ) EIA–232D ( $R_L = 450$ $\Omega$ ) EIA–423	$V_{OH}$	5.0 5.0 4.0	– – –	6.0 6.0 6.0	V
Output Resistance ( $R_L \geq 450$ $\Omega$ )	$R_O$	–	25	50	$\Omega$
Output Short–Circuit Current (Note 2) ( $V_{in} = V_{out} = 0$ V) ( $V_{in} = V_{IH}(\text{Min})$ , $V_{out} = 0$ V)	$I_{OSH}$ $I_{OSL}$	– 150 + 15	– –	– 15 + 150	mA
Output Leakage Current (Note 3) ( $V_{CC} = V_{EE} = 0$ V, $-6.0$ V $\leq V_O \leq 6.0$ V)	$I_{ox}$	– 100	–	100	$\mu$ A
Power Supply Currents ( $R_W = 100$ k $\Omega$ , $R_L = \infty$ , $V_{IL} \leq V_{in} \leq V_{IH}$ )	$I_{CC}$ $I_{EE}$	– – 18	– –	+ 18 –	mA

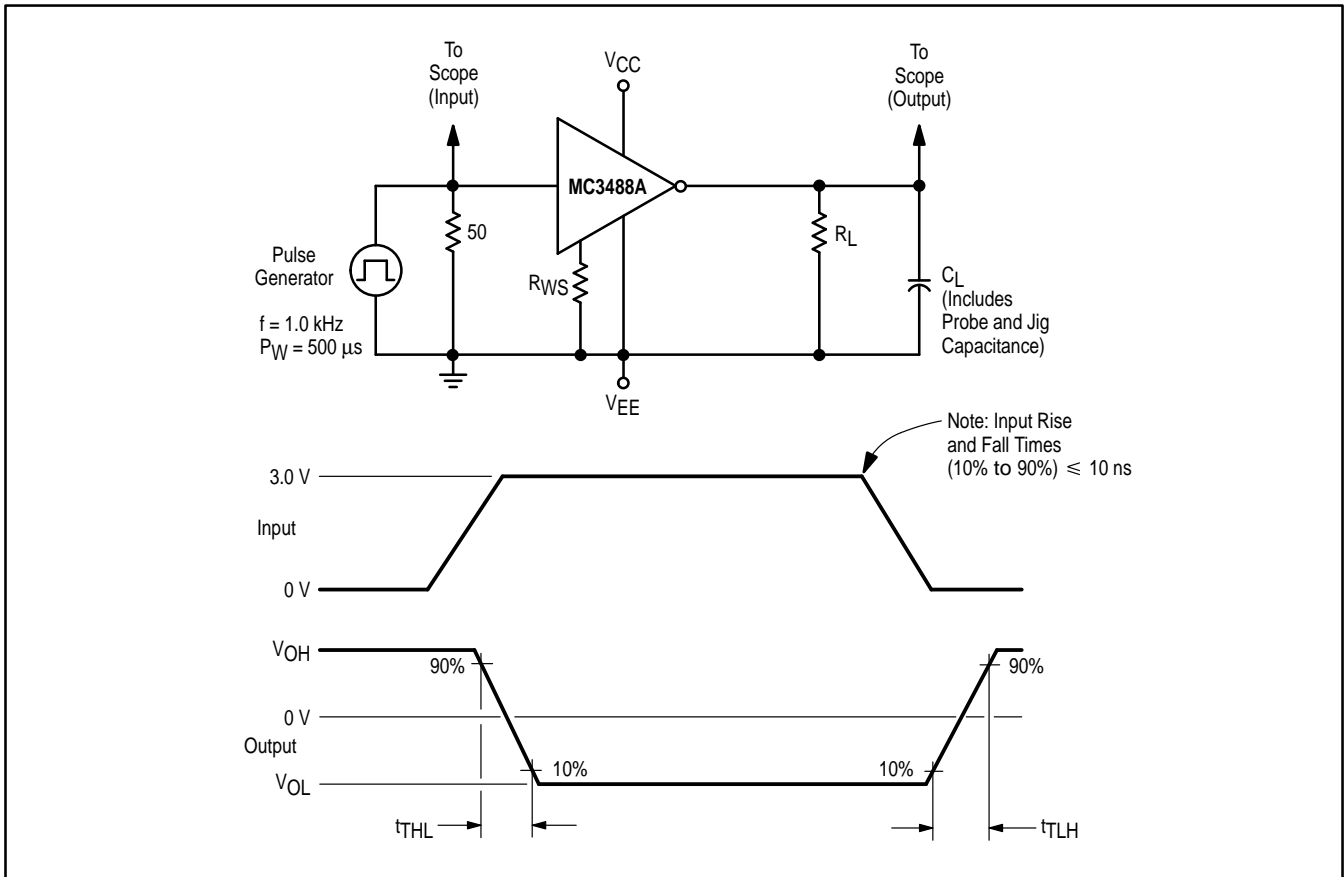
- NOTES:** 1. Devices should not be operated at these values. The "Electrical Characteristics" provide conditions for actual device operation.  
 2. One output shorted at a time.  
 3. No  $V_{EE}$  diode required.

## MC3488A

**TRANSITION TIMES** (Unless otherwise noted,  $C_L = 30 \text{ pF}$ ,  $f = 1.0 \text{ kHz}$ ,  $V_{CC} = -V_{EE} = 12.0 \text{ V} \pm 10\%$ ,  $T_A = 25^\circ\text{C}$ ,  $R_L = 450 \Omega$ .  
Transition times measured 10% to 90% and 90% to 10%)

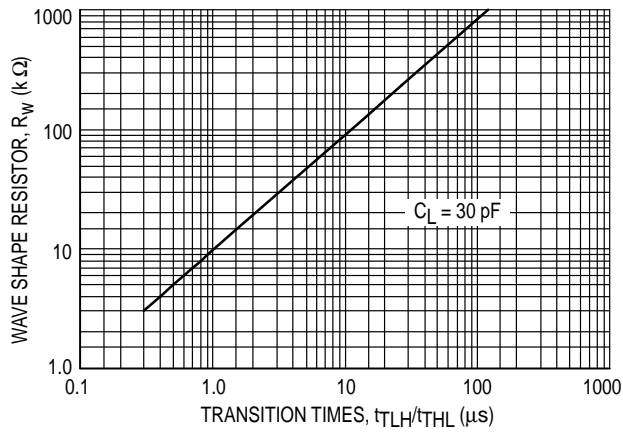
Characteristic	Symbol	Min	Typ	Max	Unit
Transition Time, Low-to-High State Output ( $R_W = 10 \text{ k}\Omega$ ) ( $R_W = 100 \text{ k}\Omega$ ) ( $R_W = 500 \text{ k}\Omega$ ) ( $R_W = 1000 \text{ k}\Omega$ )	$t_{TLH}$	0.8	—	1.4	$\mu\text{s}$
		8.0	—	14	
		40	—	70	
		80	—	140	
Transition Time, High-to-Low State Output ( $R_W = 10 \text{ k}\Omega$ ) ( $R_W = 100 \text{ k}\Omega$ ) ( $R_W = 500 \text{ k}\Omega$ ) ( $R_W = 1000 \text{ k}\Omega$ )	$t_{THL}$	0.8	—	1.4	$\mu\text{s}$
		8.0	—	14	
		40	—	70	
		80	—	140	

**Figure 1. Test Circuit and Waveforms for Transition Times**

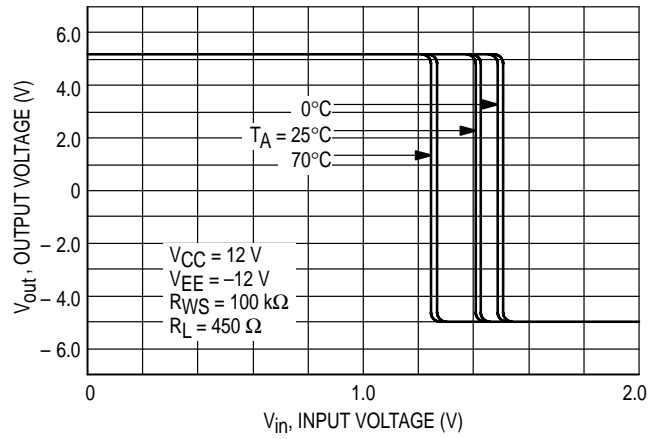


# MC3488A

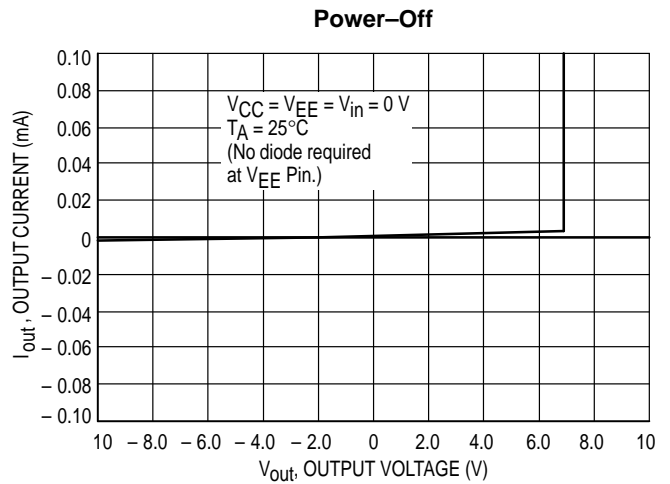
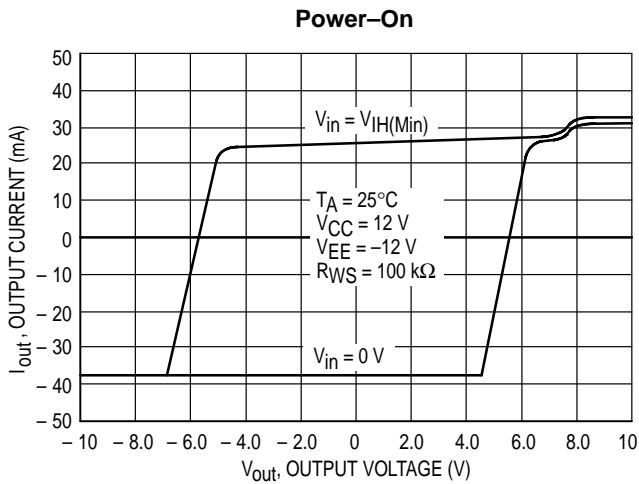
**Figure 2. Output Transition Times versus Wave Shape Resistor Value**



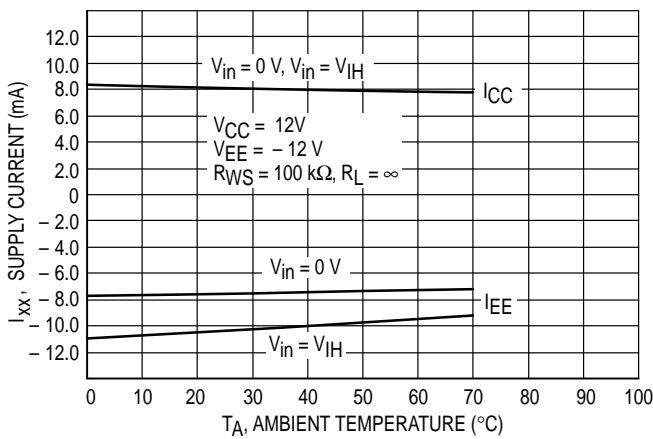
**Figure 3. Input/Output Characteristics versus Temperature**



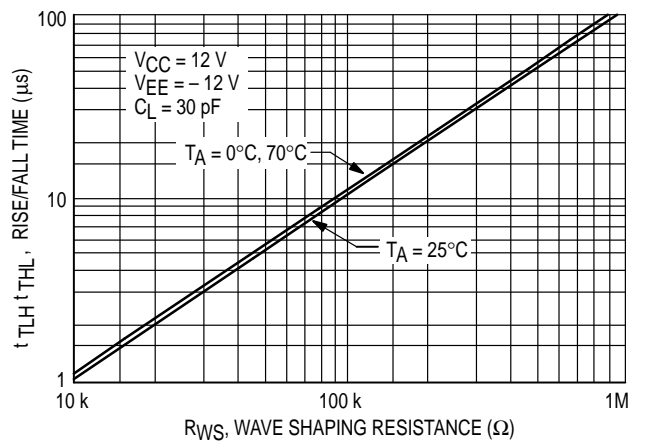
**Figure 4. Output Current versus Output Voltage**



**Figure 5. Supply Current versus Temperature**



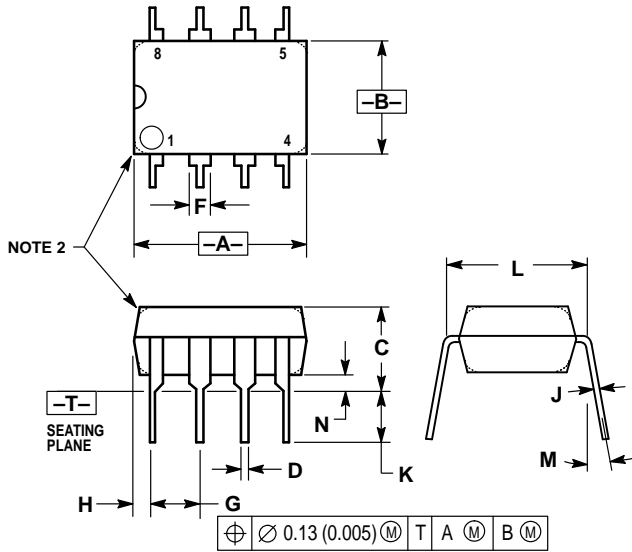
**Figure 6. Rise/Fall Time versus R\_WS**



# MC3488A

## OUTLINE DIMENSIONS

### P1 SUFFIX PLASTIC PACKAGE CASE 626-05 ISSUE K

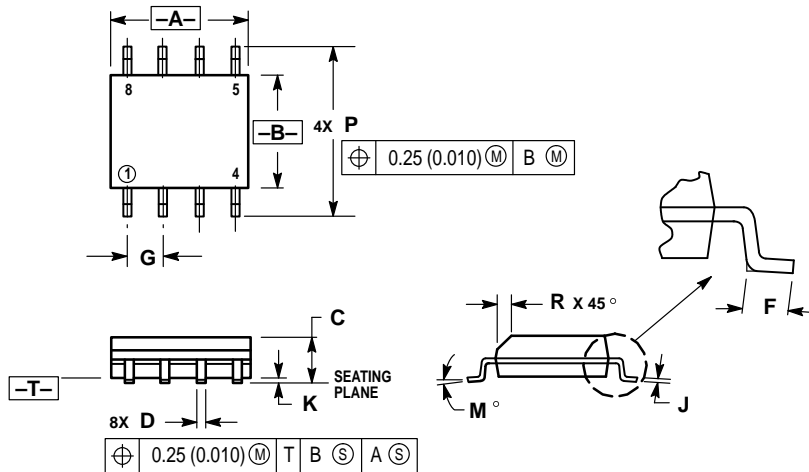


NOTES:

1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.40	10.16	0.370	0.400
B	6.10	6.60	0.240	0.260
C	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	—	10°	—	10°
N	0.76	1.01	0.030	0.040

### D SUFFIX PLASTIC PACKAGE CASE 751-05 (SO-8) ISSUE N




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.18	0.25	0.007	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

## MC3488A

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

**How to reach us:**

**USA/EUROPE/Locations Not Listed:** Motorola Literature Distribution;  
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447 or 602-303-5454

**MFAX:** RMFAX0@email.sps.mot.com – TOUCHTONE 602-244-6609  
**INTERNET:** <http://Design-NET.com>

**JAPAN:** Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, 6F Seibu-Butsuryu-Center,  
3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-81-3521-8315

**ASIA/PACIFIC:** Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,  
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298



MOTOROLA