

# LM4041

## 1.225V Precision micropower shunt voltage reference

### Description

The LM4041 is a bandgap circuit designed to achieve a precision micro-power voltage reference of 1.225 V. The device is available in the small outline SOT23 surface mount packages which is ideal for applications where space saving is important.

The device has been designed to be highly tolerant of capacitive loads so maintaining excellent stability.

This device offers a pin for pin compatible alternative to the LM4041 voltage reference.

The LM4041 is available to 0.5% C grade for precision applications. Excellent performance is maintained over the 60 $\mu$ A to 12mA operating current range with a typical temperature coefficient of only 20ppm/ $^{\circ}$ C.

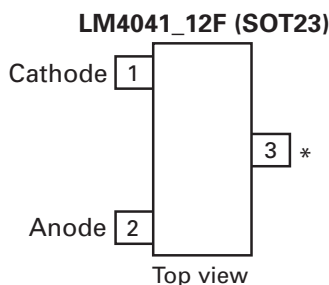
### Features

- Small packages: SOT23
- No output capacitor required
- Output voltage tolerance
  - LM4041C  $\pm$ 0.5% at 25 $^{\circ}$ C
  - LM4041D  $\pm$ 1% at 25 $^{\circ}$ C
- Low output noise  
(10 Hz to 10kHz) ..... 60 $\mu$ Vrms
- Wide operating current range 60 $\mu$ A to 12mA
- Extended temperature range -40 $^{\circ}$ C to +125 $^{\circ}$ C
- Low temperature coefficient 100ppm/ $^{\circ}$ C (max)

### Applications

- Battery powered equipment
- Precision power supplies
- Portable instrumentation
- Portable communications devices
- Notebook and palmtop computers
- Data acquisition systems

### Pinout information



\* Pin 3 must be left floating or connected to pin 2

### Ordering information

25 $^{\circ}$ C tol.	Voltage (V)	Order code	Pack	Part mark	Status	Reel size	Tape width	Quantity per reel
0.5%	1.225	LM4041CFTA	SOT23	R1C	Preview	7", 180mm	8mm	3000
1%	1.225	LM4041DFTA	SOT23	R1D	Preview	7", 180mm	8mm	3000

## Absolute maximum ratings

Continuous reverse current ( $I_{KA}$ ) ..... 20mA  
Continuous forward current ( $I_{REF}$ ) ..... 10mA  
Operating junction temperature ..... -40°C to 150°C  
Storage temperature ..... -55°C to 150°C

Operation above the absolute maximum rating may cause device failure. Operation at the absolute maximum ratings, for extended periods, may reduce device reliability.

Unless otherwise stated voltages specified are relative to the ANODE pin.

## Package thermal data

Package	$\Theta_{JA}$	$P_{DIS}$ $T_{amb} = 25^{\circ}C, T_J = 150^{\circ}C$
SOT23	380°C/W	330mW

## Recommended operating conditions

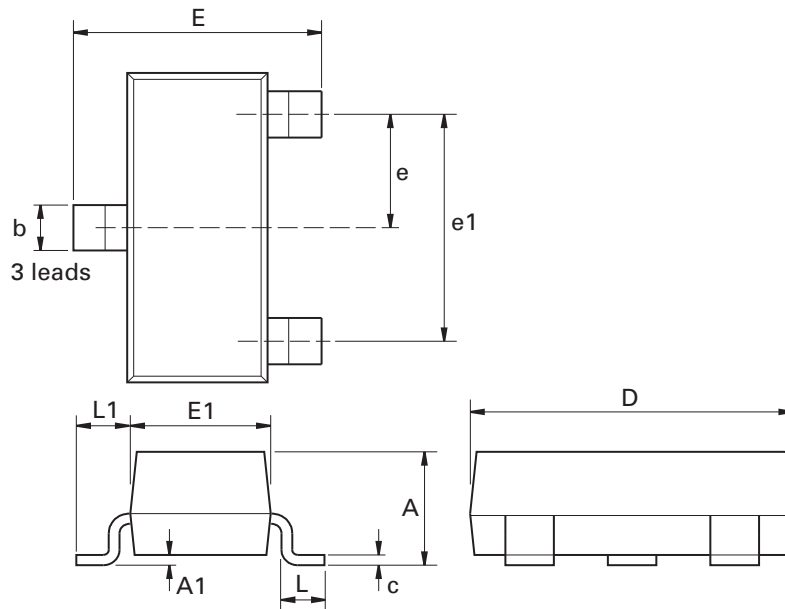
	Min.	Max.	Units
Reverse current	0.06	15	mA
Operating ambient temperature range	-40	125	°C

## Electrical characteristics

Over recommended operating conditions,  $T_{amb} = 25^{\circ}\text{C}$ , unless otherwise stated. LM4041C and LM4041D have initial tolerances of 0.5% and 1% respectively.

Symbol	Parameter	Conditions		Typ.	LM4041C Limits	LM4041D Limits	Units
			$T_{amb}$				
$V_{REF}$	Reverse breakdown voltage	$I_R = 100 \mu\text{A}$	$25^{\circ}\text{C}$	1.225			V
	Reverse breakdown voltage tolerance	$I_R = 100 \mu\text{A}$	$25^{\circ}\text{C}$		$\pm 6$	$\pm 12$	mV
			-40 to $85^{\circ}\text{C}$		$\pm 14$	$\pm 24$	
			-40 to $125^{\circ}\text{C}$		$\pm 18.4$	$\pm 31$	
$I_{RMIN}$	Minimum operating current		$25^{\circ}\text{C}$	45	60	65	$\mu\text{A}$
			-40 to $85^{\circ}\text{C}$		65	70	
			-40 to $125^{\circ}\text{C}$		68	73	
$\Delta V_R/\Delta T$	Average reverse breakdown voltage temperature coefficient	$I_R = 10 \text{ mA}$	-40 to $125^{\circ}\text{C}$	$\pm 20$			ppm/ $^{\circ}\text{C}$
		$I_R = 1 \text{ mA}$ ,		$\pm 15$	$\pm 100$	$\pm 150$	
		$I_R = 100 \mu\text{A}$		$\pm 15$			
$\Delta V_R/\Delta I_R$	Reverse breakdown change with current	$I_{RMIN} < I_R < 1 \text{ mA}$	$25^{\circ}\text{C}$	0.7	1.5	2.0	mV
			-40 to $85^{\circ}\text{C}$		2.0	2.5	
			-40 to $125^{\circ}\text{C}$		2.0	2.5	
		$1 \text{ mA} < I_R < 12 \text{ mA}$	$25^{\circ}\text{C}$	2.5	6.0	8.0	
			-40 to $85^{\circ}\text{C}$		8.0	10.0	
			-40 to $125^{\circ}\text{C}$		8.0	10.0	
$Z_R$	Dynamic output impedance	$I_R = 1 \text{ mA}$ , $f = 120 \text{ Hz}$ $I_{AC} = 0.1 I_R$		0.5	1.5	2.0	$\Omega$
$e_n$	Noise voltage	$I_R = 100 \mu\text{A}$ $10 \text{ Hz} < f < 10 \text{ kHz}$		60			$\mu\text{V}_{RMS}$
$\Delta V_R$	Long term stability (non cumulative)	$t = 1000 \text{ Hrs}$ $I_R = 100 \mu\text{A}$		120			ppm

## Package outline - SOT23



Dim.	Millimeters		Inches		Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Max.	Max.
A	-	1.12	-	0.044	e1	1.90 NOM		0.075 NOM	
A1	0.01	0.10	0.0004	0.004	E	2.10	2.64	0.083	0.104
b	0.30	0.50	0.012	0.020	E1	1.20	1.40	0.047	0.055
C	0.085	0.120	0.003	0.008	L	0.25	0.62	0.018	0.024
D	2.80	3.04	0.110	0.120	L1	0.45	0.62	0.018	0.024
e	0.95 NOM		0.0375 NOM		-	-	-	-	-

**Note:** Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

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