



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



## 800 mA Fixed-Output CMOS LDO with Shutdown

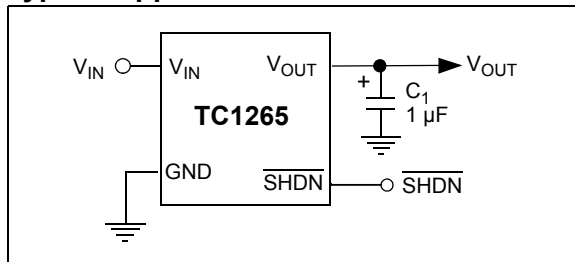
### Features

- Very Low Dropout Voltage
- 800 mA Output Current
- High Output Voltage Accuracy
- Standard or Custom Output Voltages
- Overcurrent and Overtemperature Protection
- SHDN Input for Active Power Management
- ERROR Output Can Be Used as a Low Battery Detector (SOIC only)

### Applications

- Battery-operated Systems
- Portable Computers
- Medical Instruments
- Instrumentation
- Cellular/GSM/PHS Phones
- Linear Post-Regulators for SMPS
- Pagers

### Typical Application



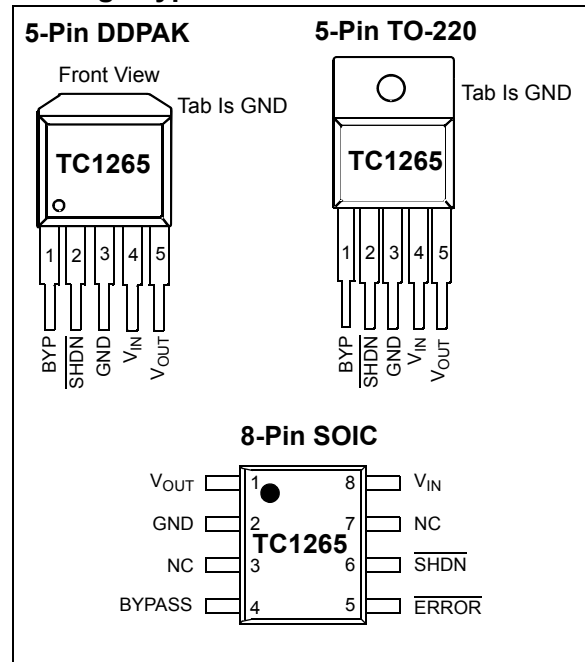
### Description

The TC1265 is a fixed-output, high-accuracy (typically  $\pm 0.5\%$ ) CMOS low dropout regulator. Designed specifically for battery-operated systems, the TC1265's CMOS construction eliminates wasted ground current, significantly extending battery life. Total supply current is typically  $80\ \mu\text{A}$  at full load (20 to 60 times lower than in bipolar regulators).

Key features of the TC1265 include ultra low noise operation, very low dropout voltage (typically 450 mV at full load) and fast response to step changes in load.

The TC1265 incorporates both overtemperature and overcurrent protection. The TC1265 is stable with an output capacitor of only  $1\ \mu\text{F}$  and has a maximum output current of 800 mA. It is available in 8-Pin SOIC, 5-Pin TO-220 and 5-Pin DDPAK packages.

### Package Type



# TC1265

## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings †

Input Voltage .....	6.5V
Output Voltage.....	(V <sub>SS</sub> – 0.3V) to (V <sub>IN</sub> + 0.3V)
Power Dissipation.....	Internally Limited ( <b>Note 7</b> )
Maximum Voltage on Any Pin .....	V <sub>IN</sub> + 0.3V to -0.3V
Operating Temperature Range.....	-40°C < T <sub>J</sub> < 125°C
Storage Temperature.....	-65°C to +150°C

† **Notice:** Stresses above those listed under "Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

### DC CHARACTERISTICS

<b>Electrical Specifications:</b> Unless otherwise indicated, V <sub>IN</sub> = V <sub>R</sub> + 1.5V, ( <b>Note 1</b> ), I <sub>L</sub> = 100 μA, C <sub>L</sub> = 3.3 μF, SHDN > V <sub>IH</sub> , T <sub>A</sub> = +25°C. <b>Boldface</b> type specifications apply for junction temperatures of -40°C to +125°C.						
Parameters	Sym	Min	Typ	Max	Units	Conditions
Input Operating Voltage	V <sub>IN</sub>	<b>2.7</b>	—	<b>6.0</b>	V	<b>Note 2</b>
Maximum Output Current	I <sub>OUTMAX</sub>	<b>800</b>	—	—	mA	
Output Voltage	V <sub>OUT</sub>	<b>V<sub>R</sub> – 2.5%</b> <b>V<sub>R</sub> – 2%</b>	V <sub>R</sub> ± 0.5% V <sub>R</sub> ± 0.5%	<b>V<sub>R</sub> + 2.5%</b> <b>V<sub>R</sub> + 3%</b>	V	V <sub>R</sub> ≥ 2.5V V <sub>R</sub> = 1.8V
V <sub>OUT</sub> Temperature Coefficient	ΔV <sub>OUT</sub> /ΔT	—	40	—	ppm/°C	<b>Note 3</b>
Line Regulation	ΔV <sub>OUT</sub> /ΔV <sub>IN</sub>	—	0.007	<b>0.35</b>	%	(V <sub>R</sub> + 1V) ≤ V <sub>IN</sub> ≤ 6V
Load Regulation ( <b>Note 4</b> )	ΔV <sub>OUT</sub> /V <sub>OUT</sub>	<b>-0.01</b>	0.002	<b>+0.01</b>	%/mA	I <sub>L</sub> = 0.1 mA to I <sub>OUTMAX</sub>
Dropout Voltage ( <b>Note 5</b> )	V <sub>IN</sub> –V <sub>OUT</sub>	—	20	<b>30</b>	mV	V <sub>R</sub> ≥ 2.5V, I <sub>L</sub> = 100 μA
		—	50	<b>160</b>		I <sub>L</sub> = 100 mA
		—	150	<b>480</b>		I <sub>L</sub> = 300 mA
		—	260	<b>800</b>		I <sub>L</sub> = 500 mA
		—	450	<b>1300</b>		I <sub>L</sub> = 800 mA
		—	1000	<b>1200</b>		V <sub>R</sub> = 1.8V, I <sub>L</sub> = 500 mA
		—	1200	<b>1400</b>		I <sub>L</sub> = 800 mA
Supply Current	I <sub>DD</sub>	—	80	<b>130</b>	μA	SHDN = V <sub>IH</sub> , I <sub>L</sub> = 0
Shutdown Supply Current	I <sub>SHDN</sub>	—	0.05	<b>1</b>	μA	SHDN = 0V
Power Supply Rejection Ratio	PSRR	—	64	—	db	F ≤ 1 kHz
Output Short Circuit Current	I <sub>OUTSC</sub>	—	1200	1400	mA	V <sub>OUT</sub> = 0V
Thermal Regulation	ΔV <sub>OUT</sub> /ΔP <sub>D</sub>	—	0.04	—	V/W	<b>Note 6</b>
Output Noise	eN	—	260	—	nV/√Hz	I <sub>L</sub> = I <sub>OUTMAX</sub> , F = 10 kHz

**Note 1:** V<sub>R</sub> is the regulator output voltage setting.

**2:** The minimum V<sub>IN</sub> has to justify the conditions: V<sub>IN</sub> ≥ V<sub>R</sub> + V<sub>DROPOUT</sub> and V<sub>IN</sub> ≥ 2.7V for I<sub>L</sub> = 0.1 mA to I<sub>OUTMAX</sub>.

**3:**

$$TCV_{OUT} = \frac{(V_{OUTMAX} - V_{OUTMIN}) - 10^6}{V_{OUT} \times \Delta T}$$

**4:** Regulation is measured at a constant junction temperature using low duty cycle pulse testing. Load regulation is tested over a load range from 0.1 mA to the maximum specified output current. Changes in output voltage due to heating effects are covered by the thermal regulation specification.

**5:** Dropout voltage is defined as the input-to-output differential at which the output voltage drops 2% below its nominal value measured at a 1.5V differential.

**6:** Thermal regulation is defined as the change in output voltage at a time T after a change in power dissipation is applied, excluding load or line regulation effects. Specifications are for a current pulse equal to I<sub>LMAX</sub> at V<sub>IN</sub> = 6V for T = 10 ms.

**7:** The maximum allowable power dissipation is a function of ambient temperature, the maximum allowable junction temperature and the thermal resistance from junction-to-air (i.e., T<sub>A</sub>, T<sub>J</sub>, θ<sub>JA</sub>). Exceeding the maximum allowable power dissipation causes the device to initiate thermal shutdown. Please see **Section 5.0 "Thermal Considerations"** for more details.

**8:** Hysteresis voltage is referenced to V<sub>R</sub>.

## DC CHARACTERISTICS (CONTINUED)

<b>Electrical Specifications:</b> Unless otherwise indicated, $V_{IN} = V_R + 1.5V$ , ( <b>Note 1</b> ), $I_L = 100 \mu A$ , $C_L = 3.3 \mu F$ , $SHDN > V_{IH}$ , $T_A = +25^\circ C$ . <b>Boldface</b> type specifications apply for junction temperatures of $-40^\circ C$ to $+125^\circ C$ .						
Parameters	Sym	Min	Typ	Max	Units	Conditions
<b>SHDN Input</b>						
SHDN Input High Threshold	$V_{IH}$	<b>45</b>	—	—	$\%V_{IN}$	
SHDN Input Low Threshold	$V_{IL}$	—	—	<b>15</b>	$\%V_{IN}$	
<b>ERROR Output (SOIC Only)</b>						
Minimum Operating Voltage	$V_{MIN}$	1.0	—	—	V	
Output Logic Low Voltage	$V_{OL}$	—	—	<b>400</b>	mV	1 mA Flows to $\overline{ERROR}$
ERROR Threshold Voltage	$V_{TH}$	—	$0.95 \times V_R$	—	V	
ERROR Positive Hysteresis	$V_{HYS}$	—	50	—	mV	<b>Note 8</b>

**Note 1:**  $V_R$  is the regulator output voltage setting.

**2:** The minimum  $V_{IN}$  has to justify the conditions:  $V_{IN} \geq V_R + V_{DROPOUT}$  and  $V_{IN} \geq 2.7V$  for  $I_L = 0.1 \text{ mA}$  to  $I_{OUTMAX}$ .

**3:**

$$TCV_{OUT} = \frac{(V_{OUTMAX} - V_{OUTMIN}) - 10^6}{V_{OUT} \times \Delta T}$$

**4:** Regulation is measured at a constant junction temperature using low duty cycle pulse testing. Load regulation is tested over a load range from 0.1 mA to the maximum specified output current. Changes in output voltage due to heating effects are covered by the thermal regulation specification.

**5:** Dropout voltage is defined as the input-to-output differential at which the output voltage drops 2% below its nominal value measured at a 1.5V differential.

**6:** Thermal regulation is defined as the change in output voltage at a time T after a change in power dissipation is applied, excluding load or line regulation effects. Specifications are for a current pulse equal to  $I_{LMAX}$  at  $V_{IN} = 6V$  for  $T = 10 \text{ ms}$ .

**7:** The maximum allowable power dissipation is a function of ambient temperature, the maximum allowable junction temperature and the thermal resistance from junction-to-air (i.e.,  $T_A$ ,  $T_J$ ,  $\theta_{JA}$ ). Exceeding the maximum allowable power dissipation causes the device to initiate thermal shutdown. Please see **Section 5.0 "Thermal Considerations"** for more details.

**8:** Hysteresis voltage is referenced to  $V_R$ .

## TEMPERATURE CHARACTERISTICS

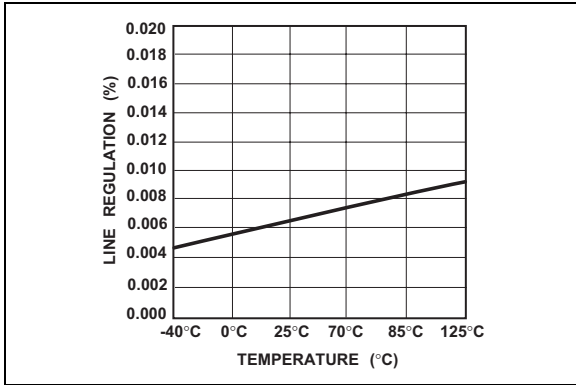
<b>Electrical Specifications:</b> Unless otherwise indicated, $V_{IN} = V_R + 1.5V$ , $I_L = 100 \mu A$ , $C_L = 3.3 \mu F$ , $SHDN > V_{IH}$ , $T_A = +25^\circ C$ .						
Parameters	Sym	Min	Typ	Max	Units	Conditions
<b>Temperature Ranges</b>						
Specified Temperature Range	$T_A$	-40	—	+125	$^\circ C$	<b>(Note 1)</b>
Operating Temperature Range	$T_J$	-40	—	+125	$^\circ C$	
Storage Temperature Range	$T_A$	-65	—	+150	$^\circ C$	
<b>Thermal Package Resistances</b>						
Thermal Resistance, 5L-DDPAK	$\theta_{JA}$	—	57	—	$^\circ C/W$	
Thermal Resistance, 5L-TO-220	$\theta_{JA}$	—	71	—	$^\circ C/W$	
Thermal Resistance, 8L-SOIC	$\theta_{JA}$	—	163	—	$^\circ C/W$	

**Note 1:** Operation in this range must not cause  $T_J$  to exceed Maximum Junction Temperature ( $+125^\circ C$ ).

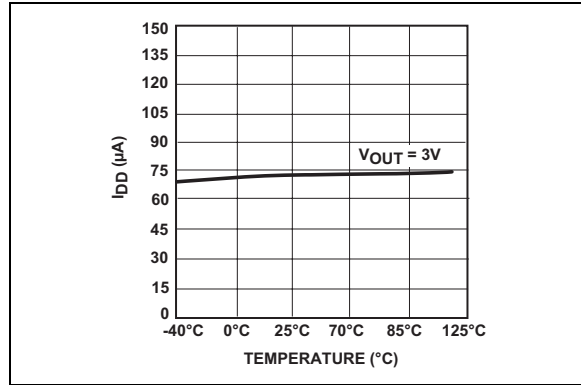
# TC1265

## 2.0 TYPICAL PERFORMANCE CURVES

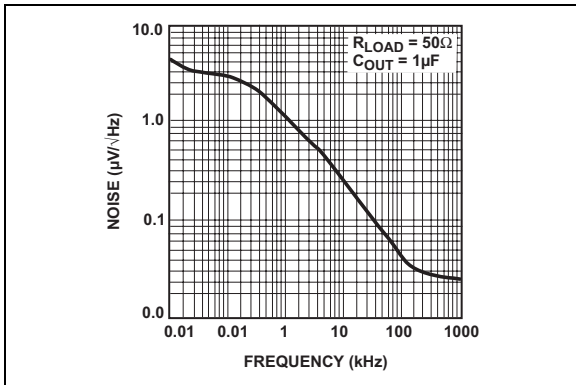
**Note:** The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be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



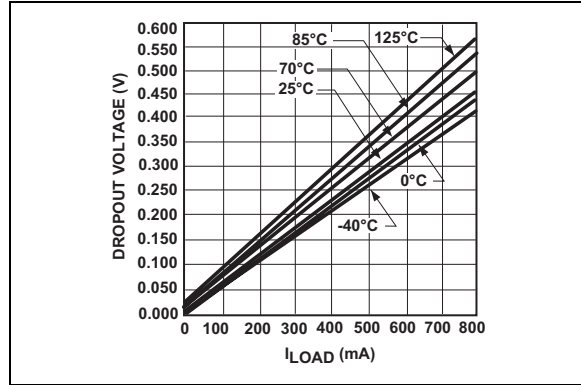
**FIGURE 2-1:** Line Regulation vs. Temperature.



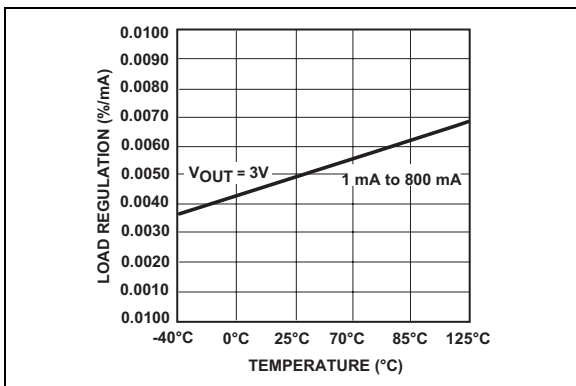
**FIGURE 2-4:**  $I_{DD}$  vs. Temperature.



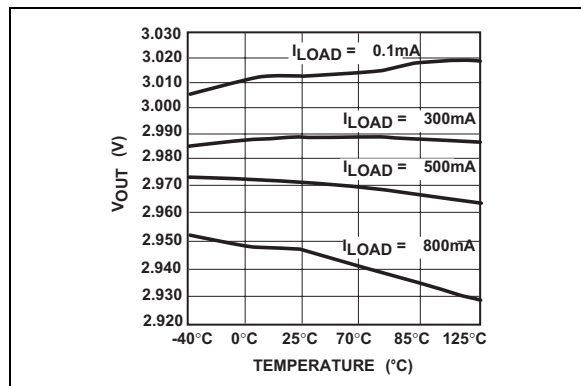
**FIGURE 2-2:** Output Noise vs. Frequency.



**FIGURE 2-5:** 3.0V Dropout Voltage vs.  $I_{LOAD}$ .

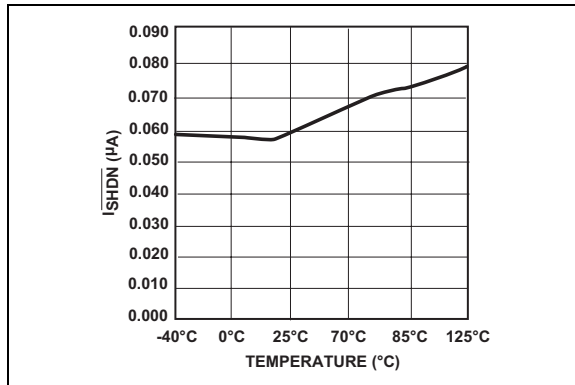


**FIGURE 2-3:** Load Regulation vs. Temperature.



**FIGURE 2-6:** 3.0V  $V_{OUT}$  vs. Temperature.

## 2.0 TYPICAL PERFORMANCE CURVES (CONT)



**FIGURE 2-1:**  $I_{SHDN}$  vs. Temperature.

## 3.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in [Table 3-1](#).

**TABLE 3-1: PIN FUNCTION TABLE**

Pin No. (8-Pin SOIC)	Pin No. (5-Pin DDPACK) (5-Pin TO-220)	Symbol	Description
1	5	$V_{OUT}$	Regulated voltage output
2	3	GND	Ground terminal
3	—	NC	No connect
4	1	BYPASS	Reference bypass input
5	—	$\overline{\text{ERROR}}$	Out-of-Regulation Flag (open-drain output)
6	2	$\overline{\text{SHDN}}$	Shutdown control input
7	—	NC	No connect
8	4	$V_{IN}$	Unregulated supply input

### 3.1 Regulated Output Voltage ( $V_{OUT}$ )

Regulated voltage output.

### 3.2 Ground (GND)

Ground terminal.

### 3.3 Reference Bypass (BYPASS)

Reference bypass input. Connecting a 470 pF to this input further reduces output noise.

### 3.4 Out-of-Regulation Flag ( $\overline{\text{ERROR}}$ )

Out-of-regulation flag (open-drain output). This output goes low when  $V_{OUT}$  is out-of-tolerance by approximately -5%.

### 3.5 Shutdown Control ( $\overline{\text{SHDN}}$ )

Shutdown control input. The regulator is fully enabled when a logic-high is applied to this input. The regulator enters shutdown when a logic-low is applied to this input. During shutdown, the output voltage falls to zero and the supply current is reduced to 0.05  $\mu\text{A}$  (typical).

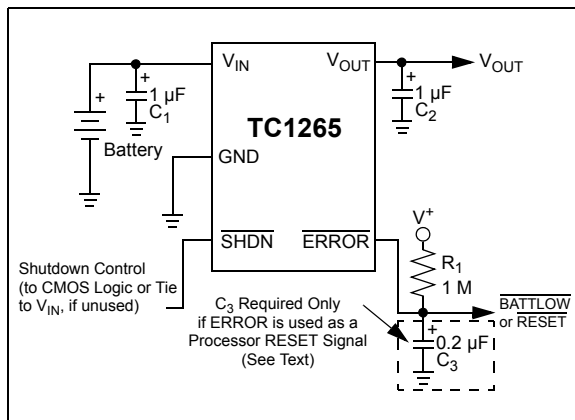
### 3.6 Unregulated Supply ( $V_{IN}$ )

Unregulated supply input.

## 4.0 DETAILED DESCRIPTION

The TC1265 is a precision, fixed-output LDO. Unlike bipolar regulators, the TC1265's supply current does not increase with load current. In addition,  $V_{OUT}$  remains stable and within regulation over the entire 0 mA to  $I_{LOADMAX}$  load current range (an important consideration in RTC and CMOS RAM battery back-up applications).

Figure 4-1 shows a typical application circuit.



**FIGURE 4-1:** Typical Application Circuit.

### 4.1 Output Capacitor

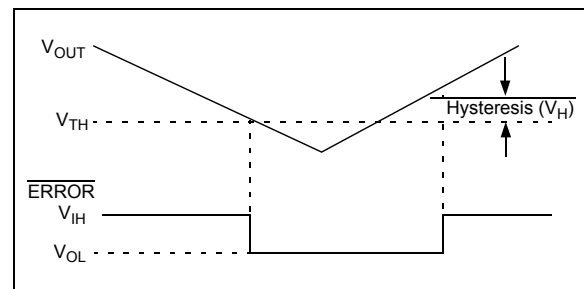
A 1 µF (min.) capacitor from  $V_{OUT}$  to ground is required. The output capacitor should have an Effective Series Resistance (ESR) greater than 0.1Ω and less than 5Ω. A 1 µF capacitor should be connected from  $V_{IN}$  to GND if there is more than 10 inches of wire between the regulator and the AC filter capacitor, or if a battery is used as the power source. Aluminum electrolytic or tantalum capacitor types can be used. Since many aluminum electrolytic capacitors freeze at approximately -30°C, solid tantalums are recommended for applications operating below -25°C. When operating from sources other than batteries, supply-noise rejection and transient response can be improved by increasing the value of the input and output capacitors, and by employing passive filtering techniques.

### 4.2 $\overline{ERROR}$ Output

$\overline{ERROR}$  is driven low whenever  $V_{OUT}$  falls out of regulation by more than -5% (typ.). This condition may be caused by low input voltage, output current limiting, or thermal limiting. The  $\overline{ERROR}$  threshold is 5% below rated  $V_{OUT}$  regardless of the programmed output voltage value (e.g.,  $ERROR = V_{OL}$  at 4.75V (typ.) for a 5.0V regulator and 2.85V (typ.) for a 3.0V regulator).  $\overline{ERROR}$  output operation is shown in Figure 4-2.

Note that  $\overline{ERROR}$  is active when  $V_{OUT}$  is at or below  $V_{TH}$  and inactive when  $V_{OUT}$  is above  $V_{TH} + V_H$ .

As shown in Figure 4-1,  $\overline{ERROR}$  can be used as a battery low flag or as a processor  $\overline{RESET}$  signal (with the addition of timing capacitor  $C_3$ ).  $R_1 \times C_3$  should be chosen to maintain  $\overline{ERROR}$  below  $V_{IH}$  of the processor  $\overline{RESET}$  input for at least 200 ms to allow time for the system to stabilize. Pull-up resistor  $R_1$  can be tied to  $V_{OUT}$ ,  $V_{IN}$  or any other voltage less than  $(V_{IN} + 0.3V)$ .



**FIGURE 4-2:**  $\overline{ERROR}$  Output Operation.



# TC1265

## 5.0 THERMAL CONSIDERATIONS

### 5.1 Thermal Shutdown

Integrated thermal protection circuitry shuts the regulator off when die temperature exceeds 160°C. The regulator remains off until the die temperature drops to approximately 150°C.

### 5.2 Power Dissipation

The amount of power the regulator dissipates is primarily a function of input voltage, output voltage and output current. The following equation is used to calculate worst-case actual power dissipation:

#### EQUATION 5-1:

$$P_D = (V_{INMAX} - V_{OUTMIN})I_{LOADMAX}$$

Where:

$P_D$  = Worst-case actual power dissipation

$V_{INMAX}$  = Maximum voltage on  $V_{IN}$

$V_{OUTMIN}$  = Minimum regulator output voltage

$I_{LOADMAX}$  = Maximum output (load) current

The maximum allowable power dissipation (Equation 5-2) is a function of the maximum ambient temperature ( $T_{AMAX}$ ), the maximum allowable die temperature ( $T_{JMAX}$ ) and the thermal resistance from junction-to-air ( $\theta_{JA}$ ).

#### EQUATION 5-2:

$$P_{DMAX} = \frac{T_{JMAX} - T_{AMAX}}{\theta_{JA}}$$

Where:

$P_D$  = Worst-case actual power dissipation

$V_{INMAX}$  = Maximum voltage on  $V_{IN}$

$V_{OUTMIN}$  = Minimum regulator output voltage

$I_{LOADMAX}$  = Maximum output (load) current

Table 5-1 and Table 5-2 show various values of  $\theta_{JA}$  for the TC1265 package types.

**TABLE 5-1: THERMAL RESISTANCE GUIDELINES FOR TC1265 IN 8-PIN SOIC PACKAGE**

Copper Area (Topside)*	Copper Area (Backside)	Board Area	Thermal Resistance ( $\theta_{JA}$ )
2500 sq mm	2500 sq mm	2500 sq mm	60°C/W
1000 sq mm	2500 sq mm	2500 sq mm	60°C/W
225 sq mm	2500 sq mm	2500 sq mm	68°C/W
100 sq mm	2500 sq mm	2500 sq mm	74°C/W

\* Pin 2 is ground. Device is mounted on the top-side.

**TABLE 5-2: THERMAL RESISTANCE GUIDELINES FOR TC1265 IN 5-PIN DPAK/TO-220 PACKAGE**

Copper Area (Topside)*	Copper Area (Backside)	Board Area	Thermal Resistance ( $\theta_{JA}$ )
2500 sq mm	2500 sq mm	2500 sq mm	25°C/W
1000 sq mm	2500 sq mm	2500 sq mm	27°C/W
125 sq mm	2500 sq mm	2500 sq mm	35°C/W

\* Tab of device attached to top-side copper

Equation 5-1 can be used in conjunction with Equation 5-2 to ensure regulator thermal operation is within limits. For example:

Given:

$$V_{INMAX} = 3.3V \pm 10\%$$

$$V_{OUTMIN} = 2.7V \pm 0.5\%$$

$$I_{LOADMAX} = 275 \text{ mA}$$

$$T_{JMAX} = 125^\circ\text{C}$$

$$T_{AMAX} = 95^\circ\text{C}$$

$$\theta_{JA} = 60^\circ\text{C/W (SOIC)}$$

Find:

- Actual power dissipation
- Maximum allowable dissipation

Actual power dissipation:

$$P_D \approx (V_{INMAX} - V_{OUTMIN})I_{LOADMAX}$$

$$P_D = (3.3 \times 1.1) - (2.7 \times .995)275 \times 10^{-3}$$

$$P_D = 260 \text{ mW}$$

Maximum allowable power dissipation:

$$P_{DMAX} = \frac{T_{JMAX} - T_{AMAX}}{\theta_{JA}}$$

$$P_{DMAX} = \frac{(125 - 95)}{60}$$

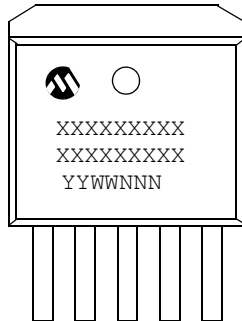
$$P_{DMAX} = 500 \text{ mW}$$

In this example, the TC1265 dissipates a maximum of 260 mW, below the allowable limit of 500 mW. In a similar manner, Equation 5-1 and Equation 5-2 can be used to calculate maximum current and/or input voltage limits. For example, the maximum allowable  $V_{IN}$  is found by substituting the maximum allowable power dissipation of 500 mW into Equation 5-1, from which  $V_{INMAX} = 4.6V$ .

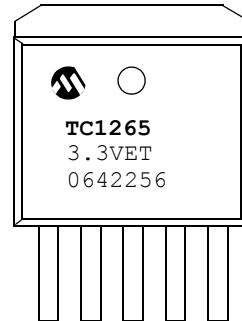
## 6.0 PACKAGING INFORMATION

### 6.1 Package Marking Information

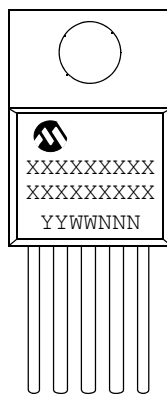
**5-Lead DDKPAK**



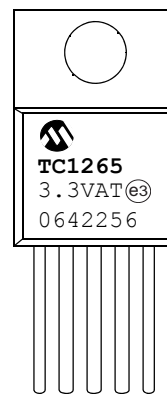
**Example**



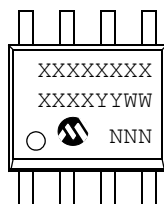
**5-Lead TO-220**



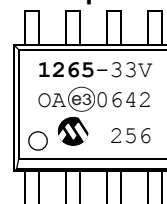
**Example:**



**8-Lead SOIC (150 mil)**



**Example:**



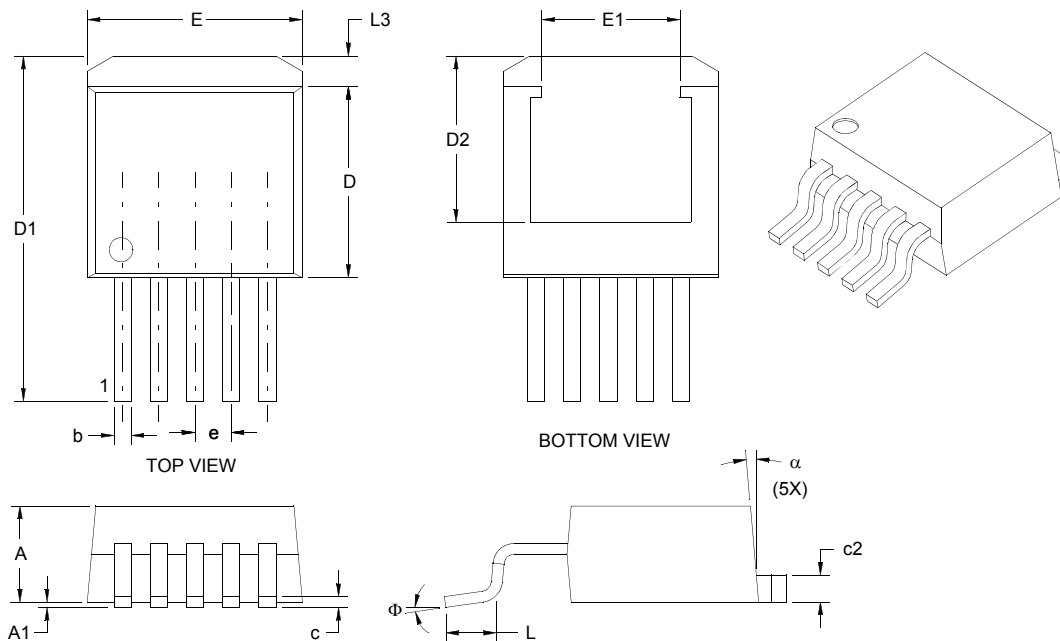
<b>Legend:</b>	XX...X	Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator (e3) can be found on the outer packaging for this package.

**Note:** In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.

# TC1265

## 5-Lead Plastic (ET) (DDPAK) )

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimension Limits	Units	INCHES*			MILLIMETERS		
		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins			5			5	
Pitch	e	.067 BSC			1.70 BSC		
Overall Height	A	.170	.177	.183	4.32	4.50	4.65
Standoff §	A1	.000	.005	.010	0.00	0.13	0.25
Overall Width	E	.385	.398	.410	9.78	10.11	10.41
Exposed Pad Width	E1	.256 REF			6.50 REF		
Molded Package Length	D	.330	.350	.370	8.38	8.89	9.40
Overall Length	D1	.549	.577	.605	13.94	14.66	15.37
Exposed Pad Length	D2	.303 REF			7.75 REF		
Lead Thickness	c	.014	.020	.026	0.36	0.51	0.66
Pad Thickness	c2	.045	--	.055	1.14	--	1.40
Lead Width	b	.026	.032	.037	0.66	0.81	0.94
Foot Length	L	.068	.089	.110	1.73	2.26	2.79
Pad Length	L3	.045	--	.067	1.14	--	1.70
Foot Angle	Φ	--	--	8°	--	--	8°
Mold Draft Angle	α	3°	--	7°	3°	--	7°

\* Controlling Parameter

§ Significant Characteristic

**Notes:**

Dimensions D and E do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

See ASME Y14.5M

REF: Reference Dimension, usually without tolerance, for information purposes only.

See ASME Y14.5M

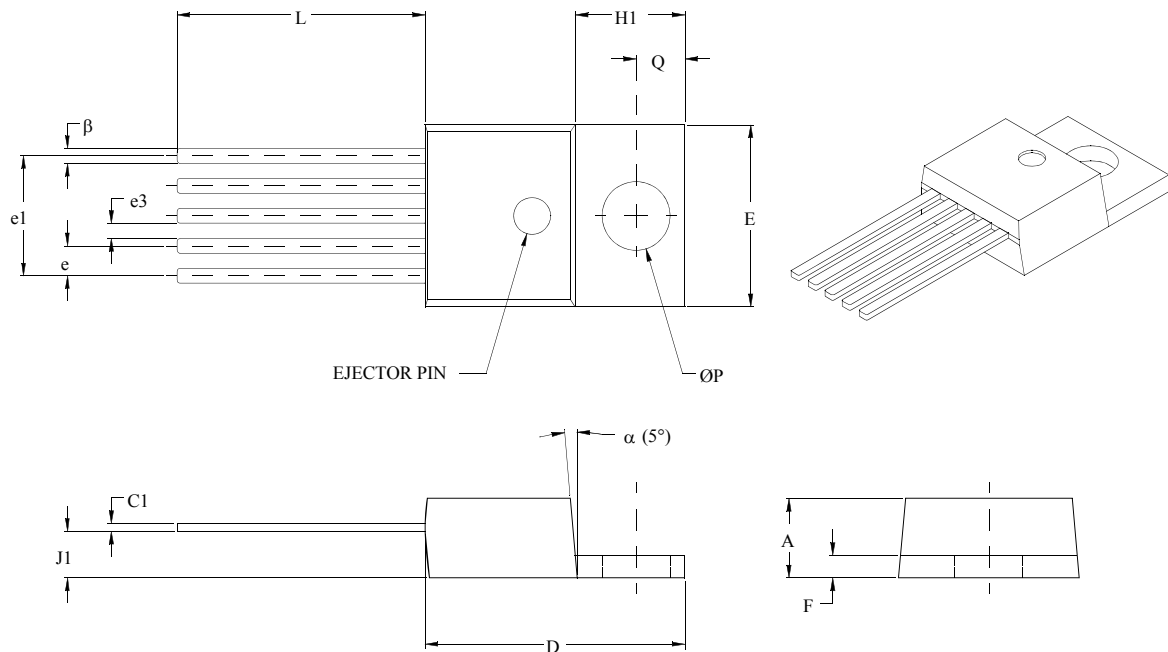
JEDEC equivalent: TO-252

Drawing No. C04-012

Revised 07-19-05

## 5-Lead Plastic Transistor Outline (AT) (TO-220)

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimension Limits	Units	INCHES*		MILLIMETERS	
		MIN	MAX	MIN	MAX
Lead Pitch	e	.060	.072	1.52	1.83
Overall Lead Centers	e1	.263	.273	6.68	6.93
Space Between Leads	e3	.030	.040	0.76	1.02
Overall Height	A	.160	.190	4.06	4.83
Overall Width	E	.385	.415	9.78	10.54
Overall Length	D	.560	.590	14.22	14.99
Flag Length	H1	.234	.258	5.94	6.55
Flag Thickness	F	.045	.055	1.14	1.40
Through Hole Center	Q	.103	.113	2.62	2.87
Through Hole Diameter	P	.146	.156	3.71	3.96
Lead Length	L	.540	.560	13.72	14.22
Base to Bottom of Lead	J1	.090	.115	2.29	2.92
Lead Thickness	C1	.014	.022	0.36	0.56
Lead Width	β	.025	.040	0.64	1.02
Mold Draft Angle	α	3°	7°	3°	7°

\* Controlling Parameter

**Notes:**

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254 mm) per side.

JEDEC equivalent: TO-220

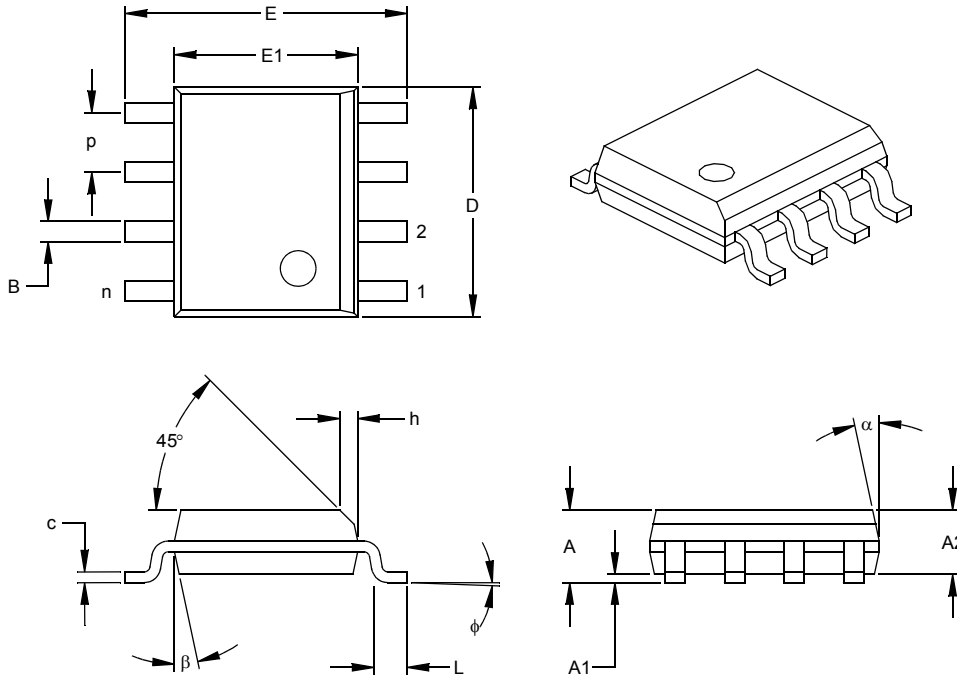
Drawing No. C04-036

Revised 08-01-05

# TC1265

## 8-Lead Plastic Small Outline (SN) – Narrow, 150 mil Body (SOIC)

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Units		INCHES*			MILLIMETERS		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n	8			8		
Pitch	p		.050			1.27	
Overall Height	A	.053	.061	.069	1.35	1.55	1.75
Molded Package Thickness	A2	.052	.056	.061	1.32	1.42	1.55
Standoff §	A1	.004	.007	.010	0.10	0.18	0.25
Overall Width	E	.228	.237	.244	5.79	6.02	6.20
Molded Package Width	E1	.146	.154	.157	3.71	3.91	3.99
Overall Length	D	.189	.193	.197	4.80	4.90	5.00
Chamfer Distance	h	.010	.015	.020	0.25	0.38	0.51
Foot Length	L	.019	.025	.030	0.48	0.62	0.76
Foot Angle	φ	0	4	8	0	4	8
Lead Thickness	c	.008	.009	.010	0.20	0.23	0.25
Lead Width	B	.013	.017	.020	0.33	0.42	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

\* Controlling Parameter  
 § Significant Characteristic

**Notes:**

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-012

Drawing No. C04-057

## APPENDIX A: REVISION HISTORY

### Revision D (October 2006)

- **Section 1.0 “Electrical Characteristics”:**  
Changed dropout voltage typical value for  $I_L = 500$  mA from 700 to 1000 and maximum value from 1000 to 1200 for. Changed typical value for  $I_L = 800$  mA from 890 to 1200
- **Section 6.0 “Packaging Information”:** Added pb-free symbol to package marking information
- Added disclaimer to package outline drawings
- Updated package outline drawings as needed
- Added Appendix A - Revision History

### Revision C (October 2004)

- Not Documented

### Revision B (May 2002)

- Not Documented

### Revision A (March 2002)

- Original Release of this Document.

# TC1265

---

NOTES:

## PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

<u>PART NO.</u>	<u>X.XX</u>	<u>XX</u>	<u>XX</u>	<b>Examples:</b>
<b>Device</b>	<b>Voltage Option</b>	<b>Package</b>	<b>Tape and Reel</b>	
Device	TC1265 Fixed Output CMOS LDO with Shutdown			a) TC1265-1.8VAT 1.8V LDO, TO-220-5 pkg.
Voltage Option:*	1.8V = 1.8V			b) TC1265-2.5VAT 2.5V LDO, TO-220-5 pkg.
	2.5V = 2.5V			c) TC1265-3.0VAT 3.0V LDO, TO-220-5 pkg.
	3.0V = 3.0V			d) TC1265-3.3VAT 3.3V LDO, TO-220-5 pkg.
	3.3V = 3.3V			a) TC1265-1.8VETTR 1.8V LDO, DDPAK-5 pkg., Tape and Reel
	* Other output voltages are available. Please contact your local Microchip sales office for details.			b) TC1265-2.5VETTR 2.5V LDO, DDPAK-5 pkg., Tape and Reel
Package	AT = Plastic (TO-220), 5-Lead			c) TC1265-3.0VETTR 3.0V LDO, DDPAK-5 pkg., Tape and Reel
	ET = Plastic Transistor Outline (DDPAK), 5-Lead			d) TC1265-3.3VETTR 3.3V LDO, DDPAK-5 pkg., Tape and Reel
	ETTR = Plastic Transistor Outline (DDPAK), 5-Lead, Tape and Reel			a) TC1265-1.8VOA 1.8V LDO, SOIC-8 pkg.
	OA = Plastic SOIC, (150 mil Body), 8-lead			b) TC1265-1.8VOATR 1.8V LDO, SOIC-8 pkg., Tape and Reel
	OATR = Plastic SOIC, (150 mil Body), 8-lead, Tape and Reel			c) TC1265-2.5VOA 2.5V LDO, SOIC-8 pkg.
				d) TC1265-2.5VOATR 2.5V LDO, SOIC-8 pkg., Tape and Reel
				e) TC1265-3.0VOA 3.0V LDO, SOIC-8 pkg.
				f) TC1265-3.0VOATR 3.0V LDO, SOIC-8 pkg., Tape and Reel
				g) TC1265-3.3VOA 3.3V LDO, SOIC-8 pkg.
				h) TC1265-3.3VOATR 3.3V LDO, SOIC-8 pkg., Tape and Reel



# TC1265

---

NOTES:

---

**Note the following details of the code protection feature on Microchip devices:**

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

---

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

**Trademarks**

The Microchip name and logo, the Microchip logo, Accuron, dsPIC, KEELOQ, microID, MPLAB, PIC, PICmicro, PICSTART, PRO MATE, PowerSmart, rfPIC, and SmartShunt are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.


AmpLab, FilterLab, Migratable Memory, MXDEV, MXLAB, SEEVAL, SmartSensor and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Analog-for-the-Digital Age, Application Maestro, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, ECAN, ECONOMONITOR, FanSense, FlexROM, fuzzyLAB, In-Circuit Serial Programming, ICSP, ICEPIC, Linear Active Thermistor, Mindi, MiWi, MPASM, MPLIB, MPLINK, PICkit, PICDEM, PICDEM.net, PICLAB, PICtail, PowerCal, PowerInfo, PowerMate, PowerTool, REAL ICE, rFLAB, rfPICDEM, Select Mode, Smart Serial, SmartTel, Total Endurance, UNI/O, WiperLock and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

All other trademarks mentioned herein are property of their respective companies.

© 2006, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

**QUALITY MANAGEMENT SYSTEM**  
**CERTIFIED BY DNV**  
**== ISO/TS 16949:2002 ==**

*Microchip received ISO/TS-16949:2002 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona, Gresham, Oregon and Mountain View, California. The Company's quality system processes and procedures are for its PIC® 8-bit MCUs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.*



**MICROCHIP**

---

---

## WORLDWIDE SALES AND SERVICE

---

---

### AMERICAS

#### Corporate Office

2355 West Chandler Blvd.  
Chandler, AZ 85224-6199  
Tel: 480-792-7200  
Fax: 480-792-7277  
Technical Support:  
<http://support.microchip.com>  
Web Address:  
[www.microchip.com](http://www.microchip.com)

#### Atlanta

Alpharetta, GA  
Tel: 770-640-0034  
Fax: 770-640-0307

#### Boston

Westborough, MA  
Tel: 774-760-0087  
Fax: 774-760-0088

#### Chicago

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

#### Dallas

Addison, TX  
Tel: 972-818-7423  
Fax: 972-818-2924

#### Detroit

Farmington Hills, MI  
Tel: 248-538-2250  
Fax: 248-538-2260

#### Kokomo

Kokomo, IN  
Tel: 765-864-8360  
Fax: 765-864-8387

#### Los Angeles

Mission Viejo, CA  
Tel: 949-462-9523  
Fax: 949-462-9608

#### Santa Clara

Santa Clara, CA  
Tel: 408-961-6444  
Fax: 408-961-6445

#### Toronto

Mississauga, Ontario,  
Canada  
Tel: 905-673-0699  
Fax: 905-673-6509

### ASIA/PACIFIC

#### Asia Pacific Office

Suites 3707-14, 37th Floor  
Tower 6, The Gateway  
Harbour City, Kowloon  
Hong Kong  
Tel: 852-2401-1200  
Fax: 852-2401-3431

#### Australia - Sydney

Tel: 61-2-9868-6733  
Fax: 61-2-9868-6755

#### China - Beijing

Tel: 86-10-8528-2100  
Fax: 86-10-8528-2104

#### China - Chengdu

Tel: 86-28-8665-5511  
Fax: 86-28-8665-7889

#### China - Fuzhou

Tel: 86-591-8750-3506  
Fax: 86-591-8750-3521

#### China - Hong Kong SAR

Tel: 852-2401-1200  
Fax: 852-2401-3431

#### China - Qingdao

Tel: 86-532-8502-7355  
Fax: 86-532-8502-7205

#### China - Shanghai

Tel: 86-21-5407-5533  
Fax: 86-21-5407-5066

#### China - Shenyang

Tel: 86-24-2334-2829  
Fax: 86-24-2334-2393

#### China - Shenzhen

Tel: 86-755-8203-2660  
Fax: 86-755-8203-1760

#### China - Shunde

Tel: 86-757-2839-5507  
Fax: 86-757-2839-5571

#### China - Wuhan

Tel: 86-27-5980-5300  
Fax: 86-27-5980-5118

#### China - Xian

Tel: 86-29-8833-7250  
Fax: 86-29-8833-7256

### ASIA/PACIFIC

#### India - Bangalore

Tel: 91-80-4182-8400  
Fax: 91-80-4182-8422

#### India - New Delhi

Tel: 91-11-4160-8631  
Fax: 91-11-4160-8632

#### India - Pune

Tel: 91-20-2566-1512  
Fax: 91-20-2566-1513

#### Japan - Yokohama

Tel: 81-45-471-6166  
Fax: 81-45-471-6122

#### Korea - Gumi

Tel: 82-54-473-4301  
Fax: 82-54-473-4302

#### Korea - Seoul

Tel: 82-2-554-7200  
Fax: 82-2-558-5932 or  
82-2-558-5934

#### Malaysia - Penang

Tel: 60-4-646-8870  
Fax: 60-4-646-5086

#### Philippines - Manila

Tel: 63-2-634-9065  
Fax: 63-2-634-9069

#### Singapore

Tel: 65-6334-8870  
Fax: 65-6334-8850

#### Taiwan - Hsin Chu

Tel: 886-3-572-9526  
Fax: 886-3-572-6459

#### Taiwan - Kaohsiung

Tel: 886-7-536-4818  
Fax: 886-7-536-4803

#### Taiwan - Taipei

Tel: 886-2-2500-6610  
Fax: 886-2-2508-0102

#### Thailand - Bangkok

Tel: 66-2-694-1351  
Fax: 66-2-694-1350

### EUROPE

#### Austria - Wels

Tel: 43-7242-2244-39  
Fax: 43-7242-2244-393

#### Denmark - Copenhagen

Tel: 45-4450-2828  
Fax: 45-4485-2829

#### France - Paris

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

#### Germany - Munich

Tel: 49-89-627-144-0  
Fax: 49-89-627-144-44

#### Italy - Milan

Tel: 39-0331-742611  
Fax: 39-0331-466781

#### Netherlands - Drunen

Tel: 31-416-690399  
Fax: 31-416-690340

#### Spain - Madrid

Tel: 34-91-708-08-90  
Fax: 34-91-708-08-91

#### UK - Wokingham

Tel: 44-118-921-5869  
Fax: 44-118-921-5820

10/19/06