4-PIN μP RESET MONITORS

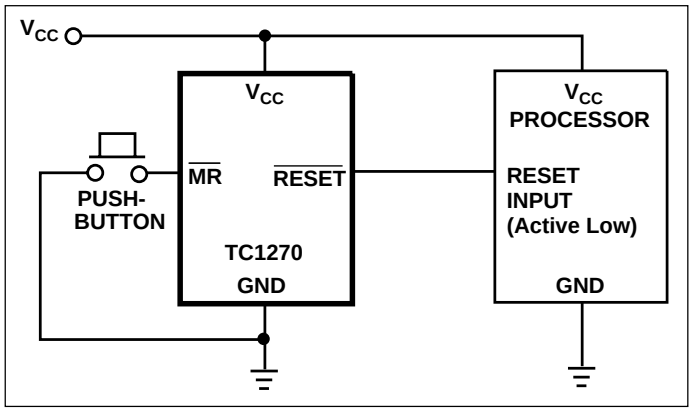
FEATURES

- **Precision V_{CC} Monitor for 1.8V, 2.7V, 3.0V, 3.3V, 5.0V Nominal Supplies**
- **Manual Reset Input**
- **140msec Guaranteed Minimum $\overline{\text{RESET}}$, RESET Output Duration**
- **$\overline{\text{RESET}}$ Output Guaranteed to V_{CC} = 1.0V (TC1270)**
- **Low 7μA Supply Current**
- **V_{CC} Transient Immunity**
- **Small 4-Pin SOT-143 Package**
- **No External Components**
- **Replacement for MAX811/812 and Offers a Lower Threshold Voltage Option**

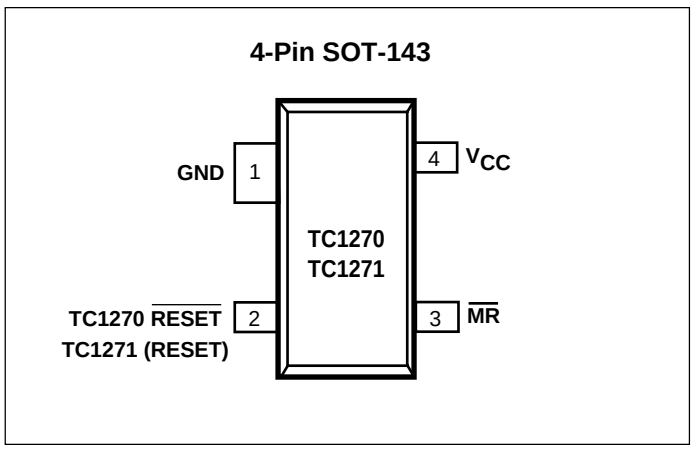
TYPICAL APPLICATIONS

- **Computers**
- **Embedded Systems**
- **Battery Powered Equipment**
- **Critical μP Power Supply Monitoring**

TYPICAL OPERATING CIRCUIT



PIN CONFIGURATION



GENERAL DESCRIPTION

The TC1270 and TC1271 are cost-effective system supervisor circuits designed to monitor V_{CC} in digital systems and provide a reset signal to the host processor when necessary. A manual reset input is provided to override the reset monitor, and is suitable for use as a push-button reset. No external components are required.

The reset output is driven active within 20μsec (4μsec for F version) of V_{CC} falling through the reset voltage threshold. RESET is maintained active for a minimum of 140msec after V_{CC} rises above the reset threshold. The TC1271 has an active-high RESET output while the TC1270 has an active-low $\overline{\text{RESET}}$ output. The output of the TC1270 is guaranteed valid down to V_{CC} = 1V. Both devices are available in a 4-Pin SOT-143 package.

The TC1270/1 are optimized to reject fast transient glitches on the V_{CC} line. Low supply current of 7μA (V_{CC} = 3.3V) makes these devices suitable for battery powered applications.

ORDERING INFORMATION

Part No.	Package	Temp. Range
TC1270xERC	4-Pin SOT-143	– 40°C to +85°C
TC1271xERC	4-Pin SOT-143	– 40°C to +85°C

NOTE: The "x" denotes a suffix for V_{CC} threshold - see table below.

Suffix*	Reset V_{CC} Threshold (V)
L	4.63
M	4.38
T	3.08
S	2.93
R	2.63
F	1.75

*(Custom thresholds available, contact factory.)

ABSOLUTE MAXIMUM RATINGS*

Supply Voltage (V_{CC} to GND) ..... +6.0V
$\overline{RESET}$, RESET ..... –0.3V to (V_{CC} + 0.3V)
Input Current, V_{CC}.. ..... 20 mA
Output Current, $\overline{RESET}$, RESET ..... 20 mA
Operating Temperature Range ..... –40°C to +85°C
Storage Temperature Range ..... – 65°C to +150°C
Lead Temperature (Soldering, 10 sec) ..... +260°C

*This is a stress rating 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.

ELECTRICAL CHARACTERISTICS: V_{CC} = 5V for L/M versions, Vcc = 3.3V for T/S versions, Vcc = 3V for R version, Vcc = 2.0V for F version. T_A = –40°C to +85°C unless otherwise noted. Typical values are at T_A = +25°C. (Note 1)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{CC}	V_{CC} Range		1.2	—	5.5	V
I_{CC}	Supply Current	$V_{CC} > V_{TH}$, for L, M, R, S, T, F	—	7	15	μA
		$V_{CC} < V_{TH}$, L, M, R, S, T	—	10	15	
		$V_{CC} < V_{TH}$, F	—	6	12	
V_{TH}	Reset Threshold	TC127_L: T_A = +25°C	4.54	4.63	4.72	V
		T_A = –40°C to +85°C	4.50	—	4.75	
		TC127_M: T_A = +25°C	4.30	4.38	4.46	
		T_A = –40°C to +85°C	4.25	—	4.50	
		TC127_T: T_A = +25°C	3.03	3.08	3.14	
		T_A = –40°C to +85°C	3.00	—	3.15	
		TC127_S: T_A = +25°C	2.88	2.93	2.98	
		T_A = –40°C to +85°C	2.85	—	3.00	
		TC127_R: T_A = +25°C	2.58	2.63	2.68	
		T_A = –40°C to +85°C	2.55	—	2.70	
		TC127_F: T_A = +25°C	1.71	1.75	1.79	
		T_A = –40°C to +85°C	1.70	—	1.80	
	Reset Threshold Tempco		—	30	—	ppm/°C
	V_{CC} to Reset Delay	V_{CC} = V_{TH} to V_{TH} –125mV; L, M, R, S, T	—	20	—	μsec
		F	—	5	—	
t_{RP}	Reset Active Timeout Period	V_{CC} = $V_{TH\ (MAX)}$	140	280	560	msec
t_{MR}	$\overline{MR}$ Minimum Pulse Width		10	—	—	μsec
	$\overline{MR}$ Glitch Immunity		—	0.1	—	μsec
t_{MD}	$\overline{MR}$ to Reset Propagation Delay		—	0.5	—	μsec
V_{IH}	$\overline{MR}$ Input Threshold	$V_{CC} > V_{TH(MAX)}$,	2.3	—	—	V
V_{IL}		TC127_L/M	—	—	0.8	
V_{IH}		$V_{CC} > V_{TH(MAX)}$,	$0.7V_{CC}$	—	—	V
V_{IL}		TC127_R/S/T/F	—	—	$0.15V_{CC}$	
	$\overline{MR}$ Pull-up Resistance		10	20	40	KΩ
V_{OH}	RESET Output Voltage High (TC1271)	I_{SOURCE} = 150μA; $V_{CC} \le V_{TH(MIN)}$	0.8 V_{CC}	—	—	V
V_{OL}	RESET Output Voltage Low (TC 1271)	TC1271F only, I_{SINK} = 500μA, V_{CC} = $V_{TH(MAX)}$	—	—	0.2	V
		TC1271R/S/T only, I_{SINK} = 1.2 mA, V_{CC} = $V_{TH(MAX)}$	—	—	0.3	
		TC1271L/M only, I_{SINK} = 3.2 mA V_{CC} = $V_{TH(MAX)}$	—	—	0.4	

ELECTRICAL CHARACTERISTICS (Cont.) : Vcc = 5V for L/M versions, Vcc = 3.3V for T/S versions, Vcc = 3V for R version, Vcc = 2.0V for F version. T_A = –40°C to +85°C unless otherwise noted. Typical values are at T_A = +25°C. (Note 1)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{OL}	$\overline{RESET}$ Output Voltage Low (TC1270)	TC1270R/S/T only: I_{SINK} = 1.2 mA, $V_{CC} = V_{TH\ (MIN)}$ TC1270F only,: I_{SINK} = 500 μA, $V_{CC} = V_{TH\ (MIN)}$ TC1270L/M only, I_{SINK} = 3.2 mA, $V_{CC} = V_{TH\ (MIN)}$ I_{SINK} = 50 μA, V_{CC} > 1.0V	— — —	— — —	0.3 0.4 TBD	V
V_{OH}	$\overline{RESET}$ Output Voltage High (TC1270)	TC1270L/M only, I_{SOURCE} = 800 μA, $V_{CC} > V_{TH(MAX)}$ TC1270R/S/T/F only I_{SOURCE} = 500 μA, $V_{CC} > V_{TH(MAX)}$	V_{CC} – 1.5 0.8 V_{CC}	— —	— —	V

NOTES: 1. Production testing done at T_A = +25°C, over temperature limits guaranteed by design.
2.$\overline{RESET}$ output for TC1270, RESET Output for T1271

PIN DESCRIPTION

Pin No. (SOT-143-4)	Symbol	Description
1	GND	Ground
2	$\overline{RESET}$ (TC1270)	$\overline{RESET}$ output remains low while V_{CC} is below the reset voltage threshold, and for at least 140 msec min. after V_{CC} rises above reset threshold.
2	RESET (TC1271)	RESET output remains high while V_{CC} is below the reset voltage threshold, and for at least 140 msec min. after V_{CC} rises above reset threshold.
3	$\overline{MR}$	Manual Reset input generates a reset when $\overline{MR}$ is below V_{IL}.
4	V_{CC}	Supply voltage

APPLICATIONS INFORMATION

V_{CC} Transient Rejection

The TC1270/1 provides accurate V_{CC} monitoring and reset timing during power-up, power-down, and brownout/ sag conditions, and rejects negative-going transients (glitches) on the power supply line. Figure 1 shows the maximum transient duration vs. maximum negative excursion (overdrive) for glitch rejection. Any combination of duration and overdrive that lays **under** the curve will **not** generate a reset signal. Combinations above the curve are detected as a brownout or power-down. Transient immunity can be improved by adding a capacitor in close proximity to the V_{CC} pin of the TC1270/1.

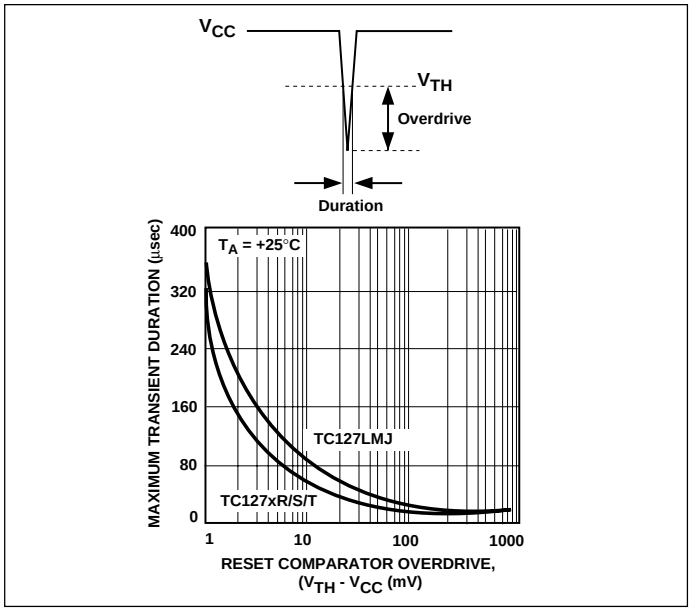


Figure 1. Maximum Transient Duration vs. Overdrive for Glitch Rejection at 25°C

RESET Signal Integrity During Power-Down

The TC1270 $\overline{\text{RESET}}$ output is valid to V_{CC} = 1.0V. Below this voltage the output becomes an "open circuit" and does not sink current. This means CMOS logic inputs to the µP will be floating at an undetermined voltage. Most digital systems are completely shutdown well above this voltage. However, in situations where $\overline{\text{RESET}}$ must be maintained valid to V_{CC} = 0V, a pull-down resistor must be connected from $\overline{\text{RESET}}$ to ground to discharge stray capacitances and hold the output low (Figure 2). This resistor value, though not critical, should be chosen such that it does not appreciably load $\overline{\text{RESET}}$ under normal operation (100kΩ will be suitable for most applications). Similarly, a pull-up resistor to V_{CC} is required for the TC1271 to ensure a valid high $\overline{\text{RESET}}$ for V_{CC} below 1.1V.

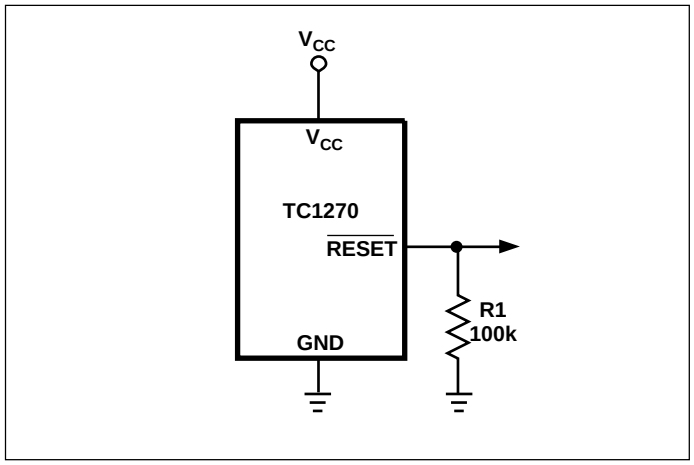


Figure 2. Ensuring $\overline{\text{RESET}}$ Valid to V_{CC} = 0V

Processors With Bidirectional I/O Pins

Some µP's (such as Motorola 68HC11) have bi-directional reset pins. Depending on the current drive capability of the processor pin, an indeterminate logic level may result if there is a logic conflict. This can be avoided by adding a 4.7 kΩ resistor in series with the output of the TC1270/1 (Figure 3). If there are other components in the system which require a reset signal, they should be buffered so as not to load the reset line. If the other components are required to follow the reset I/O of the µP, the buffer should be connected as shown with the solid line.

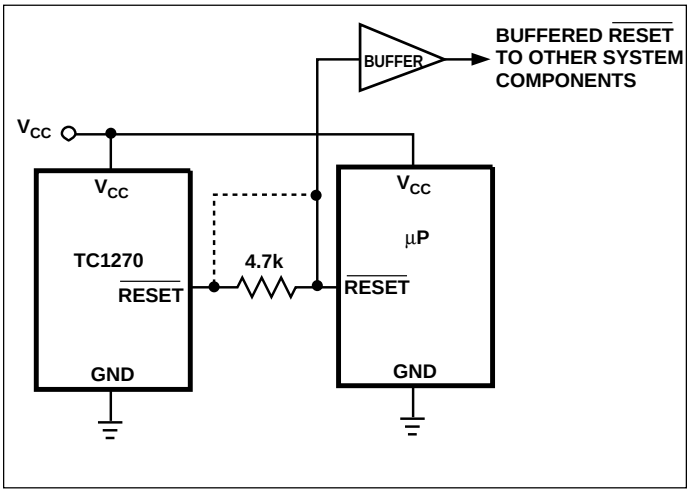
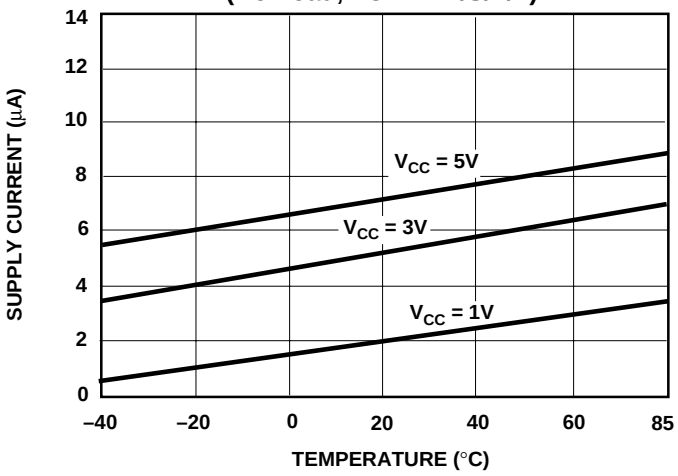


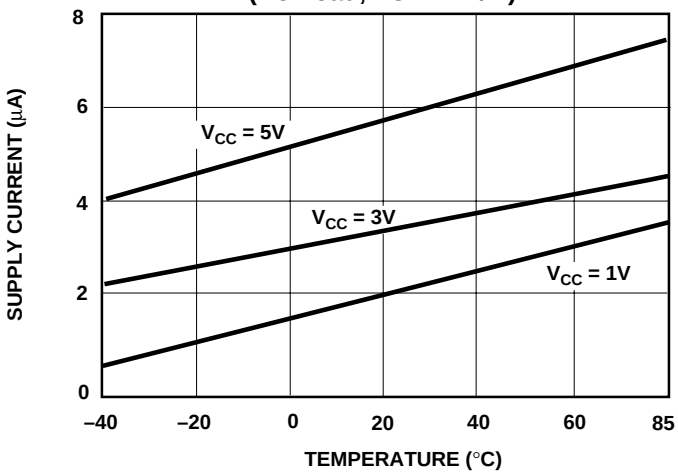
Figure 3. Interfacing to Bidirectional Reset I/O

TYPICAL CHARACTERISTICS

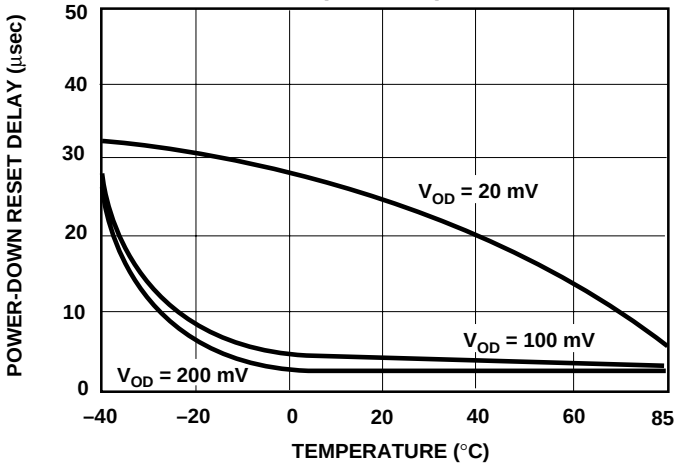
Supply Current vs.Temperature (No Load, TC127xR/S/T/F)



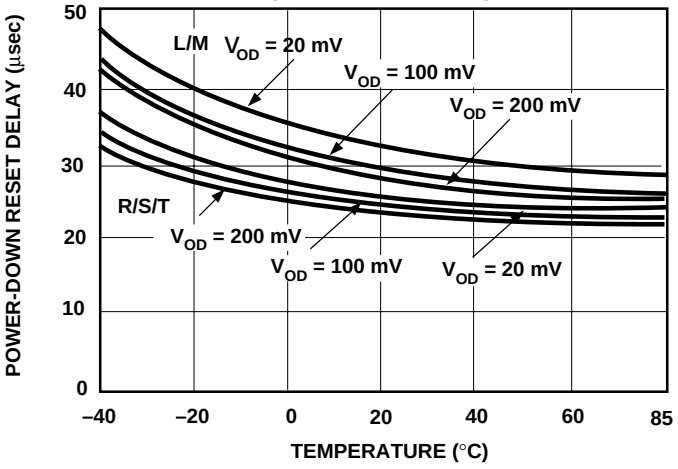
Supply Current vs.Temperature (No Load, TC127xL/M)



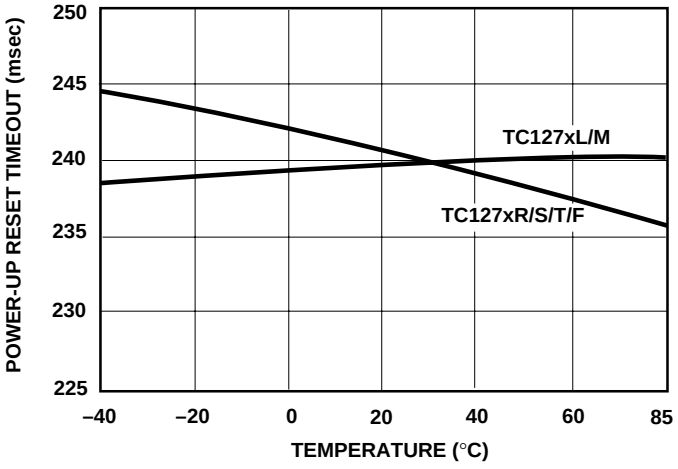
Power-Down Reset Delay vs. Temperature (TC127xF)



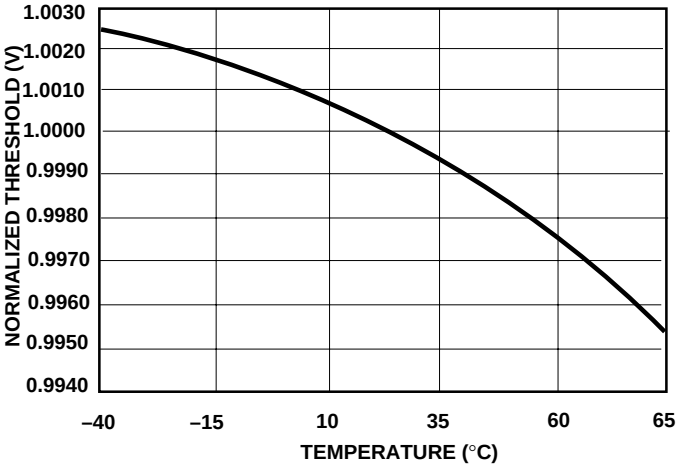
Power-Down Reset Delay vs. Temperature (TC127xL/M/R/S/T)



Power-Up Reset Timeout vs. Temperature



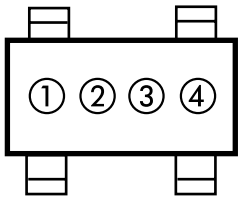
Normalized Reset Threshold vs. Temperature



TC1270
TC1271

MARKING

4-Pin SOT-143



① & ② part number code + temperature range (two-digit code)

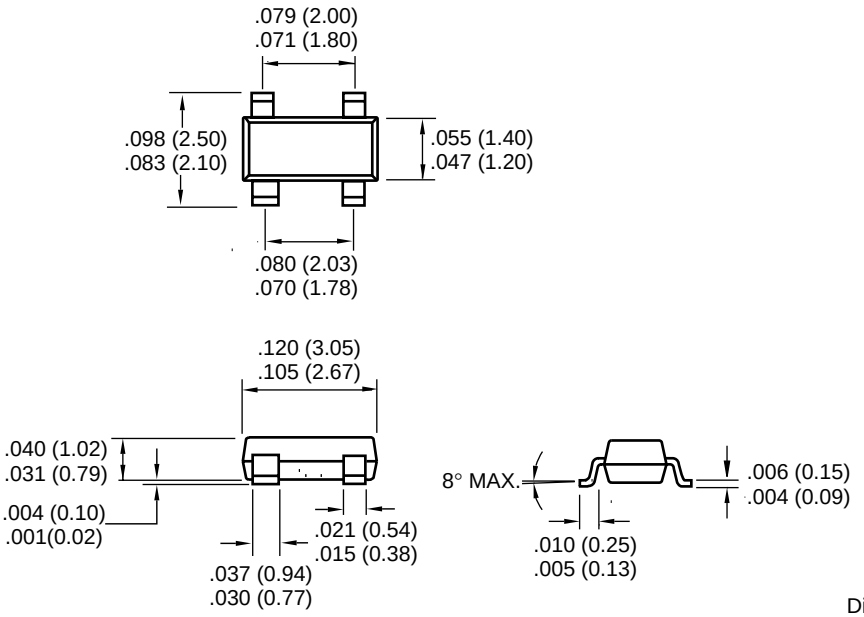
Part Number	(V)	Code
TC1270LERC	4.63	S1
TC1270MERC	4.38	S2
TC1270TERC	3.08	S3
TC1270SERC	2.93	S4
TC1270RERC	2.63	S5
TC1270FERC	1.75	S7
TC1271LERC	4.63	T1
TC1271MERC	4.38	T2
TC1271TERC	3.08	T3
TC1271SERC	2.93	T4
TC1271RERC	2.63	T5
TC1271FERC	1.75	T7

③ represents year and quarter code

④ represents lot ID number

PACKAGE DIMENSIONS

4-Pin SOT-143



Dimensions: inches (mm)

WORLDWIDE SALES AND SERVICE

AMERICAS

Corporate Office
2355 West Chandler Blvd.
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Web Address: http://www.microchip.com

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Tel: 978-371-6400 Fax: 978-371-0050

Chicago
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Itasca, IL 60143
Tel: 630-285-0071 Fax: 630-285-0075

Dallas
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Addison, TX 75001
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Dayton
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Miamisburg, OH 45342
Tel: 937-291-1654 Fax: 937-291-9175

Detroit
Tri-Atria Office Building
32255 Northwestern Highway, Suite 190
Farmington Hills, MI 48334
Tel: 248-538-2250 Fax: 248-538-2260

Los Angeles
18201 Von Karman, Suite 1090
Irvine, CA 92612
Tel: 949-263-1888 Fax: 949-263-1338

Mountain View
Analog Product Sales
1300 Terra Bella Avenue
Mountain View, CA 94043-1836
Tel: 650-968-9241 Fax: 650-967-1590

New York
150 Motor Parkway, Suite 202
Hauppauge, NY 11788
Tel: 631-273-5305 Fax: 631-273-5335

San Jose
Microchip Technology Inc.
2107 North First Street, Suite 590
San Jose, CA 95131
Tel: 408-436-7950 Fax: 408-436-7955

Toronto
6285 Northam Drive, Suite 108
Mississauga, Ontario L4V 1X5, Canada
Tel: 905-673-0699 Fax: 905-673-6509

ASIA/PACIFIC

China - Beijing
Microchip Technology Beijing Office
Unit 915
New China Hong Kong Manhattan Bldg.
No. 6 Chaoyangmen Beidajie
Beijing, 100027, No. China
Tel: 86-10-85282100 Fax: 86-10-85282104

China - Shanghai
Microchip Technology Shanghai Office
Room 701, Bldg. B
Far East International Plaza
No. 317 Xian Xia Road
Shanghai, 200051
Tel: 86-21-6275-5700 Fax: 86-21-6275-5060

Hong Kong
Microchip Asia Pacific
RM 2101, Tower 2, Metroplaza
223 Hing Fong Road
Kwai Fong, N.T., Hong Kong
Tel: 852-2401-1200 Fax: 852-2401-3431

India
Microchip Technology Inc.
India Liaison Office
Divyasree Chambers
1 Floor, Wing A (A3/A4)
No. 11, OíShaugnessey Road
Bangalore, 560 025, India
Tel: 91-80-2290061 Fax: 91-80-2290062

Japan
Microchip Technology Intl. Inc.
Benex S-1 6F
3-18-20, Shinyokohama
Kohoku-Ku, Yokohama-shi
Kanagawa, 222-0033, Japan
Tel: 81-45-471- 6166 Fax: 81-45-471-6122

Korea
Microchip Technology Korea
168-1, Youngbo Bldg. 3 Floor
Samsung-Dong, Kangnam-Ku
Seoul, Korea
Tel: 82-2-554-7200 Fax: 82-2-558-5934

ASIA/PACIFIC (continued)

Singapore
Microchip Technology Singapore Pte Ltd.
200 Middle Road
#07-02 Prime Centre
Singapore, 188980
Tel: 65-334-8870 Fax: 65-334-8850

Taiwan
Microchip Technology Taiwan
11F-3, No. 207
Tung Hua North Road
Taipei, 105, Taiwan
Tel: 886-2-2717-7175 Fax: 886-2-2545-0139

EUROPE

Australia
Microchip Technology Australia Pty Ltd
Suite 22, 41 Rawson Street
Epping 2121, NSW
Australia
Tel: 61-2-9868-6733 Fax: 61-2-9868-6755

Denmark
Microchip Technology Denmark ApS
Regus Business Centre
Lautrup hoj 1-3
Ballerup DK-2750 Denmark
Tel: 45 4420 9895 Fax: 45 4420 9910

France
Arizona Microchip Technology SARL
Parc díActivite du Moulin de Massy
43 Rue du Saule Trapu
Batiment A - ler Etage
91300 Massy, France
Tel: 33-1-69-53-63-20 Fax: 33-1-69-30-90-79

Germany
Arizona Microchip Technology GmbH
Gustav-Heinemann Ring 125
D-81739 Munich, Germany
Tel: 49-89-627-144 0 Fax: 49-89-627-144-44

Germany
Analog Product Sales
Lochhamer Strasse 13
D-82152 Martinsried, Germany
Tel: 49-89-895650-0 Fax: 49-89-895650-22

Italy
Arizona Microchip Technology SRL
Centro Direzionale Colleoni
Palazzo Taurus 1 V. Le Colleoni 1
20041 Agrate Brianza
Milan, Italy
Tel: 39-039-65791-1 Fax: 39-039-6899883

United Kingdom
Arizona Microchip Technology Ltd.
505 Eskdale Road
Winnersh Triangle
Wokingham
Berkshire, England RG41 5TU
Tel: 44 118 921 5869 Fax: 44-118 921-5820