Low Voltage Reference

Features

- Output Voltage: 2.5 V±25 mV
- Input Voltage Range: 4.5 V to 40 V
- Quiescent Current: 1.2 mA Typical
- Output Current: 10 mA
- Temperature Coefficient: 10 ppm/°C Typical
- Guaranteed Temperature Drift Specification
- Equivalent to AD580
- Standard DIP-8, SOP-8,MSOP-8 and SOT-23-6 Package

DIP-8

SOP-8


MSOP-8


SOT-23-6

Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
MC1403N	DIP-8	MC1403	TUBE	2000pcs/box
MC1403M/TR	SOP-8	MC1403	REEL	2500pcs/reel
MC1403MM/TR	MSOP-8	1403	REEL	3000pcs/reel
MC1403M6/TR	SOT-23-6	1403	REEL	3000pcs/reel
MC1403BN	DIP-8	MC1403B	TUBE	2000pcs/box
MC1403BM/TR	SOP-8	MC1403B	REEL	2500pcs/reel
MC1403BMM/TR	MSOP-8	1403B	REEL	3000pcs/reel
MC1403BM6/TR	SOT-23-6	1403B	REEL	3000pcs/reel

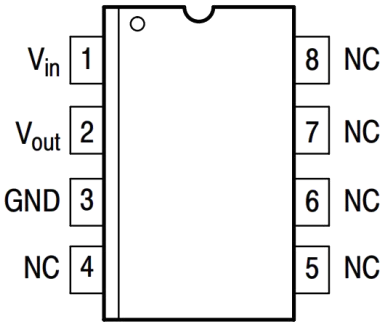
General Description

A precision band−gap voltage reference designed for critical instrumentation and D/A converter applications. This unit is designed to work with D/A converters, up to 12 bits in accuracy, or as a reference for power supply applications.

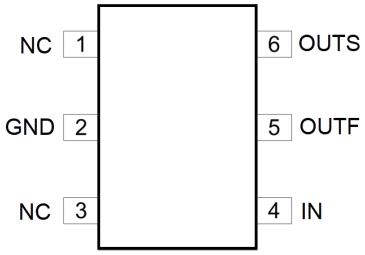
Typical Applications

- Voltage Reference for 8 to 12 Bit D/A Converters
- Low TC Zener Replacement
- High Stability Current Reference
- Voltmeter System Reference
- Pb−Free Package is Available

Pin Connections



DIP-8/SOP-8/MSOP-8



SOT-23-6

Maximum Ratings (TA = 25℃, unless otherwise noted.)

Rating		Symbol	Value	Unit
Input Voltage		V_I	40	V
Storage Temperature		T_{stg}	−65 to 150	℃
Junction Temperature		T_J	+175	℃
Operating Ambient Temperature Range	MC1403B	T_A	−40 to +85	℃
	MC1403		0 to +70	℃
Lead Temperature (Soldering, 10 seconds)		TL	260	℃

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

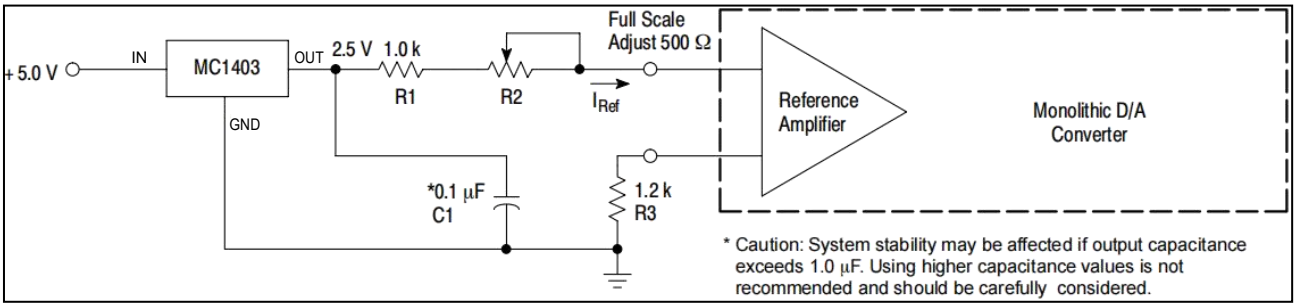


Figure 1. A Reference for Monolithic D/A Converters

Providing the Reference Current
for ON Semiconductor Monolithic D/A Converters

The MC1403 makes an ideal reference for many mono- lithic D/A converters, requiring a stable current reference of nominally 2.0 mA. This can be easily obtained from the MC1403 with the addition of a series resistor, R1. A variable resistor, R2, is recommended to provide means for full− scale adjust on the D/A converter.

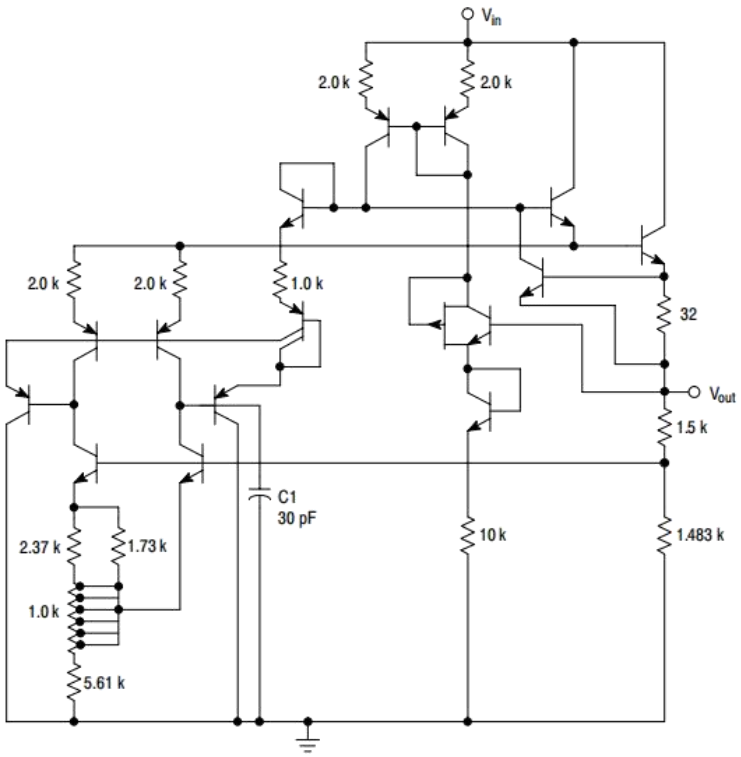
The resistor R3 improves temperature performance by matching the impedance on both inputs of the D/A reference amplifier. The capacitor decouples any noise present on the reference line. It is essential if the D/A converter is located any appreciable distance from the reference.

A single MC1403 reference can provide the required current input for up to five of the monolithic D/A converters.

Electrical Characteristics (Vin = 15 V, TA = 25℃, unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage(I_O = 0 mA)	V_{out}	2.475	2.5	2.525	V
Temperature Coefficient of Output Voltage*MC1403	$\Delta V_O/\Delta T$	—	10	40	ppm/℃
Output Voltage Change* (Over specified temperature range) MC1403 0 to +70℃ MC1403B −40 to +85℃	ΔV_O	 — —	 — —	 7.0 12.5	mV
Line Regulation (I_O = 0 mA) (15 V≤V_I≤40 V) (4.5 V≤V_I≤15 V)	Reg_{line}	— —	1.2 0.6	4.5 3.0	mV
Load Regulation (0 mA < I_O < 10 mA)	Reg_{load}	—	—	10	mV
Quiescent Current (I_O = 0 mA)	I_Q	—	1.2	1.5	mA

*Guaranteed but not tested.



This device contains 15 active transistors.

Figure 2. MC1403, B Schematic

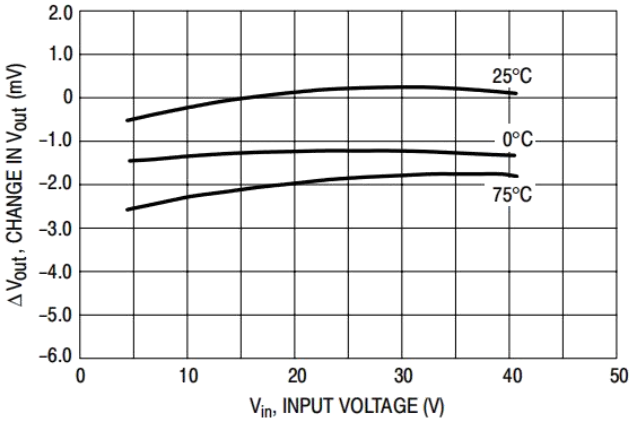


Figure 3. Typical Change in Vout versus Vin
(Normalized to Vin = 15 V @ TC = 25℃)

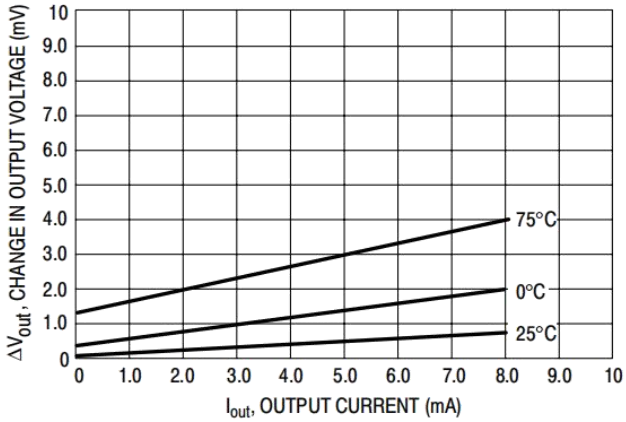


Figure 4. Change in Output Voltage v
ersus Load Current
(Normalized to Vout @ Vin = 15 V, Iout = 0 mA)

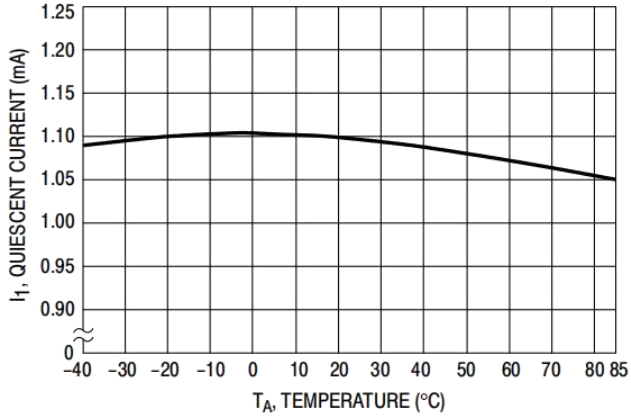


Figure 5. Quiescent Current versus Temperature
(Vin = 15 V, Iout = 0 mA)

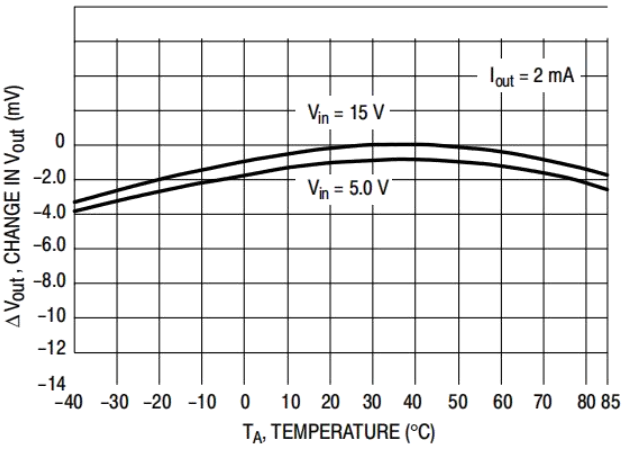


Figure 6. Change in Vout versus
Temperature(Normalized to Vout @ Vin = 15 V)

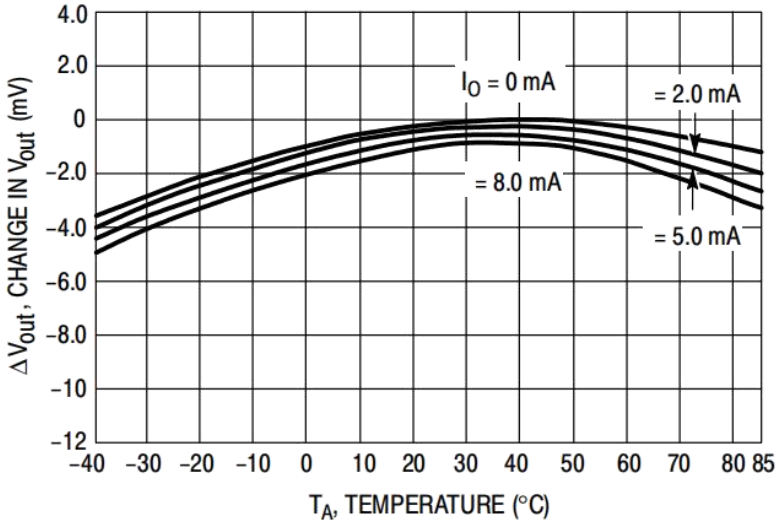


Figure 7. Change in Vout versus Temperature
(Normalized to TA = 25℃, Vin = 15 V, Iout = 0 mA)

3−1/2−Digit Voltmeter − Common Anode Displays, Flashing Overrange

An example of a 3−1/2−digit voltmeter using the MC14433 is shown in the circuit diagram of Figure 8. The reference voltage for the system uses an MC1403 2.5 V reference IC. The full scale potentiometer can calibrate for a full scale of 199.9 mV or 1.999 V. When switching from 2.0 V to 200 mV operation, RI is also changed, as shown on the diagram.

When using RC equal to 300 kΩ, the clock frequency for the system is about 66 kHz. The resulting conversion time is approximately 250 ms.

When the input is overrange, the display flashes on and off. The flashing rate is one−half the conversion rate. This is done by dividing the EOC pulse rate by 2 with 1/2 MC14013B flip−flop and blanking the display using the blanking input of the MC14543B.

The display uses an LED display with common anode digit lines driven with an MC14543B decoder and an MC1413 LED driver. The MC1413 contains 7 Darlington transistor drivers and resistors to drive the segments of the display. The digit drive is provided by four MPS−A12 Darlington transistors operating in an emitter−follower configuration. The MC14543B, MC14013B and LED displays are referenced to VEE via Pin 13 of the MC14433.This places the full power supply voltage across the display.The current for the display may be adjusted by the value of the segment resistors shown as 150 Ω in Figure 8.

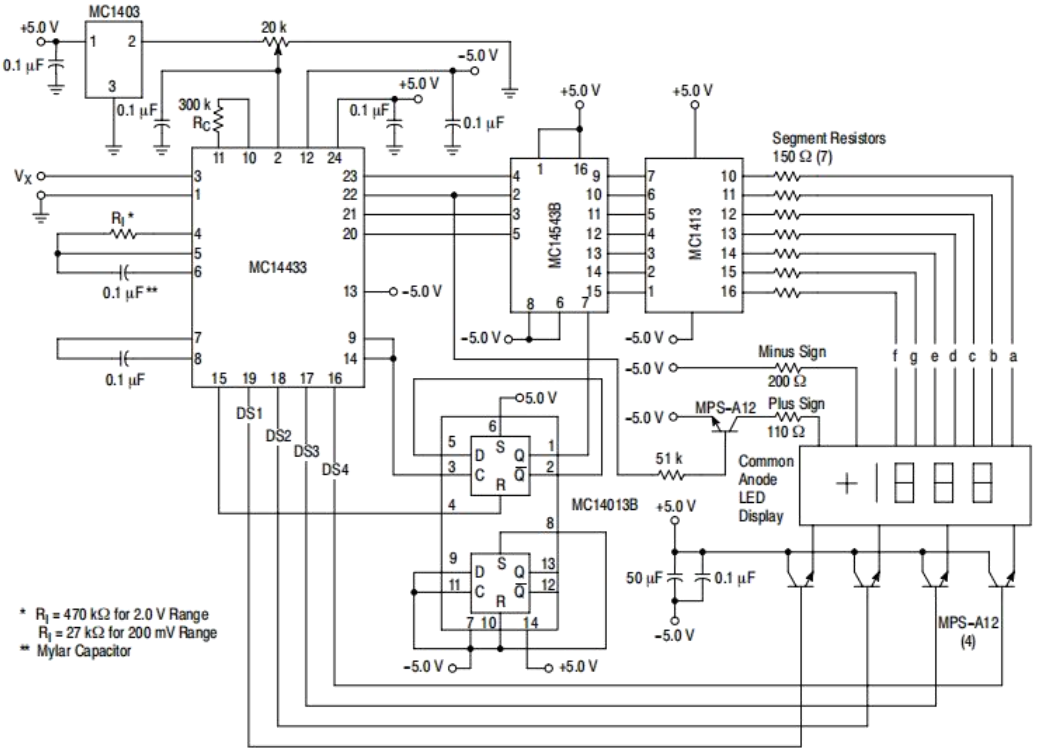
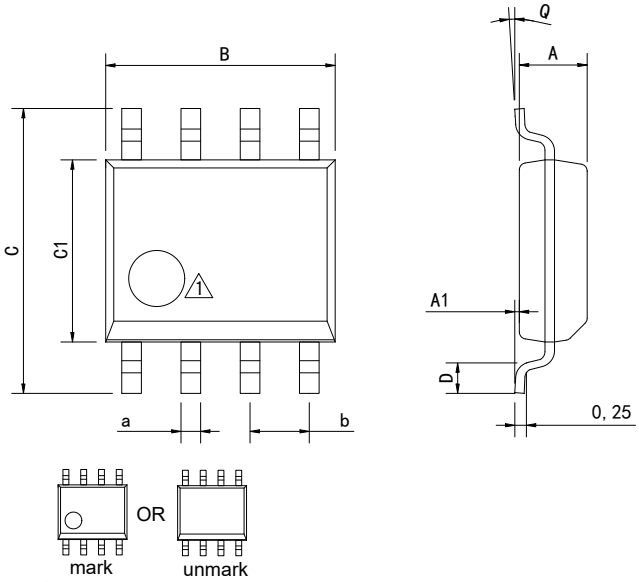


Figure 8. 3−1/2−Digit Voltmeter

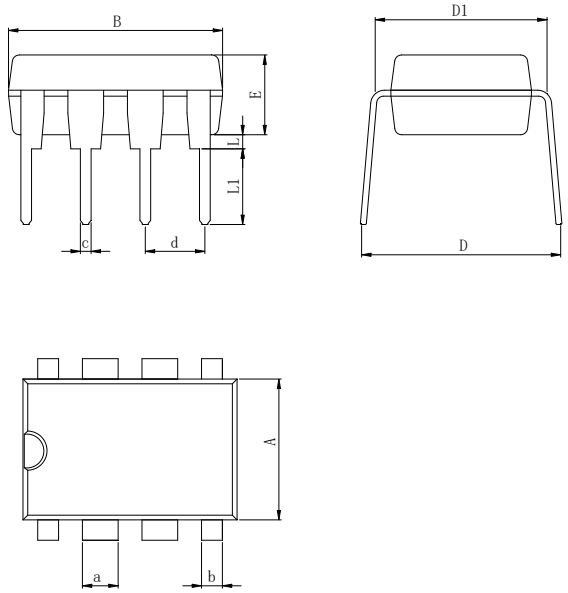
Physical Dimensions

SOP-8



Dimensions In Millimeters(SOP-8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	4.90	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	5.10	6.20	4.00	0.80	8°	0.45	

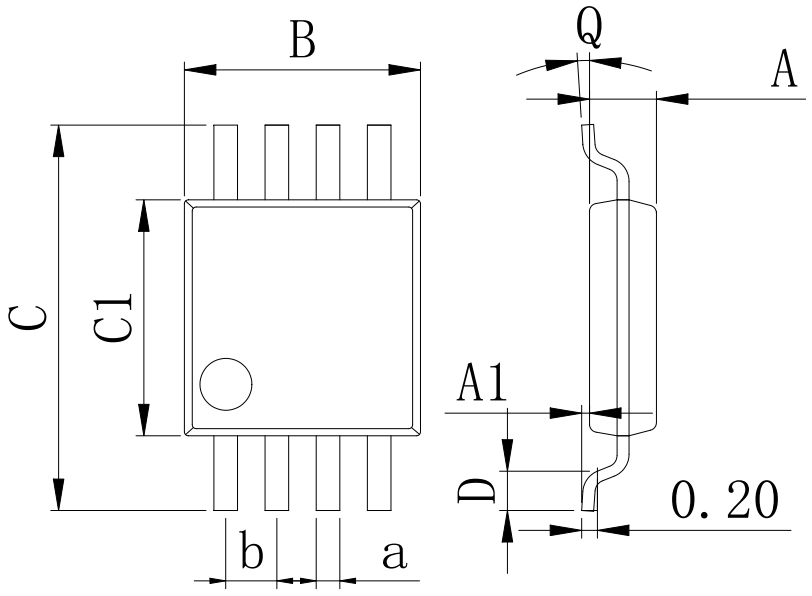
DIP-8



Dimensions In Millimeters(DIP-8)											
Symbol:	A	B	D	D1	E	L	L1	a	b	c	d
Min:	6.10	9.00	8.10	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
Max:	6.68	9.50	10.9	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

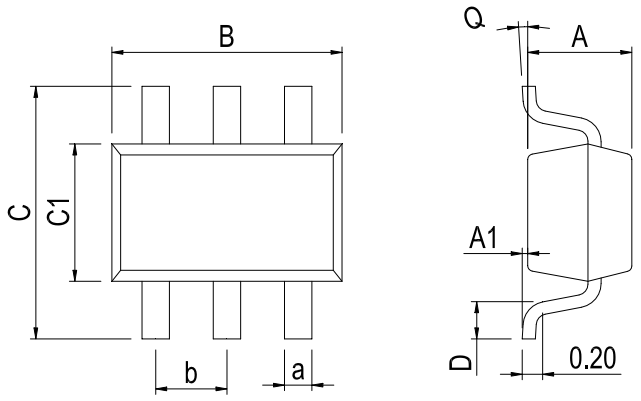
Physical Dimensions

MSOP-8



Dimensions In Millimeters(MSOP-8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.80	0.05	2.90	4.75	2.90	0.35	0°	0.25	0.65 BSC
Max:	0.90	0.20	3.10	5.05	3.10	0.75	8°	0.35	

SOT-23-6



Dimensions In Millimeters(SOT-23-6)									
Symbol:	**A**	**A1**	**B**	**C**	**C1**	**D**	**Q**	**a**	**b**
Min:	1.00	0.00	2.82	2.65	1.50	0.30	0°	0.30	0.95 BSC
Max:	1.15	0.15	3.02	2.95	1.70	0.60	8°	0.50	

Revision History

REVISION NUMBER	DATE	REVISION	PAGE
V1.0	2015-7	New	1-10
V1.1	2018-8	Update encapsulation type、Updated DIP-8 dimension	1、7
V1.2	2024-11	Update Lead Temperature	3
V1.3	2025-12	Update important statements、Update SOP-8 Dimension drawing	7、10
V1.4	2026-4	Add SOT-23-6 package	1

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