

PRELIMINARY - April 13, 1998

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

DESCRIPTION

The SC4040 is a two terminal precision voltage reference with thermal stability guaranteed over temperature. The SC4040 has a typical dynamic output impedance of 0.25Ω . Active output circuitry provides a very sharp turn on characteristic - the minimum operating current is $60\mu\text{A}$, 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.

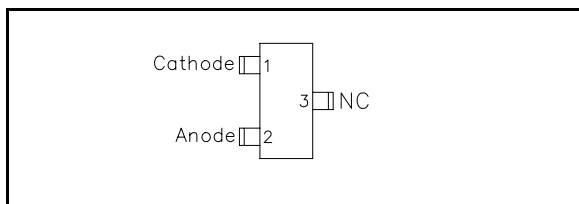
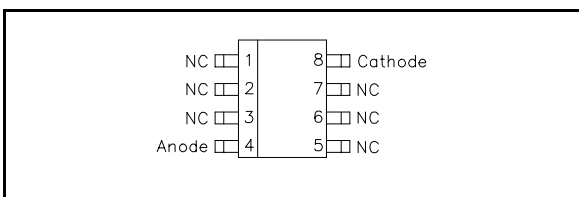
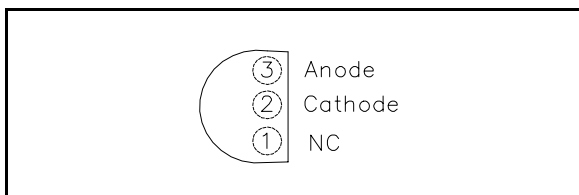
FEATURES

- Trimmed bandgap design (0.2%)
- Wide operating current range $60\mu\text{A}$ to 20mA
- Low dynamic impedance (0.25Ω)
- Available in SOT-23, TO-92 and SO-8

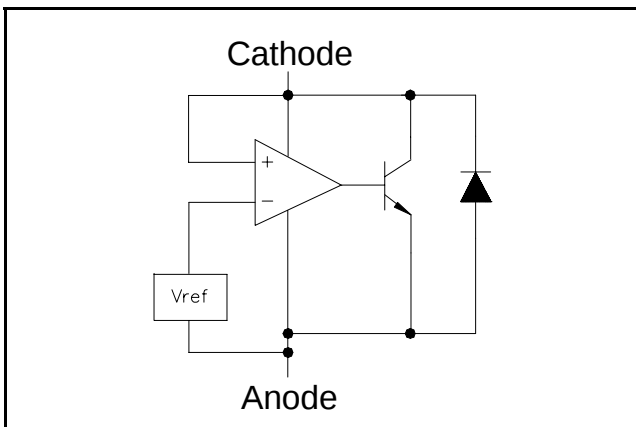
APPLICATIONS

- Cellular telephones
- Portable computers
- Instrumentation
- Automotive

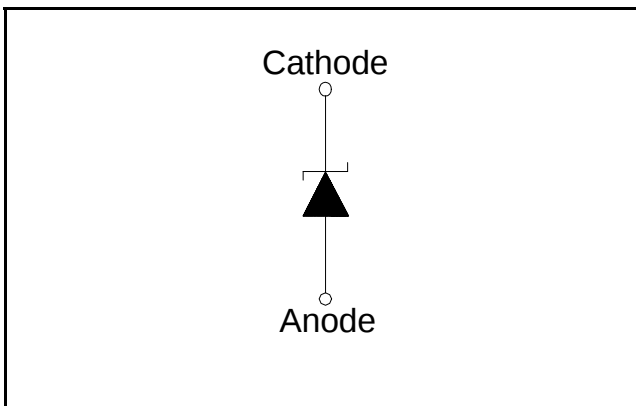
PIN CONFIGURATIONS

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 μ 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 ⁽¹⁾	SC4040ASK	SC4040BSK	SC4040CSK	SC4040DSK	SC4040ESK	3K
SO-8 ⁽¹⁾	SC4040AS	SC4040BS	SC4040CS	SC4040DS	SC4040ES	2.5K
TO-92 ⁽¹⁾⁽²⁾	SC4040AZ	SC4040BZ	SC4040CZ	SC4040DZ	SC4040EZ	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°C unless otherwise specified.				SC4040A (0.1%)			SC4040B (0.2%)			
Parameter	Symbol	Condition		MIN	TYP	MAX	MIN	TYP	MAX	UNITS
Reverse Breakdown Voltage	V _Z	I _Z = 100μA	T _A = 25°C	2.4975	2.5000	2.5025	2.495	2.500	2.505	V
			T _A = -40 to +85°C	2.481	2.500	2.519	2.479	2.500	2.521	V
Minimum Operating Current	I _{Z(min)}				60	80		60	80	μA
Reverse Breakdown Voltage Temperature Coefficient	$\frac{\Delta V_Z}{\Delta T}$	I _Z = 10mA I _Z = 1mA I _Z = 100μA	T _A = -40 to +85°C			±100			±100	ppm/°C
Ratio of Change in V _Z to Change in I _Z	$\frac{\Delta V_Z}{\Delta I_Z}$	I _{Z(min)} ≤ I _Z ≤ 1mA	T _A = 25°C			0.8			0.8	mV
			T _A = -40 to +85°C			1.0			1.0	mV
		1mA ≤ I _Z ≤ 12mA	T _A = 25°C			6.0			6.0	mV
			T _A = -40 to +85°C			8.0			8.0	mV
Reverse Dynamic Impedance	Z _R	I _Z = 1mA, f = 120 Hz, I _{AC} = 0.1 I _Z			0.25	0.8		0.25	0.8	Ω
Wideband Noise (RMS)	e _N	I _Z = 100μA 10Hz ≤ f ≤ 10kHz			35			35		μV
Long Term Stability of Reverse Breakdown Voltage	ΔV _Z	t = 1000 hours T = 25°C ± 0.1°C I _Z = 100μA			120			120		ppm

T _A = 25°C unless otherwise specified.				SC4040C (0.5%)			SC4040D (1.0%)			
Parameter	Symbol	Condition		MIN	TYP	MAX	MIN	TYP	MAX	UNITS
Reverse Breakdown Voltage	V _Z	I _Z = 100μA	T _A = 25°C	2.488	2.500	2.512	2.475	2.500	2.525	V
			T _A = -40 to +85°C	2.471	2.500	2.529	2.451	2.500	2.549	V
Minimum Operating Current	I _{Z(min)}				60	80		60	80	μA
Reverse Breakdown Voltage Temperature Coefficient	$\frac{\Delta V_Z}{\Delta T}$	I _Z = 10mA I _Z = 1mA I _Z = 100μA	T _A = -40 to +85°C			±100			±150	ppm/°C
Ratio of Change in V _Z to Change in I _Z	$\frac{\Delta V_Z}{\Delta I_Z}$	I _{Z(min)} ≤ I _Z ≤ 1mA	T _A = 25°C			0.8			1.0	mV
			T _A = -40 to +85°C			1.0			1.2	mV
		1mA ≤ I _Z ≤ 12mA	T _A = 25°C			6.0			8.0	mV
			T _A = -40 to +85°C			8.0			10.0	mV
Reverse Dynamic Impedance	Z _R	I _Z = 1mA, f = 120 Hz, I _{AC} = 0.1 I _Z			0.25	0.9		0.25	1.1	Ω
Wideband Noise (RMS)	e _N	I _Z = 100μA 10Hz ≤ f ≤ 10kHz			20			35		μV
Long Term Stability of Reverse Breakdown Voltage	ΔV _Z	t = 1000 hours T = 25°C ± 0.1°C I _Z = 100μA			120			120		ppm

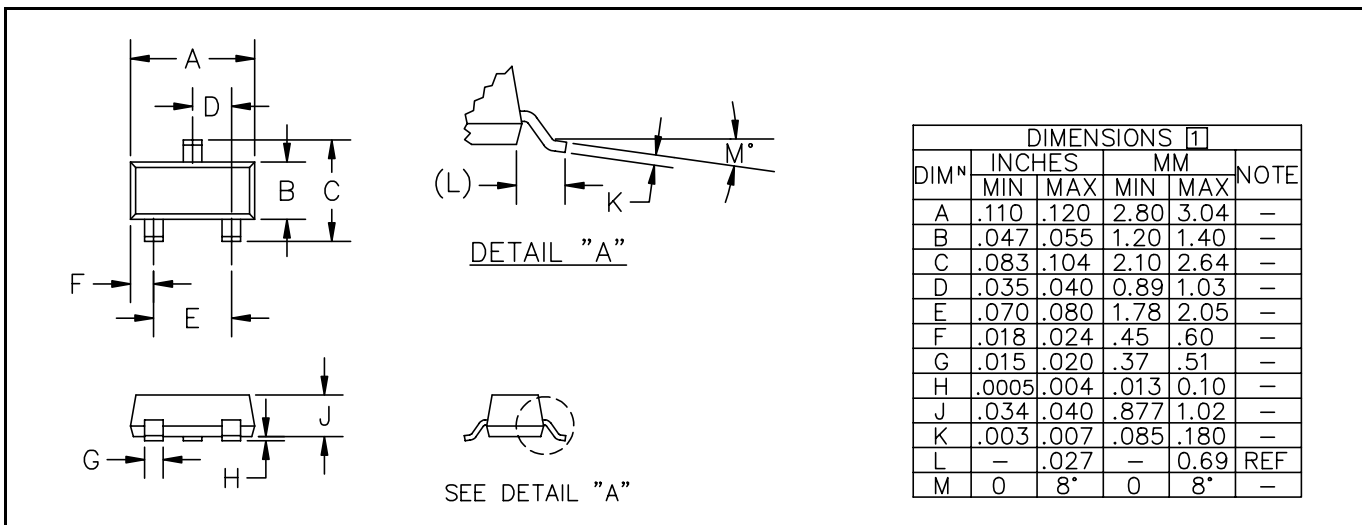
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ELECTRICAL CHARACTERISTICS

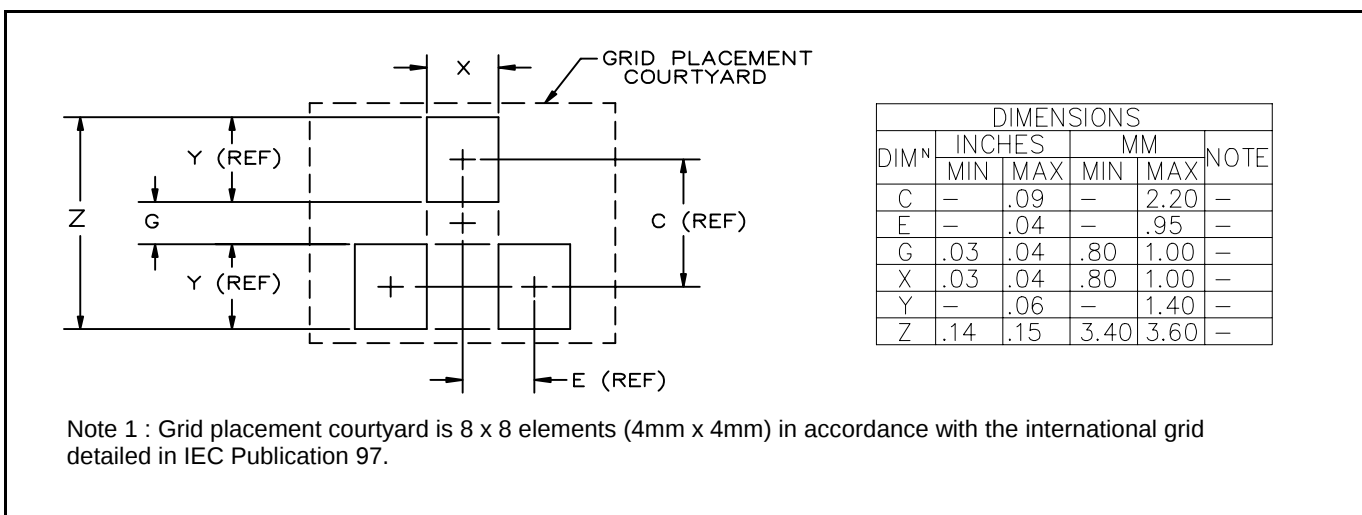
$T_A = 25^\circ\text{C}$ unless otherwise specified.				SC4040E (2.0%)			
Parameter	Symbol	Condition		MIN	TYP	MAX	UNITS
Reverse Breakdown Voltage	V_Z	$I_Z = 100\mu\text{A}$	$T_A = 25^\circ\text{C}$	2.450	2.500	2.550	V
			$T_A = -40$ to $+85^\circ\text{C}$	2.426	2.500	2.574	V
Minimum Operating Current	$I_{Z(\min)}$				60	80	μA
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 $+85^\circ\text{C}$			± 150	ppm/ $^\circ\text{C}$
Ratio of Change in V_Z to Change in I_Z	$\frac{\Delta V_Z}{\Delta I_Z}$	$I_{Z(\min)} \leq I_Z \leq 1\text{mA}$	$T_A = 25^\circ\text{C}$			1.0	mV
			$T_A = -40$ to $+85^\circ\text{C}$			1.2	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	1.1	Ω
Wideband Noise (RMS)	e_N	$I_Z = 100\mu\text{A}$ $10\text{Hz} \leq f \leq 10\text{kHz}$			35		μV
Long Term Stability of Reverse Breakdown Voltage	ΔV_Z	$t = 1000\text{ hours}$ $T = 25^\circ\text{C} \pm 0.1^\circ\text{C}$ $I_Z = 100\mu\text{A}$			120		ppm

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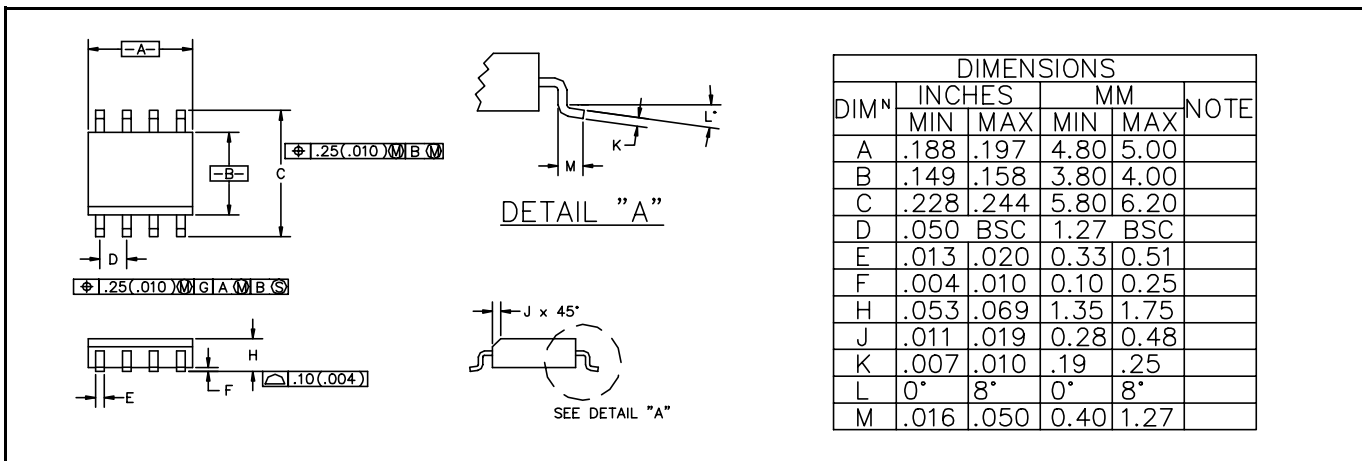
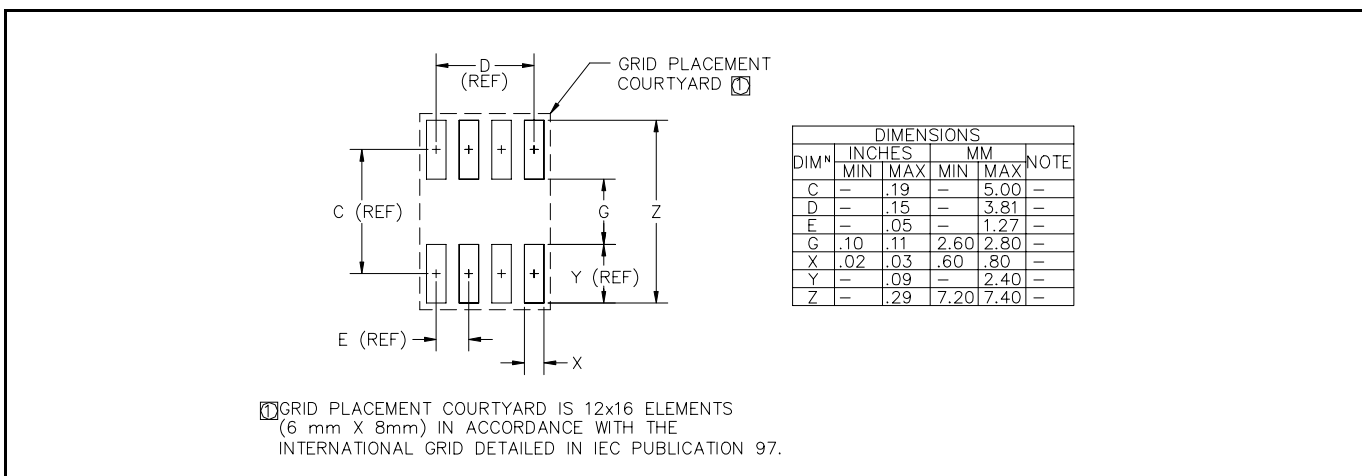
OUTLINE DRAWING SOT-23



LAND PATTERN SOT-23



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OUTLINE DRAWING SO-8

LAND PATTERN SO-8

OUTLINE DRAWING TO-92
