

PRELIMINARY - April 13, 1998

TEL:805-498-2111 FAX:805-498-3804 WEB:http://www.semtech.com

**DESCRIPTION**

The SC4041 is a two terminal precision voltage reference with thermal stability guaranteed over temperature. The very low fixed output voltage of 1.225 V is ideal for use with today's low voltage integrated circuits. The SC4041 has a typical dynamic output impedance of 0.25Ω. Active output circuitry provides a very sharp turn on characteristic - the minimum operating current is 60μA, with a maximum of 20mA.

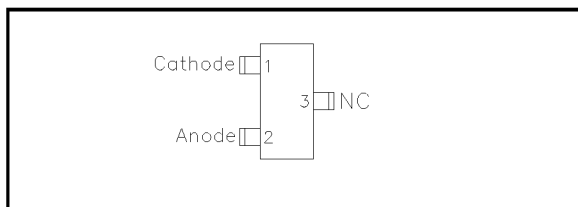
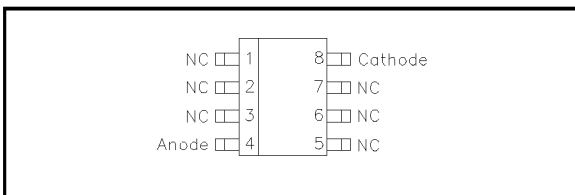
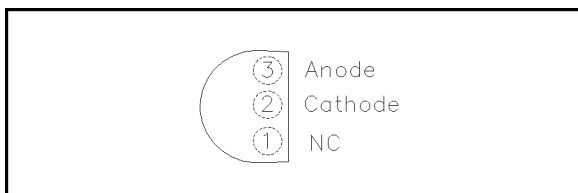
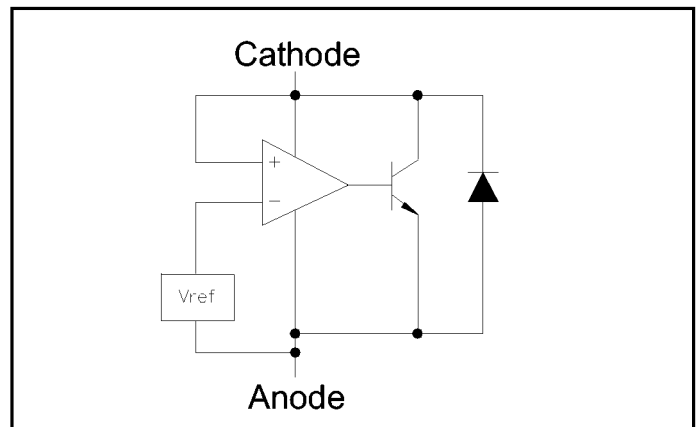
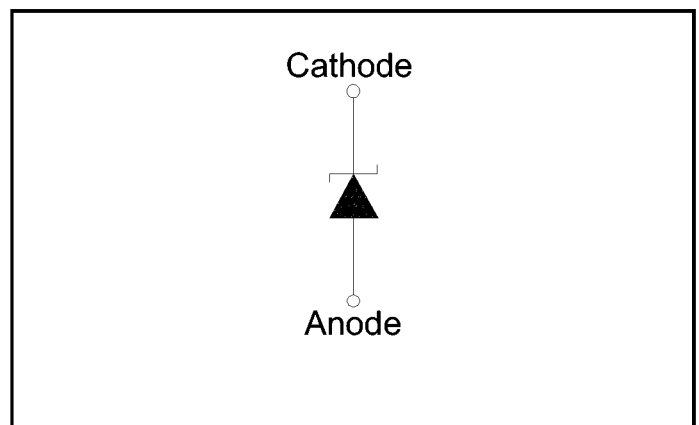
Available with five voltage tolerances (0.1%, 0.2%, 0.5%, 1.0% and 2.0%) and three package outlines (SOT-23, SO-8 and TO-92), this part allows the designer the opportunity to select the optimum combination of cost and performance for their application.

**FEATURES**

- Low voltage operation (1.225V)
- Trimmed bandgap design (0.1%)
- Wide operating current range 60μA to 20mA
- Low dynamic impedance (0.25Ω)
- Available in SOT-23, TO-92 and SO-8

**APPLICATIONS**

- Cellular telephones
- Portable computers
- Instrumentation
- Automotive

**PIN CONFIGURATIONS**
**SOT-23-3 Lead (Top View)**

**SO-8 Lead (Top View)**

**TO-92 (Top View)**

**BLOCK DIAGRAM**

**SYMBOL DIAGRAM**




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**ABSOLUTE MAXIMUM RATINGS**

Parameter	Symbol	Maximum	Units
Reverse Current		60 $\mu$ A to 20	mA
Operating Temperature Range	$T_A$	-40 to +85	$^{\circ}$ C
Operating Junction Temperature Range	$T_J$	-40 to +150	$^{\circ}$ C
Storage Temperature Range	$T_{STG}$	-65 to +150	$^{\circ}$ C
Lead Temperature (Soldering) 10 seconds	$T_{LEAD}$	260	$^{\circ}$ C
ESD Rating	ESD	2	kV

**ORDERING INFORMATION**

PACKAGE	TOLERANCE					T/R Quantity
	0.1%	0.2%	0.5%	1.0%	2.0%	
SOT-23-3L <sup>(1)</sup>	SC4041ASK	SC4041BSK	SC4041CSK	SC4041DSK	SC4041ESK	3K
SO-8 <sup>(1)</sup>	SC4041AS	SC4041BS	SC4041CS	SC4041DS	SC4041ES	2.5K
TO-92 <sup>(1)(2)</sup>	SC4041AZ	SC4041BZ	SC4041CZ	SC4041DZ	SC4041EZ	TR=3K, TA=2K

## Notes:

- (1) Add suffix 'TR' for Tape & Reel.  
(2) Add suffix 'TA' for Tape Ammo.



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**ELECTRICAL CHARACTERISTICS**

$T_A = 25^\circ\text{C}$ unless otherwise specified.				SC4041A (0.1%)			SC4041B (0.2%)			
Parameter	Symbol	Condition		MIN	TYP	MAX	MIN	TYP	MAX	UNITS
Reverse Breakdown Voltage	$V_Z$	$I_Z = 100\mu\text{A}$	$T_A = 25^\circ\text{C}$	1.2238	1.2250	1.2262	1.2226	1.2250	1.2274	V
			$T_A = -40$ to $+85^\circ\text{C}$	1.2158	1.2250	1.2342	1.2146	1.2250	1.2354	V
Minimum Operating Current	$I_{Z(\text{min})}$				30	60		30	60	$\mu\text{A}$
Reverse Breakdown Voltage Temperature Coefficient	$\frac{\Delta V_Z}{\Delta T}$	$I_Z = 10\text{mA}$ $I_Z = 1\text{mA}$ $I_Z = 100\mu\text{A}$	$T_A = -40$ to $+85^\circ\text{C}$			$\pm 100$			$\pm 100$	ppm/ $^\circ\text{C}$
Ratio of Change in $V_Z$ to Change in $I_Z$	$\frac{\Delta V_Z}{\Delta I_Z}$	$I_{Z(\text{min})} \leq I_Z \leq 1\text{mA}$	$T_A = 25^\circ\text{C}$			1.5			1.5	mV
			$T_A = -40$ to $+85^\circ\text{C}$			2.0			2.0	mV
		$1\text{mA} \leq I_Z \leq 12\text{mA}$	$T_A = 25^\circ\text{C}$			6.0			6.0	mV
			$T_A = -40$ to $+85^\circ\text{C}$			8.0			8.0	mV
Reverse Dynamic Impedance	$Z_R$	$I_Z = 1\text{mA}$ , $f = 120\text{ Hz}$ , $I_{AC} = 0.1 I_Z$			0.25	1.5		0.25	1.5	$\Omega$
Wideband Noise (RMS)	$e_N$	$I_Z = 100\mu\text{A}$ $10\text{Hz} \leq f \leq 10\text{kHz}$			20			20		$\mu\text{V}$
Long Term Stability of Reverse Breakdown Voltage	$\Delta V_Z$	$t = 1000$ hours $T = 25^\circ\text{C} \pm 0.1^\circ\text{C}$ $I_Z = 100\mu\text{A}$			120			120		ppm

$T_A = 25^\circ\text{C}$ unless otherwise specified.				SC4041C (0.5%)			SC4041D (1.0%)			
Parameter	Symbol	Condition		MIN	TYP	MAX	MIN	TYP	MAX	UNITS
Reverse Breakdown Voltage	$V_Z$	$I_Z = 100\mu\text{A}$	$T_A = 25^\circ\text{C}$	1.219	1.225	1.231	1.213	1.225	1.237	V
			$T_A = -40$ to $+85^\circ\text{C}$	1.211	1.225	1.239	1.201	1.225	1.249	V
Minimum Operating Current	$I_{Z(\text{min})}$				30	60		30	60	$\mu\text{A}$
Reverse Breakdown Voltage Temperature Coefficient	$\frac{\Delta V_Z}{\Delta T}$	$I_Z = 10\text{mA}$ $I_Z = 1\text{mA}$ $I_Z = 100\mu\text{A}$	$T_A = -40$ to $+85^\circ\text{C}$			$\pm 100$			$\pm 150$	ppm/ $^\circ\text{C}$
Ratio of Change in $V_Z$ to Change in $I_Z$	$\frac{\Delta V_Z}{\Delta I_Z}$	$I_{Z(\text{min})} \leq I_Z \leq 1\text{mA}$	$T_A = 25^\circ\text{C}$			1.5			2.0	mV
			$T_A = -40$ to $+85^\circ\text{C}$			2.0			2.5	mV
		$1\text{mA} \leq I_Z \leq 12\text{mA}$	$T_A = 25^\circ\text{C}$			6.0			8.0	mV
			$T_A = -40$ to $+85^\circ\text{C}$			8.0			10.0	mV
Reverse Dynamic Impedance	$Z_R$	$I_Z = 1\text{mA}$ , $f = 120\text{ Hz}$ , $I_{AC} = 0.1 I_Z$			0.25	1.5		0.25	2.0	$\Omega$
Wideband Noise (RMS)	$e_N$	$I_Z = 100\mu\text{A}$ $10\text{Hz} \leq f \leq 10\text{kHz}$			20			20		$\mu\text{V}$
Long Term Stability of Reverse Breakdown Voltage	$\Delta V_Z$	$t = 1000$ hours $T = 25^\circ\text{C} \pm 0.1^\circ\text{C}$ $I_Z = 100\mu\text{A}$			120			120		ppm

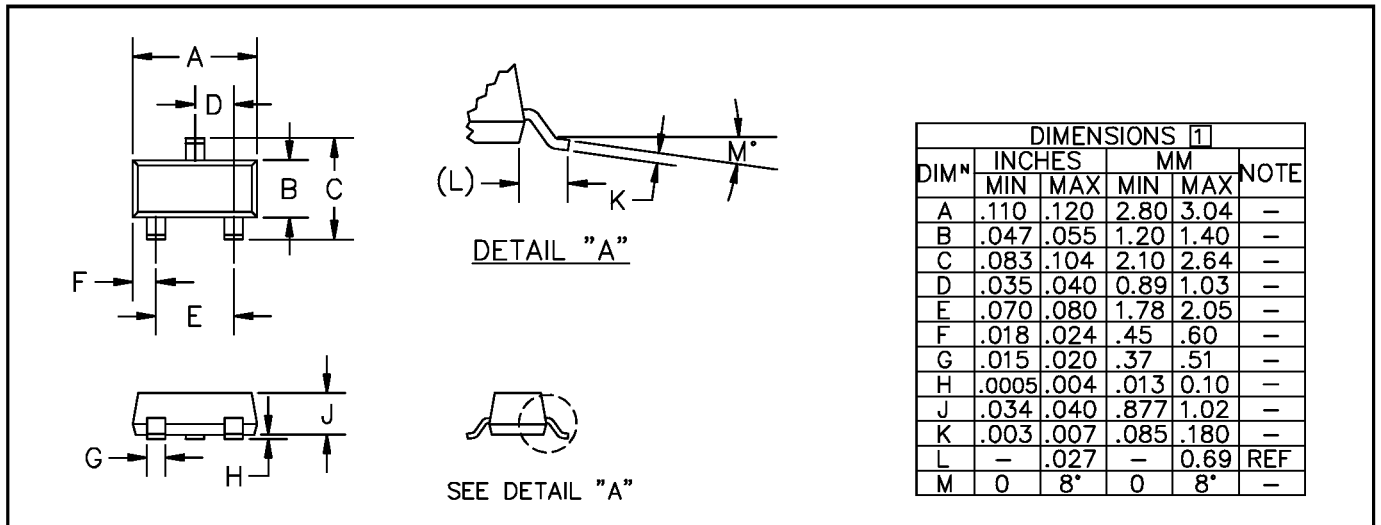
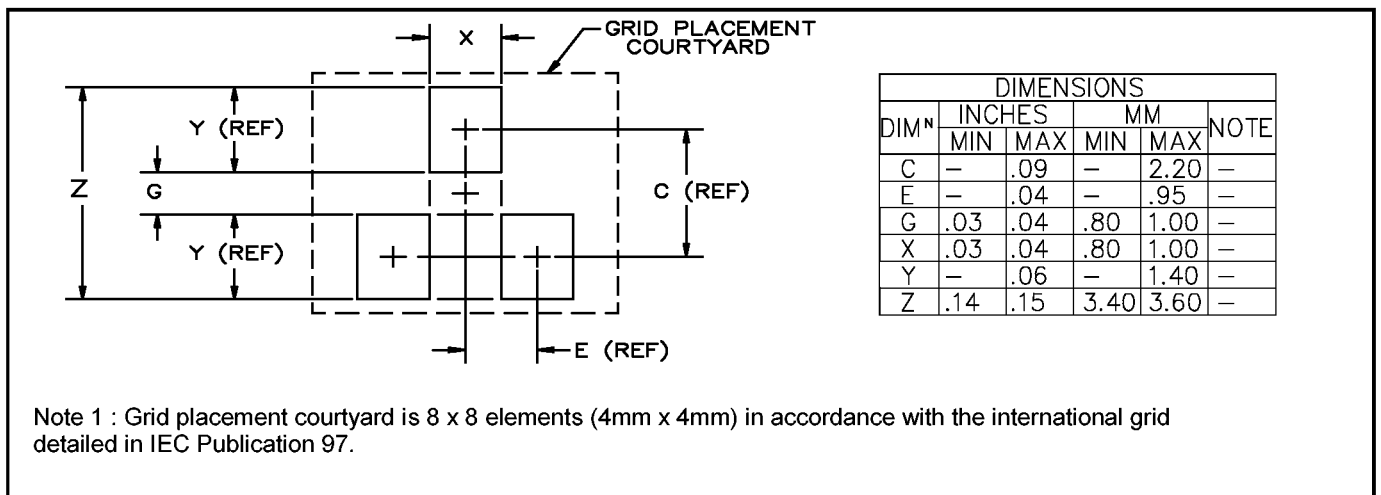


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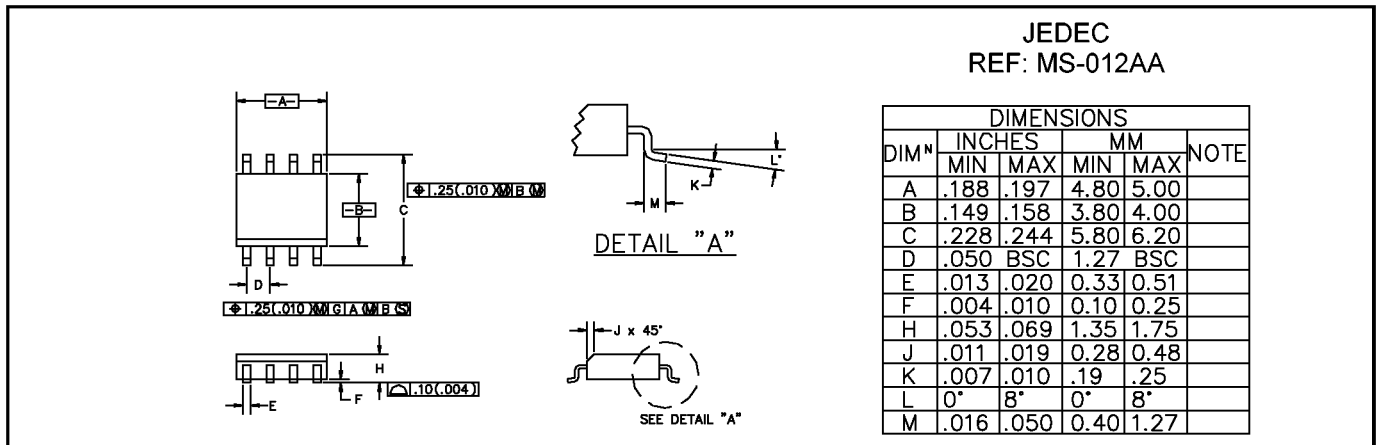
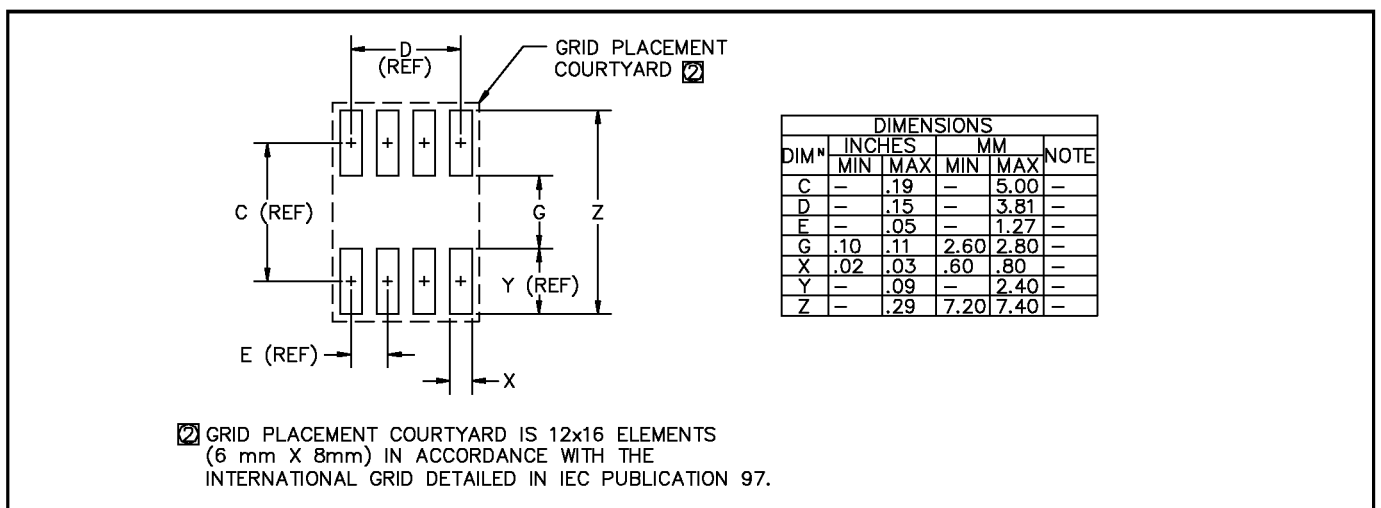
**ELECTRICAL CHARACTERISTICS**

$T_A = 25^\circ\text{C}$ unless otherwise specified.				SC4041E (2.0%)			
Parameter	Symbol	Condition		MIN	TYP	MAX	UNITS
Reverse Breakdown Voltage	$V_Z$	$I_Z = 100\mu\text{A}$	$T_A = 25^\circ\text{C}$	1.200	1.225	1.250	V
			$T_A = -40$ to $+85^\circ\text{C}$	1.189	1.225	1.261	V
Minimum Operating Current	$I_{Z(\text{min})}$				30	60	$\mu\text{A}$
Reverse Breakdown Voltage Temperature Coefficient	$\frac{\Delta V_Z}{\Delta T}$	$I_Z = 10\text{mA}$ $I_Z = 1\text{mA}$ $I_Z = 100\mu\text{A}$	$T_A = -40$ to $+85^\circ\text{C}$			$\pm 150$	ppm/ $^\circ\text{C}$
Ratio of Change in $V_Z$ to Change in $I_Z$	$\frac{\Delta V_Z}{\Delta I_Z}$	$I_{Z(\text{min})} \leq I_Z \leq 1\text{mA}$	$T_A = 25^\circ\text{C}$			2.0	mV
			$T_A = -40$ to $+85^\circ\text{C}$			2.5	mV
		$1\text{mA} \leq I_Z \leq 12\text{mA}$	$T_A = 25^\circ\text{C}$			8.0	mV
			$T_A = -40$ to $+85^\circ\text{C}$			10.0	mV
Reverse Dynamic Impedance	$Z_R$	$I_Z = 1\text{mA}$ , $f = 120\text{ Hz}$ , $I_{AC} = 0.1 I_Z$			0.25	2.0	$\Omega$
Wideband Noise (RMS)	$e_N$	$I_Z = 100\mu\text{A}$ $10\text{Hz} \leq f \leq 10\text{kHz}$			20		$\mu\text{V}$
Long Term Stability of Reverse Breakdown Voltage	$\Delta V_Z$	$t = 1000$ hours $T = 25^\circ\text{C} \pm 0.1^\circ\text{C}$ $I_Z = 100\mu\text{A}$			120		ppm

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**OUTLINE DRAWING SOT-23-3L**

**LAND PATTERN SOT-23-3L**


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**OUTLINE DRAWING SO-8**

**LAND PATTERN SO-8**

**OUTLINE DRAWING TO-92**
