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

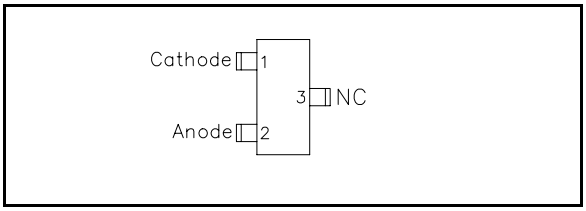
- Low voltage operation (1.225V)
- Trimmed bandgap design (0.1%)
- Wide operating current range 60µA to 20mA
- Low dynamic impedance (0.25Ω)
- Available in SOT-23, TO-92 and SO-8

APPLICATIONS

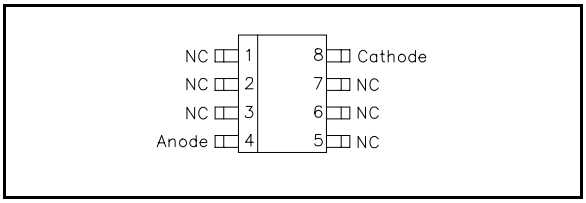
- Cellular telephones
- Portable computers
- Instrumentation
- Automotive

PIN CONFIGURATIONS

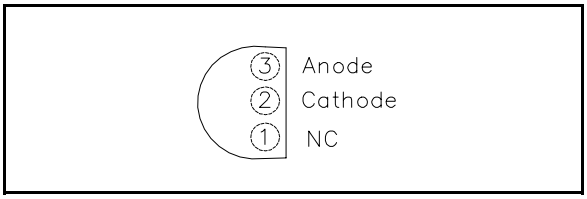
SOT-23-3 Lead (Top View)



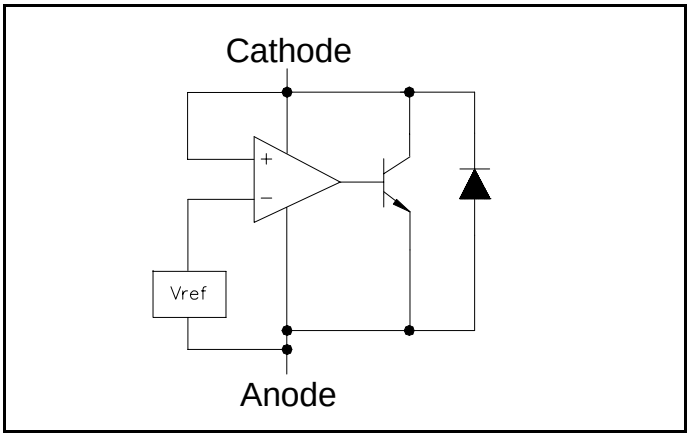
SO-8 Lead (Top View)



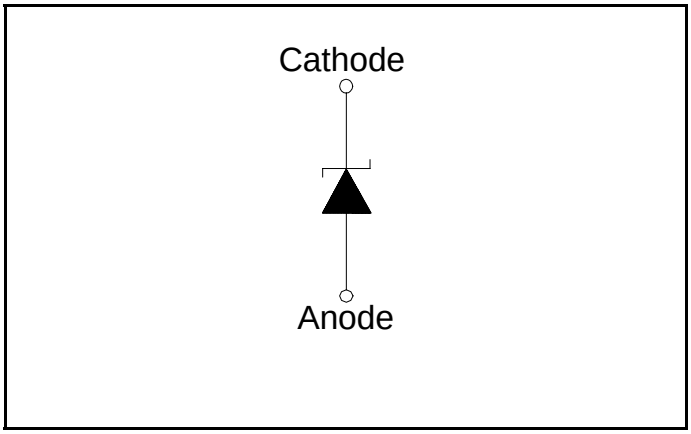
TO-92 (Top View)



BLOCK DIAGRAM



SYMBOL DIAGRAM



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ABSOLUTE MAXIMUM RATINGS

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

ORDERING INFORMATION

PACKAGE	TOLERANCE					
	0.1%	0.2%	0.5%	1.0%	2.0%	T/R Quantity
SOT-23-3L (1)	SC4041ASK	SC4041BSK	SC4041CSK	SC4041DSK	SC4041ESK	3K
SO-8 (1)	SC4041AS	SC4041BS	SC4041CS	SC4041DS	SC4041ES	2.5K
TO-92 (1)(2)	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°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 = 100µA	T_A = 25°C	1.2238	1.2250	1.2262	1.2226	1.2250	1.2274	V
			T_A = -40 to +85°C	1.2158	1.2250	1.2342	1.2146	1.2250	1.2354	V
Minimum Operating Current	$I_{Z(min)}$				30	60		30	60	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	$\frac{\Delta V_Z}{\Delta I_Z}$	$I_{Z(min)} \le I_Z \le$ 1mA	T_A = 25°C			1.5			1.5	mV
			T_A = -40 to +85°C			2.0			2.0	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	1.5		0.25	1.5	Ω
Wideband Noise (RMS)	e_N	I_Z = 100µA 10Hz ≤ f ≤ 10kHz			20			20		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.				SC4041C (0.5%)			SC4041D (1.0%)			
Parameter	**Symbol**	**Condition**		**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**UNITS**
Reverse Breakdown Voltage	V_Z	I_Z = 100µA	T_A = 25°C	1.219	1.225	1.231	1.213	1.225	1.237	V
			T_A = -40 to +85°C	1.211	1.225	1.239	1.201	1.225	1.249	V
Minimum Operating Current	$I_{Z(min)}$				30	60		30	60	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	$\frac{\Delta V_Z}{\Delta I_Z}$	$I_{Z(min)} \le I_Z \le$ 1mA	T_A = 25°C			1.5			2.0	mV
			T_A = -40 to +85°C			2.0			2.5	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	1.5		0.25	2.0	Ω
Wideband Noise (RMS)	e_N	I_Z = 100µA 10Hz ≤ f ≤ 10kHz			20			20		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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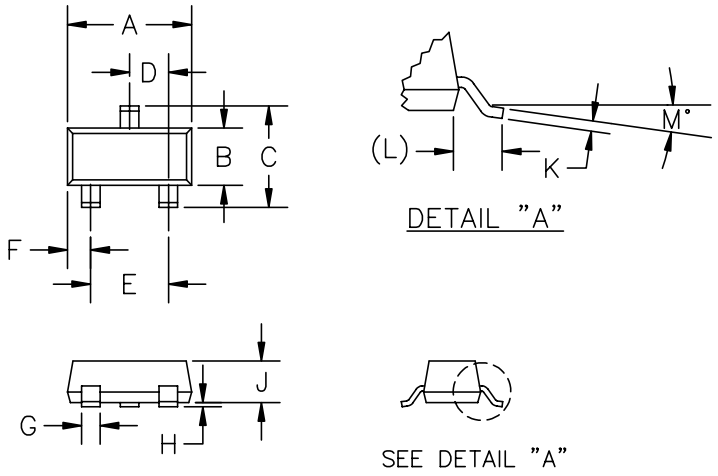
ELECTRICAL CHARACTERISTICS

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

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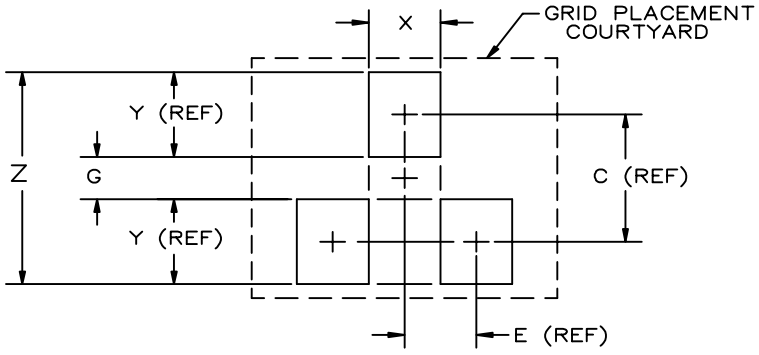
PRELIMINARY - April 13, 1998

OUTLINE DRAWING SOT-23-3L



DIMENSIONS [1]					
DIMN	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	.110	.120	2.80	3.04	–
B	.047	.055	1.20	1.40	–
C	.083	.104	2.10	2.64	–
D	.035	.040	0.89	1.03	–
E	.070	.080	1.78	2.05	–
F	.018	.024	.45	.60	–
G	.015	.020	.37	.51	–
H	.0005	.004	.013	0.10	–
J	.034	.040	.877	1.02	–
K	.003	.007	.085	.180	–
L	–	.027	–	0.69	REF
M	0	8°	0	8°	–

LAND PATTERN SOT-23-3L



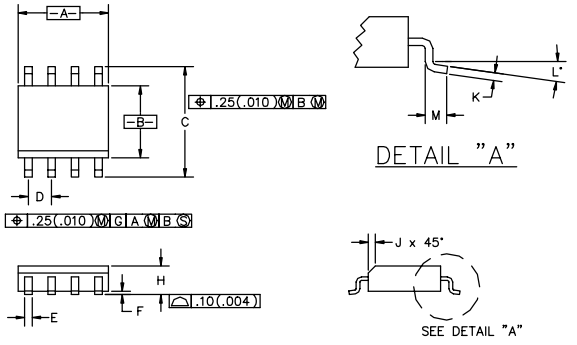
DIMENSIONS					
DIMN	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
C	–	.09	–	2.20	–
E	–	.04	–	.95	–
G	.03	.04	.80	1.00	–
X	.03	.04	.80	1.00	–
Y	–	.06	–	1.40	–
Z	.14	.15	3.40	3.60	–

Note 1 : Grid placement courtyard is 8 x 8 elements (4mm x 4mm) in accordance with the international grid detailed in IEC Publication 97.

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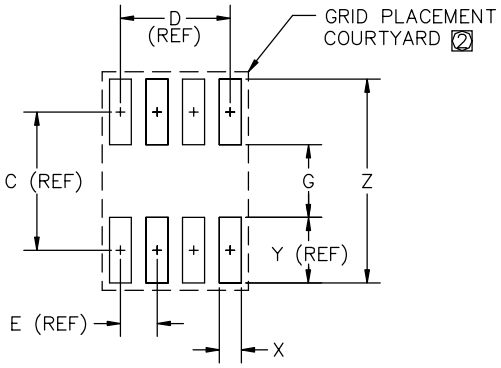
OUTLINE DRAWING SO-8



JEDEC
REF: MS-012AA

DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	.188	.197	4.80	5.00	
B	.149	.158	3.80	4.00	
C	.228	.244	5.80	6.20	
D	.050	BSC	1.27	BSC	
E	.013	.020	0.33	0.51	
F	.004	.010	0.10	0.25	
H	.053	.069	1.35	1.75	
J	.011	.019	0.28	0.48	
K	.007	.010	.19	.25	
L	0°	8°	0°	8°	
M	.016	.050	0.40	1.27	

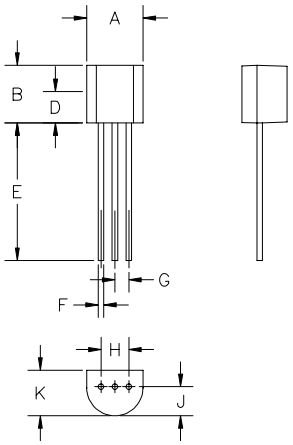
LAND PATTERN SO-8



DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
C	–	.19	–	5.00	–
D	–	.15	–	3.81	–
E	–	.05	–	1.27	–
G	.10	.11	2.60	2.80	–
X	.02	.03	.60	.80	–
Y	–	.09	–	2.40	–
Z	–	.29	7.20	7.40	–

(2) GRID PLACEMENT COURTYARD IS 12x16 ELEMENTS (6 mm X 8mm) IN ACCORDANCE WITH THE INTERNATIONAL GRID DETAILED IN IEC PUBLICATION 97.

OUTLINE DRAWING TO-92



DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	.175	.205	4.445	5.207	—
B	.170	.210	4.318	5.334	—
E	.500	.610	12.7	15.5	—
F	.016	.021	.407	.533	—
G	.045	.055	1.143	1.397	—
H	.095	.105	2.413	2.667	—
J	.080	.105	2.032	2.667	—
K	.125	.165	3.175	4.191	—

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