

4-Pin μ P Reset Monitors

Features

- Precision V_{CC} Monitor for 1.8V, 2.7V, 3.0V, 3.3V and 5.0V Nominal Supplies
- Manual Reset Input
- 140msec Minimum $\overline{\text{RESET}}$, RESET Output Duration
- $\overline{\text{RESET}}$ Output Valid to $V_{CC} = 1.0\text{V}$ (TC1270)
- Low $7\mu\text{A}$ 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

Applications

- Computers
- Embedded Systems
- Battery Powered Equipment
- Critical μ P Power Supply Monitoring

Device Selection Table

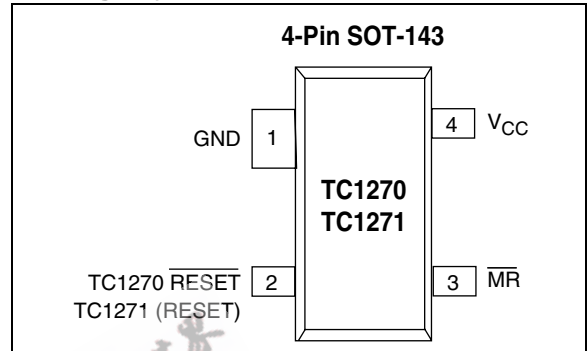
Part Number	Package	Temp. Range
TC1270xERC	4-Pin SOT-143	-40°C to +85°C
TC1271xERC	4-Pin SOT-143	-40°C to +85°C

NOTE: "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.

Package Type



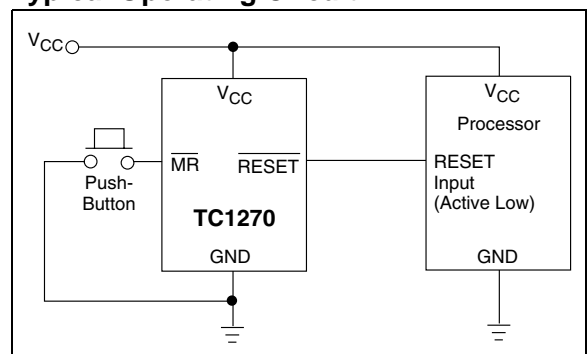
General Description

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 $20\mu\text{sec}$ ($4\mu\text{sec}$ 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 valid down to $V_{CC} = 1\text{V}$. Both devices are available in a 4-Pin SOT-143 package.

The TC1270/TC1271 devices are optimized to reject fast transient glitches on the V_{CC} line. Low supply current of $7\mu\text{A}$ ($V_{CC} = 3.3\text{V}$) makes these devices suitable for battery powered applications.

Typical Operating Circuit



TC1270/TC1271

1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings*

Supply Voltage (V_{CC} to GND)	+6.0V
$\overline{\text{RESET}}$, RESET	-0.3V to ($V_{CC} + 0.3V$)
Input Current, V_{CC}	20mA
Output Current, $\overline{\text{RESET}}$, RESET	20mA
Operating Temperature Range	-40°C to +85°C
Storage Temperature Range	-65°C to +150°C

*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 operation sections of the specifications is not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

TC1270/TC1271 ELECTRICAL SPECIFICATIONS

Electrical Characteristics: $V_{CC} = 5V$ for L/M versions, $V_{CC} = 3.3V$ for T/S versions, $V_{CC} = 3V$ for R version, $V_{CC} = 2.0V$ for F version. $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ unless otherwise noted. Typical values are at $T_A = +25^\circ\text{C}$. (Note 1).

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
V_{CC}	V_{CC} Range	1.2	—	5.5	V	
I_{CC}	Supply Current	—	7	15	μA	$V_{CC} > V_{TH}$, for L/M/R/S/T/F $V_{CC} < V_{TH}$, for L/M/R/S/T $V_{CC} < V_{TH}$, for F
V_{TH}	Reset Threshold	4.54	4.63	4.72	V	TC127_L; $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ TC127_M; $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ TC127_T; $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ TC127_S; $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ TC127_R; $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ TC127_F; $T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$
		4.50	—	4.75		
		4.30	4.38	4.46		
		4.25	—	4.50		
		3.03	3.08	3.14		
		3.00	—	3.15		
		2.88	2.93	2.98		
		2.85	—	3.00		
		2.58	2.63	2.68		
		2.55	—	2.70		
1.71	1.75	1.79				
1.70	—	1.80				
	Reset Threshold Tempco	—	30	—	ppm/ $^\circ\text{C}$	
	V_{CC} to Reset Delay	—	20	—	μsec	$V_{CC} = V_{TH}$ to $V_{TH} - 125\text{mV}$; L/M/R/S/T/F
		—	5	—		
t_{RP}	Reset Active Timeout Period	140	280	560	msec	$V_{CC} = V_{TH(\text{MAX})}$
t_{MR}	$\overline{\text{MR}}$ Minimum Pulse Width	10	—	—	μsec	
	$\overline{\text{MR}}$ Glitch Immunity	—	0.1	—	μsec	
t_{MD}	$\overline{\text{MR}}$ to Reset Propagation Delay	—	0.5	—	μsec	
V_{IH} V_{IL}	$\overline{\text{MR}}$ Input Threshold	2.3	—	—	V	$V_{CC} > V_{TH(\text{MAX})}$, TC127_L/M
V_{IH} V_{IL}		0.7 V_{CC}	—	—	V	$V_{CC} > V_{TH(\text{MAX})}$, TC127_R/S/T/F
	$\overline{\text{MR}}$ Pull-up Resistance	10	20	40	k Ω	

Note 1: Production testing done at $T_A = +25^\circ\text{C}$, over temperature limits ensured by design.
2: RESET output for TC1270, RESET output for TC1271.

TC1270/TC1271

TC1270/TC1271 ELECTRICAL SPECIFICATIONS (CONTINUED)

Electrical Characteristics: $V_{CC} = 5V$ for L/M versions, $V_{CC} = 3.3V$ for T/S versions, $V_{CC} = 3V$ for R version, $V_{CC} = 2.0V$ for F version. $T_A = -40^{\circ}C$ to $+85^{\circ}C$ unless otherwise noted. Typical values are at $T_A = +25^{\circ}C$. (Note 1).

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
V_{OH}	RESET Output Voltage High (TC1271)	$0.8 V_{CC}$	—	—	V	$I_{SOURCE} = 150\mu A$; $V_{CC} \leq V_{TH(MIN)}$
V_{OL}	RESET Output Voltage Low (TC1271)	—	—	0.2	V	TC1271F only, $I_{SINK} = 500\mu A$, $V_{CC} = V_{TH(MAX)}$
		—	—	0.3		TC1271R/S/T only, $I_{SINK} = 1.2mA$, $V_{CC} = V_{TH(MAX)}$
		—	—	0.4		TC1271L/M only, $I_{SINK} = 3.2mA$, $V_{CC} = V_{TH(MAX)}$
V_{OL}	RESET Output Voltage Low (TC1270)	—	—	0.3	V	TC1270R/S/T only, $I_{SINK} = 1.2mA$, $V_{CC} = V_{TH(MIN)}$
		—	—	0.4		TC1270F only: $I_{SINK} = 500\mu A$, $V_{CC} = V_{TH(MIN)}$
		—	—	TBD		TC1270L/M only, $I_{SINK} = 3.2mA$, $V_{CC} = V_{TH(MIN)}$
		—	—			$I_{SINK} = 50\mu A$, $V_{CC} > 1.0V$
V_{OH}	RESET Output Voltage High (TC1270)	$V_{CC} - 1.5$	—	—	V	TC1270L/M only, $I_{SOURCE} = 800\mu A$, $V_{CC} = V_{TH(MAX)}$
		$0.8 V_{CC}$	—	—		TC1270R/S/T/F only, $I_{SOURCE} = 500\mu A$, $V_{CC} = V_{TH(MAX)}$

- Note** 1: Production testing done at $T_A = +25^{\circ}C$, over temperature limits ensured by design.
 2: RESET output for TC1270, RESET output for TC1271.

TC1270/TC1271

2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

TABLE 2-1: PIN FUNCTION TABLE

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

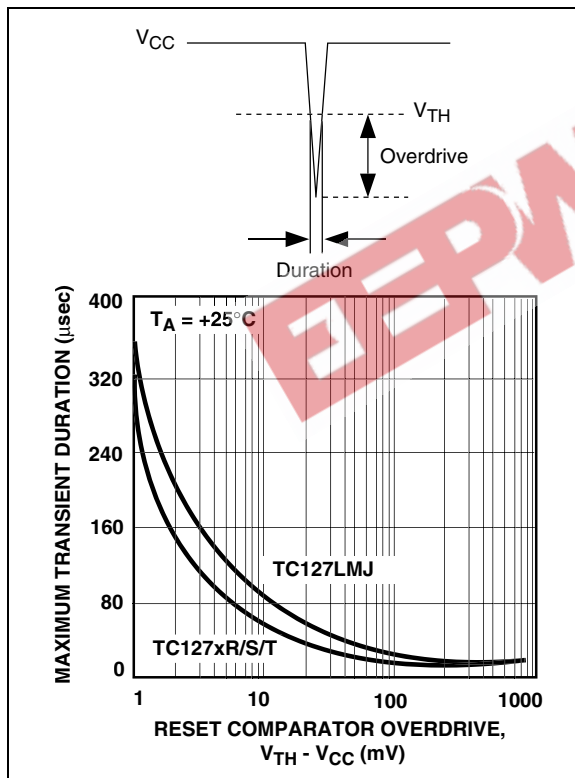
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3.0 APPLICATIONS INFORMATION

3.1 V_{CC} Transient Rejection

The TC1270/TC1271 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 3-1 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/TC1271.

FIGURE 3-1: MAXIMUM TRANSIENT DURATION VS. OVERDRIVE FOR GLITCH REJECTION AT 25°C

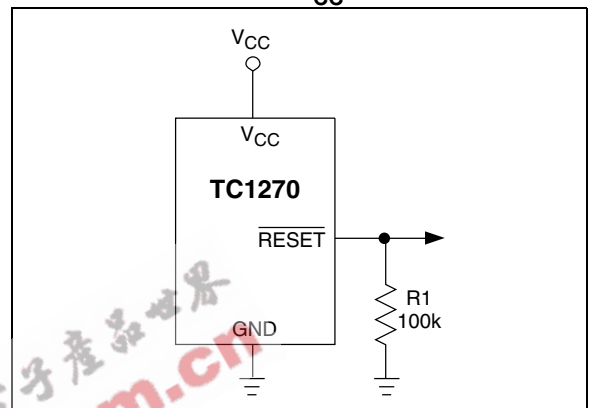


3.2 RESET Signal Integrity During Power-Down

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 shut down 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 3-2). This resistor value, though not critical, should be chosen such that it does not appreciably load $\overline{\text{RESET}}$ under normal operation (100k Ω 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.

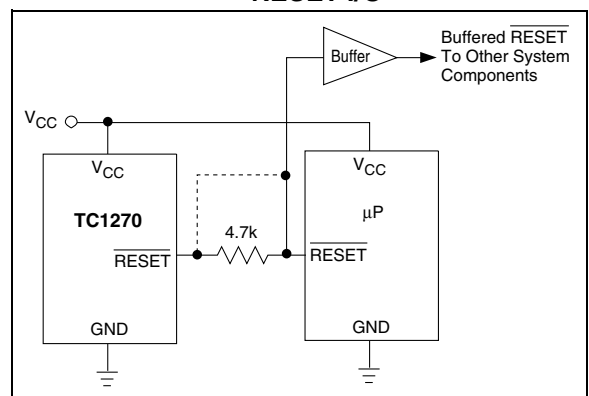
FIGURE 3-2: ENSURING $\overline{\text{RESET}}$ VALID TO $V_{CC} = 0V$



3.3 Processors With Bidirectional I/O Pins

Some μP 's (such as Motorola 68HC11) have bidirectional 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 k Ω resistor in series with the output of the TC1270/TC1271 (Figure 3-3). 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.

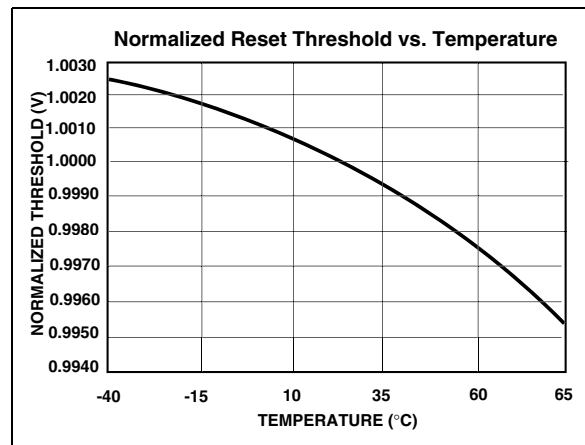
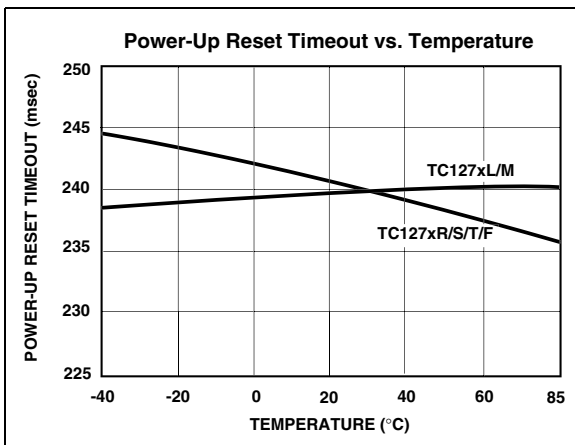
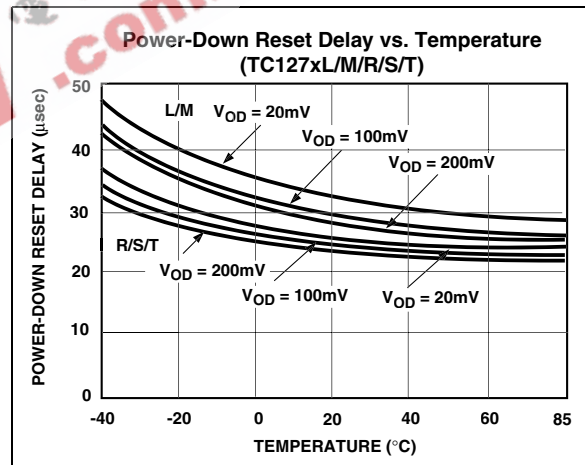
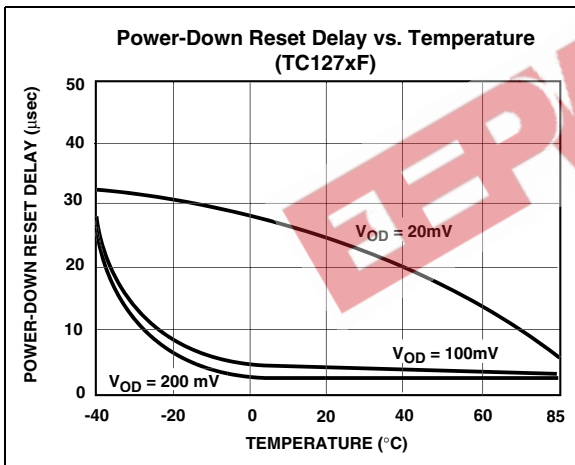
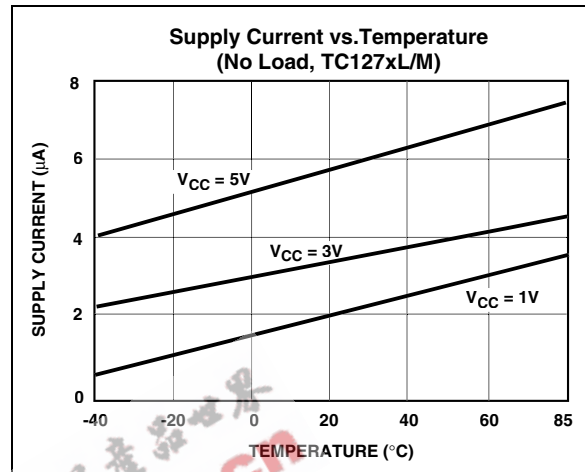
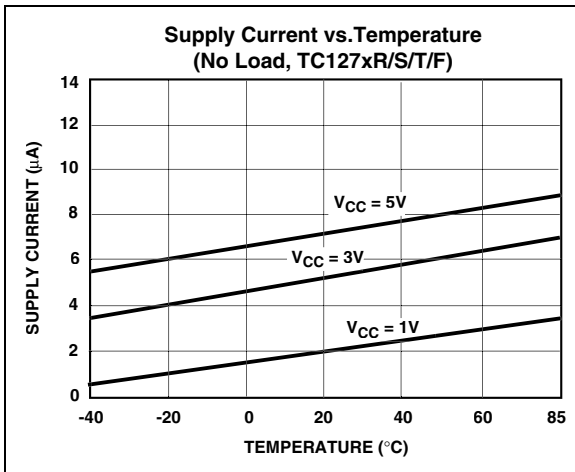
FIGURE 3-3: INTERFACING TO BIDIRECTIONAL RESET I/O



TC1270/TC1271

4.0 TYPICAL CHARACTERISTICS

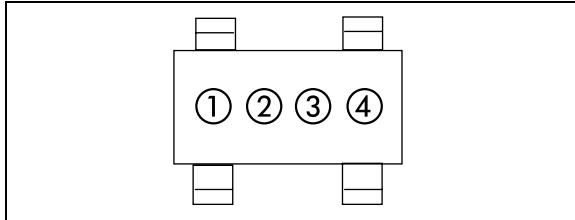
Note: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.



TC1270/TC1271

5.0 PACKAGING INFORMATION

5.1 Package Marking Information



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

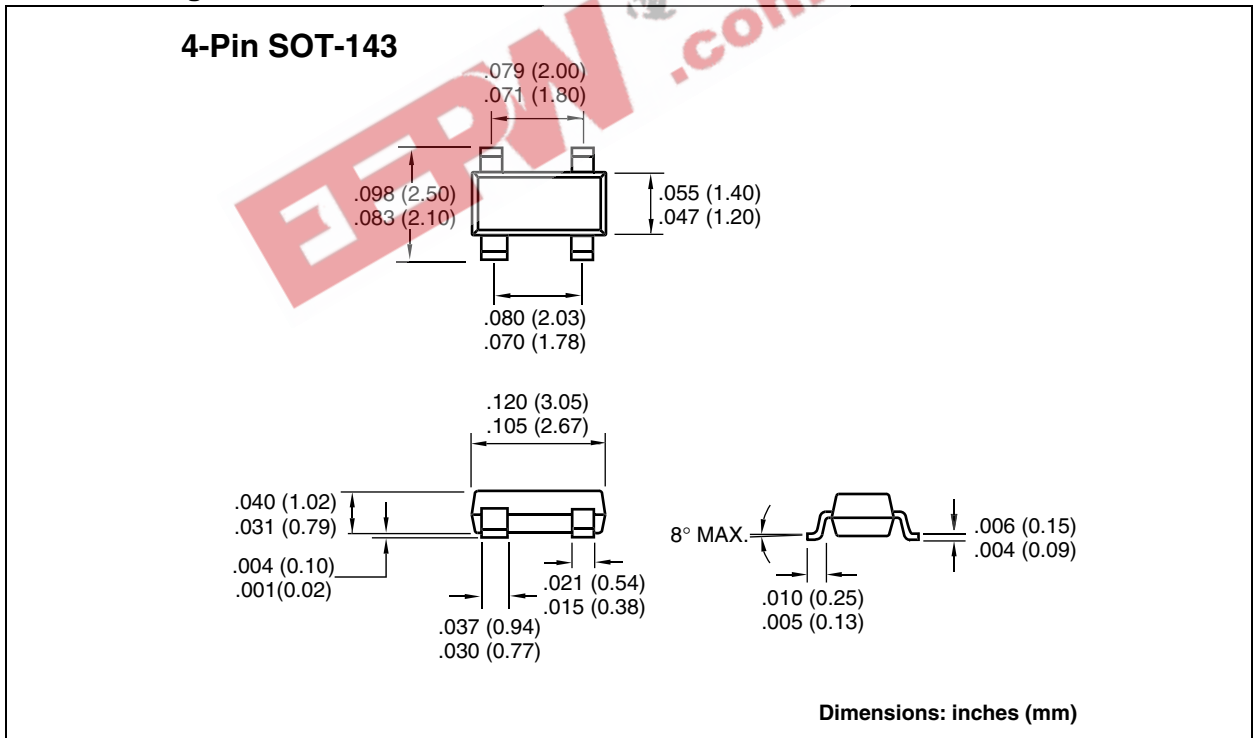
Part Number	(V)	Code
TC1270LERC	4.63	S1
TC1270MERC	4.38	S2
TC1270TERC	3.08	S3
TC1270SERC	2.93	S4
TC1270RERC	2.63	S5
TC1270FERC	1.75	S7

Part Number	(V)	Code
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 production lot ID code

5.2 Package Dimensions



TC1270/TC1271

NOTES:

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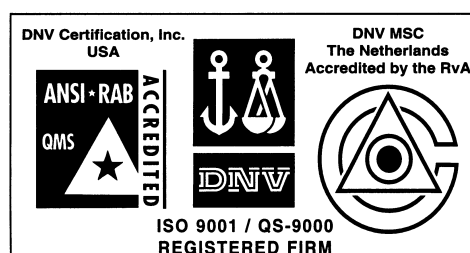
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150 Motor Parkway, Suite 202
Hauppauge, NY 11788
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San Jose

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

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

China - Beijing

Microchip Technology Consulting (Shanghai)
Co., Ltd., Beijing Liaison Office
Unit 915
Bei Hai Wan Tai Bldg.
No. 6 Chaoyangmen Beidajie
Beijing, 100027, No. China
Tel: 86-10-85282100 Fax: 86-10-85282104

China - Chengdu

Microchip Technology Consulting (Shanghai)
Co., Ltd., Chengdu Liaison Office
Rm. 2401, 24th Floor,
Ming Xing Financial Tower
No. 88 TIDU Street
Chengdu 610016, China
Tel: 86-28-86766200 Fax: 86-28-86766599

China - Fuzhou

Microchip Technology Consulting (Shanghai)
Co., Ltd., Fuzhou Liaison Office
Unit 28F, World Trade Plaza
No. 71 Wusi Road
Fuzhou 350001, China
Tel: 86-591-7503506 Fax: 86-591-7503521

China - Shanghai

Microchip Technology Consulting (Shanghai)
Co., Ltd.
Room 701, Bldg. B
Far East International Plaza
No. 317 Xian Xia Road
Shanghai, 200051
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China - Shenzhen

Microchip Technology Consulting (Shanghai)
Co., Ltd., Shenzhen Liaison Office
Rm. 1315, 13/F, Shenzhen Kerry Centre,
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Microchip Technology Hongkong Ltd.
Unit 901-6, 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, O'Shaughnessy Road
Bangalore, 560 025, India
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Korea

Microchip Technology Korea
168-1, Youngbo Bldg. 3 Floor
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Singapore

Microchip Technology Singapore Pte Ltd.
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Taiwan

Microchip Technology Taiwan
11F-3, No. 207
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EUROPE

Denmark

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Tel: 33-1-69-53-63-20 Fax: 33-1-69-30-90-79

Germany

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

Italy

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

Microchip Ltd.
505 Eskdale Road
Winnersh Triangle
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Tel: 44 118 921 5869 Fax: 44-118 921-5820

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