Product Change Notification / SYST-05UJRT826

Date:

06-Jan-2022

Product Category:

Linear Regulators

PCN Type:

Document Change

Notification Subject:

Data Sheet - MCP1792/MCP1793 Data Sheet

Affected CPNs:

SYST-05UJRT826_Affected_CPN_01062022.pdf
SYST-05UJRT826_Affected_CPN_01062022.csv

Notification Text:

SYST-05UJRT826

Microchip has released a new Product Documents for the MCP1792/MCP1793 Data Sheet of devices. If you are using one of these devices please read the document located at MCP1792/MCP1793 Data Sheet.

Notification Status: Final

Description of Change: 1. Updated Product Identification System
2. Added Product Identification System (Automotive) to include automotive information and examples
3. Minor layout changes

Impacts to Data Sheet: See above details

Reason for Change: To Improve Productivity

Change Implementation Status: Complete

Date Document Changes Effective: 06 January 2022

NOTE: Please be advised that this is a change to the document only the product has not been changed.

Markings to Distinguish Revised from Unrevised Devices: N/A

Attachments:

MCP1792/MCP1793 Data Sheet

Please contact your local Microchip sales office with questions or concerns regarding this notification.

Terms and Conditions:

If you wish to receive Microchip PCNs via email please register for our PCN email service at our PCN home page select register then fill in the required fields. You will find instructions about registering for Microchips PCN email service in the PCN FAQ section.

If you wish to change your PCN profile, including opt out, please go to the PCN home page select login and sign into your myMicrochip account. Select a profile option from the left navigation bar and make the applicable selections.

Affected Catalog Part Numbers (CPN)

MCP1792-3302H/DB
MCP1792-4102H/DBVAO
MCP1792-5002H/DB
MCP1792T-3302H/CB
MCP1792T-3302H/CBVAO
MCP1792T-3302H/DB
MCP1792T-3302H/DBV01
MCP1792T-3302H/DBV02
MCP1792T-3302H/DBVAO
MCP1792T-4102H/CB
MCP1792T-4102H/CBVAO
MCP1792T-4102H/DB
MCP1792T-4102H/DBVAO
MCP1792T-5002H/CB
MCP1792T-5002H/CBVAO
MCP1792T-5002H/DB
MCP1792T-5002H/DBVAO
MCP1793T-3302H/DC
MCP1793T-3302H/DCVAO
MCP1793T-3302H/OT
MCP1793T-3302H/OTVAO
MCP1793T-4102H/DC
MCP1793T-4102H/DCVAO
MCP1793T-4102H/OT
MCP1793T-4102H/OTVAO
MCP1793T-5002H/DC
MCP1793T-5002H/DCVAO
MCP1793T-5002H/OT
MCP1793T-5002H/OTVAO

MCP1792/3

100 mA High-Voltage Automotive LDO

Features

- AEC-Q100 with Grade 0 and PPAP Capable
- Wide Input Voltage Range: 4.5V to 55V
  - Up to 70V transient
  - Under Voltage Lock Out (UVLO): 2.7V typical
- Extended Operating Temperature Range: -40°C to +150°C
- Standard Output Regulated Voltages (V_R): 3.3V and 5.0V (Note)
  - Tolerance ± 2.0% typical
- Low Quiescent Supply Current: 25 µA typical
- Low Shutdown Quiescent Supply Current: 2 µA typical
- Output Current Capability: 100 mA typical
  - Short Circuit Current Foldback Protection
  - Thermal Shutdown Protection: 175°C
- Stable with Ceramic Output Capacitor: 2.2 µF
- High PSRR:
  - 80 dB @ 100 Hz typical
  - 55 dB @ 100 kHz typical
- Available in the following packages:
  - 3-Lead SOT-223 (MCP1792)
  - 3-Lead SOT-23A (MCP1792)
  - 5-Lead SOT-223 (MCP1793)
  - 5-Lead SOT-23 (MCP1793)

Applications

- Automotive Electronics
- Microcontroller Biasing
- High-Voltage Battery Packs for Power Tools, ebikes, etc
- Smoke Detectors and other Alarm Sensors

Description

The MCP1792/3 family devices are high-voltage, low dropout (LDO) regulators, capable of generating 100 mA output current. The input voltage range of 4.5V to 55V makes it suitable in 12V to 48V power rails and in high-voltage battery packs.

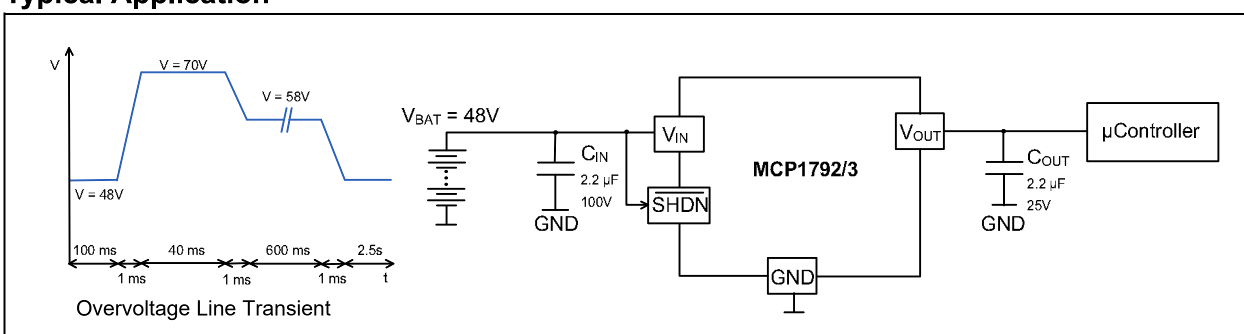
A low UVLO at shutdown of 2.4V makes it adequate for cold cranking conditions in automotive applications.

The MCP1792/3 comes in two standard fixed output voltage versions: 3.3V and 5.0V. The regulator output is stable with 2.2 µF ceramic capacitors. The device is protected from short-circuit events by the current foldback function and from overheating by means of thermal shutdown protection.

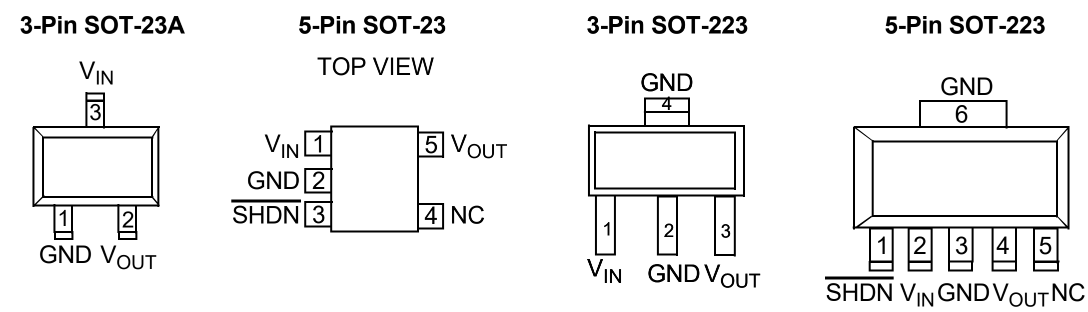
The MCP1792 is the 3-lead version of the MCP1792/3 device family and the MCP1793 is the 5-lead version, which offers shutdown functionality ($\overline{SHDN}$ pin). While in shutdown, the quiescent current drops to 2 µA, allowing for lower, overall power consumption. The device itself has a ground current of 100 µA typical, while delivering maximum output current of 100 mA.

Note: For other voltage options, contact your local sales office.

Typical Application



Package Types



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings(†)

Input Voltage ....+70.0V
Maximum Voltage on V_{IN}, $\overline{SHDN}$ .... (GND – 0.3V) to (V_{IN} + 0.3V)
Maximum Voltage on V_{OUT}- .... (GND – 0.3V) to 5.5V
Output Short-Circuit Duration .... Unlimited **(Note 2)**
Storage Temperature .... -55°C to +175°C
Maximum Junction Temperature, T_J .... +175°C
Operating Junction Temperature, T_J .... -40°C to +150°C
ESD protection on all pins:
HBM .... ≥ 2 kV
CDM .... ≥ 750V
MM .... ≥ 200V

† **Notice:** Stresses above those listed under “Absolute 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 intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

AC/DC CHARACTERISTICS

Electrical Specifications: Unless otherwise noted, $V_{IN} = V_R$ + 1.2V **(Note 1)**, I_{OUT} = 1 mA, $C_{IN} = C_{OUT}$ = 2.2 µF ceramic (X7R), T_A = +25°C, $\overline{SHDN}$ > 2.4V. **Boldface** type applies for ambient temperatures T_A of -40°C to +150°C (**Note 2**).

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Input Operating Voltage	V_{IN}	**4.5**	—	**55**	V	—
Output Voltage Range	V_{OUT}	V_R – 2%	V_R	V_R + 2%	—	T_A of -40°C to +85°C
		V_R – 3%	V_R	**V_R + 3%**	—	T_A of -40°C to +150°C
Input Quiescent Current	I_Q	—	25	**45**	µA	I_{OUT} = 0A
Input Quiescent Current for $\overline{SHDN}$ Mode	$I_{\overline{SHDN}}$	—	2	**12**	µA	$\overline{SHDN}$ = GND, V_{IN} = 55V
Ground Current	I_{GND}	—	100	**150**	µA	I_{OUT} = 100 mA
		—	25	—		I_{OUT} = 1 mA
Maximum Continuous Output Current	I_{OUT}	**100**	—	—	mA	(**Note 2**)
Foldback Current Corner	I_{OUT_SC}	**—**	230	370	mA	V_{IN} ≤ 55V (**Note 5**)
Foldback Current	$I_{FOLDBACK}$	—	10	—	mA	V_{OUT}~0V, R_{LOAD} ≥ 0.1Ω, V_{IN} ≤ 55V, (**Note 5**)

Note 1: V_R is the nominal output voltage. The minimum input voltage is $V_{IN} = V_R$ + 1.2V or $V_{IN} = V_{IN\_MIN}$, whichever is greater.

2: 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}). See the Temperature Specifications table and **Section 5.0 “Application Information”**. Exceeding the maximum allowable power dissipation will cause the device operating junction temperature to exceed the maximum 150°C rating. Sustained junction temperatures above 150°C can impact the device reliability.

3: Dropout voltage is defined as the input to output voltage differential at which the output voltage drops 2% below its nominal value that was measured with an input voltage of $V_{IN} = V_R$ + 1.2V.

4: PSRR measurement is carried out with C_{IN} = 0 µF, V_{IN} = 7V, I_{OUT} = 10 mA, V_{INAC} = 0.4 V_{pkpk}.

5: Not production tested.

AC/DC CHARACTERISTICS (CONTINUED)

Electrical Specifications: Unless otherwise noted, $V_{IN} = V_R + 1.2V$ (**Note 1**), I_{OUT} = 1 mA, $C_{IN} = C_{OUT}$ = 2.2 µF ceramic (X7R), T_A = +25°C, $\overline{SHDN}$ > 2.4V. **Boldface** type applies for ambient temperatures T_A of -40°C to +150°C (**Note 2**).

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Line Regulation	$\Delta V_{OUT}/(V_{OUT} x \Delta V_{IN})$	—	±0.0002	**±0.05**	%/V	4.5V < V_{IN} < 55V, 6.2V < V_{IN} < 55V
Load Regulation	$\Delta V_{OUT}/V_{OUT}$	-1	0.2	+1	%	I_{OUT} = 1 mA to 100 mA, T_A of -40°C to +85°C
		-2	0.2	**+2**		I_{OUT} = 1 mA to 100 mA, T_A of -40°C to +150°C
Dropout Voltage	$V_{DROPOUT}$	—	250	400	mV	T_A of -40°C to +85°C, I_{OUT} = 100 mA
		—	250	**1200**		T_A of -40°C to +150°C, I_{OUT} = 100 mA (**Note 3**)
Input Voltage to Turn On Output	V_{UVLO_High}	—	2.7	—	V	V_R = 3.3V, V_R = 5.0V, rising V_{IN}, V_{IN} = 0 to V_{IN_MIN}
Input Voltage to Turn Off Output	V_{UVLO_Low}	—	2.4	—	V	V_R = 3.3V, V_R = 5.0V, failing V_{IN}, $V_{IN} = V_{IN\_MIN}$ to 0
Shutdown Input						
Logic High Input	$V_{SHDN-HIGH}$	**2.4**	—	**V_{IN}**	V	—
Logic Low Input	$V_{SHDN-LOW}$	**0**	—	**0.8**	V	—
Shutdown Input Leakage Current	$\overline{SHDN}_{ILK}$	—	0.2	**0.4**	µA	$\overline{SHDN}$ = GND, or $\overline{SHDN}$ = 6.2V
AC Performance						
Output Voltage Delay Time	T_{DELAY}	—	800	**1200**	µs	V_{IN} = 0 to 6.2V V_{OUT} = GND to 10% of V_R, R_{LOAD} = 50Ω (**Note 5**)
Output Rise Time	T_{RISE}	—	400	—	µs	V_{IN} = 0 to 6.2V V_{OUT} = 10% to 90% of V_R, R_{LOAD} = 50Ω (**Note 5**)
Output Noise	e_N	—	400	—	µVrms	f = 10 Hz to 100 kHz, V_R = 3.3V, I_{OUT} = 10 mA (**Note 5**)
Power Supply Ripple Rejection Ratio	PSRR	—	80	—	dB	f = 100 Hz (**Note 4**, **Note 5**)
		—	55	—		f = 100 kHz (**Note 4**, **Note 5**)

Note 1: V_R is the nominal output voltage. The minimum input voltage is $V_{IN} = V_R + 1.2V$ or $V_{IN} = V_{IN\_MIN}$, whichever is greater.

2: 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}). See the Temperature Specifications table and **Section 5.0 "Application Information"**. Exceeding the maximum allowable power dissipation will cause the device operating junction temperature to exceed the maximum 150°C rating. Sustained junction temperatures above 150°C can impact the device reliability.

3: Dropout voltage is defined as the input to output voltage differential at which the output voltage drops 2% below its nominal value that was measured with an input voltage of $V_{IN} = V_R + 1.2V$.

4: PSRR measurement is carried out with C_{IN} = 0 µF, V_{IN} = 7V, I_{OUT} = 10 mA, $V_{INAC} = 0.4\ V_{pkpk}$.

5: Not production tested.

TEMPERATURE SPECIFICATIONS

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Thermal Shutdown	T_{SD}	—	175	181	°C	Rising Temperature
Thermal Shutdown Hysteresis	ΔT_{SD}	—	15	—	°C	Falling Temperature
Thermal Package Resistances						
Thermal Resistance, SOT-23A-3LD	θ_{JA}	—	147	—	°C/W	JEDEC® standard 4-layer FR4 board with 1 oz. copper
	θ_{JC}	—	115	—		
Thermal Resistance, SOT23-5LD	θ_{JA}	—	165	—		
	θ_{JC}	—	96	—		
Thermal Resistance, SOT-223-3LD	θ_{JA}	—	70	—		
	θ_{JC}	—	60	—		
Thermal Resistance, SOT-223-5LD	θ_{JA}	—	75	—		
	θ_{JC}	—	60	—		

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.

Note: Unless otherwise indicated, $C_{IN} = C_{OUT} =$ 2.2 µF ceramic (X7R), I_{OUT} = 1 mA, T_A = +25°C, $V_{IN} = V_R$ + 1.2V, $\overline{SHDN}$ = 1 MΩ pull-up to V_{IN}.

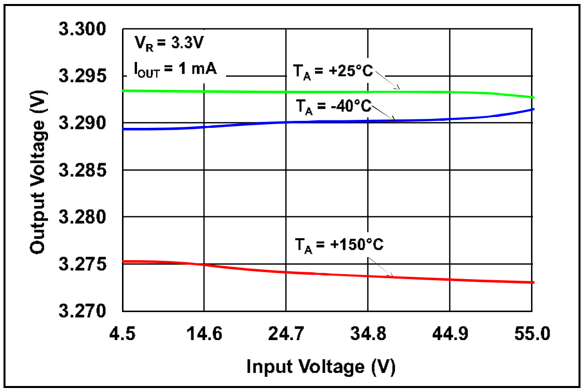


FIGURE 2-1: Output Voltage vs. Input Voltage (V_R = 3.3V).

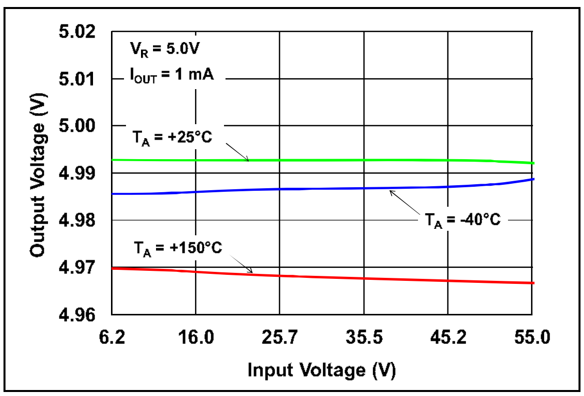


FIGURE 2-2: Output Voltage vs. Input Voltage (V_R = 5.0V).

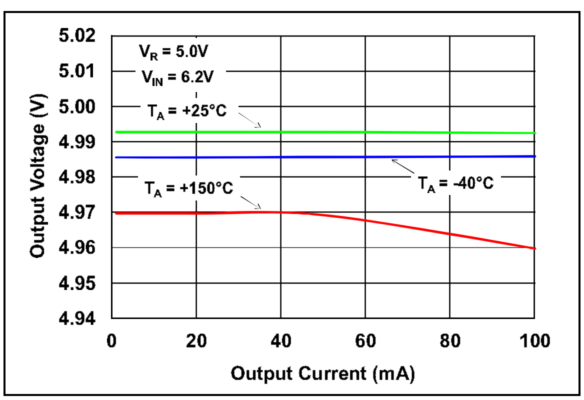


FIGURE 2-3: Output Voltage vs. Output Current (V_R = 5.0V).

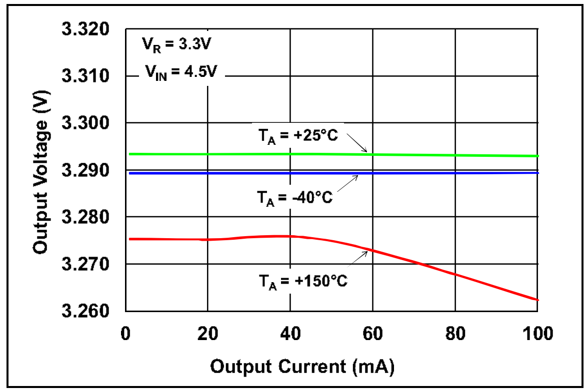


FIGURE 2-4: Output Voltage vs. Output Current (V_R = 3.3V).

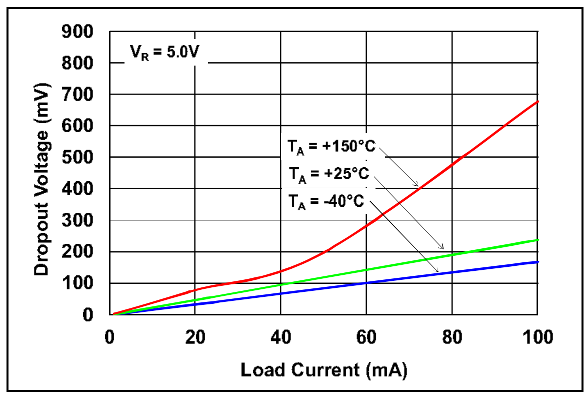


FIGURE 2-5: Dropout Voltage vs. Load Current.

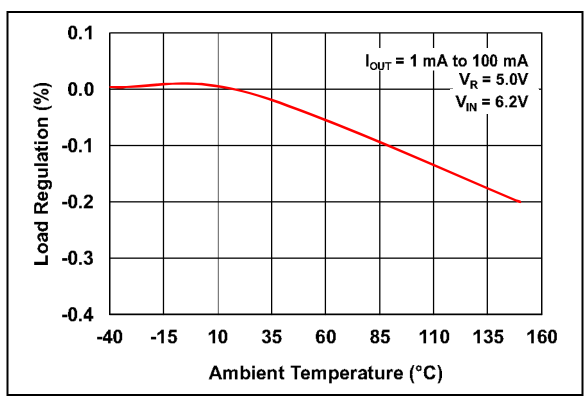


FIGURE 2-6: Load Regulation vs. Temperature (V_R = 5.0V).

Note: Unless otherwise indicated, C_{IN} = C_{OUT} = 2.2 µF ceramic (X7R), I_{OUT} = 1 mA, T_A = +25°C, V_{IN} = V_R + 1.2V, $\overline{SHDN}$ = 1 MΩ pull-up to V_{IN}.

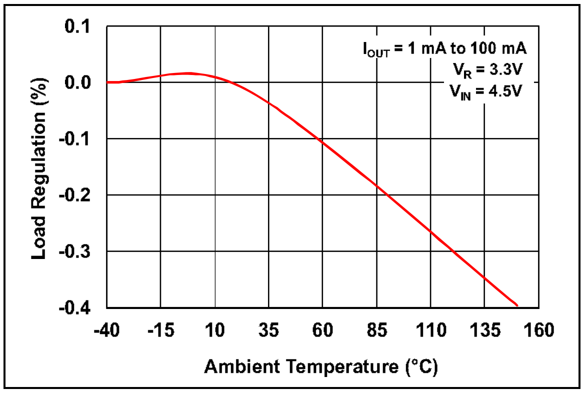


FIGURE 2-7: *Load Regulation vs. Temperature (V_R = 3.3V).*

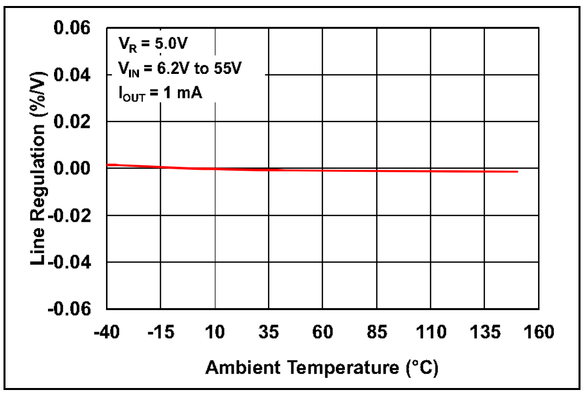


FIGURE 2-8: *Line Regulation vs. Ambient Temperature (V_R = 5.0V).*

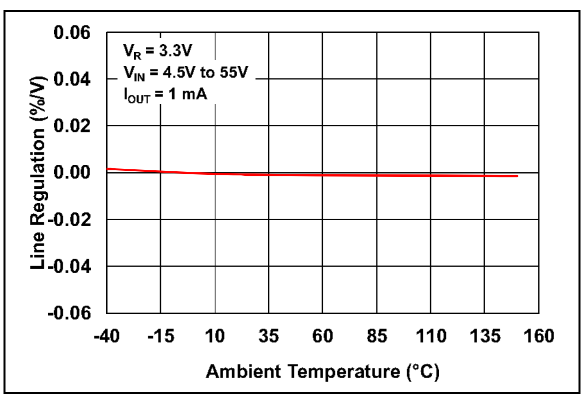


FIGURE 2-9: *Line Regulation vs. Ambient Temperature (V_R = 3.3V).*

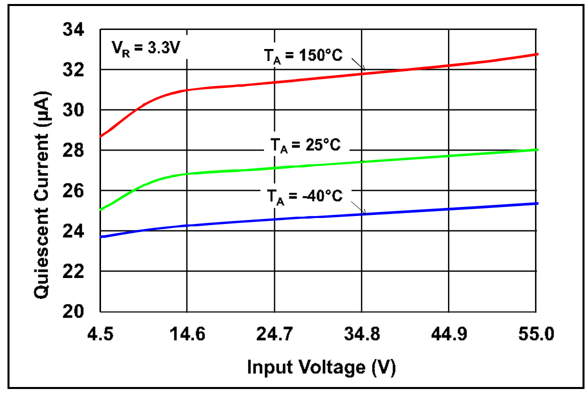


FIGURE 2-10: *Quiescent Current vs. Input Voltage (V_R = 3.3V).*

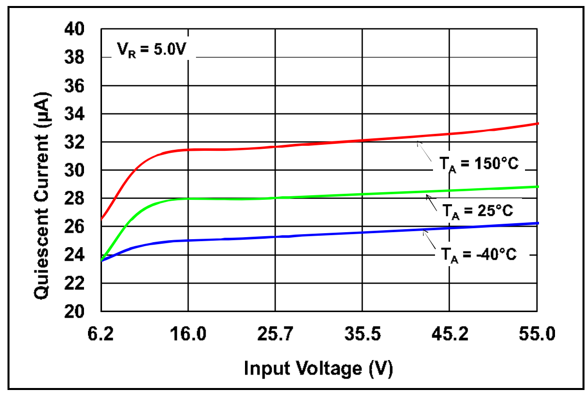


FIGURE 2-11: *Quiescent Current vs. Input Voltage (V_R = 5.0V).*

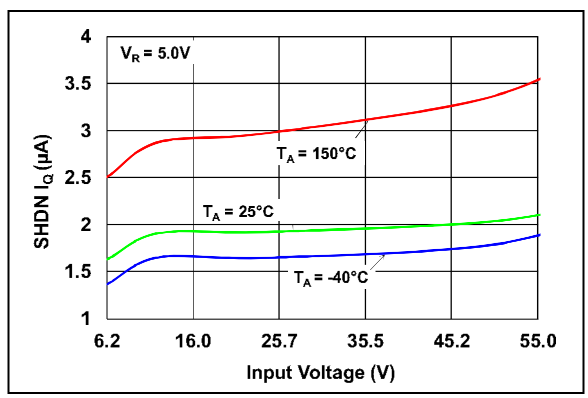


FIGURE 2-12: *Shutdown Quiescent Current vs. Input Voltage (V_R = 5.0V).*

Note: Unless otherwise indicated, $C_{IN} = C_{OUT} = 2.2\ \mu F$ ceramic (X7R), $I_{OUT} = 1\ mA$, $T_A = +25°C$, $V_{IN} = V_R + 1.2V$, $\overline{SHDN} = 1\ M\Omega$ pull-up to V_{IN}.

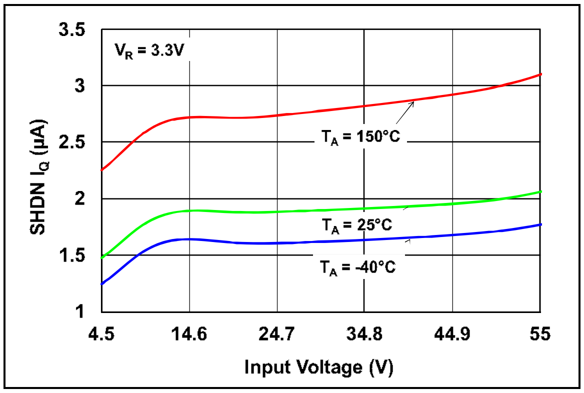


FIGURE 2-13: *Shutdown Quiescent Current vs. Input Voltage (V_R = 3.3V).*

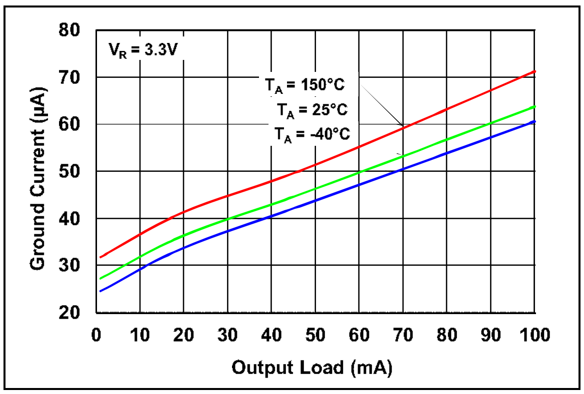


FIGURE 2-14: *Ground Current vs. Output Current (V_R = 3.3V).*

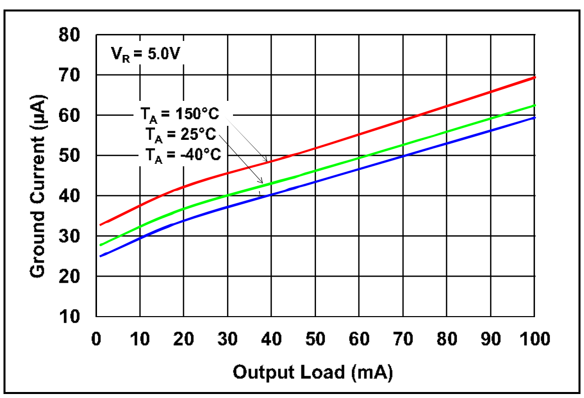


FIGURE 2-15: *Ground Current vs. Output Current (V_R = 5.0V).*

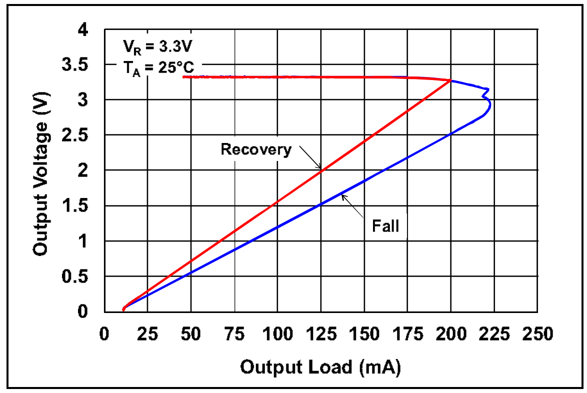


FIGURE 2-16: *Current Foldback (V_R = 3.3V).*

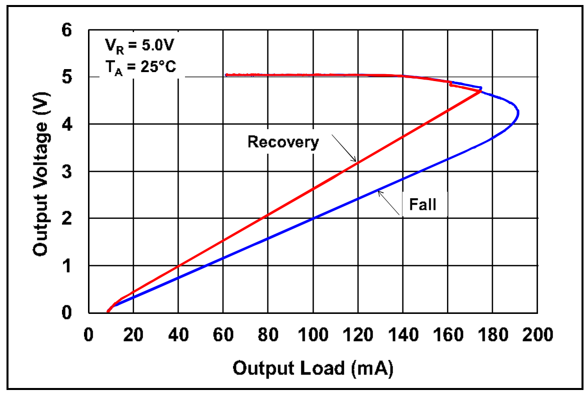


FIGURE 2-17: *Current Foldback (V_R = 5.0V).*

Note: Unless otherwise indicated, $C_{IN} = C_{OUT} = 2.2\ \mu F$ ceramic (X7R), $I_{OUT} = 1\ mA$, $T_A = +25°C$, $V_{IN} = V_R + 1.2V$, $\overline{SHDN} = 1\ M\Omega$ pull-up to V_{IN}.

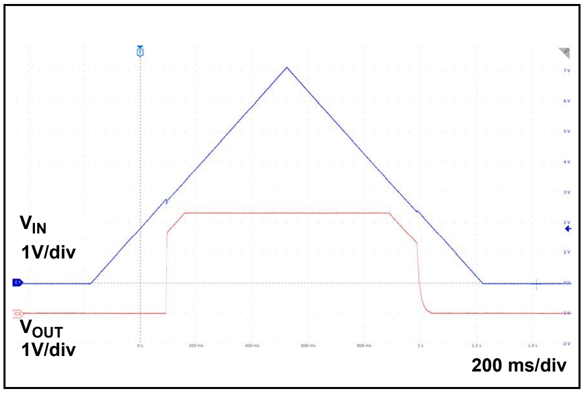


FIGURE 2-18: *UVLO (V_R = 3.3V).*

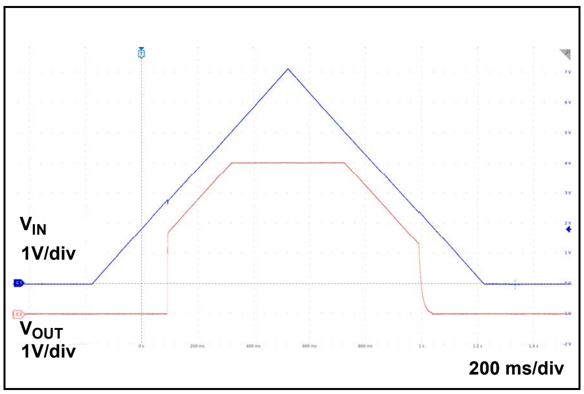


FIGURE 2-19: *UVLO (V_R = 5V).*

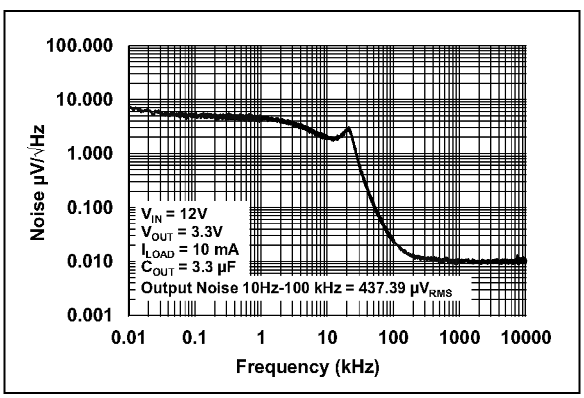


FIGURE 2-20: *Noise vs. Frequency (V_R = 3.3V).*

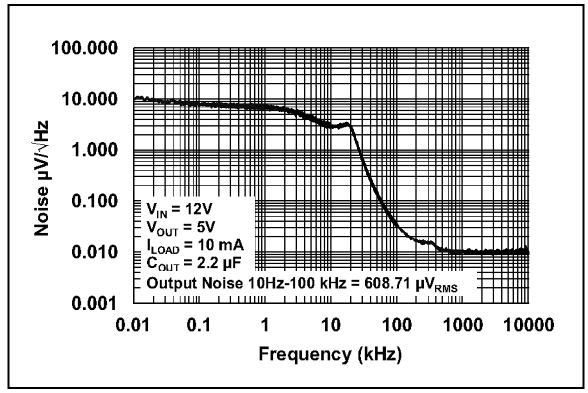


FIGURE 2-21: *Noise vs. Frequency (V_R = 5.0V).*

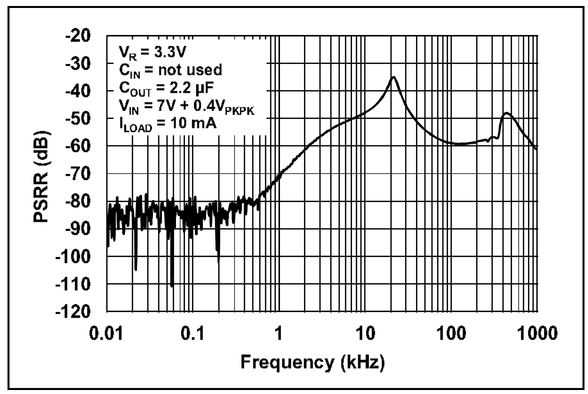


FIGURE 2-22: *Power Supply Ripple Rejection vs. Frequency (V_R = 3.3V).*

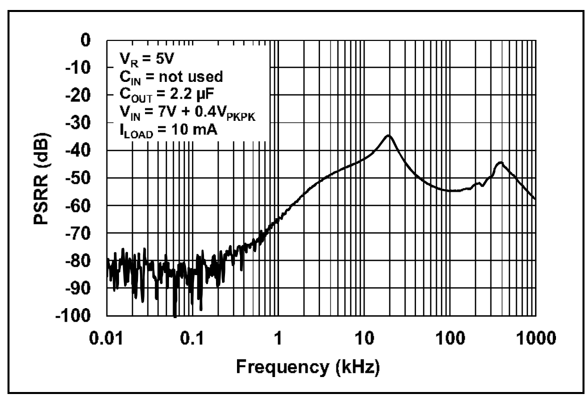


FIGURE 2-23: *Power Supply Ripple Rejection vs. Frequency (V_R = 5.0V).*

Note: Unless otherwise indicated, $C_{IN} = C_{OUT} = 2.2\ \mu F$ ceramic (X7R), $I_{OUT} = 1\ mA$, $T_A = +25°C$, $V_{IN} = V_R + 1.2V$, $\overline{SHDN} = 1\ M\Omega$ pull-up to V_{IN}.

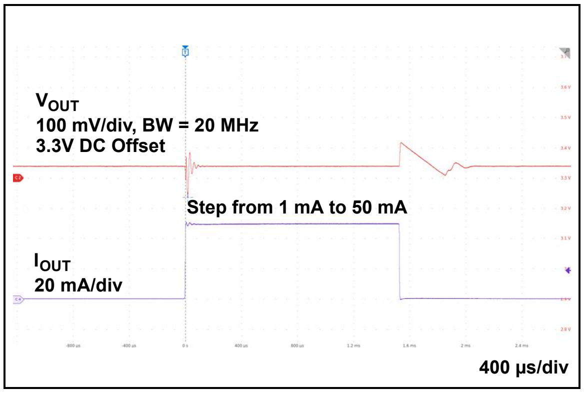


FIGURE 2-24: *Dynamic Load Step (V_R = 3.3V).*

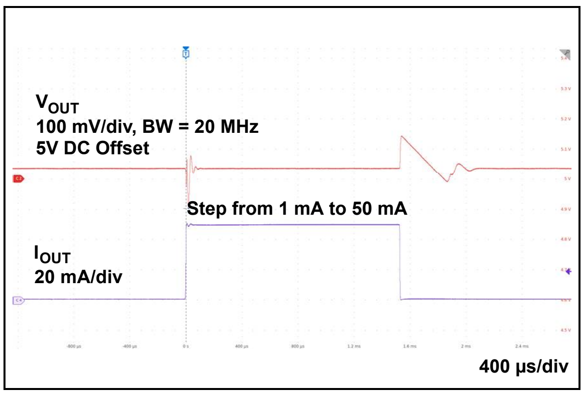


FIGURE 2-25: *Dynamic Load Step (V_R = 5.0V).*

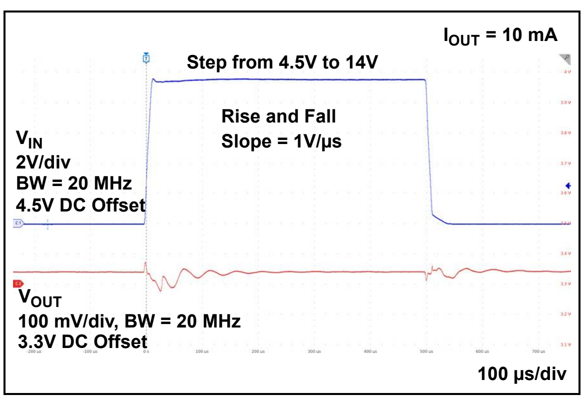


FIGURE 2-26: *Dynamic Line Step (V_R = 3.3V).*

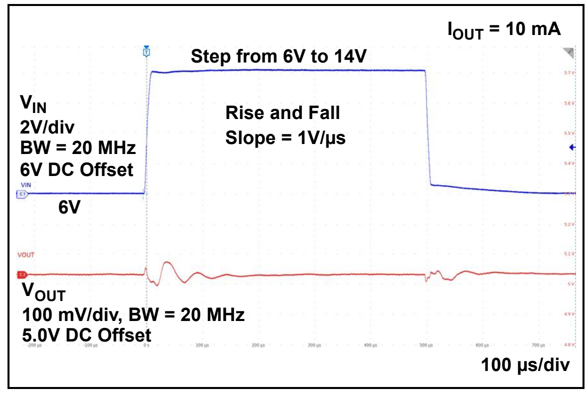


FIGURE 2-27: *Dynamic Line Step (V_R = 5.0V).*

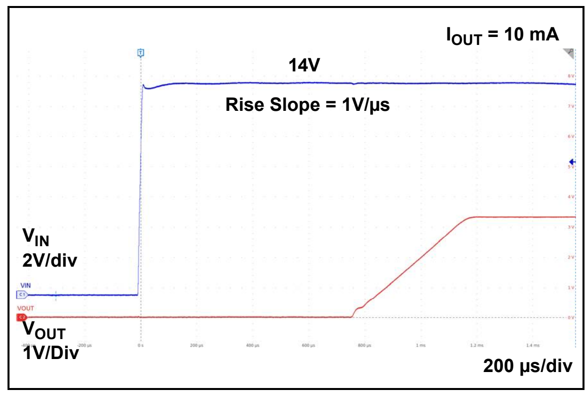


FIGURE 2-28: *Start-up From V_{IN} (0V to 14V, V_R = 3.3V).*

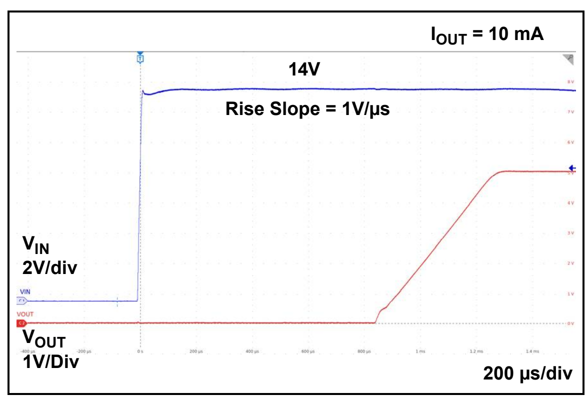


FIGURE 2-29: *Start-up From V_{IN} (0V to 14V, V_R = 5.0V).*

Note: Unless otherwise indicated, $C_{IN} = C_{OUT} = 2.2\ \mu F$ ceramic (X7R), $I_{OUT} = 1\ mA$, $T_A = +25°C$, $V_{IN} = V_R + 1.2V$, SHDN = 1 MΩ pull-up to V_{IN}.

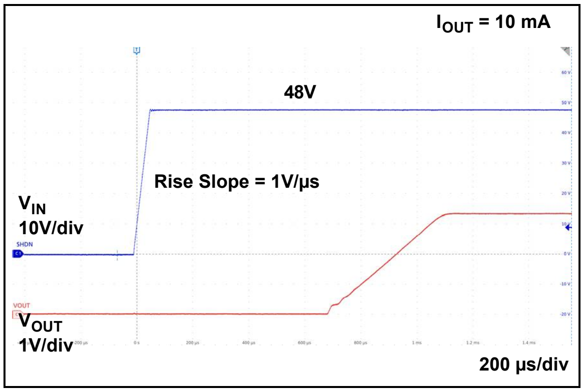


FIGURE 2-30: *Start-up From V_{IN} (0V to 48V, $V_R = 3.3V$).*

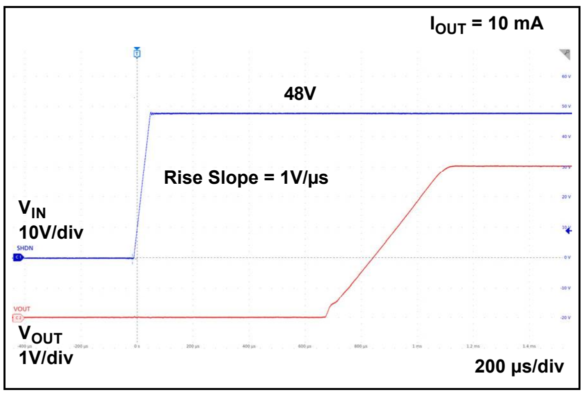


FIGURE 2-31: *Start-up From V_{IN} (0V to 48V, $V_R = 5V$).*

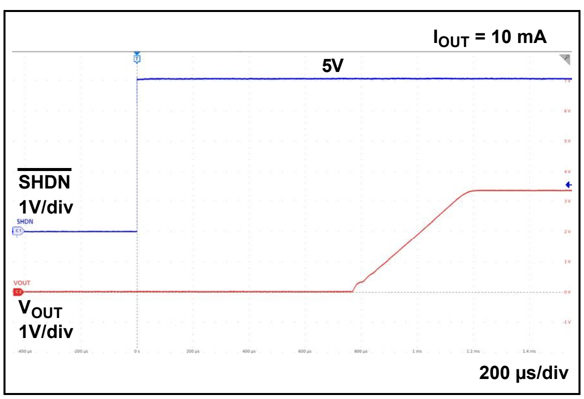


FIGURE 2-32: *Start-up From $\overline{SHDN}$ ($V_R = 3.3V$).*

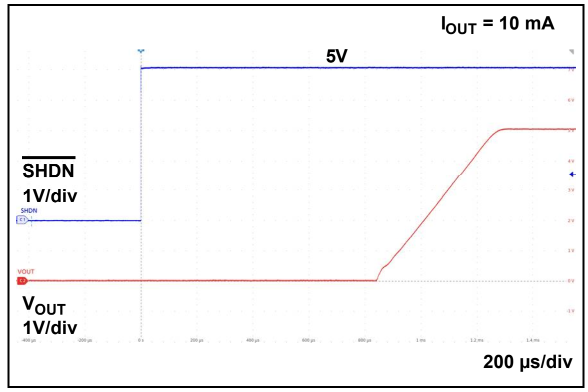


FIGURE 2-33: *Start-up From $\overline{SHDN}$ ($V_R = 5.0V$).*

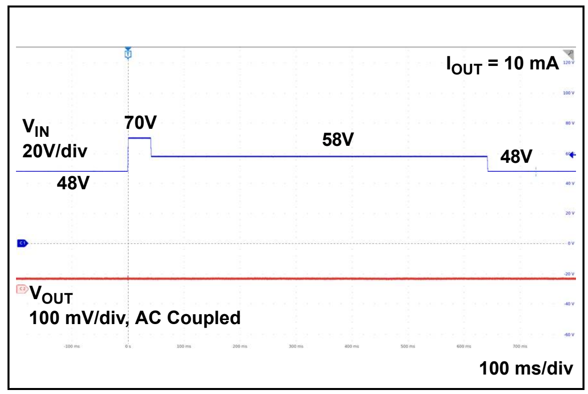


FIGURE 2-34: *Overvoltage Line Transient Response ($V_R = 5V$).*

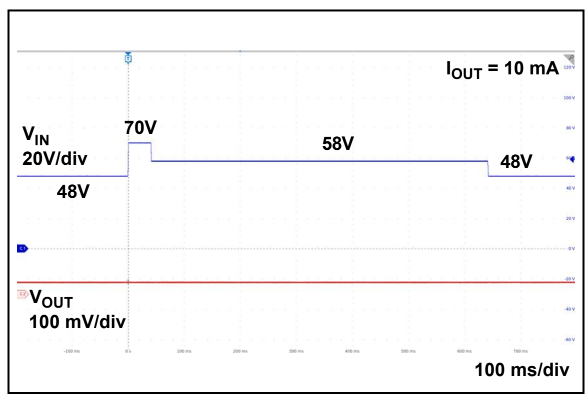


FIGURE 2-35: *Overvoltage Line Transient Response ($V_R = 3.3V$).*

3.0 PIN DESCRIPTION

The descriptions of the pins are listed in Table 3-1.

TABLE 3-1: PIN FUNCTION TABLE

SOT 23A-3	SOT 23-5	SOT 223-3	SOT 223-5	Symbol	Description
1	2	2	3	GND	Ground
2	5	3	4	V_{OUT}	Regulated Output Voltage V_R
3	1	1	2	V_{IN}	Input Voltage Supply
—	4	—	5	NC	Not connected pins (should either be left floating or connected to ground)
—	3	—	1	$\overline{SHDN}$	Shutdown Control Input. Connect to GND to turn off the output. Do not leave this pin floating.
—	—	4	6	Tab	Exposed Thermal Pad, connected to GND

3.1 Ground Pin (GND)

For optimal noise and Power Supply Rejection Ratio (PSRR) performance, the GND pin of the LDO should be tied to an electrically “quiet” circuit ground. This will ensure the LDO power supply rejection ratio and noise device performance. The GND pin of the LDO conducts only ground current and that is why a wide trace is not required. For applications that have switching or noisy inputs, tie the GND pin to the return of the output capacitor. Ground planes help lower the inductance and, as a result, reduce the effect of fast current transients.

3.2 Regulated Output Voltage Pin (V_{OUT})

The V_{OUT} pin is the regulated output voltage V_R of the LDO. A minimum output capacitance of 2.2 µF is required for the LDO to ensure the stability in all the typical applications. The MCP1792/3 is stable with ceramic capacitors. See **Section 4.2 “Output Capacitance Requirements”** for output capacitor selection guidance.

3.3 Input Voltage Supply Pin (V_{IN})

Connect the input voltage source to V_{IN}. If the input voltage source is located several inches away from the LDO, or the input source is a battery, it is recommended that an input capacitor be used. A typical input capacitance value of 2.2 µF to 10 µF should be sufficient for most applications. The type of capacitor used is ceramic. However, the low ESR characteristics of the ceramic capacitor will yield better noise and PSRR performance at high frequency.

3.4 Shutdown Control Input ($\overline{SHDN}$)

The $\overline{SHDN}$ input is used to turn the LDO output voltage off. When the $\overline{SHDN}$ input is at a logic high level, the LDO output voltage is enabled. When the $\overline{SHDN}$ input is pulled to a logic low level, the LDO output voltage is disabled. When the $\overline{SHDN}$ input is pulled low, the LDO enters a low-quiescent current shutdown state, where the typical quiescent current is 2 µA.

4.0 DETAILED DESCRIPTION

4.1 Device Overview

The MCP1792/3 is an AEC-Q100 qualified LDO capable of outputting 100 mA of current over the entire temperature range. The part is stable with a minimum 2.2 µF ceramic capacitor and features a high-voltage SHDN pin, current foldback protection and extended working temperature range: -40° to +150°. The device also features an adequate PSRR of 80 dB typical for low frequencies and 55 dB for high frequencies.

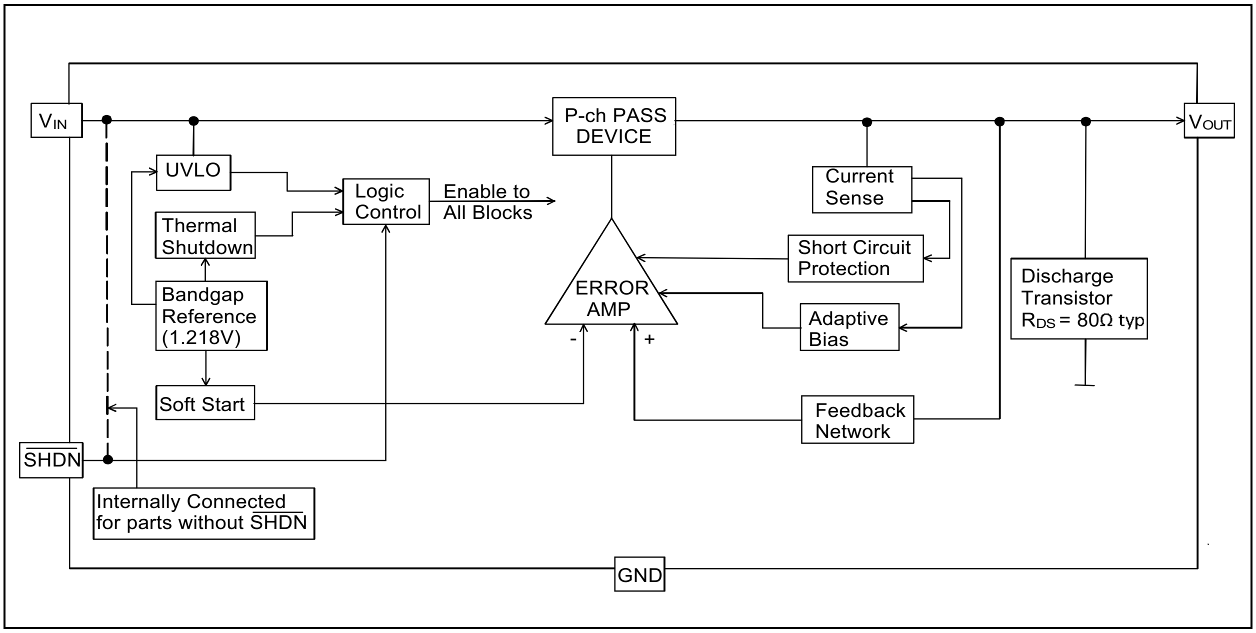


FIGURE 4-1: *Functional Block Diagram.*

An innovative adaptive bias circuitry is used to lower the power consumption at no load and light loads, without compromising the dynamic response.

The internal discharge transistor is useful in powering microcontrollers and other applications that require fast supply disconnect.

4.2 Output Capacitance Requirements

The MCP1792/3 requires a minimum output capacitance of 2.2 µF for output voltage stability. The output capacitor should be located as close to the LDO output as it is practical. The device is designed to work with low ESR ceramic capacitors. Ceramic materials X8R\L or X7R have low temperature coefficients and are well within the acceptable ESR range required.

A typical 2.2 µF X7R 0805 capacitor has an ESR of 50 mΩ. It is recommended to use an appropriate voltage rating capacitor, and the derating of the capacitance as a function of voltage and temperature needs to be taken into account.

For improved transitory behavior over the entire temperature range, a 3.3 µF output capacitor is recommended. The ceramic capacitor type should be X7R or X8R\L because their dielectrics are rated for use with temperatures between -40°C to +125°C or -55°C to +150°C, respectively.

4.3 Input Capacitance Requirements

Low input-source impedance is necessary for the LDO output to operate properly. When operating on batteries, or in applications with long lead length (> 10 inches) between the input source and the LDO, adding input capacitance is recommended. A minimum of 2.2 µF to 10 µF of capacitance is sufficient for most applications. Given the high input voltage capability of the MCP1792/3, of up to 55V DC, it is recommended to use an appropriate voltage rating capacitor, and the derating of the capacitance as a function of voltage and temperature needs to be taken into account. The ceramic capacitor type should be X7R or X8R\L because their dielectrics are rated for use with temperatures between -40°C to +125°C or -55°C to +150°C, respectively.

4.4 Circuit Protection

The MCP1792/3 features current foldback protection during an output short-circuit event that occurs in normal operation. When the current foldback block detects an increase in load current, over the typical value of 230 mA, the output current and output voltage will start to decrease until the output current reaches a value of typically 10 mA (see Figure 2-16 and Figure 2-17).

If a short circuit is present during power-up, the part will enter current limit protection.

The MCP1792/3 was tested using the AEC-Q100 test set-up in Figure 4-2. The testing conditions require the use of very high parasitic inductances on the input and output. For cases like this, it is required to prevent the output voltage going below ground with more than 1V. Note that the V_{OUT} pin can withstand a maximum of -0.3 VDC (see Absolute Maximum Ratings(†)). This can be achieved by placing a Schottky diode with the cathode to V_{OUT} and the anode to ground.

Thermal shutdown functionality is present on the device and adds to the protection features of the part. Thermal shutdown is triggered at a typical value of 175°C and has a typical hysteresis of 15°C.

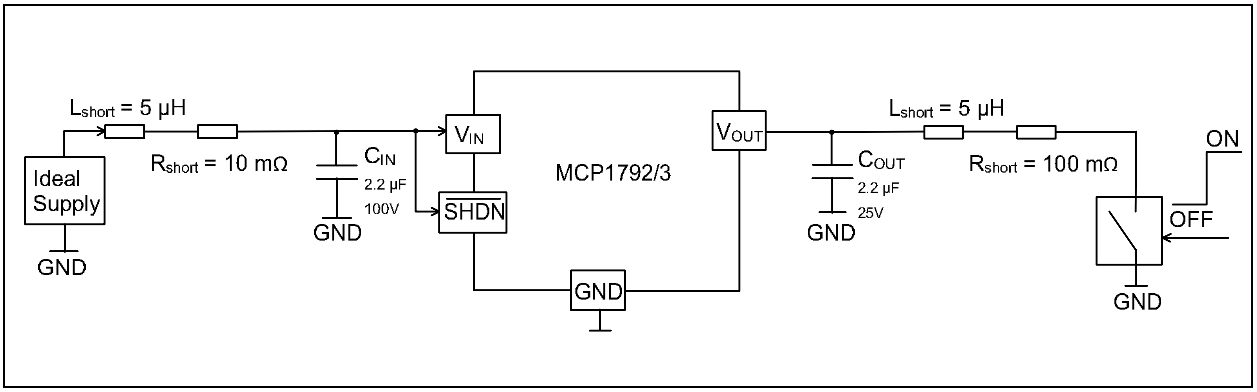


FIGURE 4-2: *Short Circuit Test Set-Up.*

4.5 Dropout Operation

For V_R = 5V, MCP1792/3 can be found operating in a dropout condition (the minimum input voltage is 4.5V), which can happen during cold crank event, when the supply voltage can drop down to 3V. It is preferred to ensure that the part does not operate in dropout during DC operation so that the AC performance is maintained.

The device has a dropout voltage of approximately 250 mV at full load and room temperature, but because of the extended temperature range at 150°C, due to increased leakage at hot, it reaches up to 1200 mV. For a 5V output, the minimum supply voltage required in order to have a regulated output, within specification, is 6.2V.

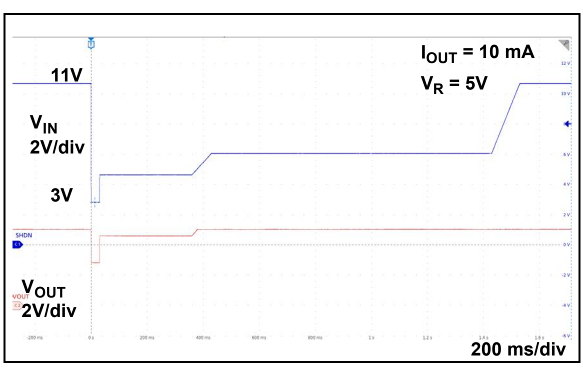


FIGURE 4-3: *Line Step from Dropout.*

4.6 Shutdown Input ($\overline{SHDN}$) and Input UVLO

The $\overline{SHDN}$ input is an active-low input signal that turns the LDO on and off. The $\overline{SHDN}$ threshold has a logic HIGH level of minimum 2.4V and a logic LOW level of maximum 0.8V.

The $\overline{SHDN}$ pin ignores low-going pulses that are up to 30 µs. This blanking window helps to reject any system noise spikes on the $\overline{SHDN}$ input signal. Then, on the rising edge of the $\overline{SHDN}$ input, the shutdown circuitry adds 770 µs delay before allowing the regulator output to turn on. This delay helps to reject any false turn-on signals or noise on the $\overline{SHDN}$ input signal. After the (30 + 770) µs delay, the regulator starts charging the load capacitor as the output rises from 0V to its regulated value. The charging current amplitude will be limited by the short circuit current value of the device. If the $\overline{SHDN}$ input signal is pulled low during the 800 µs delay period, the timer will be reset and the delay time will start over again on the next rising edge of the $\overline{SHDN}$ input. Figure 4-4 shows a timing diagram of the $\overline{SHDN}$ input.

The MCP1792/3 has an internal discharge transistor connected to the V_{OUT} PIN that is enabled when the $\overline{SHDN}$ pin goes low. The discharge occurs through a typical resistance of 80Ω.

The UVLO block helps prevent false start-ups during the power-up sequence, until the input voltage reaches a value of 2.7V. The minimum input voltage required for normal operation is 4.5V.

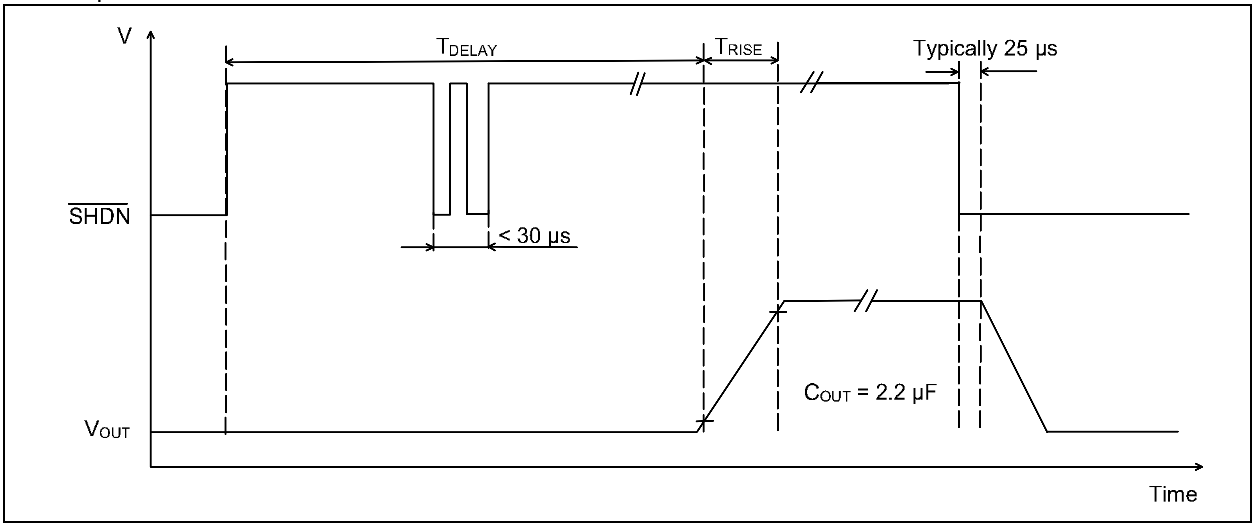


FIGURE 4-4: *Shutdown Input Timing Diagram.*

4.7 Package and Device Qualifications

The MCP1792/3 are AEC-Q100 with Grade 0 and PPAP Capable. The Grade 0 qualification allows the MCP1792/3 to be used within an extended temperature range from -40°C to +150°C.

Additionally, the package has a moisture sensitivity level (MSL) of 1 for SOT223-5L, SOT23A-3L and SOT23-5L; for SOT223-3L the package has MSL 2 rating.

5.0 APPLICATION INFORMATION

5.1 Typical Application

The MCP1792/3 is used for applications that require high input voltage and are prone to high transient voltages on the input.

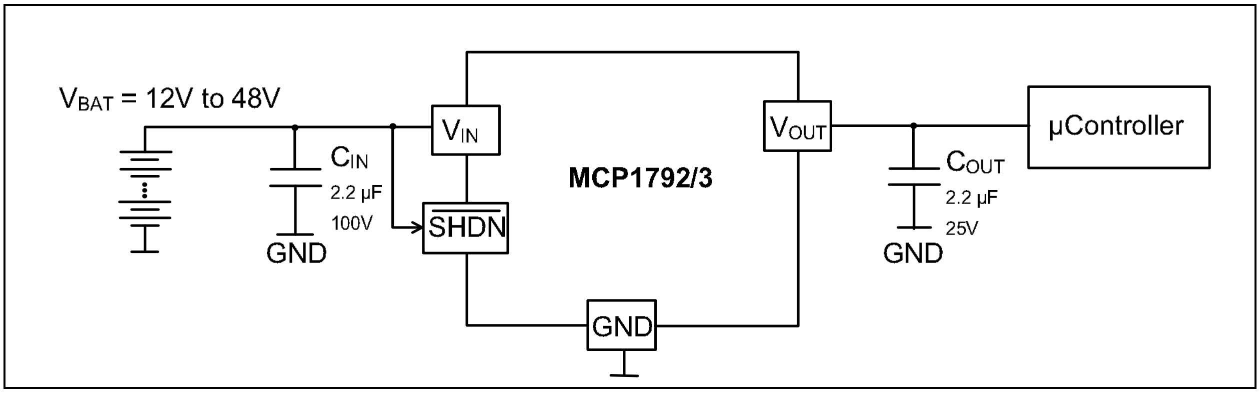


FIGURE 5-1: Typical Application Circuit using a High-Voltage Battery Pack.

5.2 Power Calculations

5.2.1 POWER DISSIPATION

The internal power dissipation within the MCP1792/3 is a function of input voltage, output voltage, output current and quiescent current. Equation 5-1 can be used to calculate the internal power dissipation for the LDO.

EQUATION 5-1:

$$P_{LDO} = (V_{IN(MAX)} - V_{OUT(MIN)}) \times I_{OUT(MAX)}$$

Where:

P_{LDO} = Internal power dissipation of the LDO pass device
$V_{IN(MAX)}$ = Maximum input voltage
$V_{OUT(MIN)}$ = LDO minimum output voltage
$I_{OUT(MAX)}$ = Maximum output current

In addition to the LDO pass element power dissipation, there is power dissipation within the MCP1792/3 as a result of quiescent or ground current. The power dissipation as a result of ground current can be calculated by applying Equation 5-2:

EQUATION 5-2:

$$P_{I(GND)} = V_{IN(MAX)} \times I_{GND}$$

Where:

$P_{I(GND)}$ = Power dissipation due to the ground current of the LDO
$V_{IN(MAX)}$ = Maximum input voltage
I_{GND} = Current flowing into the GND pin

The total power dissipated within the MCP1792/3 is the sum of the power dissipated in the LDO pass device and the $P_{I(GND)}$ term. Because of the CMOS construction, the typical I_{GND} for the MCP1792/3 is typical 100 µA at full load. Operating at a maximum V_{IN} of 55V results in a power dissipation of 5.5 mW. For most applications, this is small compared to the LDO pass device power dissipation and can be neglected.

The maximum continuous operating junction temperature specified for the MCP1792/3 is +150°C. To estimate the internal junction temperature of the MCP1792/3, the total internal power dissipation is multiplied by the thermal resistance from junction-to-ambient (θ_{JA}) of the device. For example, the thermal resistance from junction-to-ambient for the 5-Lead SOT223 package is estimated at 75°C/W.

EQUATION 5-3:

$$T_{J(MAX)} = P_{LDO} \times \theta_{JA} + T_{A(MAX)}$$

Where:

$T_{J(MAX)}$ = Maximum continuous junction temperature
P_{LDO} = Total power dissipation of the device
θ_{JA} = Thermal resistance from junction-to-ambient
$T_{A(MAX)}$ = Maximum ambient temperature

The maximum power dissipation capability for a package can be calculated given the junction-to-ambient thermal resistance and the maximum ambient temperature for the application. Equation 5-4 can be used to determine the package maximum internal power dissipation.

EQUATION 5-4:

$$P_{D(MAX)} = \frac{(T_{J(MAX)} - T_{A(MAX)})}{\theta_{JA}}$$

Where:

$P_{D(MAX)}$	=	Maximum power dissipation of the device
$T_{J(MAX)}$	=	Maximum continuous junction temperature
$T_{A(MAX)}$	=	Maximum ambient temperature
θ_{JA}	=	Thermal resistance from junction-to-ambient

EQUATION 5-5:

$$T_{J(RISE)} = P_{D(MAX)} \times \theta_{JA}$$

Where:

$T_{J(RISE)}$	=	Rise in the device junction temperature over the ambient temperature
$P_{D(MAX)}$	=	Maximum power dissipation of the device
θ_{JA}	=	Thermal resistance from junction-to-ambient

EQUATION 5-6:

$$T_J = T_{J(RISE)} + T_A$$

Where:

T_J	=	Junction temperature
$T_{J(RISE)}$	=	Rise in the device junction temperature over the ambient temperature
T_A	=	Ambient temperature

5.3 Typical Application Examples

Internal power dissipation, junction temperature rise, junction temperature and maximum power dissipation are calculated in the following example. The power dissipation as a result of ground current is small enough to be neglected.

5.3.1 POWER DISSIPATION EXAMPLE

EXAMPLE 5-1:

Package

Package Type = 5-Lead SOT223

Input Voltage

V_{IN} = 14V ± 5%

LDO Output Voltage and Current

V_{OUT} = 5V

I_{OUT} = 50 mA

Maximum Ambient Temperature

$T_{A(MAX)}$ = +60°C

Internal Power Dissipation

$P_{LDO(MAX)}$ = $(V_{IN(MAX)} - V_{OUT(MIN)})$ x $I_{OUT(MAX)}$

P_{LDO} = (14.7 – 4.9) x 50 mA

P_{LDO} = 0.49 Watts

5.3.1.1 Device Junction Temperature Rise

The internal junction temperature rise is a function of internal power dissipation and of the thermal resistance from junction-to-ambient for the application. The thermal resistance from junction-to-ambient (θ_{JA}) is derived from EIA/JEDEC standards for measuring thermal resistance. The EIA/JEDEC specification is JESD51. The standard describes the test method and board specifications for measuring the thermal resistance from junction-to-ambient. The actual thermal resistance for a particular application can vary depending on many factors such as copper area and thickness. Refer to Application Note AN792, *“A Method to Determine How Much Power a SOT23 Can Dissipate in an Application”* (DS00792), for more information regarding this subject.

EXAMPLE 5-2:

$T_{J(RISE)}$ = P_{TOTAL} x θ_{JA}

$T_{J(RISE)}$ = 0.49W x 75°C/W

$T_{J(RISE)}$ = 36.75°C

5.3.1.2 Junction Temperature Estimate

To estimate the internal junction temperature, the calculated temperature rise is added to the ambient or offset temperature. For this example, the worst-case junction temperature is estimated below:

EXAMPLE 5-3:

T_J = $T_{J(RISE)}$ + $T_{A(MAX)}$

T_J = 36.75°C + 60.0°C

T_J = 96.75°C

5.3.1.3 Maximum Package Power Dissipation at +60°C Ambient Temperature

EXAMPLE 5-4:

5Lead SOT223 (θ_{JA} = 75°C/W):

$P_{D(MAX)}$ = (150°C – 60°C)/75°C/W

$P_{D(MAX)}$ = 1.2W

6.0 BATTERY PACK APPLICATION

The MCP1792/3's features make it suitable for use in smart battery packs. The high $\overline{SHDN}$ and input voltage range of up to 55V and the transient voltage capability make it adequate for powering low-power microcontrollers used for monitoring battery health.

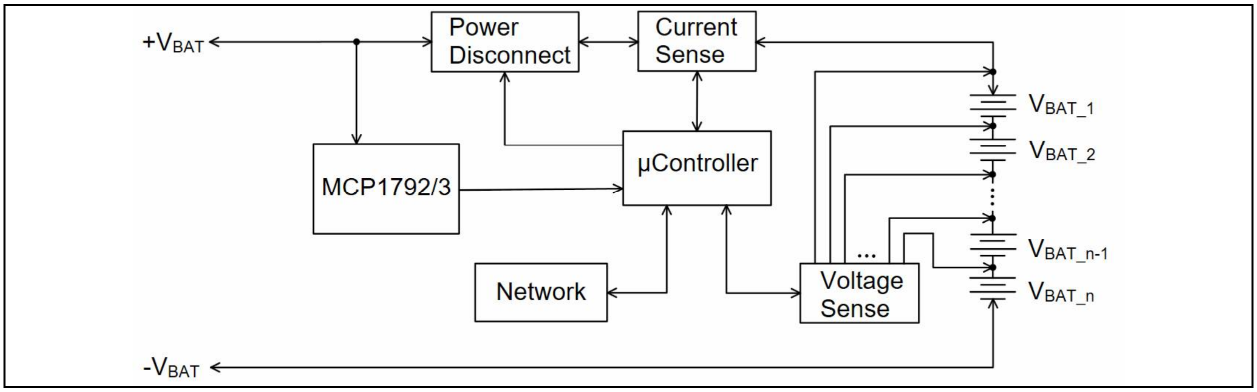
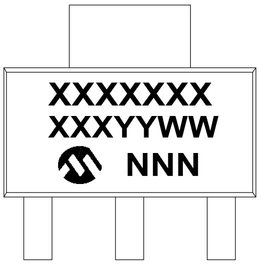


FIGURE 6-1: *Smart Battery Pack.*

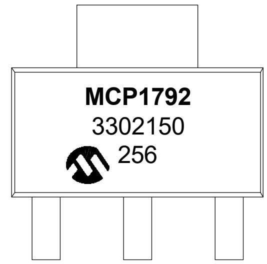
7.0 PACKAGING INFORMATION

7.1 Package Marking Information

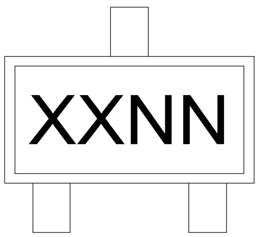
3-Lead SOT-223



Example



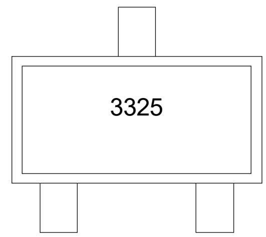
3-Lead SOT-23A



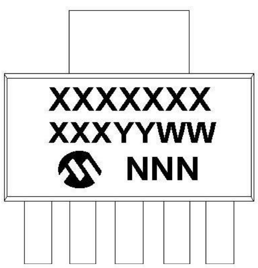
Part Number	Code
MCP1792T-3302H/CB(VAO)	33
MCP1792T-4102H/CB(VAO)	41
MCP1792T-5002H/CB(VAO)	50

Note: The content of this table applies to 3-Lead SOT-23A.

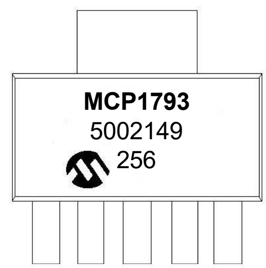
Example



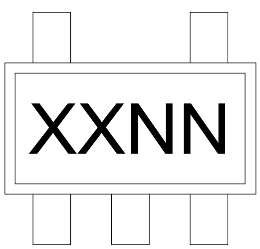
5-Lead SOT-223



Example



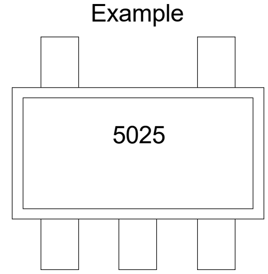
5-Lead SOT-23



Part Number	Code
MCP1793T-3302H/OT(VAO)	33
MCP1793T-4102H/OT(VAO)	41
MCP1793T-5002H/OT(VAO)	50

Note: The content of this table applies to 5-Lead SOT-23.

Example



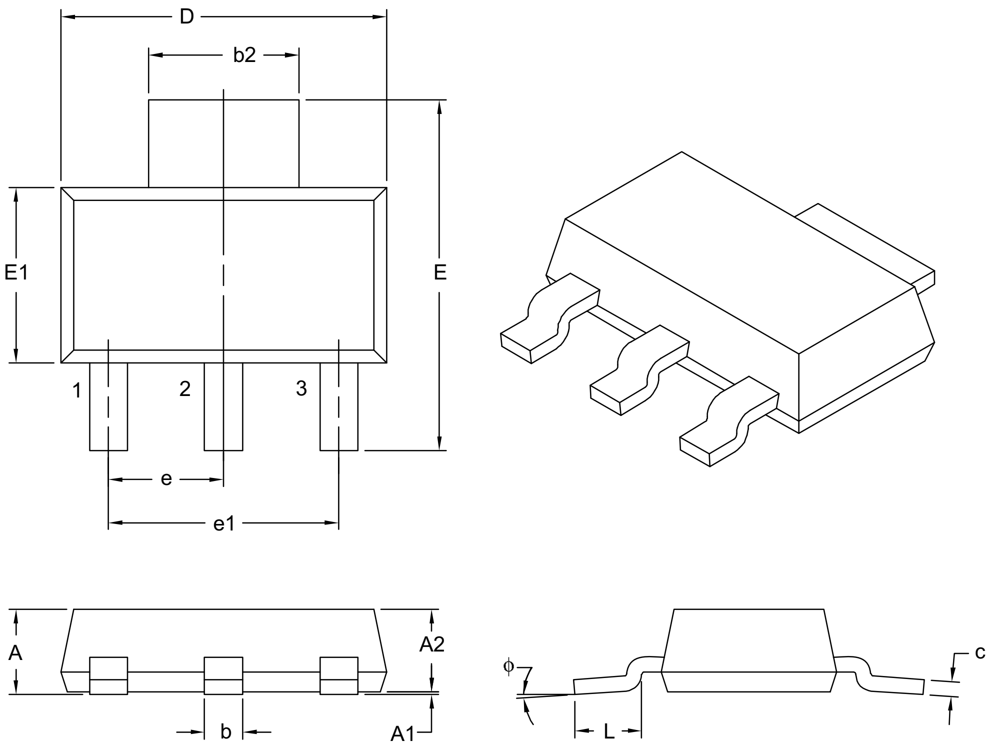
Legend:

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.

3-Lead Plastic Small Outline Transistor (DB) [SOT-223]

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



	Units	MILLIMETERS		
	Dimension Limits	MIN	NOM	MAX
Number of Leads	N	3		
Lead Pitch	e	2.30 BSC		
Outside Lead Pitch	e1	4.60 BSC		
Overall Height	A	–	–	1.80
Standoff	A1	0.02	–	0.10
Molded Package Height	A2	1.50	1.60	1.70
Overall Width	E	6.70	7.00	7.30
Molded Package Width	E1	3.30	3.50	3.70
Overall Length	D	6.30	6.50	6.70
Lead Thickness	c	0.23	0.30	0.35
Lead Width	b	0.60	0.76	0.84
Tab Lead Width	b2	2.90	3.00	3.10
Foot Length	L	0.75	–	–
Lead Angle	ϕ	0°	–	10°

Notes:

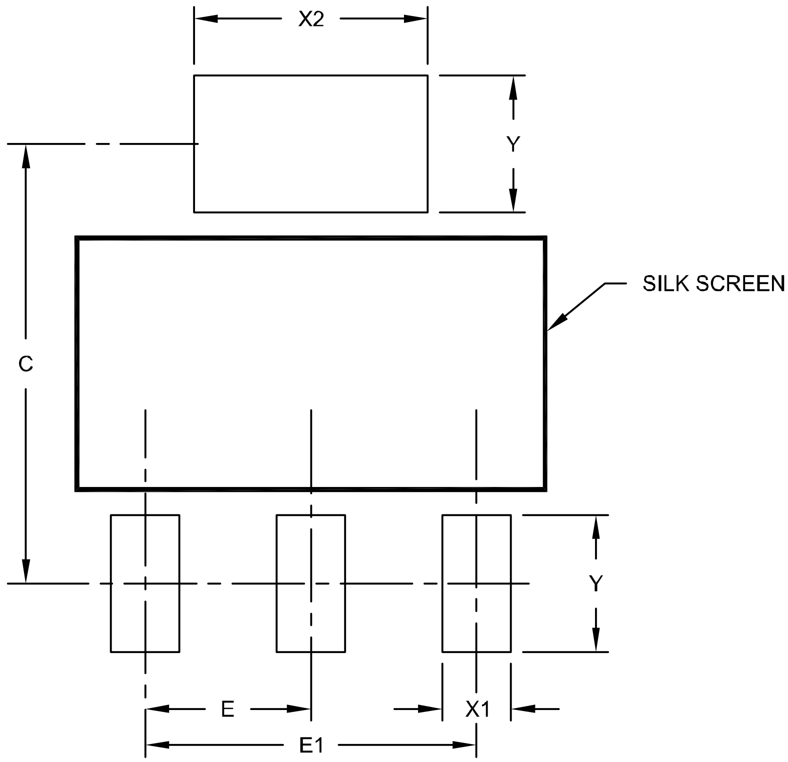
1. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.127 mm per side.
2. Dimensioning and tolerancing per ASME Y14.5M.

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

Microchip Technology Drawing C04-032B

3-Lead Plastic Small Outline Transistor (DB) [SOT-223]

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



RECOMMENDED LAND PATTERN

		Units	MILLIMETERS		
		Dimension Limits	MIN	NOM	MAX
Contact Pitch	E			2.30 BSC	
Overall Pitch	E1			4.60 BSC	
Contact Pad Spacing	C			6.10	
Contact Pad Width	X1				0.95
Contact Pad Width	X2				3.25
Contact Pad Length	Y				1.90

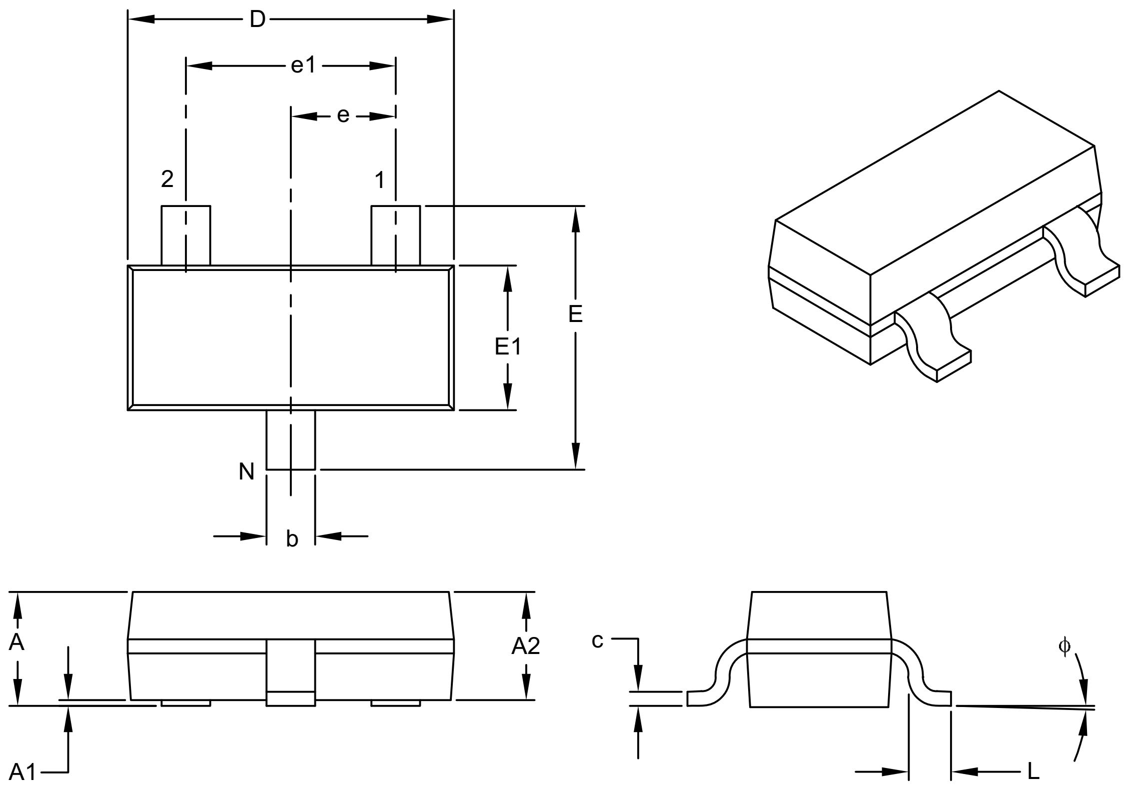
Notes:
1. Dimensioning and tolerancing per ASME Y14.5M

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

Microchip Technology Drawing No. C04-2032A

3-Lead Plastic Small Outline Transistor (CB) [SOT-23A]

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



		Units	MILLIMETERS	
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		3	
Lead Pitch	e		0.95 BSC	
Outside Lead Pitch	e1		1.90 BSC	
Overall Height	A	0.89	–	1.45
Molded Package Thickness	A2	0.90	–	1.30
Standoff	A1	0.00	–	0.15
Overall Width	E	2.10	–	3.00
Molded Package Width	E1	1.20	–	1.80
Overall Length	D	2.70	–	3.10
Foot Length	L	0.15	–	0.60
Foot Angle	ϕ	0°	–	30°
Lead Thickness	c	0.09	–	0.26
Lead Width	b	0.30	–	0.51

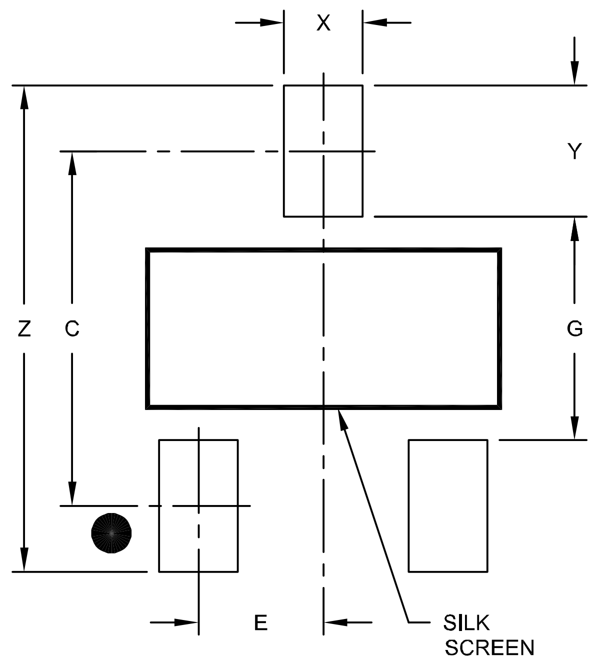
Notes:

1. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.127 mm per side.
2. Dimensioning and tolerancing per ASME Y14.5M.
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-130B

3-Lead Plastic Small Outline Transistor (CB) [SOT-23A]

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



RECOMMENDED LAND PATTERN

	Units	MILLIMETERS		
	Dimension Limits	MIN	NOM	MAX
Contact Pitch	E	0.95 BSC		
Contact Pad Spacing	C		2.70	
Contact Pad Width (X3)	X			0.60
Contact Pad Length (X3)	Y			1.00
Distance Between Pads	G	1.70		
Overall Width	Z			3.70

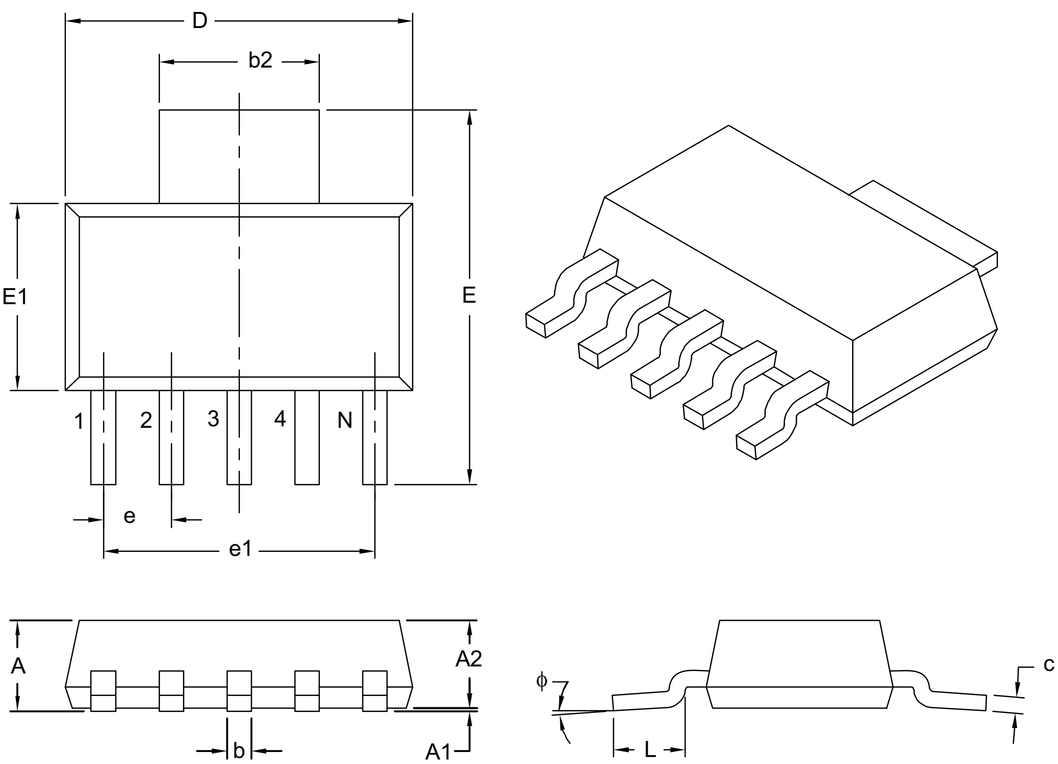
Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-2130A

5-Lead Plastic Small Outline Transistor (DC) [SOT-223]

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



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Leads	N		5	
Lead Pitch	e		1.27 BSC	
Outside Lead Pitch	e1		5.08 BSC	
Overall Height	A	–	–	1.80
Standoff	A1	0.02	0.06	0.10
Molded Package Height	A2	1.55	1.60	1.65
Overall Width	E	6.86	7.00	7.26
Molded Package Width	E1	3.45	3.50	3.55
Overall Length	D	6.45	6.50	6.55
Lead Thickness	c	0.24	0.28	0.32
Lead Width	b	0.41	0.457	0.51
Tab Lead Width	b2	2.95	3.00	3.05
Foot Length	L	0.91	–	1.14
Lead Angle	ϕ	0°	4°	8°

Notes:

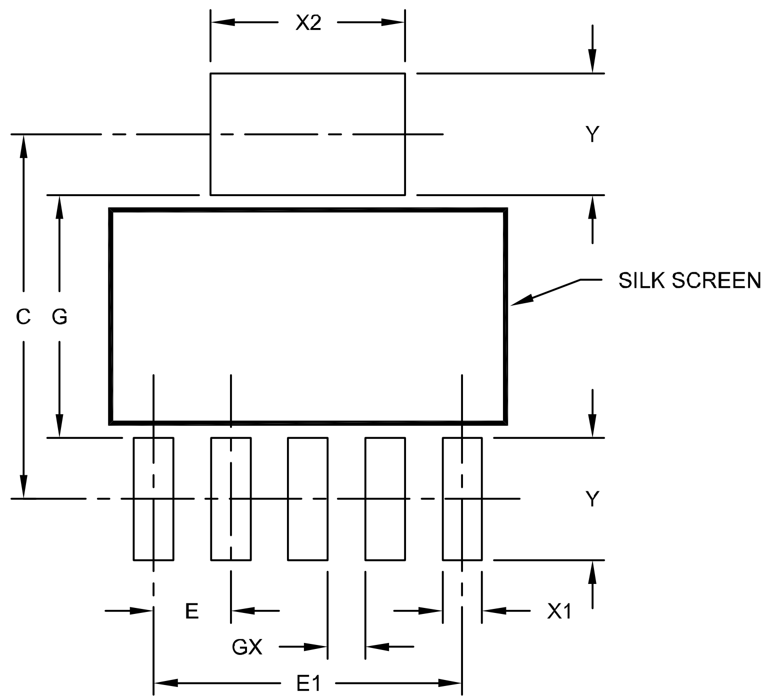
1. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.127 mm per side.
2. Dimensioning and tolerancing per ASME Y14.5M.

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

Microchip Technology Drawing C04-137B

5-Lead Plastic Small Outline Transistor (DC) [SOT-223]

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



RECOMMENDED LAND PATTERN

	Units	MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Pad Pitch	E	1.27 BSC		
Overall Pad Pitch	E1	5.08 BSC		
Pad Spacing	C		6.00	
Pad Width	X1			0.65
Pad Width	X2			3.20
Pad Length	Y			2.00
Distance Between Pads	G	4.00		
Distance Between Pads	GX	0.62		

Notes:

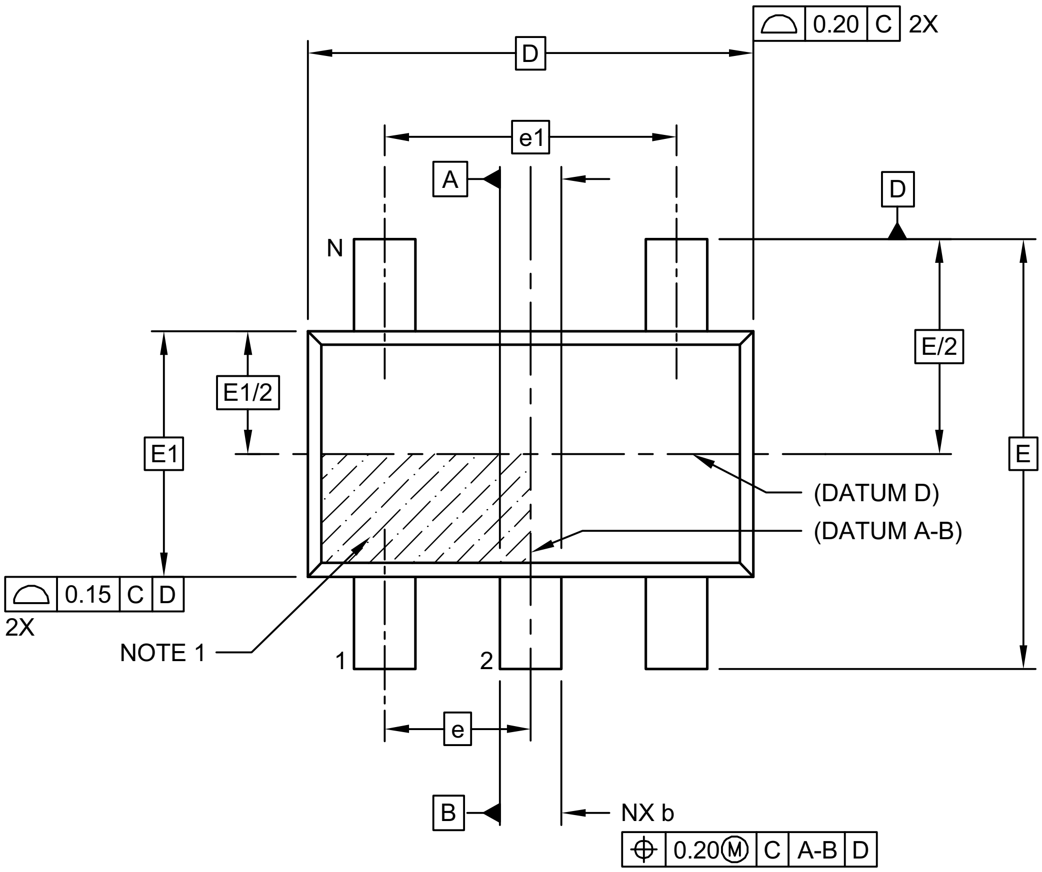
1. Dimensioning and tolerancing per ASME Y14.5M

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

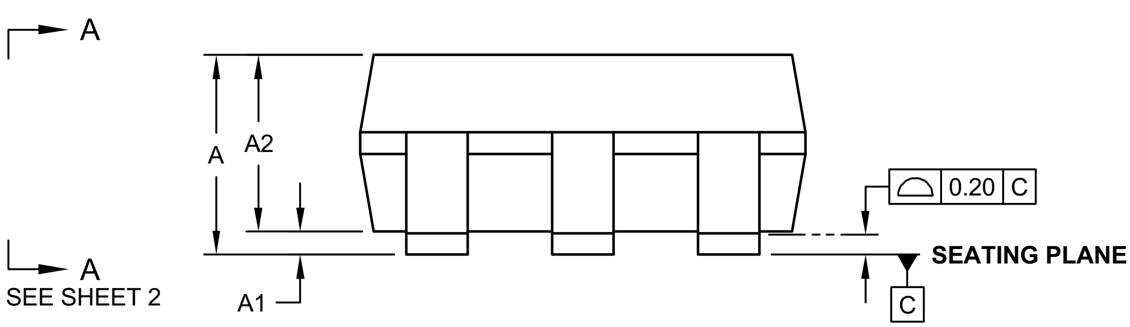
Microchip Technology Drawing No. C04-2137A

5-Lead Plastic Small Outline Transistor (OT) [SOT23]

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



TOP VIEW

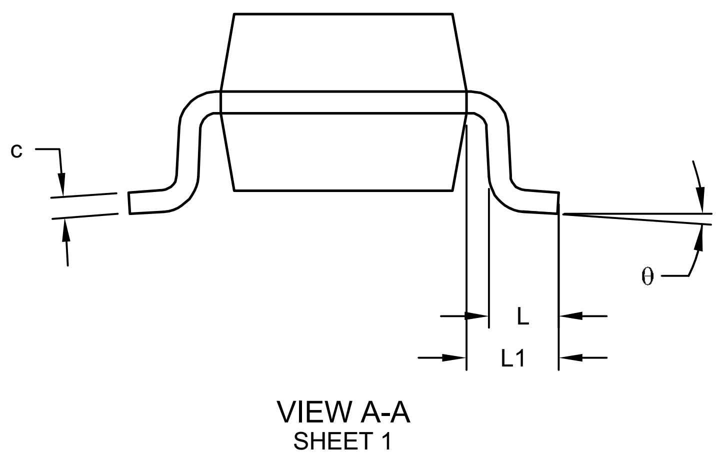


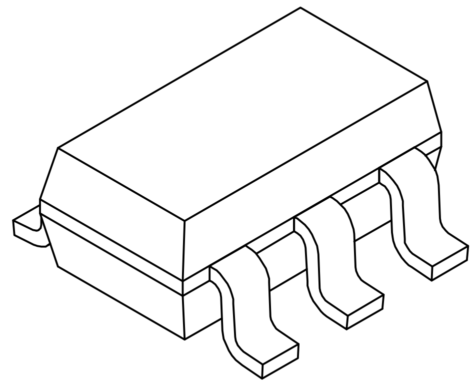
SIDE VIEW

Microchip Technology Drawing C04-091-OT Rev E Sheet 1 of 2

5-Lead Plastic Small Outline Transistor (OT) [SOT23]

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





Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N	5		
Pitch	e	0.95 BSC		
Outside lead pitch	e1	1.90 BSC		
Overall Height	A	0.90	-	1.45
Molded Package Thickness	A2	0.89	-	1.30
Standoff	A1	-	-	0.15
Overall Width	E	2.80 BSC		
Molded Package Width	E1	1.60 BSC		
Overall Length	D	2.90 BSC		
Foot Length	L	0.30	-	0.60
Footprint	L1	0.60 REF		
Foot Angle	ϕ	0°	-	10°
Lead Thickness	c	0.08	-	0.26
Lead Width	b	0.20	-	0.51

Notes:

1. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.25mm per side.
2. Dimensioning and tolerancing per ASME Y14.5M

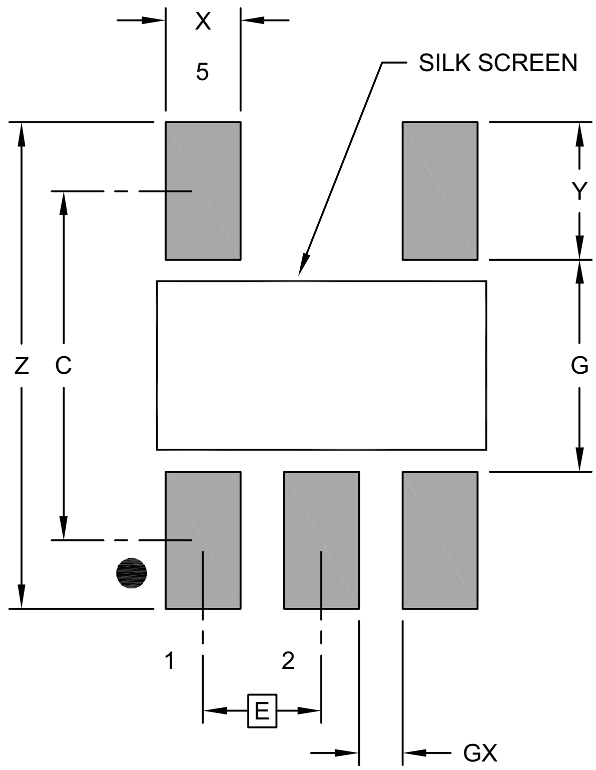
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

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

Microchip Technology Drawing C04-091-OT Rev E Sheet 2 of 2

5-Lead Plastic Small Outline Transistor (OT) [SOT23]

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



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	0.95 BSC		
Contact Pad Spacing	C		2.80	
Contact Pad Width (X5)	X			0.60
Contact Pad Length (X5)	Y			1.10
Distance Between Pads	G	1.70		
Distance Between Pads	GX	0.35		
Overall Width	Z			3.90

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

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

Microchip Technology Drawing No. C04-2091B [OT]

APPENDIX A: REVISION HISTORY

Revision D (January 2022)

- Updated Product Identification System
- Added Product Identification System (Automotive) to include automotive information and examples
- Minor layout changes

Revision C (April 2020)

- Updated device Features
- Updated Product Identification System

Revision B (October 2019)

- Updated device Features
- Updated Package Types
- Updated the AC/DC Characteristics table
- Changed symbols in Figure 4-1
- Added clarifying information in **Section 4.4 "Circuit Protection"** by specifying the type of diode necessary to prevent output voltage drop
- Updated text in **Section 4.2 "Output Capacitance Requirements"**
- Added extra paragraph in **Section 4.6 "Shutdown Input (SHDN) and Input UVLO"**
- Changed power dissipation value when operating at a maximum V_{IN} in **Section 5.2 "Power Calculations"**
- Corrected device description in Product Identification System
- Minor typographical changes throughout

Revision A (July 2019)

- Initial release of this document

NOTES:

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][(1)]	-XX	X	X	X/	XX
Device	Tape and Reel	Output Voltage	Featured Code	Tolerance	Temp.	Package

Device:	MCP1792:	100 mA High-Voltage Automotive LDO
	MCP1793:	100 mA High-Voltage Automotive LDO
Tape and Reel Option:	<Blank>	= Standard packaging (tube or tray)
	T	= Tape and Reel
Standard Output Voltages:	33	= 3.3V
	50	= 5.0V
	41	= 4.1V
Temperature:	H	= -40°C to +150°C (Automotive)
Feature Code:	0	= Fixed
Tolerance:	2	= Standard Accuracy
Package Type:	DB	= 3-Lead Plastic Small Outline Transistor, SOT-223
	CB	= 3-Lead Plastic Small Outline Transistor, SOT-23A
	DC	= 5-Lead Plastic Small Outline Transistor, SOT-223
	OT	= 5-Lead Plastic Small Outline Transistor, SOT-23
Qualification:	<Blank>	= Standard Part
	VAO	= Automotive AEC-Q100 Qualified

Examples:

a) MCP1792-3302H/DB: Tube, 3.3V output voltage, Automotive temperature, 3-LD SOT-223 package

b) MCP1792-5002H/DB: Tube, 5.0V output voltage, Automotive temperature, 3-LD SOT-223 package

c) MCP1792T-4102H/DB: Tape and Reel, 4.1V output voltage, Automotive temperature, 3-LD SOT-223 package

d) MCP1792T-5002H/DB: Tape and Reel, 5.0V output voltage, Automotive temperature, 3-LD SOT-223 package

e) MCP1792T-3302H/CB: Tape and Reel, 3.3V output voltage, Automotive temperature, 3-LD SOT-23A package

f) MCP1792T-5002H/CB: Tape and Reel, 5.0V output voltage, Automotive temperature, 3-LD SOT-23A package

g) MCP1793T-3302H/DC: Tape and Reel, 3.3V output voltage, Automotive temperature, 5-LD SOT-223 package

h) MCP1793T-5002H/DC: Tape and Reel, 5.0V output voltage, Automotive temperature, 5-LD SOT-223 package

i) MCP1793T-4102H/DC: Tape and Reel, 4.1V output voltage, Automotive temperature, 5-LD SOT-223 package

j) MCP1793T-3302H/OT: Tape and Reel, 3.3V output voltage, Automotive temperature, 5-LD SOT-23 package

k) MCP1793T-5002H/OT: Tape and Reel, 5.0V output voltage, Automotive temperature, 5-LD SOT-23 package

l) MCP1793T-4102H/OT: Tape and Reel, 4.1V output voltage, Automotive temperature, 5-LD SOT-23 package

Note 1: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

PRODUCT IDENTIFICATION SYSTEM (AUTOMOTIVE)

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

PART NO.	[X][1]	-XX	X	X	X/	XX	XXX
Device	Tape and Reel	Output Voltage	Featured Code	Tolerance	Temp.	Package	Qualif.

Device:	MCP1792:	100 mA High-Voltage Automotive LDO
	MCP1793:	100 mA High-Voltage Automotive LDO
Tape and Reel Option:	<Blank>	= Standard packaging (tube or tray)
	T	= Tape and Reel
Standard Output Voltages:	33	= 3.3V
	50	= 5.0V
	41	= 4.1V
Temperature:	H	= -40°C to +150°C (Automotive)
Feature Code:	0	= Fixed
Tolerance:	2	= Standard Accuracy
Package Type:	DB	= 3-Lead Plastic Small Outline Transistor, SOT-223
	CB	= 3-Lead Plastic Small Outline Transistor, SOT-23A
	DC	= 5-Lead Plastic Small Outline Transistor, SOT-223
	OT	= 5-Lead Plastic Small Outline Transistor, SOT-23
Qualification:	<Blank>	= Standard Part
	VAO	= Automotive AEC-Q100 Qualified

Examples:

a) MCP1792T-5002H/CBVAO: Tape and Reel, 5.0V output voltage, 3-LD SOT-23A package, Automotive Qualified

b) MCP1793T-3302H/OTVAO: Tape and Reel, 3.3V output voltage, 5-LD SOT-23 package, Automotive Qualified

c) MCP1792T-5002H/DBVAO: Tape and Reel, 5.0V output voltage, 3-LD SOT-223 package, Automotive Qualified

d) MCP1793T-5002H/DCVAO: Tape and Reel, 5.0V output voltage, 5-LD SOT-223 package, Automotive Qualified

e) MCP1792T-3302H/CBVAO: Tape and Reel, 3.3V output voltage, 5-LD SOT-23A package, Automotive Qualified

f) MCP1793T-5002H/OTVAO: Tape and Reel, 5.0V output voltage, 5-LD SOT-23 package, Automotive Qualified

g) MCP1792-4102H/DBVAO: Tube, 4.1V output voltage, 3-LD SOT-223 package, Automotive Qualified

h) MCP1793T-3302H/DCVAO: Tape and Reel, 3.3V output voltage, 5-LD SOT-223 package, Automotive Qualified

i) MCP1792T-4102H/DBVAO: Tape and Reel, 4.1V output voltage, 3-LD SOT-223 package, Automotive Qualified

j) MCP1793T-4102H/DCVAO: Tape and Reel, 4.1V output voltage, 5-LD SOT-223 package, Automotive Qualified

k) MCP1792T-4102H/CBVAO: Tape and Reel, 4.1V output voltage, 3-LD SOT-23A package, Automotive Qualified

l) MCP1793T-4102H/OTVAO: Tape and Reel, 4.1V output voltage, 5-LD SOT-23 package, Automotive Qualified

m) MCP1792T-3302H/DBVAO: Tape and Reel, 3.3V output voltage, 3-LD SOT-223 package, Automotive Qualified

Note 1: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

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