



# 4 x 4 REGISTER FILE WITH 3-STATE OUTPUTS

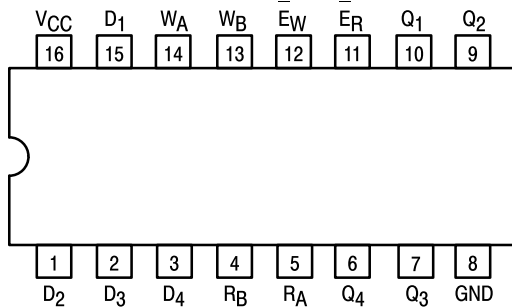
The TTL/MSI SN54/74LS670 is a high-speed, low-power 4 x 4 Register File organized as four words by four bits. Separate read and write inputs, both address and enable, allow simultaneous read and write operation.

The 3-state outputs make it possible to connect up to 128 outputs to increase the word capacity up to 512 words. Any number of these devices can be operated in parallel to generate an n-bit length.

The SN54/74LS170 provides a similar function to this device but it features open-collector outputs.

- Simultaneous Read/Write Operation
- Expandable to 512 Words by n-Bits
- Typical Access Time to 20 ns
- 3-State Outputs for Expansion
- Typical Power Dissipation of 125 mW

## CONNECTION DIAGRAM DIP (TOP VIEW)



NOTE:  
The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

## PIN NAMES

D <sub>1</sub> – D <sub>4</sub>	Data Inputs
W <sub>A</sub> , W <sub>B</sub>	Write Address Inputs
E <sub>W</sub>	Write Enable (Active LOW) Input
R <sub>A</sub> , R <sub>B</sub>	Read Address Inputs
E <sub>R</sub>	Read Enable (Active LOW) Input
Q <sub>1</sub> – Q <sub>4</sub>	Outputs (Note b)

## LOADING (Note a)

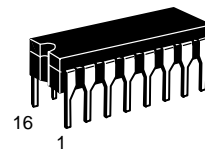
	HIGH	LOW
D <sub>1</sub> – D <sub>4</sub>	0.5 U.L.	0.25 U.L.
W <sub>A</sub> , W <sub>B</sub>	0.5 U.L.	0.25 U.L.
E <sub>W</sub>	1.0 U.L.	0.5 U.L.
R <sub>A</sub> , R <sub>B</sub>	0.5 U.L.	0.25 U.L.
E <sub>R</sub>	1.5 U.L.	0.75 U.L.
Q <sub>1</sub> – Q <sub>4</sub>	65 (25) U.L.	15 (7.5) U.L.

## NOTES:

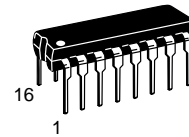
- a) 1 TTL Unit Load (U.L.) = 40  $\mu$ A HIGH/1.6 mA LOW.  
 b) The Output LOW drive factor is 7.5 U.L. for Military (54) and 15 U.L. for Commercial (74) Temperature Ranges. The Output HIGH drive factor is 25 U.L. for Military and 65 U.L. for Commercial Temperature Ranges.

# SN54/74LS670

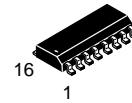
## 4 x 4 REGISTER FILE WITH 3-STATE OUTPUTS LOW POWER SCHOTTKY



**J SUFFIX**  
CERAMIC  
CASE 620-09



**N SUFFIX**  
PLASTIC  
CASE 648-08

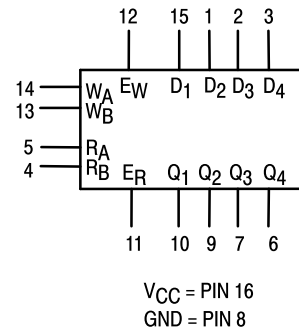


**D SUFFIX**  
SOIC  
CASE 751B-03

## ORDERING INFORMATION

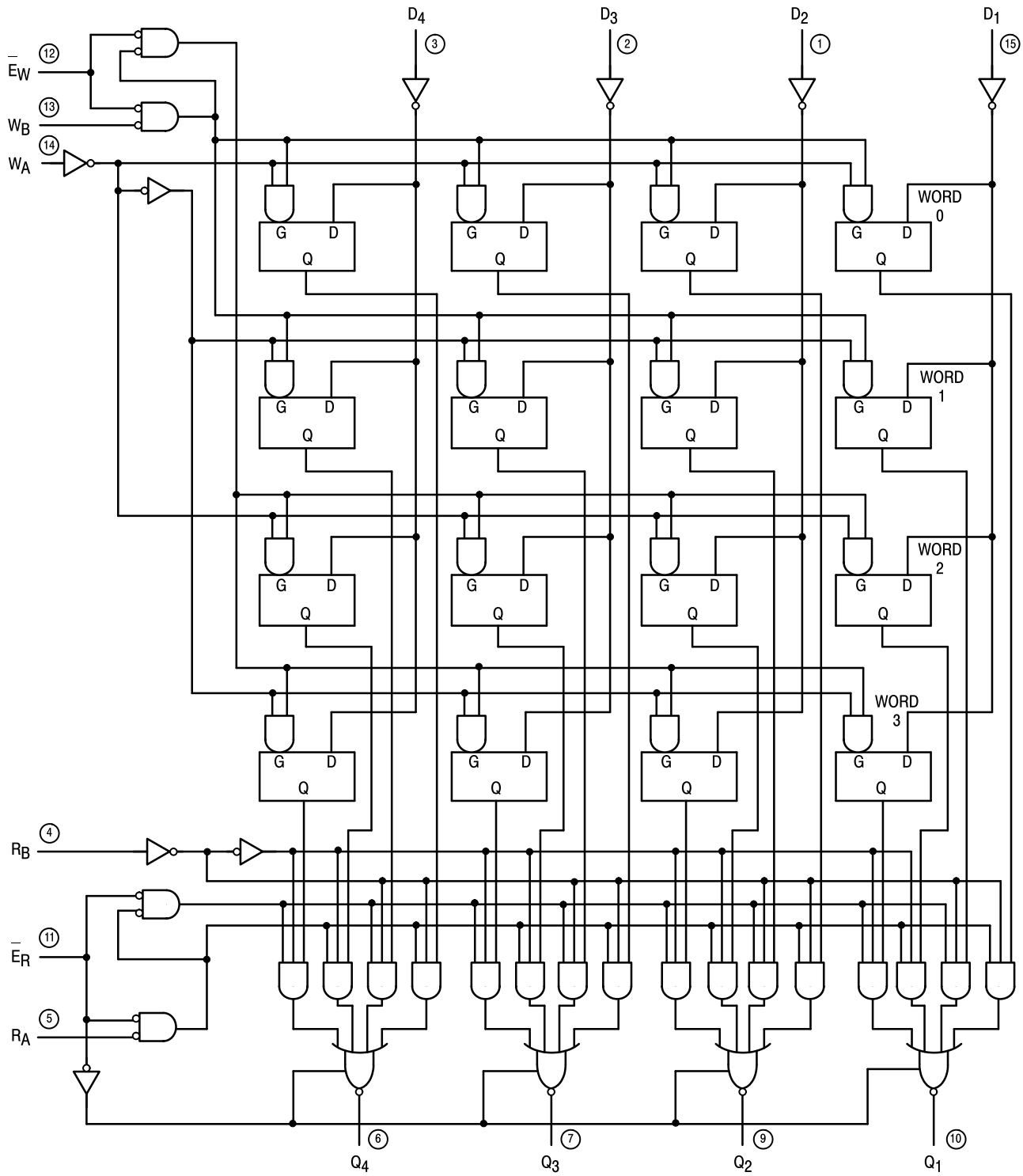
SN54LSXXXJ	Ceramic
SN74LSXXXN	Plastic
SN74LSXXXD	SOIC

## LOGIC SYMBOL



# SN54/74LS670

## LOGIC DIAGRAM



V<sub>CC</sub> = PIN 16  
 GND = PIN 8  
 ○ = PIN NUMBERS

# SN54/74LS670

## GUARANTEED OPERATING RANGES

Symbol	Parameter		Min	Typ	Max	Unit
V <sub>CC</sub>	Supply Voltage	54 74	4.5 4.75	5.0 5.0	5.5 5.25	V
T <sub>A</sub>	Operating Ambient Temperature Range	54 74	-55 0	25 25	125 70	°C
I <sub>OH</sub>	Output Current — High	54 74			-1.0 -2.6	mA
I <sub>OL</sub>	Output Current — Low	54 74			12 24	mA

## DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Symbol	Parameter	Limits			Unit	Test Conditions	
		Min	Typ	Max			
V <sub>IH</sub>	Input HIGH Voltage	2.0			V	Guaranteed Input HIGH Voltage for All Inputs	
V <sub>IL</sub>	Input LOW Voltage	54		0.7	V	Guaranteed Input LOW Voltage for All Inputs	
		74		0.8			
V <sub>IK</sub>	Input Clamp Diode Voltage		-0.65	-1.5	V	V <sub>CC</sub> = MIN, I <sub>IN</sub> = -18 mA	
V <sub>OH</sub>	Output HIGH Voltage	54	2.4	3.4	V	V <sub>CC</sub> = MIN, I <sub>OH</sub> = MAX, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> per Truth Table	
		74	2.4	3.1	V		
V <sub>OL</sub>	Output LOW Voltage	54, 74		0.25	0.4	V	I <sub>OL</sub> = 12 mA V <sub>CC</sub> = V <sub>CC</sub> MIN, V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> per Truth Table
		74		0.35	0.5	V	
I <sub>OZH</sub>	Output Off Current HIGH			20	μA	V <sub>CC</sub> = MAX, V <sub>O</sub> = 2.7 V	
I <sub>OZL</sub>	Output Off Current LOW			-20	μA	V <sub>CC</sub> = MAX, V <sub>O</sub> = 0.4 V	
I <sub>IH</sub>	Input HIGH Current D, R, W E <sub>W</sub> E <sub>R</sub>			20 40 60	μA	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 2.7 V	
	D, R, W E <sub>W</sub> E <sub>R</sub>			0.1 0.2 0.3	mA	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 7.0 V	
I <sub>IL</sub>	Input LOW Current D, R, W E <sub>W</sub> E <sub>R</sub>			-0.4 -0.8 -1.2	mA	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.4 V	
I <sub>OS</sub>	Short Circuit Current (Note 1)	-30		-130	mA	V <sub>CC</sub> = MAX	
I <sub>CC</sub>	Power Supply Current			50	mA	V <sub>CC</sub> = MAX	

Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

# SN54/74LS670

## AC CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
$t_{PLH}$ $t_{PHL}$	Propagation Delay, $R_A$ or $R_B$ to Output		23 25	40 45	ns	$V_{CC} = 5.0\text{ V}$ , $C_L = 45\text{ pF}$
$t_{PLH}$ $t_{PHL}$	Propagation Delay, $E_W$ to Output		26 28	45 50	ns	
$t_{PLH}$ $t_{PHL}$	Propagation Delay, Data to Output		25 23	45 40	ns	
$t_{PZH}$ $t_{PZL}$	Output Enable Time		15 22	35 40	ns	
$t_{PLZ}$ $t_{PHZ}$	Output Disable Time		16 30	35 50	ns	$C_L = 5.0\text{ pF}$

## AC SETUP REQUIREMENTS ( $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
$t_W$	Pulse Width	25			ns	$V_{CC} = 5.0\text{ V}$
$t_s$	Setup Time, (D)	10			ns	
$t_s$	Setup Time, (W)	15			ns	
$t_h$	Hold Time, (D)	15			ns	
$t_h$	Hold Time, (W)	5.0			ns	
$t_{rec}$	Recovery Time	25			ns	

## AC WAVEFORMS

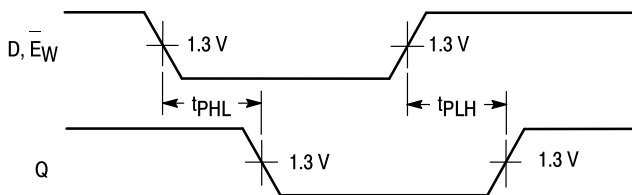


Figure 1

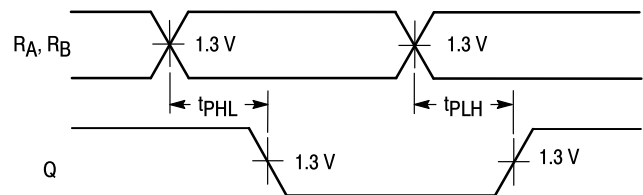


Figure 2

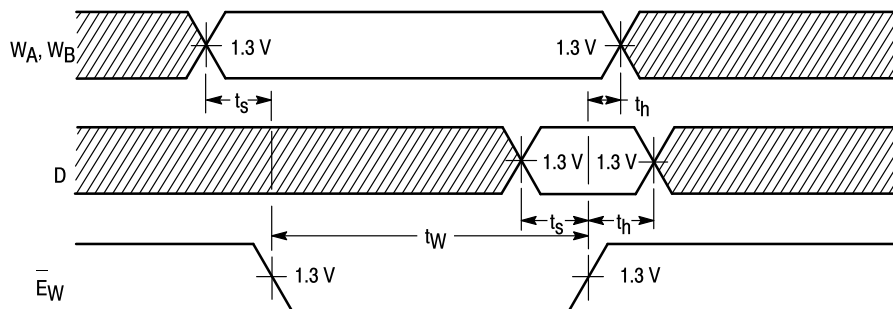
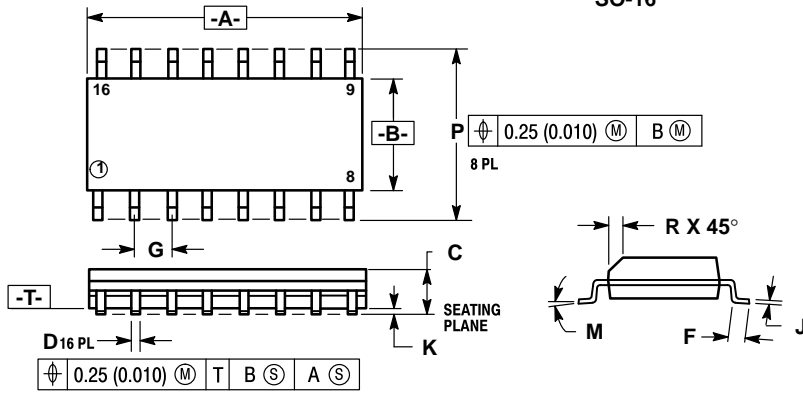


Figure 3

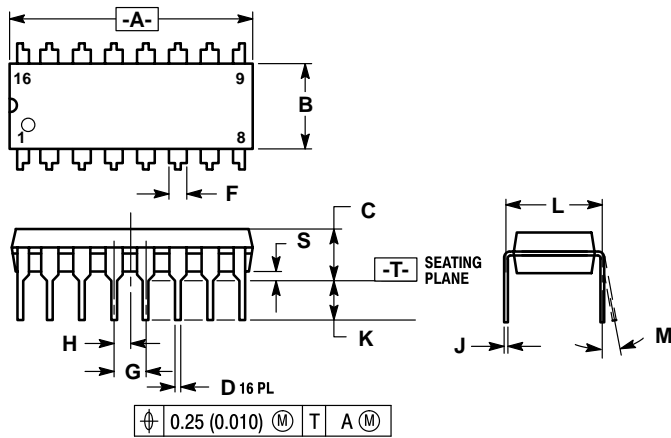
**Case 751B-03 D Suffix  
16-Pin Plastic  
SO-16**



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
  4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
  5. 751B-01 IS OBSOLETE, NEW STANDARD 751B-03.

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

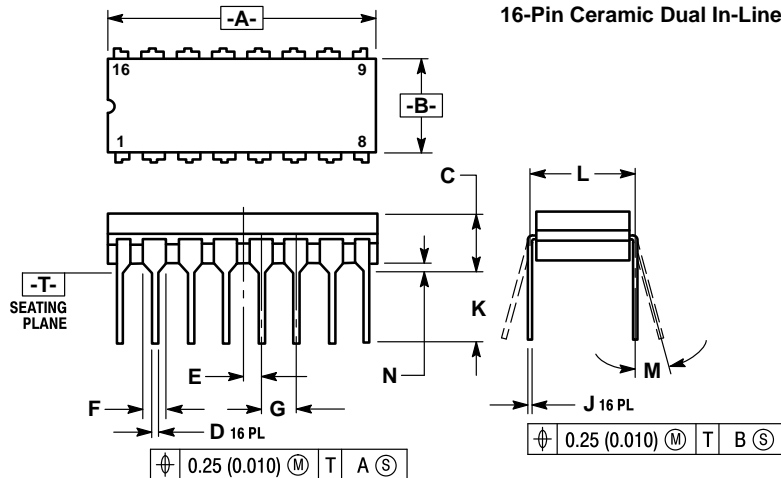
**Case 648-08 N Suffix  
16-Pin Plastic**



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.
  4. DIMENSION "B" DOES NOT INCLUDE MOLD FLASH.
  5. ROUNDED CORNERS OPTIONAL.
  6. 648-01 THRU -07 OBSOLETE, NEW STANDARD 648-08.


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	18.80	19.55	0.740	0.770
B	6.35	6.85	0.250	0.270
C	3.69	4.44	0.145	0.175
D	0.39	0.53	0.015	0.021
F	1.02	1.77	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	1.27 BSC		0.050 BSC	
J	0.21	0.38	0.008	0.015
K	2.80	3.30	0.110	0.130
L	7.50	7.74	0.295	0.305
M	0°	10°	0°	10°
S	0.51	1.01	0.020	0.040

**Case 620-09 J Suffix  
16-Pin Ceramic Dual In-Line**



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
  4. DIM F MAY NARROW TO 0.76 (0.030) WHERE THE LEAD ENTERS THE CERAMIC BODY.
  5. 620-01 THRU -08 OBSOLETE, NEW STANDARD 620-09.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	19.05	19.55	0.750	0.770
B	6.10	7.36	0.240	0.290
C	—	4.19	—	0.165
D	0.39	0.53	0.015	0.021
E	1.27 BSC		0.050 BSC	
F	1.40	1.77	0.055	0.070
G	2.54 BSC		0.100 BSC	
J	0.23	0.27	0.009	0.011
K	—	5.08	—	0.200
L	7.62 BSC		0.300 BSC	
M	0°	15°	0°	15°
N	0.39	0.88	0.015	0.035

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 can and do vary in different applications. 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.

**Literature Distribution Centers:**

USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.

EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.

JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141, Japan.

ASIA PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.



This datasheet has been download from:

[www.datasheetcatalog.com](http://www.datasheetcatalog.com)

Datasheets for electronics components.