



## Low Voltage Ultra-Sharp Knee Zener Diode

### DESCRIPTION

This new multi-layer pn junction Zener design for ultra-sharp knee characteristics is used for low-voltage regulation and very low leakage currents. The new design offers significantly improved voltage regulation and lower dynamic impedance and capacitance compared to conventional Zeners. They also provide ESD protection for those threats defined per IEC 61000-4-2 or electrical fast transients per IEC 61000-4-4 as well as other transient threats. Because of their relatively small physical size and weight, this product is ideal for use in High reliable portable and hand-held electronic devices.

**Important:** For the latest information, visit our website <http://www.microsemi.com>.

### FEATURES

- Ultra-sharp knee, low-voltage Zener
- Excellent Voltage Regulation (4X better than standard Zener diode)
- Lower Zener impedance (1/4 that of standard Zener diode)
- Lower leakage current (about 40X lower than standard Zener diode)
- Lower capacitance
- Small, hermetically sealed, surface mount UB package
- High surge capability
- RoHS compliant versions are available
- ESD Nonsensitive Rating

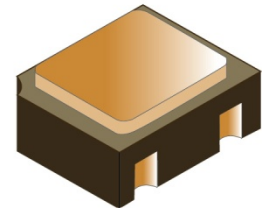
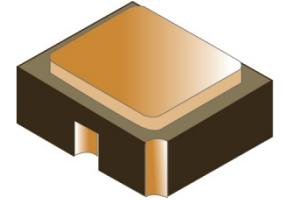
### APPLICATIONS / BENEFITS

- Superior low voltage regulation
- Portables requiring low battery drain
- ESD & EFT protection per IEC 61000-4-2 and IEC 61000-4-4
- Stabistor replacement
- Low voltage transient protection

### MAXIMUM RATINGS

Parameters/Test Conditions	Symbol	Value	Unit
Junction and Storage Temperature	T <sub>J</sub> and T <sub>STG</sub>	-55 to +150	°C
Thermal Resistance, Junction-to-Solder Pad (Infinite Sink)	R <sub>θJSP(IS)</sub>	120	°C/W
Thermal Resistance, Junction-to-Ambient on PC Board <sup>(1)</sup>	R <sub>θJA(PCB)</sub>	325	°C/W
Power Dissipation (see derating graph)	P <sub>D</sub>	500	mW
Zener Surge Current (8/20 μs)	I <sub>ZSM</sub>	25	A
Forward Voltage @ 100 mA	V <sub>F</sub>	1.00	V
Solder Temperature @ 10 s		260	°C

1. With 0.025 inch<sup>2</sup> pads (see Figure 2).



**UB Package**

**MSC – Lawrence**

6 Lake Street,  
Lawrence, MA 01841  
Tel: 1-800-446-1158 or  
(978) 620-2600  
Fax: (978) 689-0803

**MSC – Ireland**

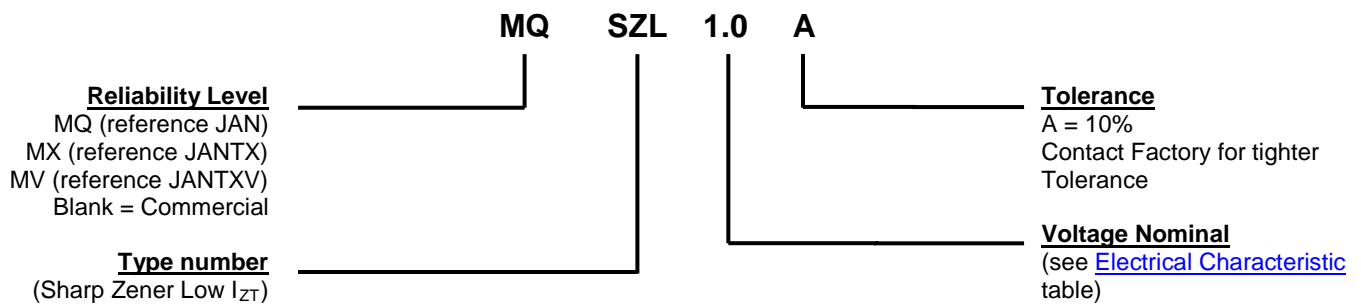
Gort Road Business Park,  
Ennis, Co. Clare, Ireland  
Tel: +353 (0) 65 6840044  
Fax: +353 (0) 65 6822298

**Website:**

[www.microsemi.com](http://www.microsemi.com)

**MECHANICAL and PACKAGING**

- CASE: Hermetically sealed ceramic package with metal lid
- TERMINALS: Gold over nickel plating
- MARKING: Device marking code and polarity band
- POLARITY: Pin 1 = cathode; (Pin 2 = not connected); Pin 3 = anode
- TAPE & REEL option: Standard per EIA-481-D. 7 inch diameter reel, 2000 devices max. per reel
- WEIGHT: Approximately 0.042 grams
- See [Package Dimensions](#) on last page.

**PART NOMENCLATURE**

**SYMBOLS & DEFINITIONS**

Symbol	Definition
$\alpha_{VZ}$	Temperature Coefficient of Regulator Voltage: The change in regulator voltage divided by the change in temperature that caused it expressed in %/C or mV/°C.
$C_T$	Total Capacitance: The total small signal capacitance between the diode terminals of a complete device.
$I_R$	Reverse Current: The dc current flowing from the external circuit into the cathode terminal at the specified voltage $V_R$ .
$I_{ZT}$	Regulator Current: The dc regulator current ( $I_Z$ ), at a specified test point ( $I_{ZT}$ ).
$V_Z$	Zener Voltage: The Zener voltage the device will exhibit at a specified current ( $I_Z$ ) in its breakdown region.
$Z_{ZT}$	The measured Zener impedance at the specified test current ( $I_{ZT}$ ).

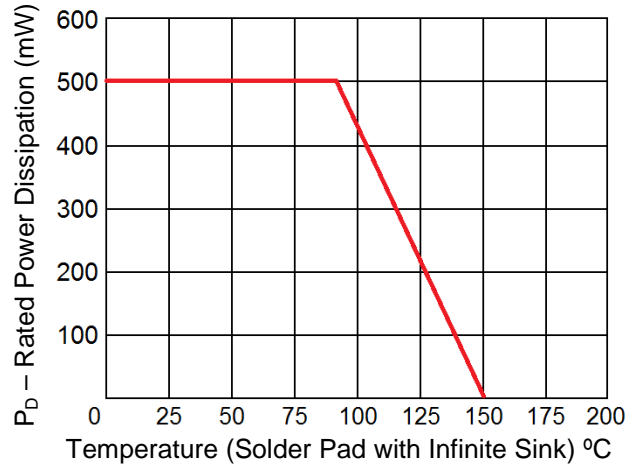
**ELECTRICAL CHARACTERISTICS @ 25 °C unless otherwise noted**

PART NUMBER	NOMINAL VOLTAGE $V_Z @ I_{ZT}$	TEST CURRENT $I_{ZT}$ (Note 5)	MAXIMUM ZENER IMPEDANCE @ $I_{ZT}$	MAXIMUM REVERSE CURRENT		MAXIMUM TOTAL CAPACITANCE $C_T$ $f = 1 \text{ MHz}$ @ 0 volts	MAXIMUM MAGNITUDE TEMPERATURE COEFFICIENT OF ZENER VOLTAGE $\alpha_{VZ}$	MAXIMUM REGULATION FACTOR $\Delta V_Z$ (Note 4)
				$I_R$	$V_R$			
	Volts	mA	Ohms	$\mu\text{A}$	Volts	pF	% / °C	Volts
SZL1.0A	1.0	0.25	325	0.05	0.3	150	-0.17	0.35
SZL1.1A	1.1	0.25	325	0.05	0.4	150	-0.17	0.35
SZL1.2A	1.2	0.25	325	0.05	0.4	150	-0.16	0.35
SZL1.3A	1.3	0.25	325	0.05	0.5	150	-0.16	0.35
SZL1.4A	1.4	0.25	325	0.05	0.5	150	-0.15	0.35
SZL1.5A	1.5	0.25	325	0.05	0.6	150	-0.15	0.35
SZL1.6A	1.6	0.25	325	0.05	0.6	150	-0.14	0.35
SZL1.7A	1.7	0.25	325	0.05	0.7	150	-0.13	0.35
SZL1.8A	1.8	0.25	325	0.05	0.8	150	-0.12	0.35
SZL1.9A	1.9	0.25	325	0.05	0.9	150	-0.12	0.35
SZL2.0A	2.0	0.25	325	0.05	1.1	150	-0.11	0.35
SZL2.2A	2.2	0.25	325	0.05	1.1	150	-0.10	0.35
SZL2.4A	2.4	0.25	325	0.05	1.2	150	-0.10	0.35

**NOTE:**

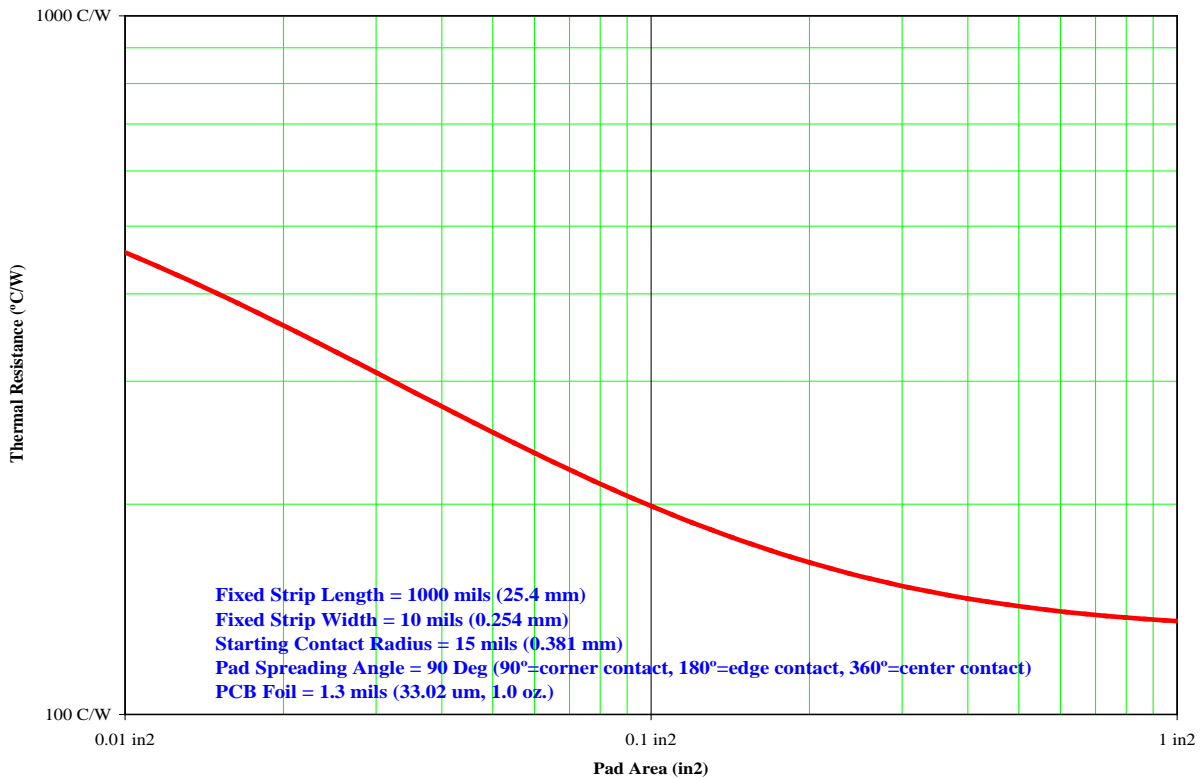
1. ZENER ( $V_Z$ ) VOLTAGE MEASUREMENT: Nominal Zener voltage is measured with the device junction in thermal equilibrium with ambient temperature of 25 °C at the test current ( $I_{ZT}$ ) shown.
2. ZENER IMPEDANCE ( $Z_{ZT}$ ): The Zener impedance is derived from the 60 Hz voltage, which results when an ac current having a rms value equal to 10% of the dc Zener current ( $I_{ZT}$ ) is superimposed on  $I_{ZT}$ .
3. REVERSE CURRENT ( $I_R$ ): Reverse (leakage) current is guaranteed and measured at  $V_R$  as shown on the table.
4. MAXIMUM REGULATION FACTOR ( $\Delta V_Z$ ):  $\Delta V_Z$  is the maximum difference between  $V_Z$  at  $I_Z = 0.025 \text{ mA}$  and  $V_Z$  at  $I_Z = 2.5 \text{ mA}$
5. MAXIMUM ZENER CURRENT ( $I_{ZM}$ ) should be based on 500 mW maximum power dissipation rating in conjunction with derating based on mounted thermal resistance divided by  $V_Z$  based on nominal  $V_Z$  modified for  $V_Z - I_Z$  trend shown in Figure 4a-c.

**GRAPHS**



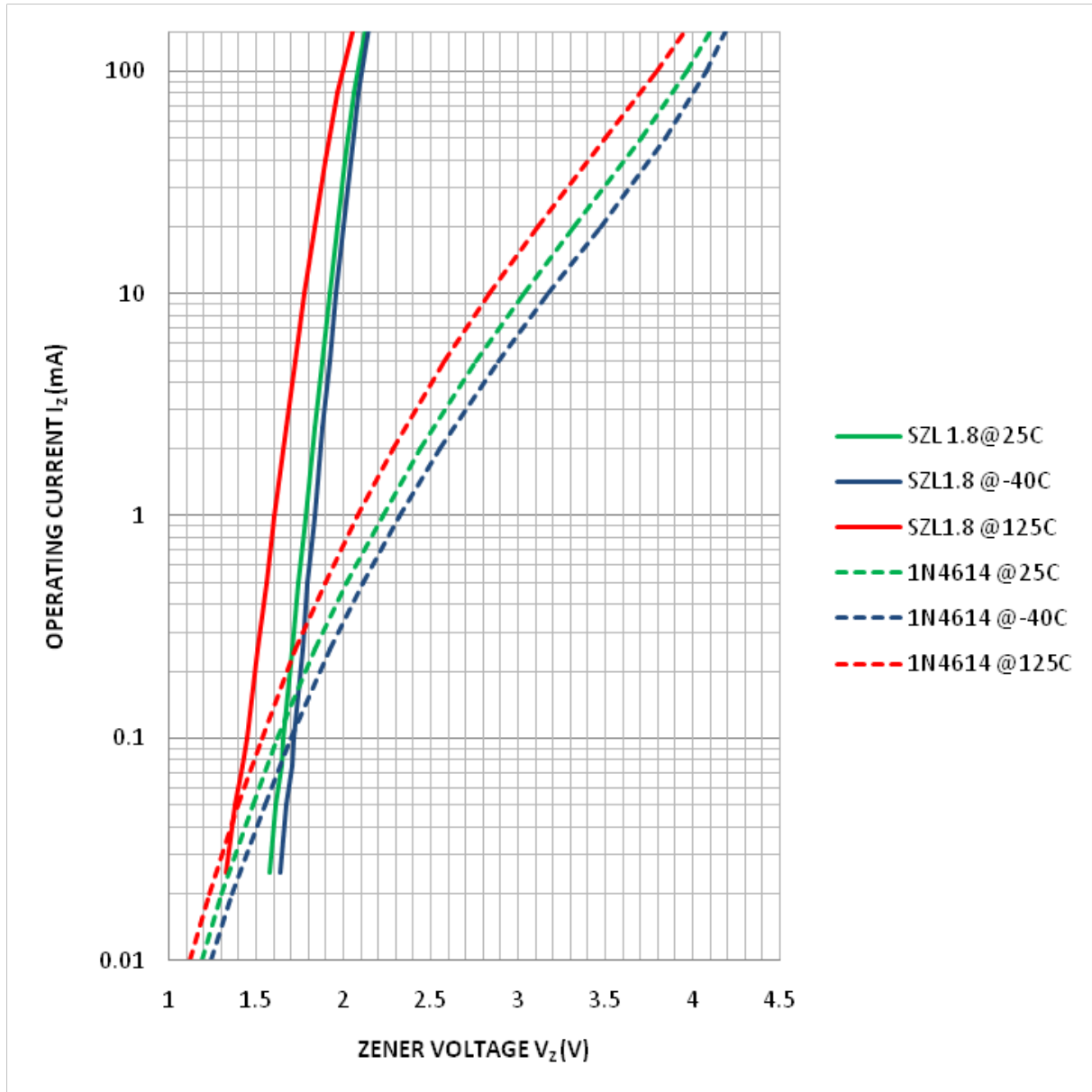
**FIGURE 1**  
Power Derating Curve  $R_{\theta JSP(IS)}$  (see Figure 2 for alternate PCB mounting)

**Total Mounted Device Thermal Resistance vs Each Terminal Pad Size**  
Sharp Knee Zener 3-Pad 90° Spread per Pad



**FIGURE 2**  
Thermal Resistance Junction to Ambient vs. Bond Pad Size (3 pads)

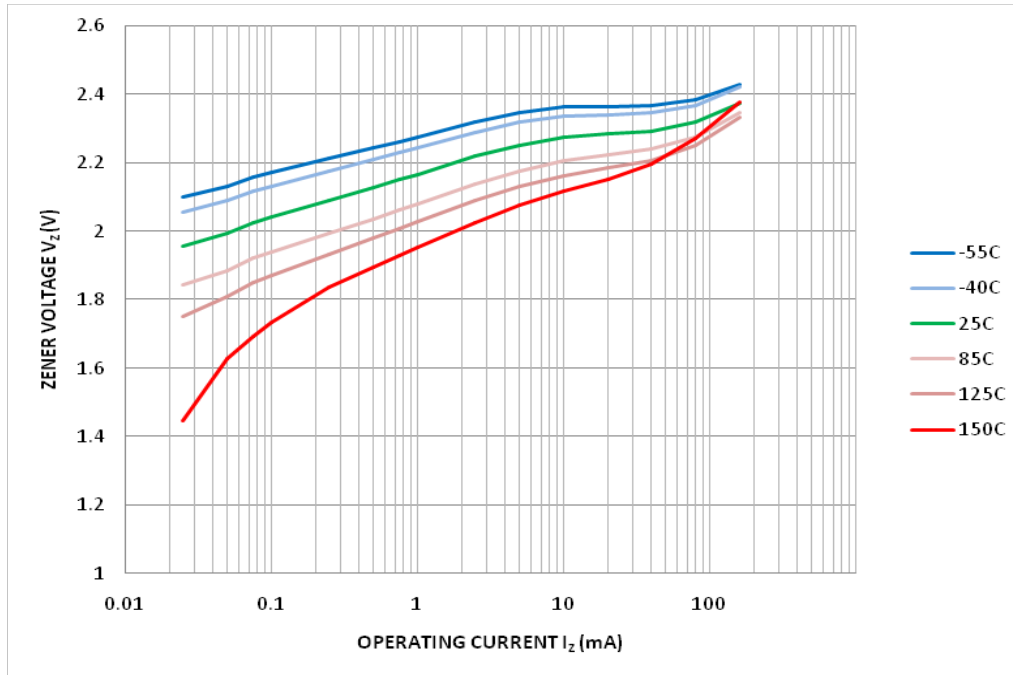
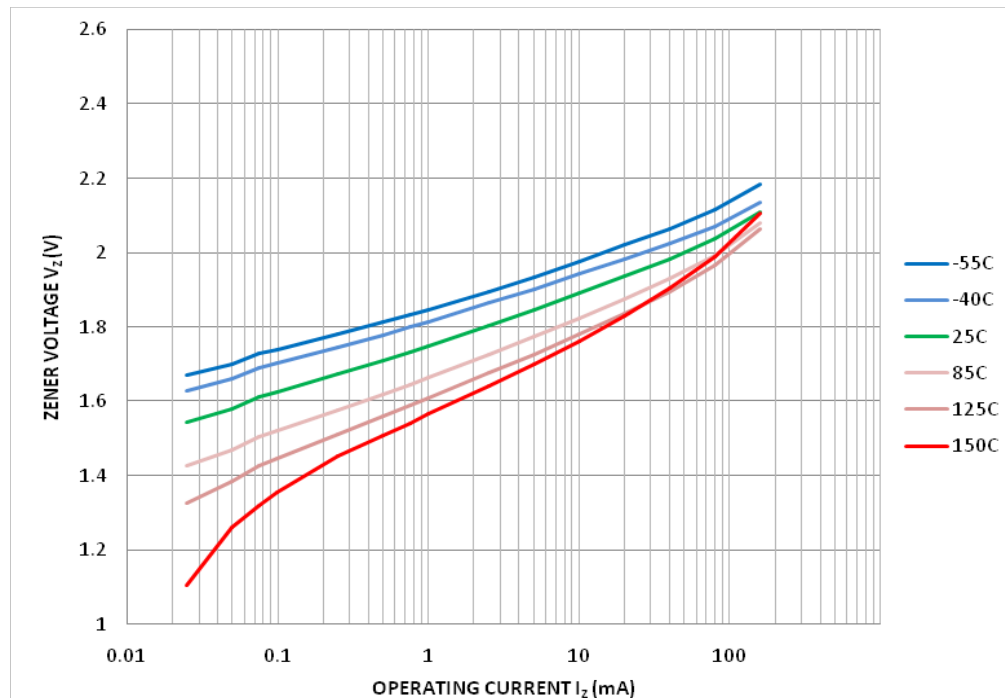
GRAPHS (continued)

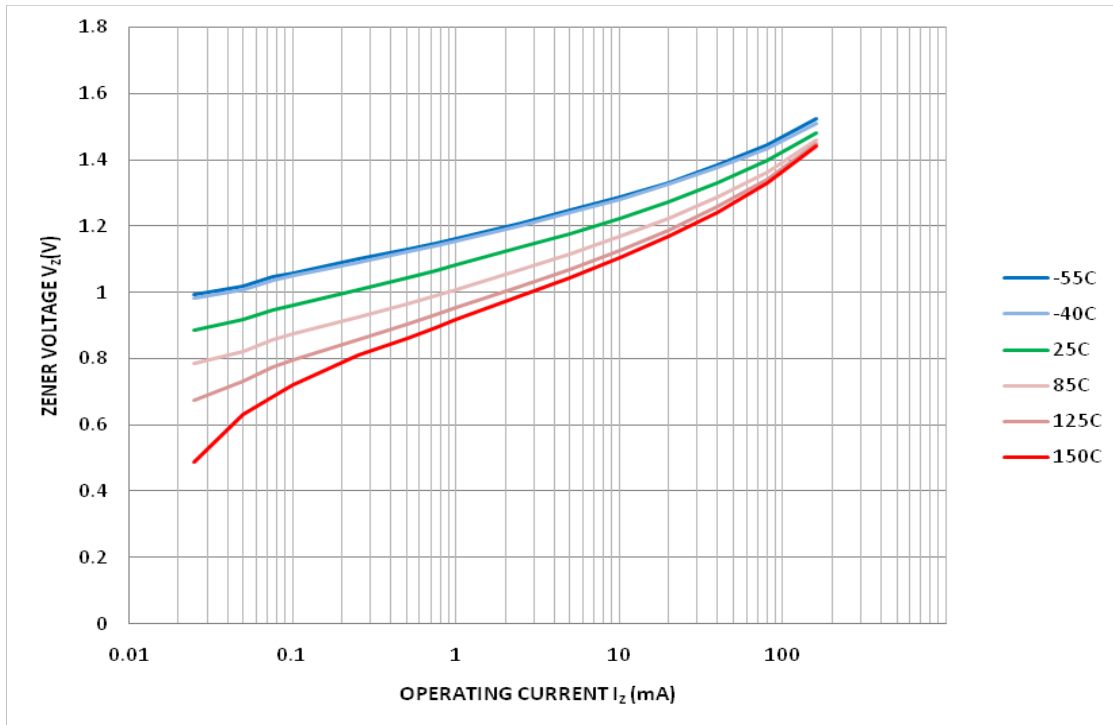


**FIGURE 3**

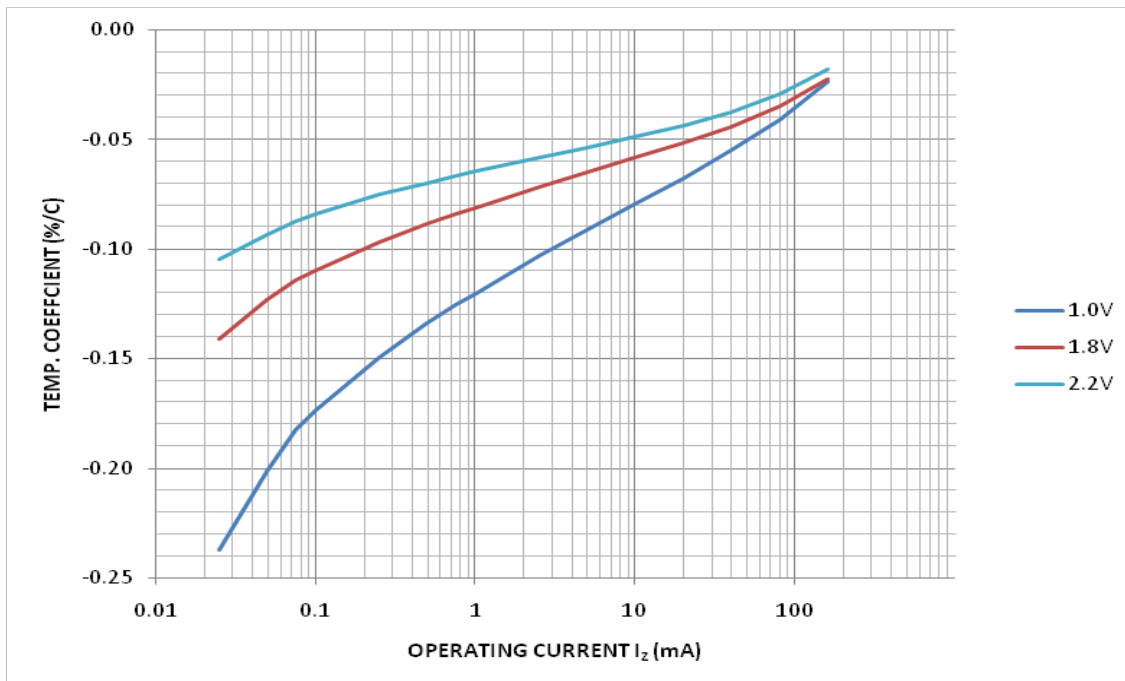
$V_z$  versus  $I_z$  Performance of SZL1.8 and 1N4614 (typical)\*

\* **Note:** Comparison of typical industry standard Zener Diode (1N4614) and Microsemi's SZL series. Both parts have a nominal  $V_z = 1.8$  V rating at 0.25 mA

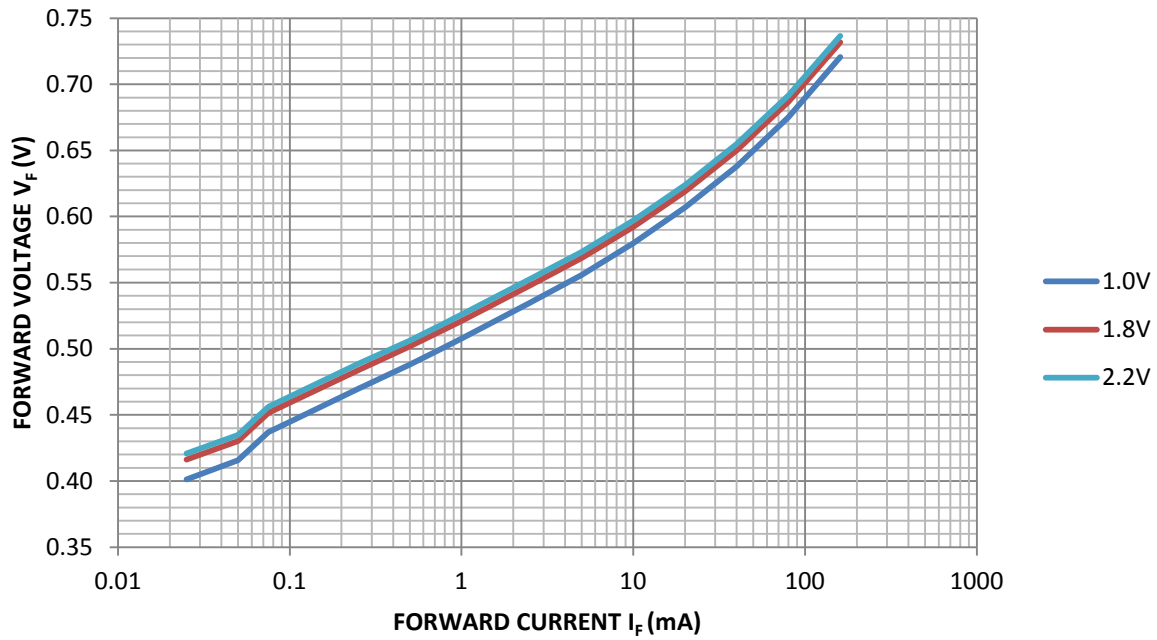
**GRAPHS (continued)**

**FIGURE 4a**
ZENER VOLTAGE vs. OPERATING CURRENT vs. TEMPERATURE - SZL2.2A (typical)

**FIGURE 4b**
ZENER VOLTAGE vs. OPERATING CURRENT vs. TEMPERATURE - SZL1.8A (typical)

**GRAPHS (continued)**


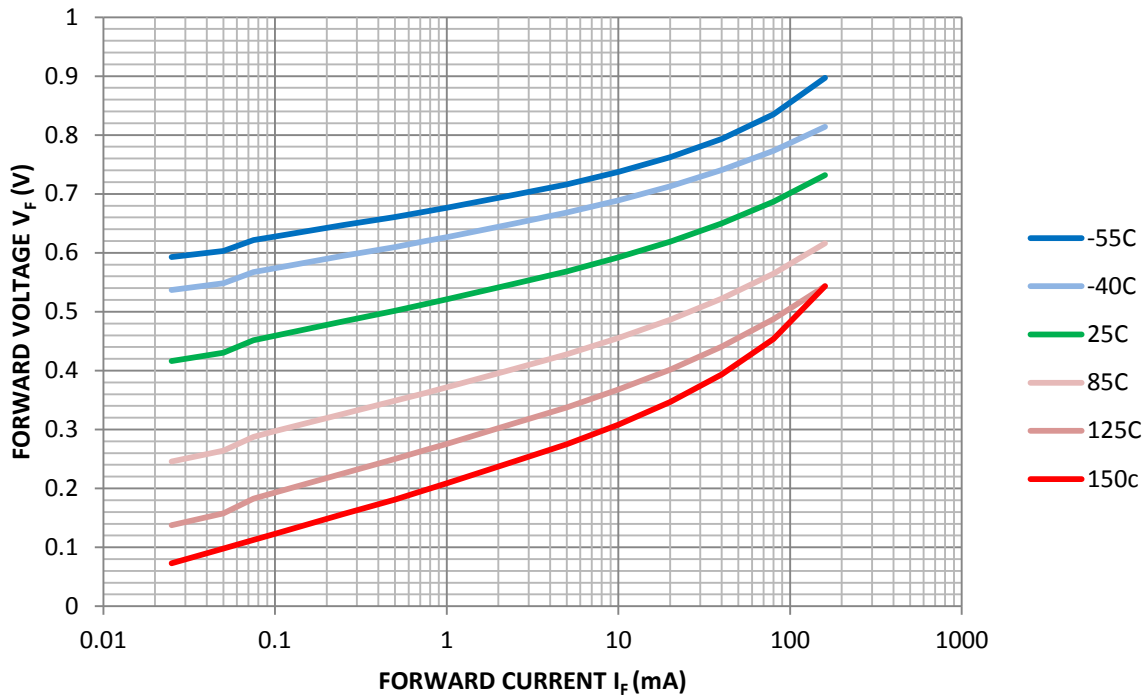
**FIGURE 4c**  
ZENER VOLTAGE vs. OPERATING CURRENT vs. TEMPERATURE - SZL1.0A (typical)



**FIGURE 5**  
ZENER VOLTAGE TEMPERATURE COEFFICIENT vs. OPERATING CURRENT (typical)  
 $\Delta T$  FROM 25 °C TO 125 °C

**GRAPHS (continued)**


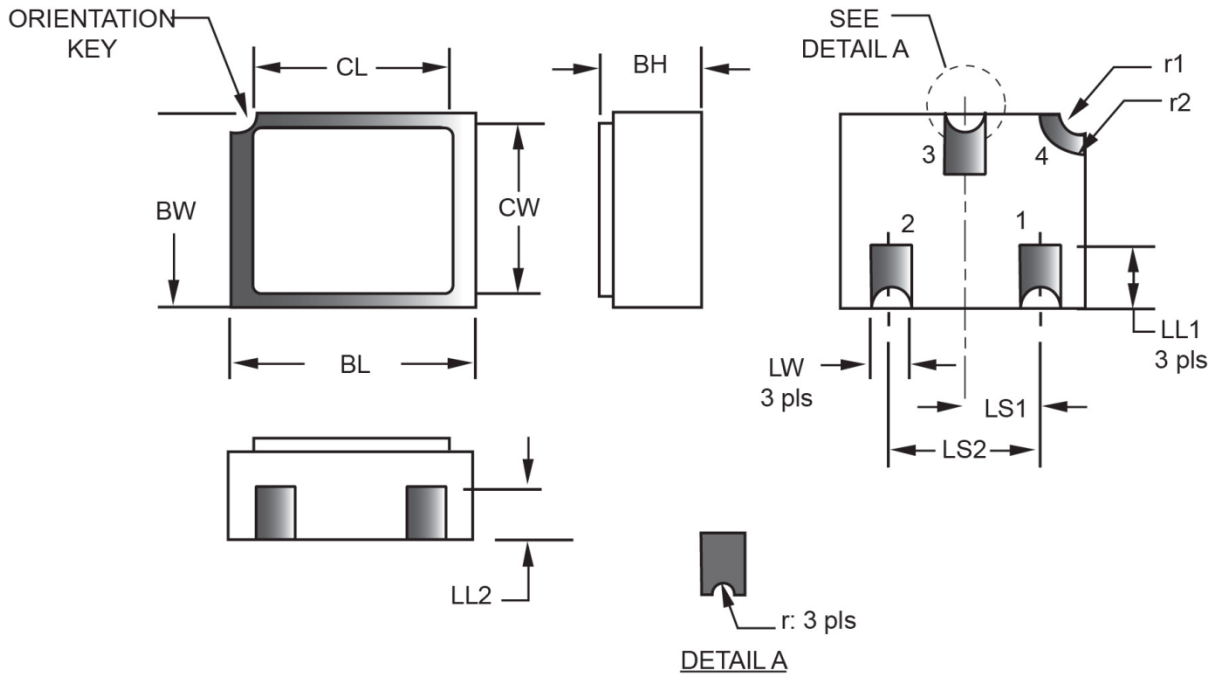
**FIGURE 6**  
**FORWARD VOLTAGE vs. FORWARD CURRENT at 25 °C (typical)**



**FIGURE 7**  
**FORWARD VOLTAGE vs. FORWARD CURRENT SZL1.8 (typical)**



PACKAGE DIMENSIONS



Symbol	Dimensions				Note	Symbol	Dimensions				Note
	inch		millimeters				inch		millimeters		
	Min	Max	Min	Max			Min	Max	Min	Max	
BH	0.046	0.056	1.17	1.42		LS1	0.035	0.040	0.89	1.02	
BL	0.115	0.128	2.92	3.25		LS2	0.071	0.079	1.80	2.01	
BW	0.095	0.108	2.41	2.74		LW	0.016	0.024	0.41	0.61	
CL	-	0.128	-	3.25		r	-	0.008	-	0.20	
CW	-	0.108	-	2.74		r1	-	0.012	-	0.30	6
LL1	0.022	0.038	0.56	0.97		r2	-	0.022	-	0.056	
LL2	0.014	0.035	0.356	0.89							

NOTES:

1. Dimensions are in inches. Millimeters are given for information only.
2. Ceramic package only.
3. Hatched areas on package denote metalized areas.
4. Pad 1 = Cathode, Pad 2 = not used, Pad 3 = Anode, Pad 4 = Shielding connected to the lid.
5. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.
6. For reference only.

SCHEMATIC



PAD ASSIGNMENTS: 1 = Cathode, 2 = Not Used, 3 = Anode, 4 = Shielding Connected to Lid