Product Change Notification / SYST-10JDCO563

Date:

11-Feb-2022

Product Category:

Linear Regulators

PCN Type:

Document Change

Notification Subject:

Data Sheet - MIC2940A/2941A - 1.25A Low-Dropout Voltage Regulator Data Sheet Document Revision

Affected CPNs:

SYST-10JDCO563_Affected_CPN_02112022.pdf
SYST-10JDCO563_Affected_CPN_02112022.csv

Notification Text:

SYST-10JDCO563

Microchip has released a new Product Documents for the MIC2940A/2941A - 1.25A Low-Dropout Voltage Regulator of devices. If you are using one of these devices please read the document located at MIC2940A/2941A - 1.25A Low-Dropout Voltage Regulator.

Notification Status: Final

Description of Change:
1) Updated the Package Marking Information drawings with the most current marking information

Impacts to Data Sheet: See above details.

Reason for Change: To Improve Productivity

Change Implementation Status: Complete

Date Document Changes Effective: 11 Feb 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:

MIC2940A/2941A - 1.25A Low-Dropout Voltage Regulator

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

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Affected Catalog Part Numbers (CPN)

MIC2940A-12WT
MIC2940A-12WU
MIC2940A-12WU-TR
MIC2940A-3.3WT
MIC2940A-3.3WU
MIC2940A-3.3WU-TR
MIC2940A-5.0WT
MIC2940A-5.0WU
MIC2940A-5.0WU-TR
MIC2941AWT
MIC2941AWT-L2
MIC2941AWT-L3
MIC2941AWU
MIC2941AWU-TR

MIC2940A/41A

1.25A Low Dropout Voltage Regulator

Features

- High Output Voltage Accuracy
- Guaranteed 1.25A Output
- Low Quiescent Current
- Low Dropout Voltage
- Extremely Tight Load and Line Regulation
- Very Low Temperature Coefficient
- Current and Thermal Limiting
- Input Can Withstand –20V Reverse Battery and +60V Positive Transients
- Logic-Controlled Electronic Shutdown
- Output Programmable from 1.24V to 26V (MIC2941A)
- Available in TO-220-3, TO-263-3, TO-220-5, and TO-263-5 Packages

Applications

- Battery-Powered Equipment
- Cellular Telephones
- Laptop, Notebook, and Palmtop Computers
- PCMCIA V_{CC} and V_{PP} Regulation/Switching
- Barcode Scanners
- Automotive Electronics
- SMPS Post-Regulator/DC-to-DC Modules
- Voltage Reference
- High Efficiency Linear Power Supplies

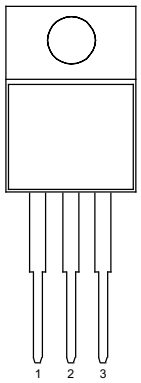
General Description

The MIC2940A and MIC2941A are "bulletproof" efficient voltage regulators with very low dropout voltage (typically 40 mV at light loads and 350 mV at 1A), and low quiescent current (240 µA typical). The quiescent current of the MIC2940A increases only slightly in dropout, thus prolonging battery life. Key MIC2940A features include protection against reversed battery, fold-back current-limiting, and automotive "load dump" protection (60V positive transient).

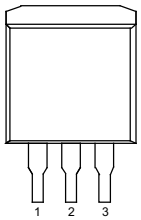
The MIC2940A is available in both fixed voltage (3.3V, 5V, and 12V) and adjustable voltage configurations. The MIC2940A-xx devices are three pin, fixed-voltage regulators. A logic-compatible shutdown input is provided on the adjustable MIC2941A, which enables the regulator to be switched on and off.

Package Types

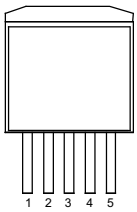
MIC2940A-x.xWT
TO-220-3 (T)
(Top View)



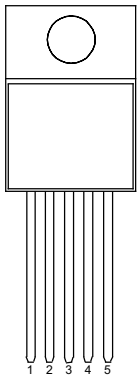
MIC2940A-x.xWU
TO-263-3 (U)
(Top View)



MIC2941AWU
TO-263-5 (U)
(Top View)

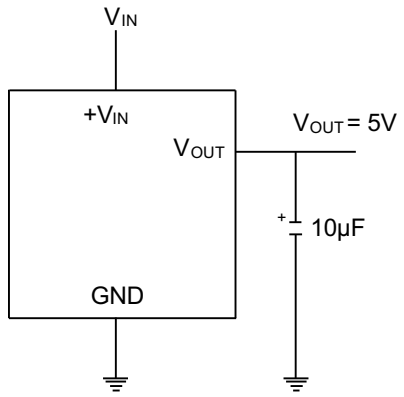


MIC2941AWT
TO-220-5 (T)
(Top View)

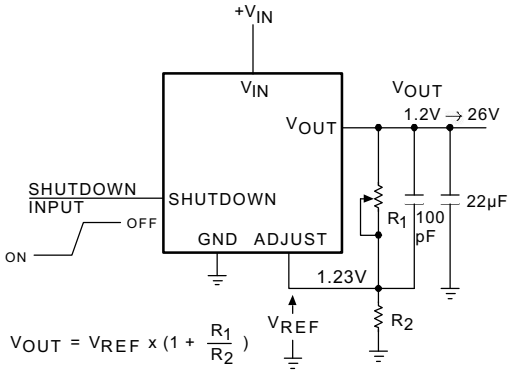


Typical Application Circuits

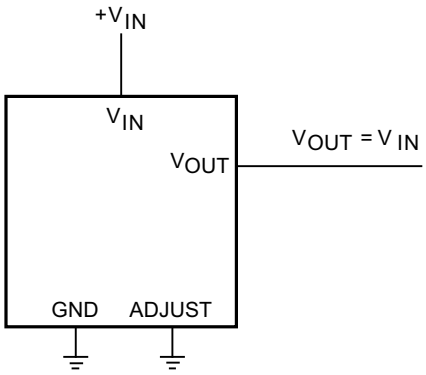
MIC2940A-5.0 FIXED +5V REGULATOR



MIC2941A ADJUSTABLE REGULATOR

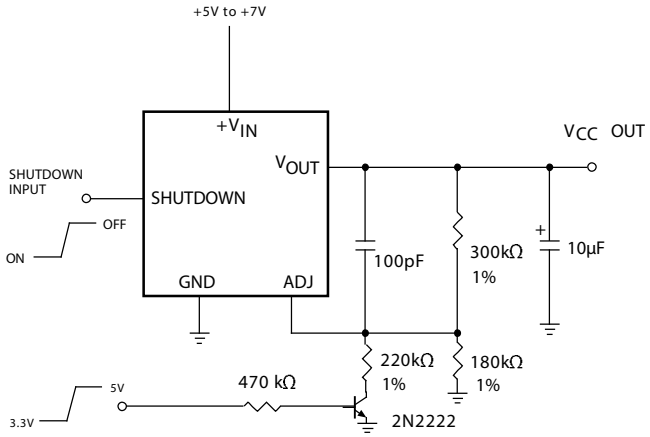


MIC2941A WIDE INPUT VOLTAGE RANGE CURRENT-LIMIT



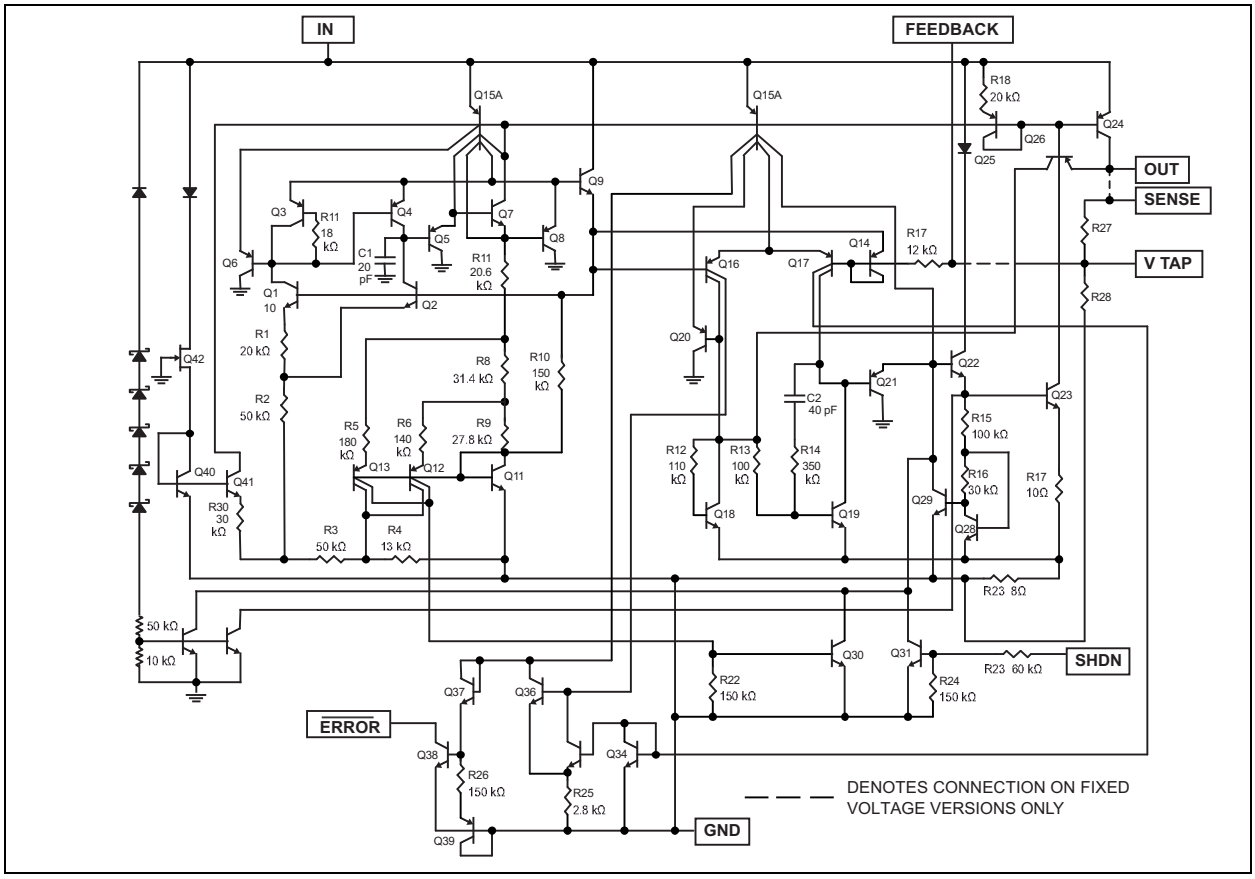
MINIMUM INPUT-OUTPUT VOLTAGE RANGES FROM 40MV TO 400MV, DEPENDING ON LOAD CURRENT

MIC2941A 5V OR 3.3V SELECTABLE REGULATOR WITH SHUTDOWN



Adjust Pin Low = Enable Output. Q1 ON = 3.3V, Q1 OFF = 5.0V.

Functional Block Diagram



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

Power Dissipation (P_D)..... Internally Limited, Note 1
Input Supply Voltage ..... –20V to +60V
Adjust Input Voltage (Note 2, Note 3)..... –1.5V to +26V
Shutdown Input Voltage ..... –0.3V to +30V
Error Comparator Output Voltage..... –0.3V to +30V

Operating Ratings ‡

Input Supply Voltage (Note 4) ..... +2V to +26V

† 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 sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

‡ Notice: The device is not guaranteed to function outside its operating ratings.

Note 1: The maximum allowable power dissipation of any T_A (ambient temperature) is $P_{D(max)} = (T_{J(max)} - T_A)/\theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.

2: Circuit of MIC2941A Adjustable Regulator in the Typical Application Circuits section (upper right) with R1 ≥ 150 kΩ. $V_{SHUTDOWN} \geq 2V$ and $V_{IN} \leq 26V$, $V_{OUT} = 0$.

3: When used in dual supply systems where the regulator load is returned to a negative supply, the output voltage must be diode clamped to ground.

4: Across the full operating temperature, the minimum input voltage range for full output current is 4.3V to 26V. Output will remain in regulation at lower output voltages and low current loads down to an input of 2V at 25°C.

ELECTRICAL CHARACTERISTICS

Electrical Characteristics: Limits in standard typeface are for T_J = +25°C and limits in **boldface** apply over the full operating temperature range. Unless otherwise specified, $V_{IN} = V_{OUT} + 1V$, I_L = 1000 mA, C_L = 10 µF. The MIC2941A is programmed to output 5V and has $V_{SHUTDOWN}$ 0.6V.

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Output Voltage Accuracy	V_O	–1	—	1	%	—
		–2	—	2		—
		–2.5	—	2.5		5mA ≤ I_L ≤ 1A
Output Voltage Temperature Coefficient	$\Delta V_O/\Delta T$	—	20	100	ppm/°C	Note 1
Line Regulation	$\Delta V_O/V_O$	—	0.06	0.50	%	I_O = 10 mA, $(V_{OUT} + 1V) \leq V_{IN} \leq 26V$
Load Regulation		—	0.04	0.16		I_L = 5 mA to 1.25A
		—	—	0.20		I_L = 5 mA to 1A, Note 2
Dropout Voltage, Note 3	$V_{IN} - V_O$	—	60	150	mV	I_L = 5 mA
		—	—	**180**		
		—	200	250		I_L = 250 mA
		—	—	**320**		
		—	350	450		I_L = 1000 mA
		—	—	**600**		
		—	400	600		I_L = 1250 mA

ELECTRICAL CHARACTERISTICS (CONTINUED)

Electrical Characteristics: Limits in standard typeface are for T_J = +25°C and limits in **boldface** apply over the full operating temperature range. Unless otherwise specified, $V_{IN} = V_{OUT} + 1V$, I_L = 1000 mA, C_L = 10 µF. The MIC2941A is programmed to output 5V and has $V_{SHUTDOWN}$ 0.6V.

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Ground Pin Current, Note 4	I_{GND}	—	240	500	µA	I_L = 5 mA
		—	3	4.5	mA	I_L = 250 mA
		—	—	**6**		
		—	22	35		I_L = 1000 mA
		—	—	**45**		
		—	35	70		I_L = 1250 mA
Ground Pin Current at Dropout, Note 4	I_{GNDDO}	—	330	600	µA	V_{IN} = 0.5V less than designed V_{OUT} (V_{OUT} 3.3), I_L = 5 mA
Current-Limit	I_{LIMIT}	—	1.6	3.5	A	V_{OUT} = 0V, Note 5
Thermal Regulation	$\Delta V_O/\Delta P_D$	—	0.05	0.2	%/W	Note 6
Output Noise Voltage (10 Hz to 100 kHz) I_L = 100 mA	e_n	—	400	—	μV_{RMS}	C_L = 10 µF
		—	260	—		C_L = 33 µF
Electrical Characteristics for MIC2941A Only						
Reference Voltage	V_{REF}	1.223	1.235	1.247	V	Note 7
		1.210	—	1.260		
		1.204	—	1.266		
Adjust Pin Bias Current	I_{BIAS}	—	20	40	nA	—
		—	—	**60**		
Reference Voltage Temperature Coefficient	$\Delta V_{REF}/\Delta T$	—	20	—	ppm/°C	—
Adjust Pin Bias Current Temperature Coefficient	$\Delta I_{BIAS}/\Delta T$	—	0.1	—	nA/°C	—

ELECTRICAL CHARACTERISTICS (CONTINUED)

Electrical Characteristics: Limits in standard typeface are for T_J = +25°C and limits in **boldface** apply over the full operating temperature range. Unless otherwise specified, $V_{IN} = V_{OUT}$ + 1V, I_L = 1000 mA, C_L = 10 µF. The MIC2941A is programmed to output 5V and has $V_{SHUTDOWN}$ 0.6V.

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Shutdown Input						
Input Logic Voltage	V_{IL}	—	1.3	**0.7**	V	Low (ON)
	V_{IH}	**2.0**	—	—		High (OFF)
Shutdown Pin Input Current	I_{SHDN}	—	30	50	µA	$V_{SHUTDOWN}$ = 2.4V
		—	—	**100**		
		—	450	600		$V_{SHUTDOWN}$ = 26V
		—	—	**750**		
Regulator Output Current in Shutdown	$I_{OUT(SHDN)}$	—	3	30	µA	Note 8
		—	—	**60**		

Note 1: Output voltage temperature coefficient is defined as the worst case voltage change divided by the total temperature range.

2: Regulation is measured at constant junction temperature using low duty cycle pulse testing. Changes in output voltage due to heating effects are covered by the thermal regulation specification.

3: Dropout voltage is defined as the input to output differential at which the output voltage drops 100 mV below its nominal value measured at 1V differential. At low values of programmed output voltage, the minimum input supply voltage of 4.3V over temperature must be taken into account.

4: Ground pin current is the regulator quiescent current. The total current drawn from the source is the sum of the load current plus the ground pin current.

5: The MIC2940A features fold-back current limiting. The short-circuit (V_{OUT} = 0V) current-limit is less than the maximum current with normal output voltage.

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 200 mA load pulse at V_{IN} = 20V (a 4W pulse) for T = 10 ms.

7: $V_{REF} \le V_{OUT} \le (V_{IN} - 1\ V)$, 4.3V ≤ V_{IN} 26V, 5 mA < $I_L \le$ 1.25A, $T_J \le T_{J(MAX)}$.

8: When used in dual supply systems where the regulator load is returned to a negative supply, the output voltage must be diode clamped to ground.

TEMPERATURE SPECIFICATIONS (Note 1)

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Storage Temperature Range	T_S	–65	—	+150	°C	—
Junction Operating Temperature Range	T_J	–40	—	+125	°C	—
Lead Temperature	—	—	—	+260	°C	Soldering, 5s
Package Thermal Resistances						
Thermal Resistance TO-220	θ_{JC}	—	2	—	°C/W	—
Thermal Resistance TO-263	θ_{JC}	—	2	—	°C/W	—

Note 1: 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 will cause the device operating junction temperature to exceed the maximum +125°C rating. Sustained junction temperatures above +125°C can impact the device reliability.

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.

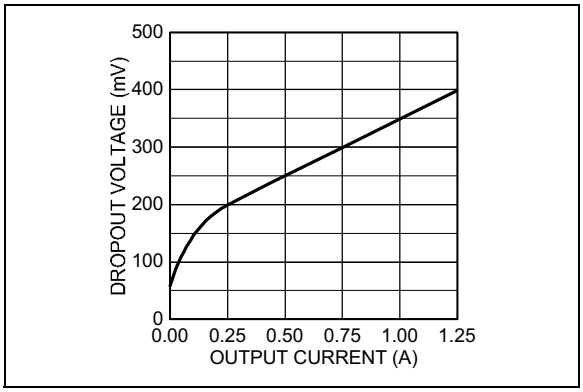


FIGURE 2-1: *Dropout Voltage vs. Output Current.*

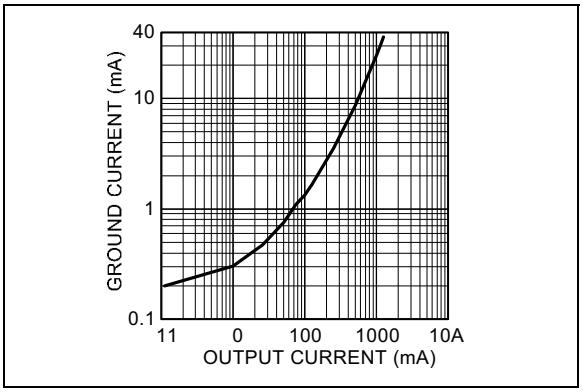


FIGURE 2-4: *Ground Current vs. Output Current.*

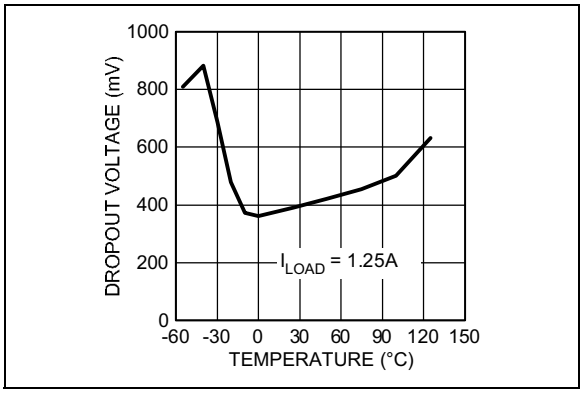


FIGURE 2-2: *Dropout Voltage vs. Temperature.*

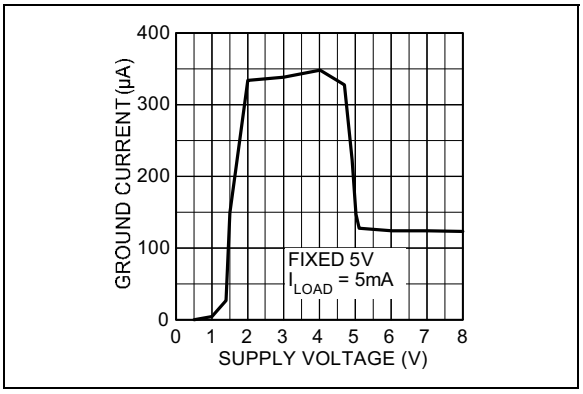


FIGURE 2-5: *Ground Current vs. Supply Voltage.*

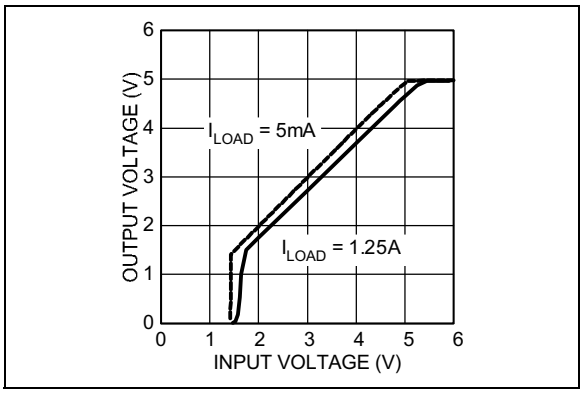


FIGURE 2-3: *Dropout Characteristics.*

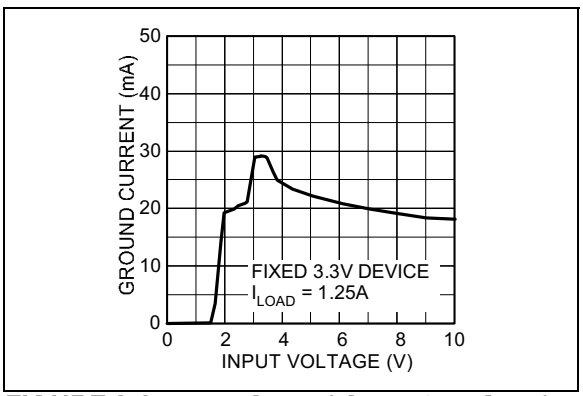


FIGURE 2-6: *Ground Current vs. Supply Voltage.*

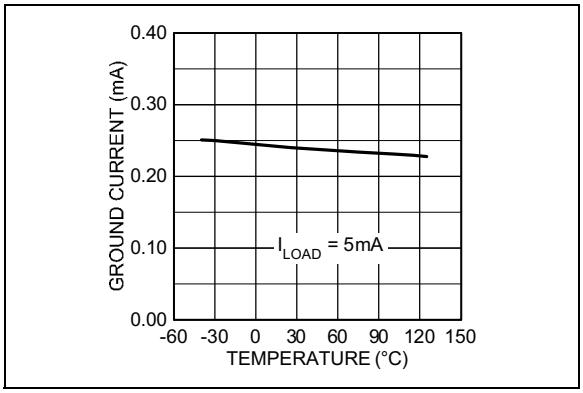


FIGURE 2-7: *Ground Current vs. Temperature.*

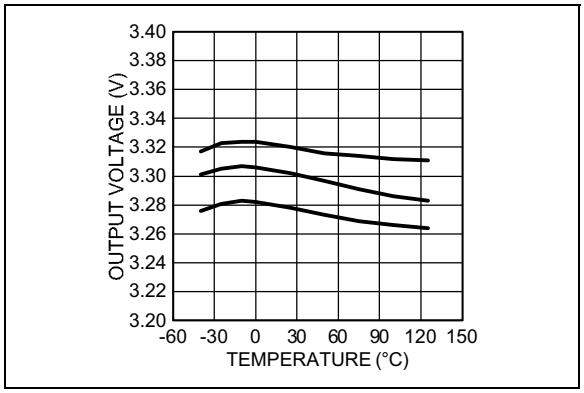


FIGURE 2-10: *Fixed 3.3V Output Voltage vs. Temperature.*

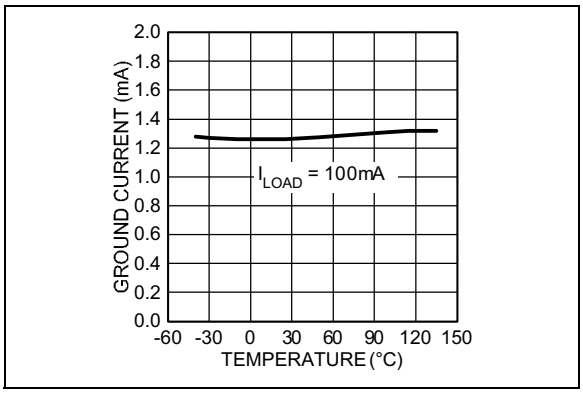


FIGURE 2-8: *Ground Current vs. Temperature.*

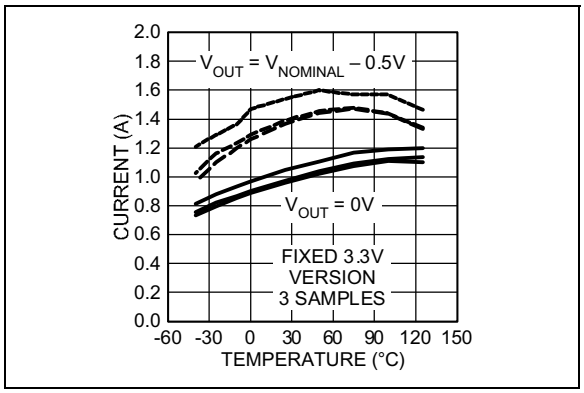


FIGURE 2-11: *Short-Circuit and Maximum Current vs. Temperature.*

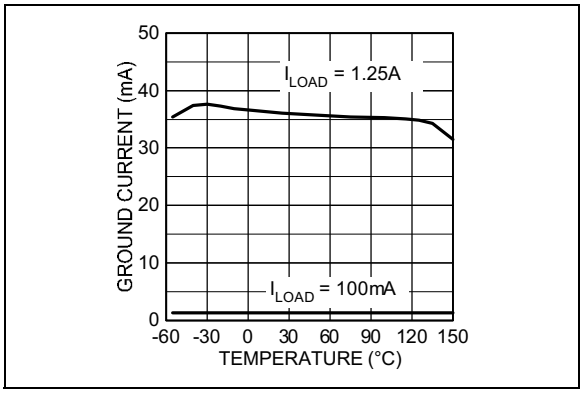


FIGURE 2-9: *Ground Current vs. Temperature.*

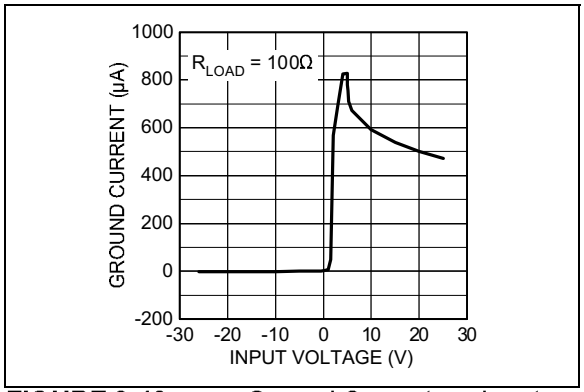


FIGURE 2-12: *Ground Current vs. Input Voltage.*

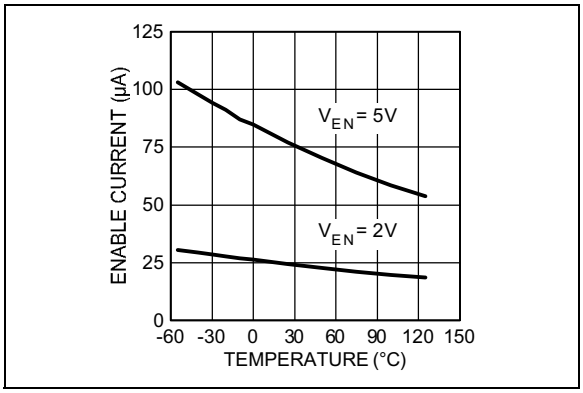


FIGURE 2-13: *MIC2941A Shutdown Current vs. Temperature.*

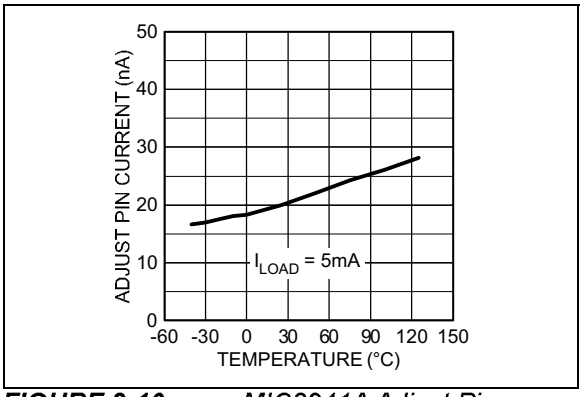


FIGURE 2-16: *MIC2941A Adjust Pin Current vs. Temperature.*

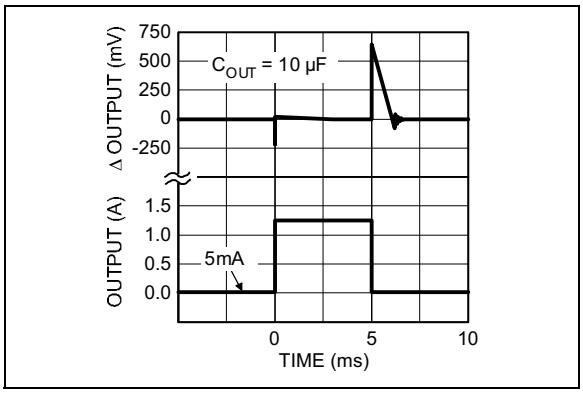


FIGURE 2-14: *Load Transient.*

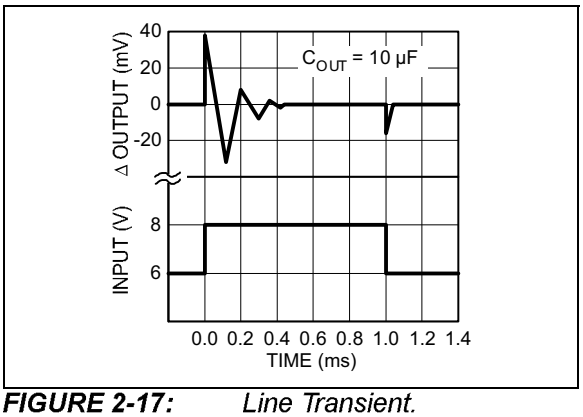


FIGURE 2-17: *Line Transient.*

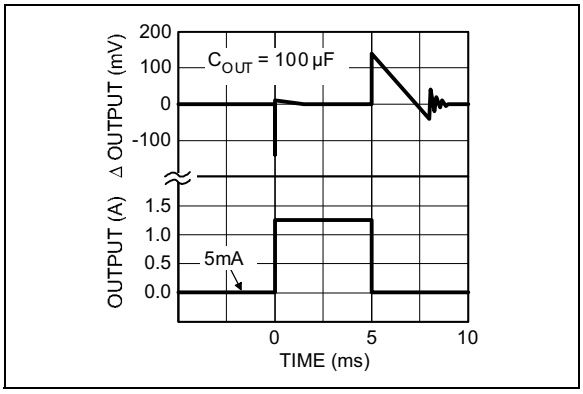


FIGURE 2-15: *Load Transient.*

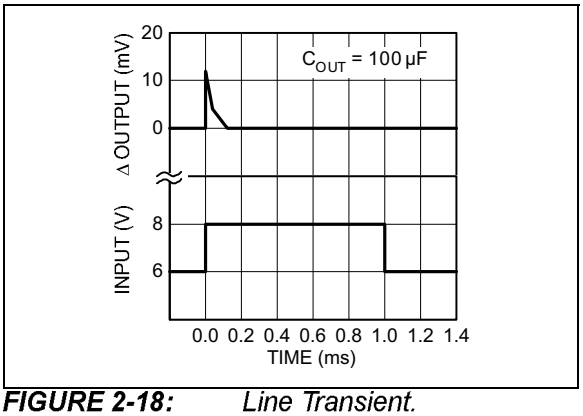


FIGURE 2-18: *Line Transient.*

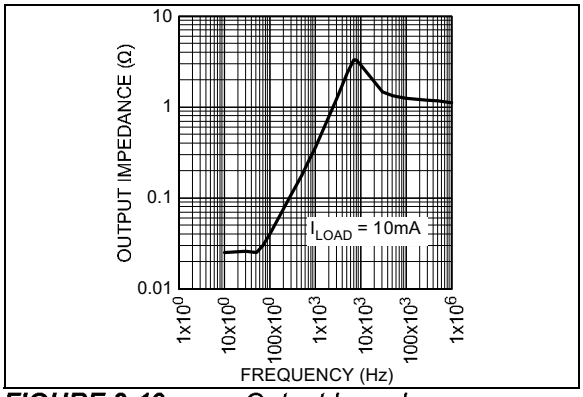


FIGURE 2-19: *Output Impedance vs. Frequency.*

3.0 PIN DESCRIPTIONS

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

TABLE 3-1: PIN FUNCTION TABLE

MIC2940A Pin Number	MIC2941A Pin Number	Pin Name	Description
1	4	Input	Unregulated input supply.
2	3	Ground	Ground.
3	5	Output	Regulated output voltage.
—	1	Adjust	Adjust (input): Connect to an external resistor voltage divider to set the output voltage.
—	2	Shutdown	Shutdown/Enable (input): Logic level low = Enable. Logic level high = Shutdown.

4.0 APPLICATION INFORMATION

4.1 External Capacitors

A 10 µF (or greater) capacitor is required between the MIC2940A output and ground to prevent oscillations due to instability. Most types of tantalum or aluminum electrolytics will be adequate; film types will work, but are costly and therefore not recommended. Many aluminum electrolytics have electrolytes that freeze at about –30°C, so solid tantalums are recommended for operation below –25°C. The important parameters of the capacitor are an effective series resistance of about 5Ω or less and a resonant frequency above 500 kHz. The value of this capacitor may be increased without limit.

At lower values of output current, less output capacitance is required for output stability. The capacitor can be reduced to 3.3 µF for current below 100 mA or 2.2 µF for currents below 10 mA. Adjusting the MIC2941A to voltages below 5V runs the error amplifier at lower gains so that more output capacitance is needed. For the worst-case situation of a 1.25A load at 1.23V output (Output shorted to Adjust) a 22 µF (or greater) capacitor should be used.

The MIC2940A will remain stable and in regulation with load currents ranging from 5 mA on up to the full 1.25A rating. The external resistors of the MIC2941A version may be scaled to draw this minimum load current.

A 0.22 µF capacitor should be placed from the MIC2940A input to ground if there is more than 10 inches of wire between the input and the AC filter capacitor or if a battery is used as the input.

4.2 Programming the Output Voltage (MIC2941A)

The MIC2941A may be programmed for any output voltage between its 1.235V reference and its 26V maximum rating. An external pair of resistors is required, as shown in the MIC2941A Adjustable Regulator Typical Application Circuit.

EQUATION 4-1:

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R1}{R2}\right) - \left|I_{FB}\right| \times R1$$

Where:
V_{REF} = The nominal 1.235V reference voltage.
I_{FB} = The adjust pin bias current (nom. 20 nA).

The minimum recommended load current of 1 µA forces an upper limit of 1.2 MΩ on the value of R2, if the regulator must work with no load (a condition often found in CMOS in standby), I_{FB} will produce a –2% typical error in V_{OUT} which may be eliminated at room temperature by trimming R1. For better accuracy, choosing R2 = 100 kΩ reduces this error to 0.17% while increasing the resistor program current to 12 µA. Because the MIC2941A typically draws 100 µA at no load with SHUTDOWN open-circuited, this is a negligible addition.

4.3 Reducing Output Noise

In reference applications, it may be advantageous to reduce the AC noise present at the output. One method is to reduce the regulator bandwidth by increasing the size of the output capacitor. This is relatively inefficient, as increasing the capacitor from 1 µF to 220 µF only decreases the noise from 430 µV to 160 μV_{RMS} for a 100 kHz bandwidth at 5V output. Noise can be reduced by a factor of four with the MIC2941A by adding a bypass capacitor across R1.

EQUATION 4-2:

$$C_{BYPASS} = \frac{1}{2\pi \times R1 \times 200Hz}$$

Pick a bypass capacitor of about 0.01 µF. When doing this, the output capacitor must be increased to 22 µF to maintain stability. These changes reduce the output noise from 430 µV to 100 μV_{RMS} for a 100 kHz bandwidth at 5V output. With the bypass capacitor added, noise no longer scales with output voltage so that improvements are more dramatic at higher output voltages.

4.4 Automotive Applications

The MIC2940A is ideally suited for automotive applications for a variety of reasons. It will operate over a wide range of input voltages with very low dropout voltages (40 mV at light loads), and very low quiescent currents (240 µA typical). These features are necessary for use in battery powered systems, such as automobiles. It is a “bulletproof” device with the ability to survive both reverse battery (negative transients up to 20V below ground), and load dump (positive transients up to 60V) conditions. A wide operating temperature range with low temperature coefficients is yet another reason to use these versatile regulators in automotive designs.

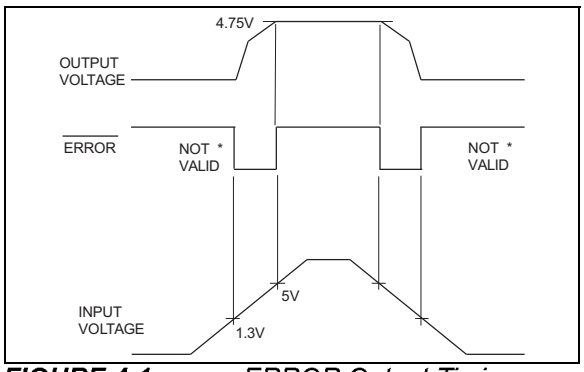
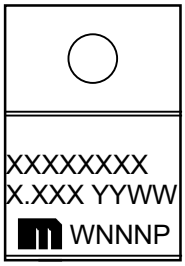


FIGURE 4-1: *ERROR Output Timing.*

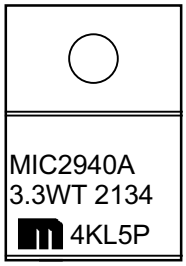
5.0 PACKAGING INFORMATION

5.1 Package Marking Information

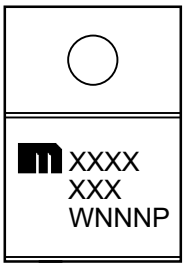
TO-220* (Fixed)



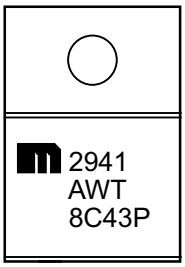
Example



TO-220* (Adj.)



Example



TO-263* (Fixed)

Example

TO-263* (Adj.)

Example

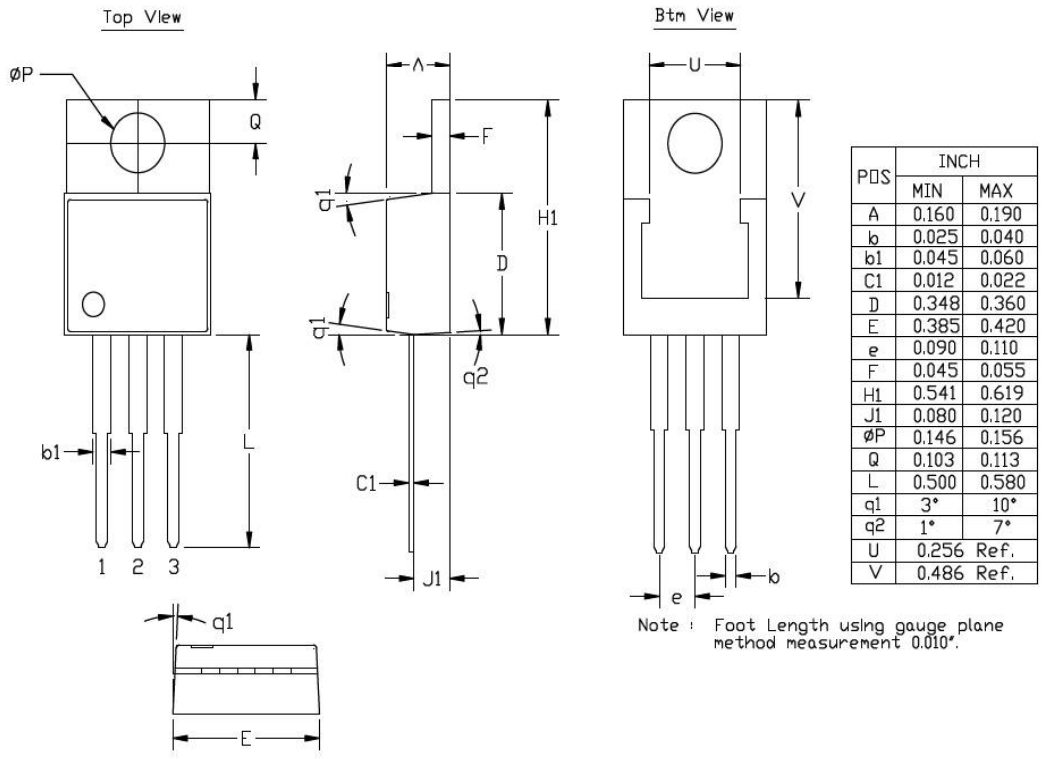
Legend:	XX...X	Product code or customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package.
	●, ▲, ▼	Pin one index is identified by a dot, delta up, or delta down (triangle mark).
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. Package may or may not include the corporate logo. Underbar (_) and/or Overbar (¯) symbol may not be to scale.	

Note: If the full seven-character YYWWNNN code cannot fit on the package, the following truncated codes are used based on the available marking space:
6 Characters = YWWNNN; 5 Characters = WWNNN; 4 Characters = WNNN; 3 Characters = NNN;
2 Characters = NN; 1 Character = N

3-Lead TO-220 Package Outline and Recommended Land Pattern

TITLE
3 LEAD TO220 PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

DRAWING #	TO220-3LD-PL-1	**UNIT**	INCH
Lead Frame	Copper Alloy	**Lead Finish**	Matte Tin



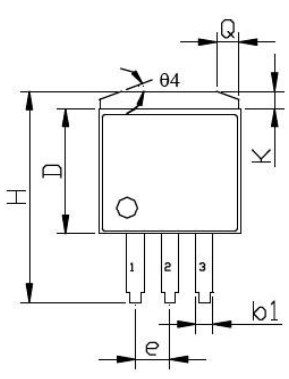
POS	INCH	
	MIN	MAX
A	0.160	0.190
b	0.025	0.040
b1	0.045	0.060
C1	0.012	0.022
D	0.348	0.360
E	0.385	0.420
e	0.090	0.110
F	0.045	0.055
H1	0.541	0.619
J1	0.080	0.120
ØP	0.146	0.156
Q	0.103	0.113
L	0.500	0.580
q1	3°	10°
q2	1°	7°
U	0.256 Ref.	
V	0.486 Ref.	

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

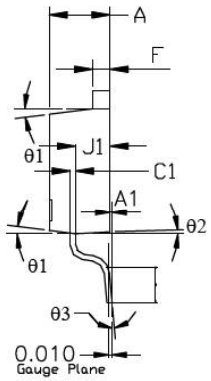
3-Lead TO-263 Package Outline and Recommended Land Pattern

TITLE
3 LEAD TO263 PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

DRAWING #	TO263-3LD-PL-1	**UNIT**	INCH/MM

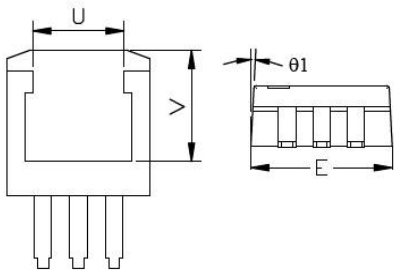


TOP VIEW



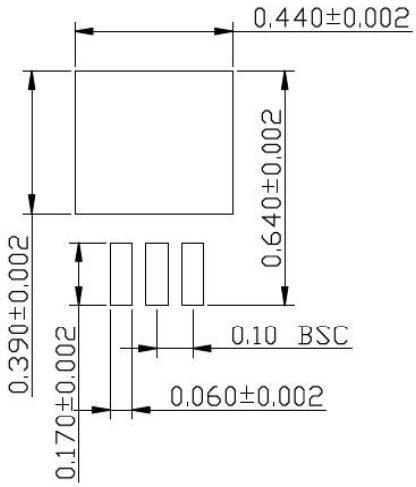
SIDE VIEW 1

POS	INCH MIN	INCH MAX	MM MIN	MM MAX
A	0.170	0.181	4.318	4.597
A1	0.000	0.012	0.000	0.305
b1	0.047	0.053	1.194	1.346
C1	0.012	0.023	0.305	0.584
D	0.330	0.361	8.382	9.169
E	0.396	0.420	10.058	10.668
e	0.095	0.105	2.413	2.667
F	0.045	0.055	1.143	1.397
H	0.575	0.625	14.605	15.875
J1	0.080	0.120	2.032	3.048
L1	0.090	0.110	2.286	2.794
K	0.045	0.066	1.143	1.676
θ1	3°	10°	3°	10°
θ2	1°	7°	1°	7°
θ3	0°	8°	0°	8°
θ4	18°	22°	18°	22°
Q	0.055	0.075	1.397	1.905
U	0.256 Ref.		6.502 Ref.	
V	0.303 Ref.		7.696 Ref.	



BOTTOM VIEW

SIDE VIEW 2



RECOMMENDED LAND PATTERN (UNIT: INCH)

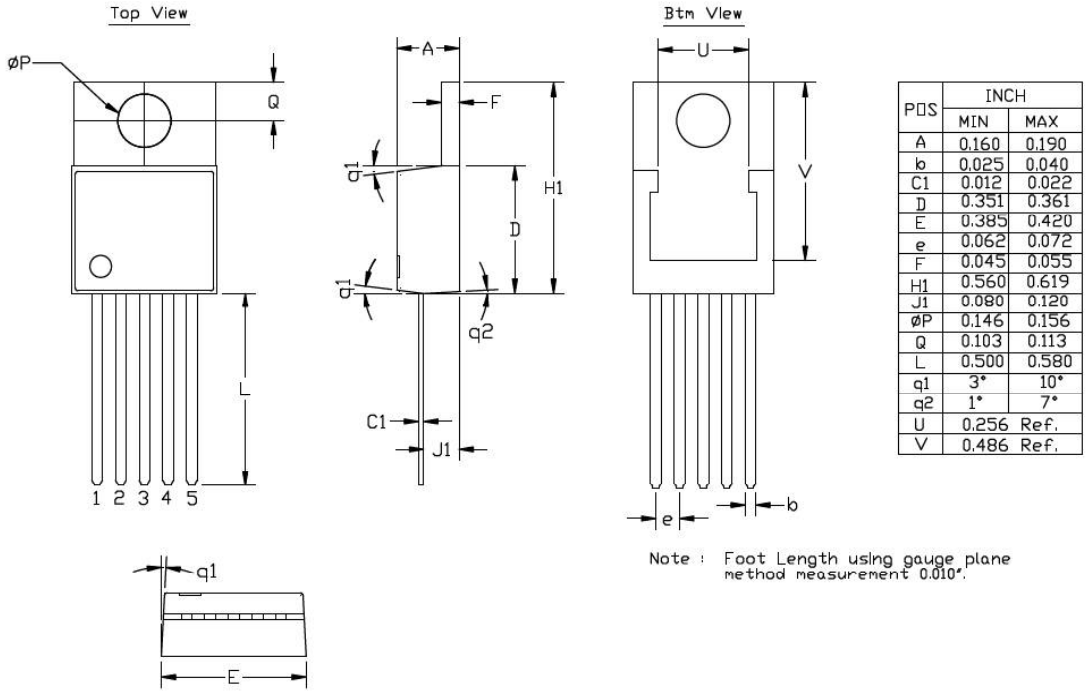
NOTES:
FOOT LENGTH USE GUAGE PLANE METHOD MEASUREMENT 0.010"

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

5-Lead TO-220 Package Outline and Recommended Land Pattern

TITLE
5 LEAD TO220 PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

DRAWING #	TO220-5LD-PL-1	**UNIT**	INCH
Lead Frame	Copper Alloy	**Lead Finish**	Matte Tin



POS	INCH	
	MIN	MAX
A	0.160	0.190
b	0.025	0.040
C1	0.012	0.022
D	0.351	0.361
E	0.385	0.420
e	0.062	0.072
F	0.045	0.055
H1	0.560	0.619
J1	0.080	0.120
ØP	0.146	0.156
Q	0.103	0.113
L	0.500	0.580
q1	3°	10°
q2	1°	7°
U	0.256 Ref.	
V	0.486 Ref.	

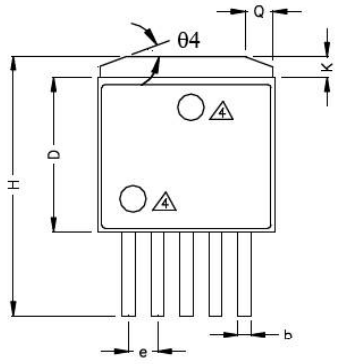
Note : Foot Length using gauge plane method measurement 0.010".

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

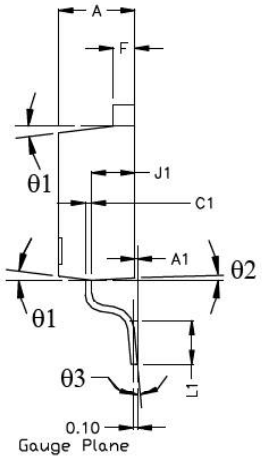
5-Lead TO-263 Package Outline and Recommended Land Pattern

TITLE
5 LEAD T0263 PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

DRAWING #	T0263-5LD-PL-1	**UNIT**	INCH/MM

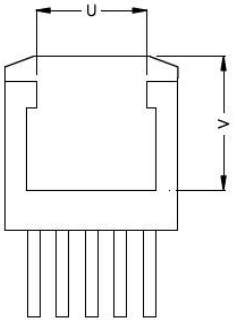


TOP VIEW

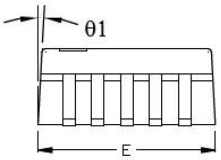


SIDE VIEW 1

POS	INCH		MM	
	MIN	MAX	MIN	MAX
A	0.170	0.181	4.318	4.597
A1	0.000	0.012	0.000	0.305
b	0.026	0.036	0.660	0.914
C1	0.012	0.023	0.305	0.584
D	0.330	0.361	8.392	9.169
E	0.396	0.420	10.058	10.668
e	0.062	0.072	1.575	1.829
F	0.045	0.055	1.143	1.397
H	0.575	0.625	14.605	15.875
J1	0.080	0.120	2.032	3.048
K	0.045	0.066	1.143	1.676
L1	0.090	0.110	2.286	2.794
θ1	3°	10°	3°	10°
θ2	1°	7°	1°	7°
θ3	0°	8°	0°	8°
θ4	18°	22°	18°	22°
Q	0.055	0.075	1.397	1.905
U	0.256 Ref.		6.502 Ref.	
V	0.305 Ref.		7.747 Ref.	

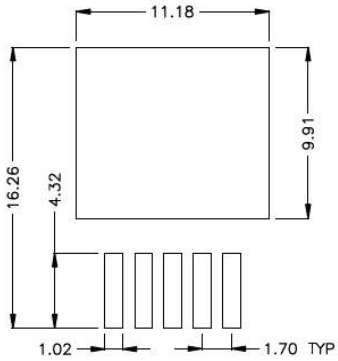


BOTTOM VIEW



SIDE VIEW 2

NOTE:
1. PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH & METAL BURR.
2. PACKAGE OUTLINE INCLUSIVE OF PLATING THICKNESS.
3. FOOT LENGTH USING GAUGE PLANE METHOD MEASUREMENT 0.010"
⚠4 PACKAGE TOP MARK MAY BE IN TOP CENTER OR LOWER LEFT CORNER
5. ALL DIMENSIONS ARE IN INCHES/MILLIMETERS.



RECOMMENDED LAND PATTERN
(UNIT : mm)

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

APPENDIX A: REVISION HISTORY

Revision A (April 2018)

- Converted Micrel document MIC2940A/41A to Microchip data sheet DS20006000A.
- Minor text changes throughout.
- Corrected bold values in Electrical Characteristics table.

Revision B (February 2022)

- Updated the Package Marking Information drawings with the most current marking information.

NOTES:

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

Device	-X.X	X	X	-XX
Part No.	Output Voltage	Junction Temp. Range	Package	Media Type

Device:	MIC2940A:	1.25A Low Dropout Voltage Regulator, Fixed Output Voltage
	MIC2941A:	1.25A Low Dropout Voltage Regulator, Adjustable Output Voltage + Shutdown
Output Voltage:	3.3 =	3.3V (MIC2940A only)
	5.0 =	5.0V (MIC2940A only)
	12 =	12V (MIC2940A only)
	<blank>=	Adjustable (MIC2941A only)
Junction Temperature Range:	W =	–40°C to +125°C, RoHS-Compliant*
Package:	T =	3-Lead TO-220 (MIC2940A) 5-Lead TO-220 (MIC2941A)
	U =	3-Lead TO-263 (MIC2940A) 5-Lead TO-263 (MIC2941A)
Media Type:	<blank>=	50/Tube
	TR =	750/Reel (TO-263 Package only)

* RoHS-compliant with “high-melting solder” exemption.

Examples:

a) MIC2940A-3.3WT:	MIC2940A, 3.3V Output Voltage, –40°C to +125°C Temperature Range, 3-Lead TO-220, 50/Tube
b) MIC2940A-3.3WU-TR:	MIC2940A, 3.3V Output Voltage, –40°C to +125°C Temperature Range, 3-Lead TO-263, 750/Reel
c) MIC2940A-5.0WU:	MIC2940A, 5.0V Output Voltage, –40°C to +125°C Temperature Range, 3-Lead TO-263, 50/Tube
d) MIC2940A-12WT:	MIC2940A, 12V Output Voltage, –40°C to +125°C Temperature Range, 3-Lead TO-220, 50/Tube
e) MIC2940A-12WU-TR:	MIC2940A, 12V Output Voltage, –40°C to +125°C Temperature Range, 3-Lead TO-263, 750/Reel
f) MIC2941AWT:	MIC2941A, Adjustable Output Voltage, –40°C to +125°C Temperature Range, 3-Lead TO-220, 50/Tube
g) MIC2941AWU:	MIC2941A, Adjustable Output Voltage, –40°C to +125°C Temperature Range, 5-Lead TO-263, 50/Tube
h) MIC2941AWU-TR:	MIC2941A, Adjustable Output Voltage, –40°C to +125°C Temperature Range, 5-Lead TO-263, 750/Reel

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.

NOTES:

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Finland - Espoo
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France - Paris
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Germany - Garching
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Fax: 49-89-627-144-44

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Netherlands - Drunen
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Fax: 31-416-690340

Norway - Trondheim
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Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

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

Sweden - Gothenberg
Tel: 46-31-704-60-40

Sweden - Stockholm
Tel: 46-8-5090-4654

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