TC1300

300 mA CMOS LDO with Shutdown, Bypass and Independent Delayed Reset Function

Features

- LDO with Integrated Microcontroller Reset Monitor Functionality
- Low Input Supply Current (80 µA, typical)
- Very Low Dropout Voltage
- 10 µsec (typ.) Wake-Up Time from $\overline{\text{SHDN}}$
- 300 mA Output Current
- Standard or Custom Output and Detected Voltages
- Power-Saving Shutdown Mode
- Bypass Input for Quiet Operation
- Separate Input for Detected Voltage
- 140 msec Minimum $\overline{\text{RESET}}$ Output Duration
- Space-Saving MSOP Package
- Specified Junction Temperature Range: -40°C to +125°C

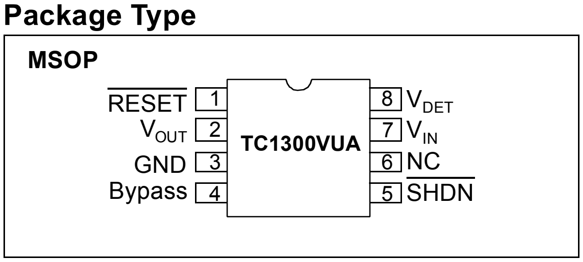
Applications

- Battery-Operated Systems
- Portable Computers
- Medical Instruments
- Pagers
- Cellular / GSM / PHS Phones

Related Literature

- AN765, "Using Microchip's Micropower LDOs", DS00765.
- AN766, "Pin-Compatible CMOS Upgrades to Bipolar LDOs", DS00766.
- AN792, "A Method to Determine How Much Power a SOT23 Can Dissipate in an Application", DS00792.

Package Type



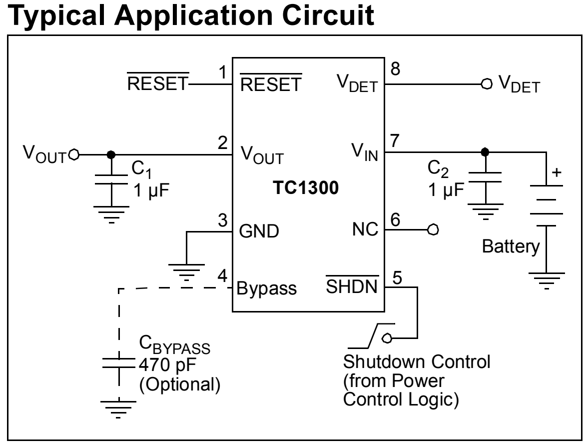
General Description

The TC1300 combines a low dropout regulator and a microcontroller reset monitor in an 8-Pin MSOP package. Total supply current is 80 µA (typical), 20 to 60 times lower than bipolar regulators.

The TC1300 has a precise output with a typical accuracy of ±0.5%. Other key features include low noise operation, low dropout voltage and internal feed-forward compensation for fast response to step changes in load. The TC1300 has both over-temperature and over-current protection. When the shutdown control ($\overline{\text{SHDN}}$) is low, the regulator output voltage falls to zero, $\overline{\text{RESET}}$ output remains valid and supply current is reduced to 30 µA (typical). The TC1300 is rated for 300 mA of output current and stable with a 1 µF output capacitor.

An active-low $\overline{\text{RESET}}$ is asserted when the detected voltage (V_{DET}) falls below the reset voltage threshold. The $\overline{\text{RESET}}$ output remains low for 300 msec (typical) after V_{DET} rises above reset threshold. The TC1300 also has a fast wake-up response time (10 µsec., typical) when released from shutdown.

Typical Application Circuit



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings*

Input Voltage 6.5V
Output Voltage .... (V_{SS} - 0.3) to (V_{IN} + 0.3)
Power Dissipation .... Internally Limited **(Note 6)**
Operating Junction Temperature, T_J .... – 40°C < T_J< 150°C
Maximum Junction Temperature, Tj .... 150°C
Storage Temperature ....– 65°C to +150°C
Maximum Voltage on Any Pin .... (V_{SS}-0.3) to (V_{IN}+0.3)

***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 operational listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

PIN DESCRIPTIONS

Pin	Description
$\overline{RESET}$	$\overline{RESET}$ output remains low while V_{DET} is below the reset voltage threshold and for 300 msec after V_{DET} rises above reset threshold.
V_{OUT}	Regulated Voltage Output
GND	Ground Terminal
Bypass	Reference Bypass Input. Connecting an optional 470 pF to this input further reduces output noise.
$\overline{SHDN}$	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, regulator output voltage falls to zero, $\overline{RESET}$ output remains valid and supply current is reduced to 30 µA (typ.).
NC	No connect
V_{IN}	Power Supply Input
V_{DET}	Detected Input Voltage. V_{DET} and V_{IN} can be connected together.

ELECTRICAL CHARACTERISTICS

V_{IN} = V_{OUT} + 1V, I_L = 0.1 mA, C_L = 3.3 µF, $\overline{SHDN}$ > V_{IH}, T_A = 25°C, unless otherwise noted. **BOLDFACE** type specifications apply for junction temperature **(Note 8)** of -40°C to +125°C.

Parameters	Sym	Min	Typ	Max	Units	Conditions
Input Operating Voltage	V_{IN}	**2.7**	—	**6.0**	V	**Note 7**
Maximum Output Current	$IOUT_{MAX}$	**300**	—	—	mA	
Output Voltage	V_{OUT}	— **V_R - 2.5%**	V_R ± 0.5% —	— **V_R + 2.5%**	V	**Note 1**
V_{OUT} Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	—	**25**	—	ppm/°C	**Note 2**
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	—	0.02	**0.35**	%	(V_R + 1V) ≤ V_{IN} ≤ 6V
Load Regulation	$\Delta V_{OUT}/V_{OUT}$	—	0.5	**2.0**	%	I_L = 0.1 mA to I_{OUTMAX}, **Note 3**

Note 1: V_R is the regulator output voltage setting.

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

3: 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.

4: Dropout voltage is defined as the input to output differential at which the output voltage drops 2% below its nominal value measured at a 1V differential.

5: 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 $I_{L_{MAX}}$ at V_{IN} = 6V for t = 10 msec.

6: 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, θ_{JA}). Exceeding the maximum allowable power dissipation causes the device to initiate thermal shutdown. Please see Section 4.0, "Thermal Considerations", of this data sheet for more details.

7: The minimum V_{IN} has to meet two conditions: V_{IN} ≥ 2.7V and V_{IN} ≥ (V_R + $V_{DROPOUT}$).

8: The junction temperature of the device is approximated by soaking the device under test at an ambient temperature equal to the desired junction temperature. The test time is small enough such that the rise in the junction temperature over the ambient temperature is not significant.

ELECTRICAL CHARACTERISTICS (CONTINUED)

$V_{IN} = V_{OUT} + 1V$, $I_L = 0.1$ mA, $C_L = 3.3$ µF, $\overline{SHDN} > V_{IH}$, $T_A = 25°C$, unless otherwise noted. **BOLDFACE** type specifications apply for junction temperature **(Note 8)** of -40°C to +125°C.

Parameters	Sym	Min	Typ	Max	Units	Conditions
Dropout Voltage **(Note 4)**	$V_{IN} - V_{OUT}$	—	1 70 210	**30** **130** **390**	mV	$I_L = 0.1$ mA $I_L = 100$ mA $I_L = 300$ mA
Supply Current	I_{SS1}	—	80	**160**	µA	$\overline{SHDN} = V_{IH}$
Shutdown Supply Current	I_{SS2}	—	30	**60**	µA	$\overline{SHDN} = 0V$
Power Supply Rejection Ratio	PSRR	—	60	—	dB	f ≤ 1 kHz, $C_{BYPASS} = 1$ nF
Output Short Circuit Current	I_{OUTSC}	—	800	1200	mA	$V_{OUT} = 0V$
Thermal Regulation	$\Delta V_{OUT}/\Delta P_D$	—	0.04	—	%/W	**Note 5**
Output Noise	eN	—	900	—	nV/Hz	f < 1 kHz, $C_{OUT} = 1$ µF, $R_{LOAD} = 50\ \Omega$, $C_{BYPASS} = 1$ nF
Wake-Up Time (from Shutdown Mode)	t_{WK}	—	10	20	µsec	$C_{IN} = 1$ µF, $V_{IN} = 5V$, $C_{OUT} = 4.7$ µF, $I_L = 30$ mA, See Figure 3-2
Settling Time (from Shutdown Mode)	ts	—	50	—	µsec	$C_{IN} = 1$ µF, $V_{IN} = 5V$ $C_{OUT} = 4.7$ µF $I_L = 30$ mA, See Figure 3-2
Thermal Shutdown Die Temperature	T_{SD}	—	150	—	°C	
Thermal Shutdown Hysteresis	T_{HYS}	—	10	—	°C	
Thermal Resistance Junction to Case	RthetaJA	—	200	—	°C/Watt	EIA/JEDEC JESD51-751-7 4-Layer Board
$\overline{SHDN}$ Input High Threshold	V_{IH}	**45**	—	—	$\%V_{IN}$	$V_{IN} = 2.5V$ to 6.0V
$\overline{SHDN}$ Input Low Threshold	V_{IL}	—	—	**15**	$\%V_{IN}$	$V_{IN} = 2.5V$ to 6.0V

Note 1: V_R is the regulator output voltage setting.

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

3: 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.

4: Dropout voltage is defined as the input to output differential at which the output voltage drops 2% below its nominal value measured at a 1V differential.

5: 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 msec.

6: 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, θ_{JA}). Exceeding the maximum allowable power dissipation causes the device to initiate thermal shutdown. Please see Section 4.0, “Thermal Considerations”, of this data sheet for more details.

7: The minimum V_{IN} has to meet two conditions: $V_{IN} \geq 2.7V$ and $V_{IN} \geq (V_R + V_{DROPOUT})$.

8: The junction temperature of the device is approximated by soaking the device under test at an ambient temperature equal to the desired junction temperature. The test time is small enough such that the rise in the junction temperature over the ambient temperature is not significant.

ELECTRICAL CHARACTERISTICS (CONTINUED)

$V_{IN} = V_{OUT} + 1V$, $I_L = 0.1$ mA, $C_L = 3.3$ µF, $\overline{SHDN} > V_{IH}$, $T_A = 25°C$, unless otherwise noted. **BOLDFACE** type specifications apply for junction temperature **(Note 8)** of -40°C to +125°C.

Parameters	Sym	Min	Typ	Max	Units	Conditions
$\overline{\text{RESET}}$ Output						
Voltage Range	V_{DET}	1.0 **1.2**	— —	6.0 **6.0**	V	T_A = 0°C to +70°C T_A = – 40°C to +125°C
$\overline{\text{Reset}}$ Threshold	V_{TH}	2.59	2.63	2.66	V	TC1300R-XX, T_A = +25°C
		2.55	—	**2.70**		TC1300R-XX, T_A = – 40°C to +125°C
		2.36	2.40	2.43		TC1300Y-XX, T_A = +25°C
		2.32	—	**2.47**		TC1300Y-XX, T_A = – 40°C to +125°C
$\overline{\text{Reset}}$ Threshold Tempco	$\Delta V_{TH} / \Delta T$	—	30	—	ppm/°C	
V_{DET} to Reset Delay	t_{RPD}	—	160	—	µsec	$V_{DET} = V_{TH}$ to (V_{TH} – 100 mV)
Reset Active Timeout Period	t_{RPU}	**140**	300	**560**	msec	
$\overline{\text{RESET}}$ Output Voltage Low	V_{OL}	—	—	0.3	V	$V_{DET} = V_{TH}$ min, I_{SINK} = 1.2 mA
$\overline{\text{RESET}}$ Output Voltage High	V_{OH}	0.8 V_{DET}	—	—	V	$V_{DET} > V_{TH}$ max, I_{SOURCE} = 500 µA

Note 1: V_R is the regulator output voltage setting.

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

3: 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.

4: Dropout voltage is defined as the input to output differential at which the output voltage drops 2% below its nominal value measured at a 1V differential.

5: 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 msec.

6: 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, θ_{JA}). Exceeding the maximum allowable power dissipation causes the device to initiate thermal shutdown. Please see Section 4.0, “Thermal Considerations”, of this data sheet for more details.

7: The minimum V_{IN} has to meet two conditions: $V_{IN} \geq 2.7V$ and $V_{IN} \geq (V_R + V_{DROPOUT})$.

8: The junction temperature of the device is approximated by soaking the device under test at an ambient temperature equal to the desired junction temperature. The test time is small enough such that the rise in the junction temperature over the ambient temperature is not significant.

2.0 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.

Junction temperature (T_J) is approximated by soaking the device under test at an ambient temperature equal to the desired Junction temperature. The test time is small enough such that the rise in the Junction temperature over the Ambient temperature is not significant.

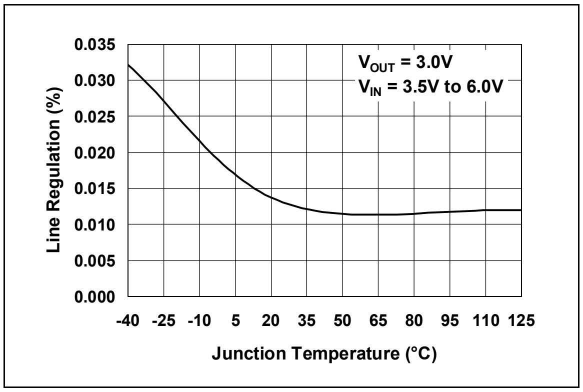


FIGURE 2-1: *Line Regulation vs. Temperature.*

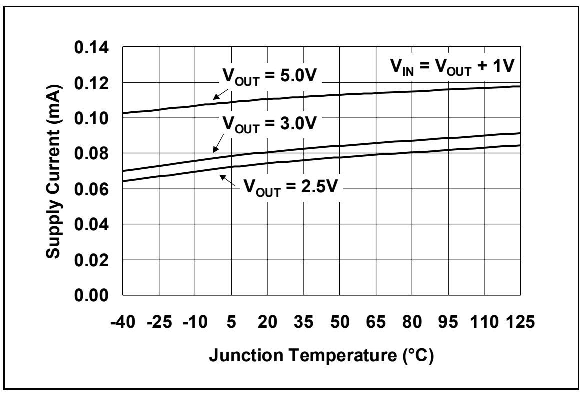


FIGURE 2-2: *Supply Current vs. Temperature.*

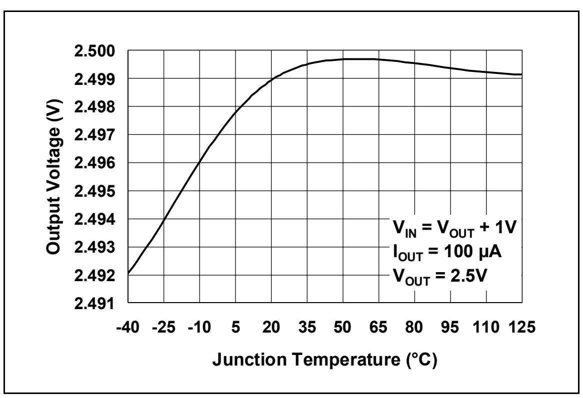


FIGURE 2-3: *Normalized V_{OUT} vs. Temperature.*

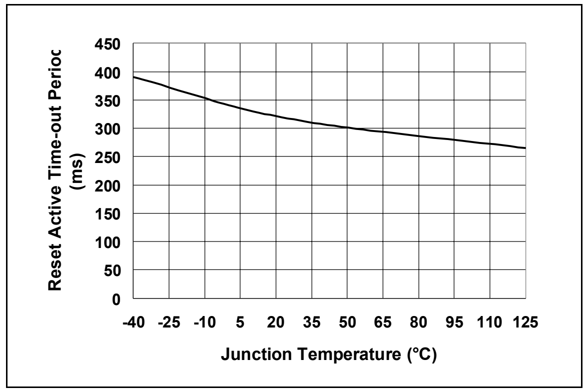


FIGURE 2-4: *Reset Active Time-out Period vs. Temperature.*

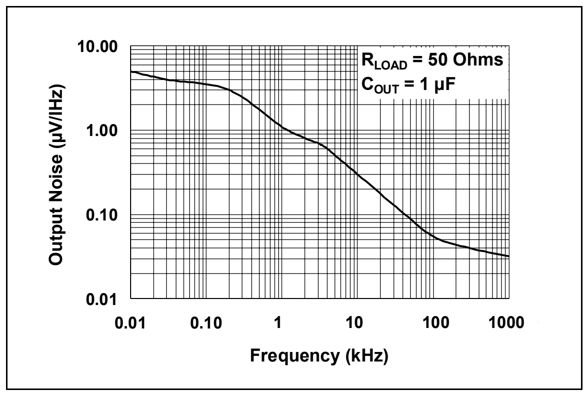


FIGURE 2-5: *Output Noise vs. Frequency.*

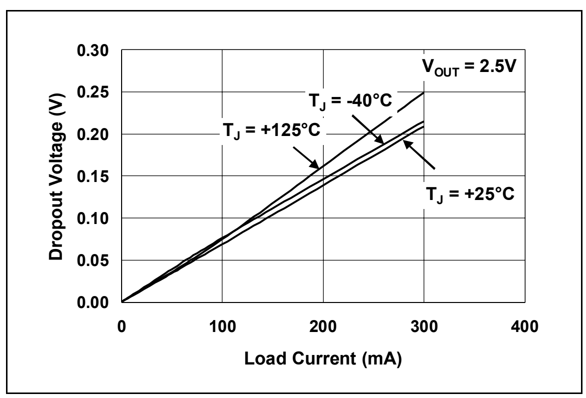


FIGURE 2-6: *Dropout Voltage vs. Load Current (2.5V).*

2.0 TYPICAL CHARACTERISTICS (CON'T)

Junction temperature (T_J) is approximated by soaking the device under test at an ambient temperature equal to the desired Junction temperature. The test time is small enough such that the rise in the Junction temperature over the Ambient temperature is not significant.

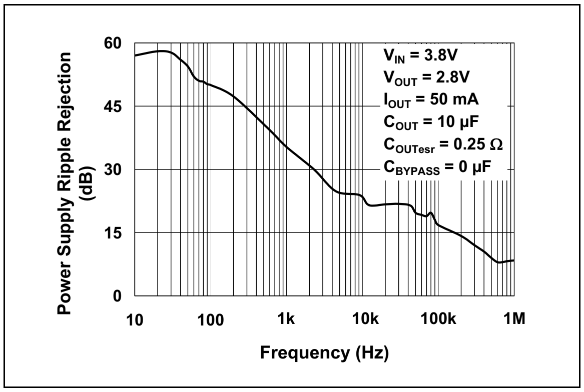


FIGURE 2-7: *Power Supply Rejection Ratio vs. Frequency.*

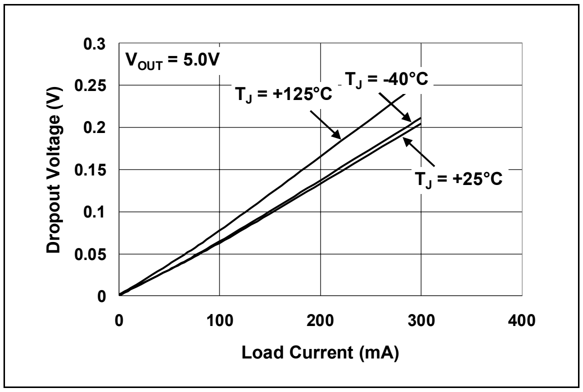


FIGURE 2-10: *Dropout Voltage vs. Load Current (5.0V).*

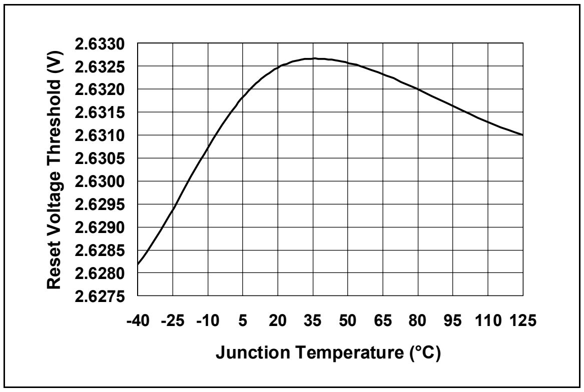


FIGURE 2-8: *Reset Voltage Threshold vs. Junction Temperature.*

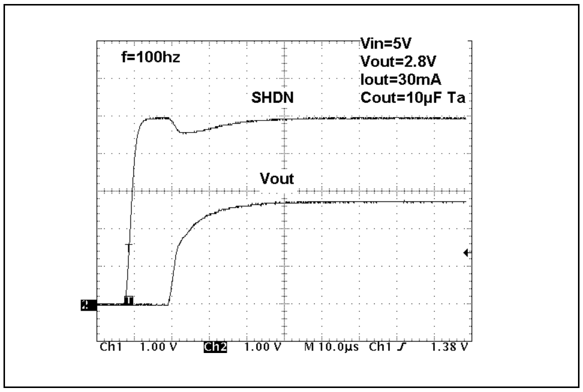


FIGURE 2-11: *Wake-Up Response Time.*

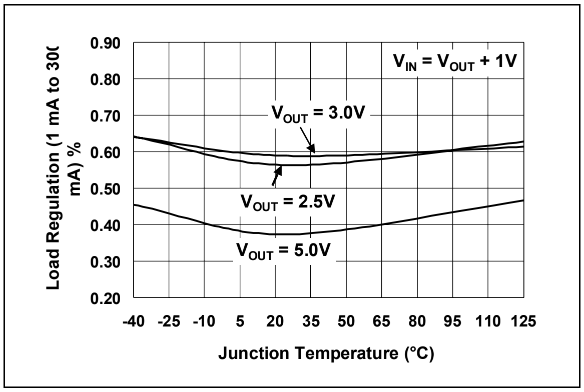


FIGURE 2-9: *Load Regulation vs. Temperature.*

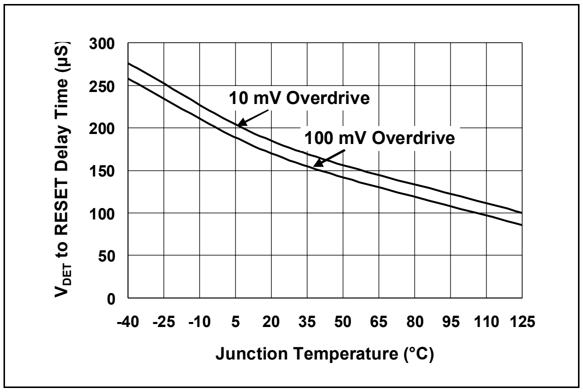


FIGURE 2-12: *V_{DET} to Reset Delay vs. Temperature.*

2.0 TYPICAL CHARACTERISTICS (CON'T)

Junction temperature (T_J) is approximated by soaking the device under test at an ambient temperature equal to the desired Junction temperature. The test time is small enough such that the rise in the Junction temperature over the Ambient temperature is not significant.

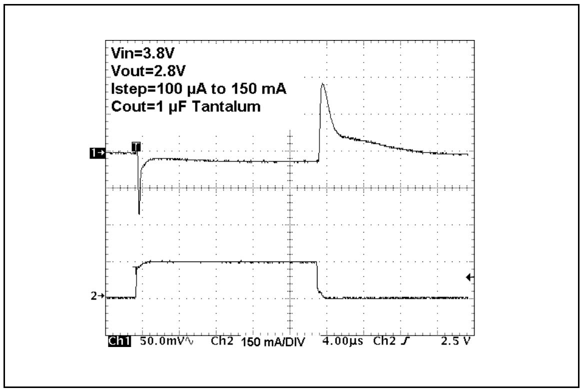


FIGURE 2-13: Load Transient Response 1 µF Output Capacitor.

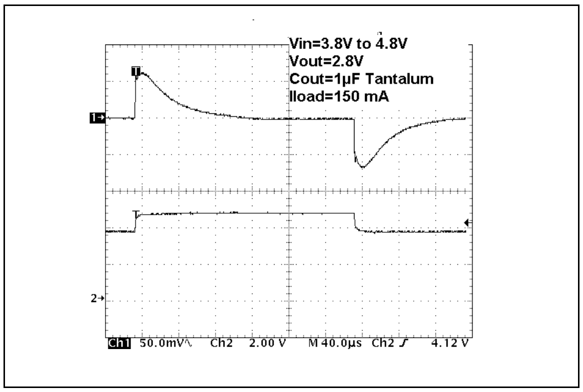


FIGURE 2-14: Line Transient Response 1 µF Output Capacitor.

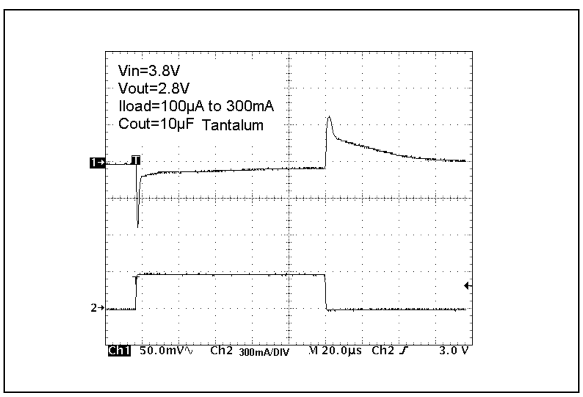


FIGURE 2-15: Load Transient Response 10 µF Output Capacitor.

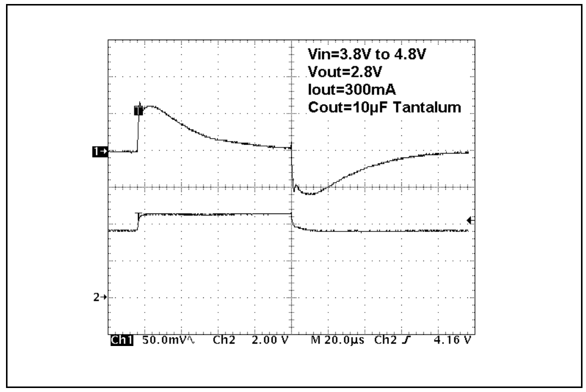


FIGURE 2-16: Line Transient Response 10 µF Output Capacitor.

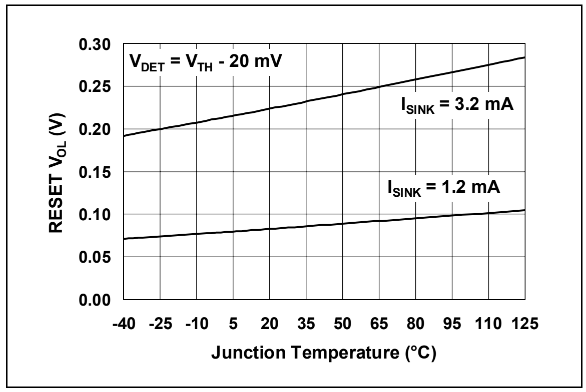


FIGURE 2-17: RESET Output Voltage Low vs. Junction Temperature.

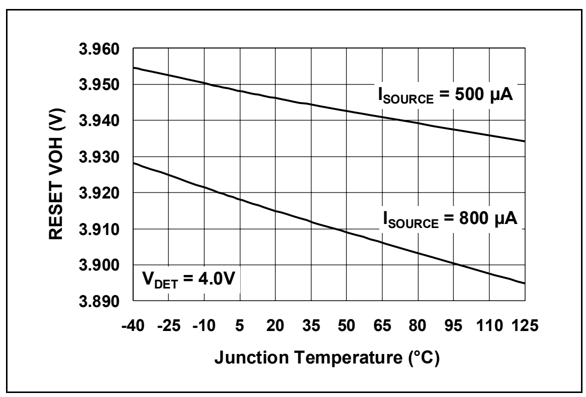


FIGURE 2-18: RESET Output Voltage High vs. Junction Temperature.

3.0 DETAILED DESCRIPTION

The TC1300 is a combination of a fixed output, low dropout regulator and a microcontroller monitor/$\overline{\text{RESET}}$. Unlike bipolar regulators, the TC1300 supply current does not increase with load current. In addition, V_{OUT} remains stable and within regulation over the entire specified operating load range (0 mA to 300 mA) and operating input voltage range (2.7V to 6.0V).

Figure 3-1 shows a typical application circuit. The regulator is enabled any time the shutdown input ($\overline{\text{SHDN}}$) is above V_{IH}. The regulator is shutdown (disabled) when $\overline{\text{SHDN}}$ is at or below V_{IL}. $\overline{\text{SHDN}}$ may be controlled by a CMOS logic gate or an I/O port of a microcontroller. If the $\overline{\text{SHDN}}$ input is not required, it should be connected directly to the input supply. While in shutdown, supply current decreases to 30 µA (typical), V_{OUT} falls to zero and $\overline{\text{RESET}}$ remains valid.

3.1 $\overline{\text{RESET}}$ Output

The $\overline{\text{RESET}}$ output is driven active-low within 160 µsec of V_{DET} falling through the reset voltage threshold. $\overline{\text{RESET}}$ is maintained active for a minimum of 140 msec after V_{DET} rises above the reset threshold. The TC1300 has an active-low $\overline{\text{RESET}}$ output. The output of the TC1300 is valid down to V_{DET} = 1V and is optimized to reject fast transient glitches on the V_{DET} line.

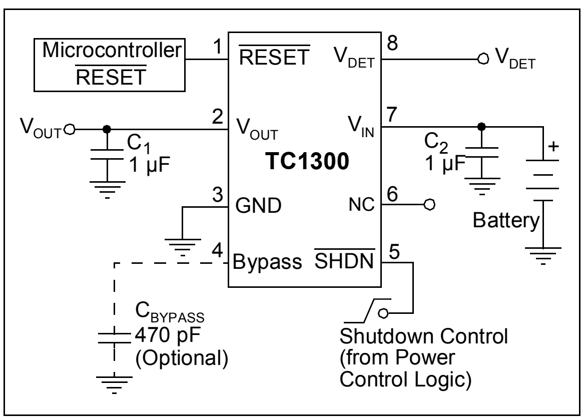


FIGURE 3-1: *Typical Application Circuit.*

3.2 Output Capacitor

A 1 µF (min) capacitor from V_{OUT} to ground is required. A 1 µF capacitor should also 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. As with all low dropout regulators, a minimum output capacitance is required to stabilize the output voltage. For the TC1300, a minimum of 1 µF of output capacitance is enough to stabilize the device over the entire operating load and line range. The selected output capacitor plays an important role is compensating the LDO regulator. For the TC1300, the selected output capacitor equivalent series resistance (ESR) range is 0.1 ohms to 5 ohms when using 1 µF of output capacitance, and 0.01 ohms to 5 ohms when using 10 µF of output capacitance. Because of the ESR requirement, tantalum and aluminum electrolytic capacitors are recommended. Aluminum electrolytic capacitors are not recommended for operation at temperatures below -25°C. When operating from sources other than batteries, rejection and transient responses can be improved by increasing the value of the input and output capacitors and employing passive filtering techniques.

3.3 Bypass Input (Optional)

An optional 470 pF capacitor connected from the Bypass input to ground reduces noise present on the internal reference, which in turn significantly reduces output noise and improves PSRR performance. This input may be left unconnected. Larger capacitor values may be used, but results in a longer time period to rated output voltage when power is initially applied.

3.4 Turn On Response

The turn-on response is defined as two separate response categories, Wake-Up Time (t_{WK}) and Settling Time (t_S).

The TC1300 has a fast Wake-Up Time (10 µsec typical) when released from shutdown. See Figure 3-2 for the Wake-Up Time designated as t_{WK}. The Wake-Up Time is defined as the time it takes for the output to rise to 2% of the V_{OUT} value after being released from shutdown.

The total turn-on response is defined as the Settling Time (t_S) (see Figure 3-2). Settling Time (inclusive with t_{WK}) is defined as the condition when the output is within 2% of its fully enabled value (50 µsec typical) when released from shutdown. The settling time of the output voltage is dependent on load conditions and output capacitance on V_{OUT} (RC response).

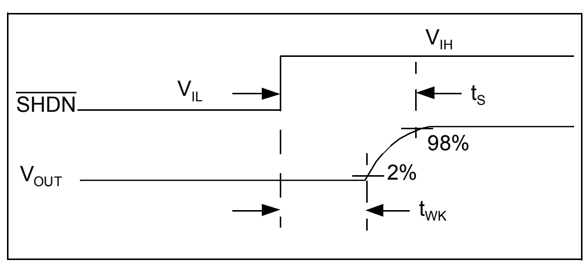


FIGURE 3-2: *Wake-Up Response Time.*

4.0 THERMAL CONSIDERATIONS

4.1 Thermal Shutdown

Integrated thermal protection circuitry shuts the regulator off when the die temperature exceeds 150°C. The regulator remains off until the die temperature drops to approximately 140°C.

4.2 Power Dissipation

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

EQUATION

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

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, P_{DMAX}, is a function of the maximum ambient temperature (T_{AMAX}), the maximum recommended die temperature (125°C) and the thermal resistance from junction-to-air (θ_{JA}). The MSOP-8 package has a θ_{JA} of approximately 200°C/Watt when mounted on a FR4 dielectric copper clad PC board.

EQUATION

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

The worst case actual power dissipation equation can be used in conjunction with the LDO maximum allowable power dissipation equation to ensure regulator thermal operation is within limits. For example:

Given:

V_{INMAX} = 4.1V
V_{OUTMIN} = 3.0V -2.5%
$I_{LOADMAX}$ = 200 mA
T_{JMAX} = 125°C
T_{AMAX} = 55°C
θ_{JA} = 200°C/W

Find:

EQUATION: ACTUAL POWER DISSIPATION

$$\begin{aligned} P_D &\approx (V_{INMAX} - V_{OUTMIN}) I_{LOADMAX} \\ &= [(4.1) - (3.0 \times .975)]200 \times 10^{-3} \\ &= 220\ mW \end{aligned}$$

EQUATION: MAXIMUM ALLOWABLE POWER DISSIPATION

$$\begin{aligned} P_{DMAX} &= \frac{(T_{JMAX} - T_{AMAX})}{\theta_{JA}} \\ &= \frac{(125 - 55)}{200} \\ &= 350\ mW \end{aligned}$$

In this example, the TC1300 dissipates a maximum of only 220 mW; below the allowable limit of 350 mW. In a similar manner, the maximum actual power dissipation equation and the maximum allowable power dissipation equation 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 350 mW into the actual power dissipation equation, from which $V_{IN_{MAX}}$ = 4.97V.

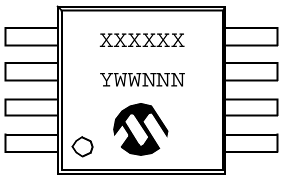
4.3 Layout Considerations

The primary path of heat conduction out of the package is via the package leads. Therefore, layouts having a ground plane, wide traces at the pads and wide power supply bus lines combine to lower θ_{JA} and, therefore, increase the maximum allowable power dissipation limit.

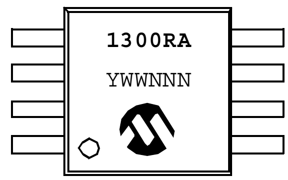
5.0 PACKAGING INFORMATION

5.1 Package Marking Information

8-Lead MSOP



Example:



Part Number	Marking Code (XXXXXX)
TC1300R - 2.5VUA	1300RA
TC1300Y - 2.7VUA	1300YF
TC1300R - 2.8VUA	1300RB
TC1300R - 2.85VUA	1300RC
TC1300R - 3.0VUA	1300RD
TC1300R - 3.3VUA	1300RE

Legend:

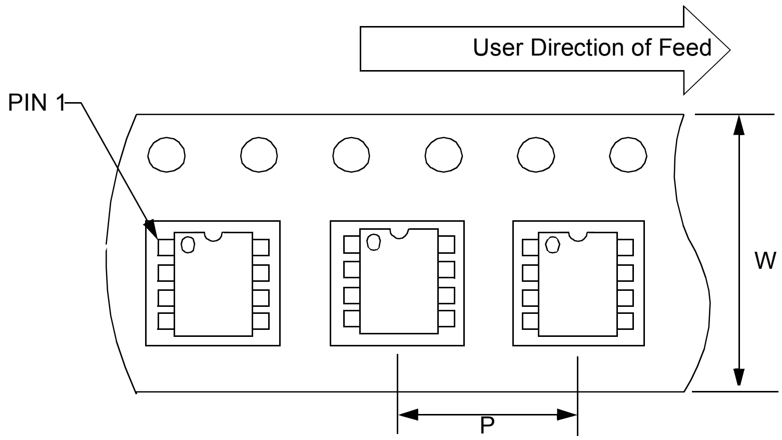
XX...X	Customer specific information*
Y	Year code (last digit of calendar year)
WW	Week code (week of January 1 is week ‘01’)
NNN	Alphanumeric traceability code

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.

* Standard marking consists of Microchip part number, year code, week code, traceability code (facility code, mask rev#, and assembly code). For marking beyond this, certain price adders apply. Please check with your Microchip Sales Office.

5.2 Package Dimensions

Component Taping Orientation for 8-Pin MSOP Devices

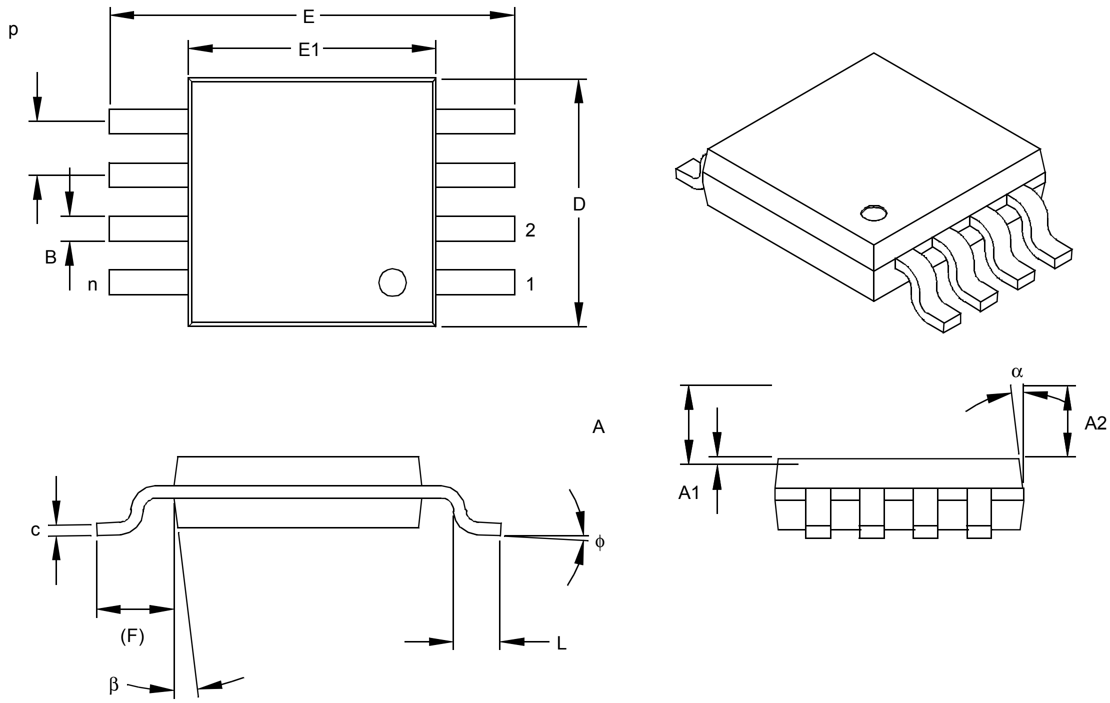


Standard Reel Component Orientation
for TR Suffix Device

Carrier Tape, Number of Components Per Reel and Reel Size:

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
8-Pin MSOP	12 mm	8 mm	2500	13 in.

8-Lead Plastic Micro Small Outline Package (UA) (MSOP)



Units		INCHES			MILLIMETERS*		
Dimension Limits		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8				8
Pitch	p		.026			0.65	
Overall Height	A			.044			1.18
Molded Package Thickness	A2	.030	.034	.038	0.76	0.86	0.97
Standoff §	A1	.002		.006	0.05		0.15
Overall Width	E	.184	.193	.200	4.67	4.90	.5.08
Molded Package Width	E1	.114	.118	.122	2.90	3.00	3.10
Overall Length	D	.114	.118	.122	2.90	3.00	3.10
Foot Length	L	.016	.022	.028	0.40	0.55	0.70
Footprint (Reference)	F	.035	.037	.039	0.90	0.95	1.00
Foot Angle	φ	0		6	0		6
Lead Thickness	c	.004	.006	.008	0.10	0.15	0.20
Lead Width	B	.010	.012	.016	0.25	0.30	0.40
Mold Draft Angle Top	α		7			7	
Mold Draft Angle Bottom	β		7			7	

*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.

Drawing No. C04-111

PRODUCT IDENTIFICATION SYSTEM

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

PART NO.	-X.X	X	/XX
Device	Output Voltages	Temperature Range	Package

Device: TC1300X-X.XXXX: 300mA CMOS LDO w/Shutdown, Bypass & Independent Delayed Reset
TC1300X-X.XXXXTR: 300mA CMOS LDO w/Shutdown, Bypass & Independent Delayed Reset (Tape and Reel)

Output Voltages:
- 2.5V = 2.5
- 2.7V = 2.7
- 2.8V = 2.8
- 2.85V = 2.85
- 3.0V = 3.0
- 3.3V = 3.3

RESET Threshold Voltages:
- 2.4V = Y
- 2.63V = R

Temperature Range: V = -40°C to +125°C

Package: UA = Micro Small Outline Package (MSOP), 8-lead

Examples:

a) TC1300R-2.5VUA: 300mA CMOS LDO w/ Shutdown, Bypass & Independent Delayed Reset, 2.5V output voltage, 2.63V RESET Threshold.
b) TC1300R-2.8VUA: 300mA CMOS LDO w/Shutdown, Bypass & Independent Delayed Reset, 2.8V output voltage, 2.63V RESET Threshold.
c) TC1300R-2.85VUA: 300mA CMOS LDO w/ Shutdown, Bypass & Independent Delayed Reset, 2.85V output voltage, 2.63V RESET Threshold.
d) TC1300R-3.0VUA: 300mA CMOS LDO w/Shutdown, Bypass & Independent Delayed Reset, 3.0V output voltage, 2.63V RESET Threshold.
e) TC1300R-3.3VUA: 300mA CMOS LDO w/Shutdown, Bypass & Independent Delayed Reset, 3.3V output voltage, 2.63V RESET Threshold.
f) TC1300R-2.85VUATR: 300mA CMOS LDO w/ Shutdown, Bypass & Independent Delayed Reset, 2.85V output voltage, 2.63V RESET Threshold, tape and reel.
g) TC1300Y-2.7VUA: 300mA CMOS LDO w/ Shutdown, Bypass & independant Delayed Reset, 2.7V output voltage, 2.4V RESET Threshold.

Sales and Support

Data Sheets
Products supported by a preliminary Data Sheet may have an errata sheet describing minor operational differences and recommended workarounds. To determine if an errata sheet exists for a particular device, please contact one of the following:

1. Your local Microchip sales office
2. The Microchip Corporate Literature Center U.S. FAX: (480) 792-7277
3. The Microchip Worldwide Site (www.microchip.com)

Please specify which device, revision of silicon and Data Sheet (include Literature #) you are using.

New Customer Notification System
Register on our web site (www.microchip.com/cn) to receive the most current information on our products.

NOTES:

Microchip received QS-9000 quality system certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona in July 1999 and Mountain View, California in March 2002. The Company's quality system processes and procedures are QS-9000 compliant for its PICmicro® 8-bit MCUs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, non-volatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001 certified.

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