

3-to-8 Line Decoder

The MC74VHCT138A is an advanced high speed CMOS 3-to-8 decoder fabricated with silicon gate CMOS technology. It achieves high speed operation similar to equivalent Bipolar Schottky TTL while maintaining CMOS low power dissipation.

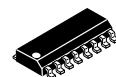
When the device is enabled, three Binary Select inputs (A0 – A2) determine which one of the outputs (Y0 – Y7) will go Low. When enable input E3 is held Low or either E2 or E1 is held High, decoding function is inhibited and all outputs go high. E3, E2, and E1 inputs are provided to ease cascade connection and for use as an address decoder for memory systems.

The VHCT inputs are compatible with TTL levels. This device can be used as a level converter for interfacing 3.3V to 5.0V, because they have full 5V CMOS level output swings.

The VHCT138A input structures provide protection when voltages between 0V and 5.5V are applied, regardless of the supply voltage. The output structures also provide protection when $V_{CC} = 0V$. These input and output structures help prevent device destruction caused by supply voltage – input/output voltage mismatch, battery backup, hot insertion, etc.

- High Speed: $t_{PD} = 7.6ns$ (Typ) at $V_{CC} = 5V$
- Low Power Dissipation: $I_{CC} = 4\mu A$ (Max) at $T_A = 25^\circ C$
- TTL-Compatible Inputs: $V_{IL} = 0.8V$; $V_{IH} = 2.0V$
- Power Down Protection Provided on Inputs and Outputs
- Balanced Propagation Delays
- Designed for 4.5V to 5.5V Operating Range
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300mA
- ESD Performance: HBM > 2000V; Machine Model > 200V
- Chip Complexity: 122 FETs or 30.5 Equivalent Gates

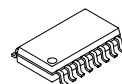
MC74VHCT138A



D SUFFIX
16-LEAD SOIC PACKAGE
CASE 751B-05



DT SUFFIX
16-LEAD TSSOP PACKAGE
CASE 948F-01

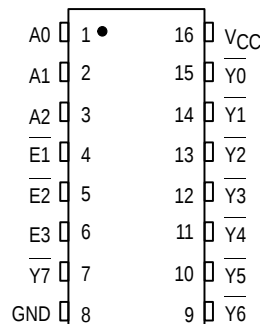


M SUFFIX
16-LEAD SOIC EIAJ PACKAGE
CASE 966-01

ORDERING INFORMATION

MC74VHCTXXXAD	SOIC
MC74VHCTXXXADT	TSSOP
MC74VHCTXXXAM	SOIC EIAJ

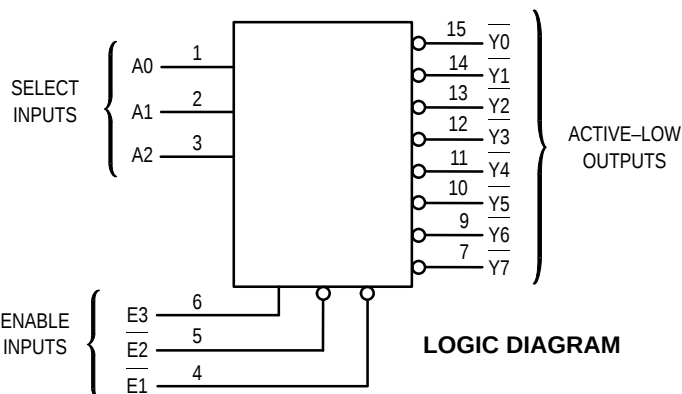
PIN ASSIGNMENT



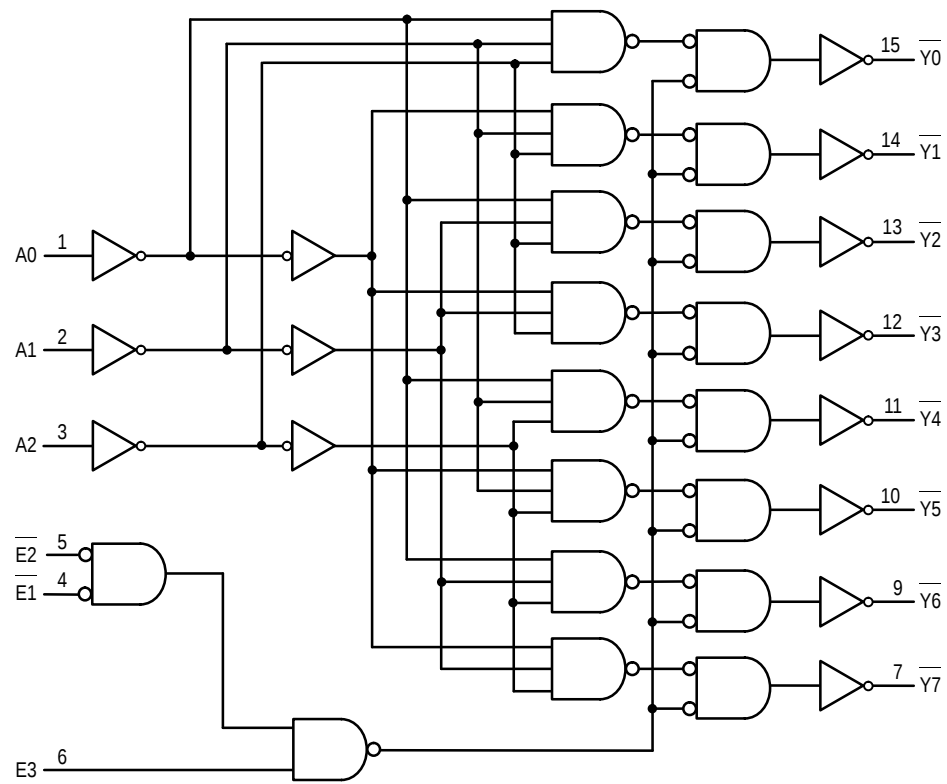
FUNCTION TABLE

Inputs						Outputs							
E3	E2	E1	A2	A1	A0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	X	H	X	X	X	H	H	H	H	H	H	H	H
X	H	X	X	X	X	H	H	H	H	H	H	H	H
L	X	X	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	L	H	H	H	H	L	H	H	H	H	H
H	L	L	H	L	L	H	H	H	H	L	H	H	H
H	L	L	H	L	H	H	H	H	H	H	L	H	H
H	L	L	H	H	L	H	H	H	H	H	H	L	H
H	L	L	H	H	H	H	H	H	H	H	H	H	L

H = high level (steady state); L = low level (steady state); X = don't care



EXPANDED LOGIC DIAGRAM



MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage	– 0.5 to + 7.0	V
V_{in}	DC Input Voltage	– 0.5 to + 7.0	V
V_{out}	DC Output Voltage $V_{CC} = 0$ High or Low State	– 0.5 to + 7.0 – 0.5 to $V_{CC} + 0.5$	V
I_{IK}	Input Diode Current	– 20	mA
I_{OK}	Output Diode Current ($V_{OUT} < GND$; $V_{OUT} > V_{CC}$)	± 20	mA
I_{out}	DC Output Current, per Pin	± 25	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	± 75	mA
P_D	Power Dissipation in Still Air, SOIC Packages† TSSOP Package†	500 450	mW
T_{stg}	Storage Temperature	– 65 to + 150	°C

* Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute–maximum–rated conditions is not implied.

† Derating — SOIC Packages: – 7 mW/°C from 65° to 125°C
TSSOP Package: – 6.1 mW/°C from 65° to 125°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high–impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range $GND \leq (V_{in} \text{ or } V_{out}) \leq V_{CC}$. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC Supply Voltage	4.5	5.5	V
V_{in}	DC Input Voltage	0	5.5	V
V_{out}	DC Output Voltage $V_{CC} = 0$ High or Low State	0 0	5.5 V_{CC}	V
T_A	Operating Temperature	– 40	+ 85	°C
t_r, t_f	Input Rise and Fall Time $V_{CC} = 5.0V \pm 0.5V$	0	20	ns/V

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V_{CC} V	$T_A = 25^\circ\text{C}$			$T_A = -40 \text{ to } 85^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	
V_{IH}	Minimum High–Level Input Voltage		4.5 to 5.5	2.0			2.0		V
V_{IL}	Maximum Low–Level Input Voltage		4.5 to 5.5			0.8		0.8	V
V_{OH}	Minimum High–Level Output Voltage $V_{in} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -50\mu\text{A}$	4.5	4.4	4.5		4.4		V
		$I_{OH} = -8\text{mA}$	4.5	3.94			3.80		
V_{OL}	Maximum Low–Level Output Voltage $V_{in} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 50\mu\text{A}$	4.5		0.0	0.1		0.1	V
		$I_{OL} = 8\text{mA}$	4.5			0.36		0.44	
I_{in}	Maximum Input Leakage Current	$V_{in} = 5.5\text{ V or GND}$	0 to 5.5			± 0.1		± 1.0	μA
I_{CC}	Maximum Quiescent Supply Current	$V_{in} = V_{CC} \text{ or GND}$	5.5			4.0		20.0	μA
I_{CCT}	Quiescent Supply Current	Per Input: $V_{IN} = 3.4\text{V}$ Other Input: $V_{CC} \text{ or GND}$	5.5			1.35		1.50	mA
I_{OPD}	Output Leakage Current	$V_{OUT} = 5.5\text{V}$	0			0.5		5.0	μA

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0\text{ns}$)

Symbol	Parameter	Test Conditions	$T_A = 25^\circ\text{C}$			$T_A = -40 \text{ to } 85^\circ\text{C}$		Unit
			Min	Typ	Max	Min	Max	
t_{PLH} , t_{PHL}	Maximum Propagation Delay, A to Y	$V_{CC} = 5.0 \pm 0.5\text{V}$ $C_L = 15\text{pF}$ $C_L = 50\text{pF}$		7.6 8.1	10.4 11.4	1.0 1.0	12.0 13.0	ns
t_{PLH} , t_{PHL}	Maximum Propagation Delay, E3 to Y	$V_{CC} = 5.0 \pm 0.5\text{V}$ $C_L = 15\text{pF}$ $C_L = 50\text{pF}$		6.6 7.1	9.1 10.1	1.0 1.0	10.5 11.5	ns
t_{PLH} , t_{PHL}	Maximum Propagation Delay, E2 or E1 to Y	$V_{CC} = 5.0 \pm 0.5\text{V}$ $C_L = 15\text{pF}$ $C_L = 50\text{pF}$		7.0 7.5	9.6 10.6	1.0 1.0	11.0 12.0	ns
C_{in}	Maximum Input Capacitance			4	10		10	pF

C_{PD}	Power Dissipation Capacitance (Note NO TAG)	Typical @ 25°C , $V_{CC} = 5.0\text{V}$	pF
		49	

1. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$. C_{PD} is used to determine the no-load dynamic power consumption; $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$.

SWITCHING WAVEFORMS

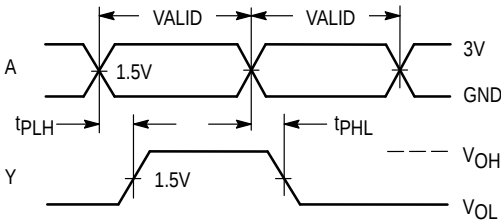


Figure 1.

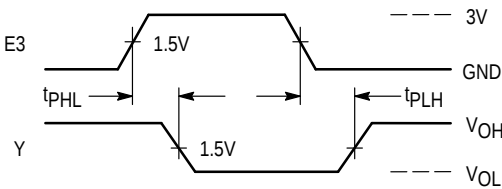


Figure 2.

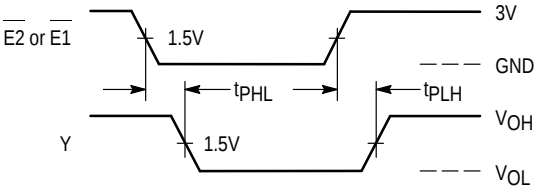
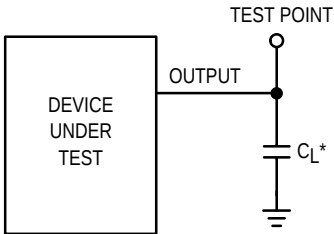


Figure 3.

TEST CIRCUIT

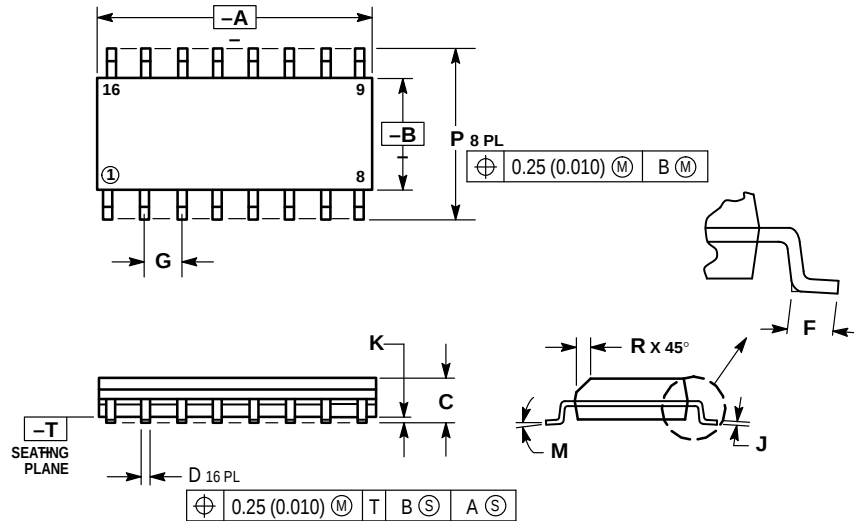


* Includes all probe and jig capacitance

Figure 4. Test Circuit

OUTLINE DIMENSIONS

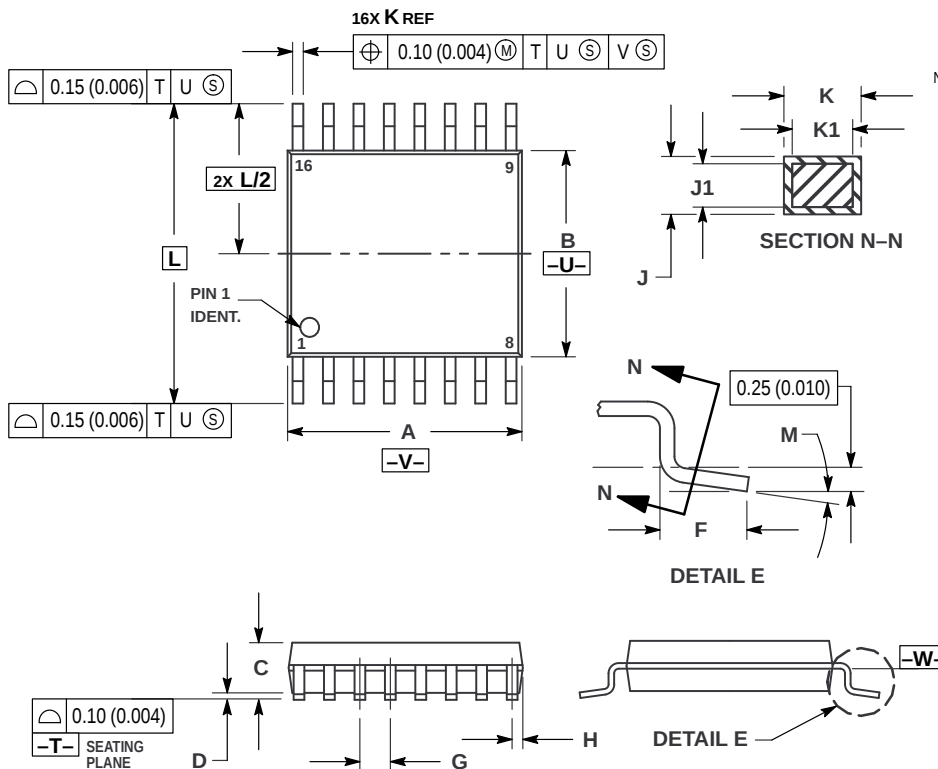
D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751B-05
ISSUE J



- 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	9.80	10.00	0.386	0.393
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	0.19	0.25	0.008	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

DT SUFFIX
PLASTIC TSSOP PACKAGE
CASE 948F-01
ISSUE O

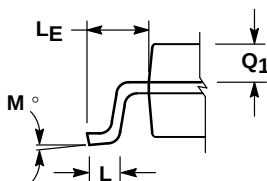
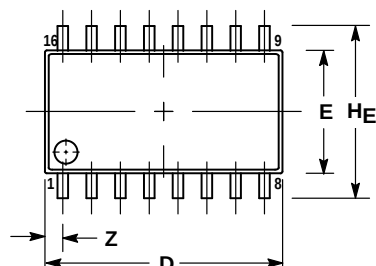


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
 5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
 6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

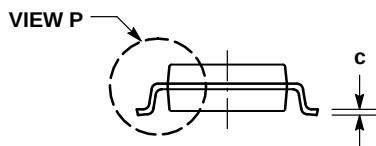
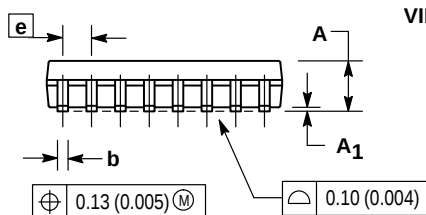
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	—	1.20	—	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC 0.026 BSC			
H	0.18	0.28	0.007	0.011
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC 0.252 BSC			
M	0°	8°	0°	8°

OUTLINE DIMENSIONS

M SUFFIX
PLASTIC SOIC EIAJ PACKAGE
CASE 966-01
ISSUE O



DETAIL P



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	—	2.05	—	0.081
A ₁	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
c	0.18	0.27	0.007	0.011
D	9.90	10.50	0.390	0.413
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
H _E	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
L _E	1.10	1.50	0.043	0.059
M	0°	10°	0°	10°
Q ₁	0.70	0.90	0.028	0.035
Z	—	0.78	—	0.031

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.

Mfax is a trademark of Motorola, Inc.

How to reach us:

USA/EUROPE/Locations Not Listed: Motorola Literature Distribution;
P.O. Box 5405, Denver, Colorado 80217. 303-675-2140 or 1-800-441-2447

JAPAN: Nippon Motorola Ltd.: SPD, Strategic Planning Office, 4-32-1,
Nishi-Gotanda, Shinagawa-ku, Tokyo 141, Japan. 81-3-5487-8488

Mfax™: RMFAX0@email.sps.mot.com — TOUCHTONE 602-244-6609
— US & Canada ONLY 1-800-774-1848

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

INTERNET: <http://motorola.com/sps>

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9