MLL4099–MLL4135
MLL4614–MLL4627

MOTOROLA

4

LOW NOISE LEVEL SILICON PASSIVATED ZENER DIODES

. . . designed for 250 mW applications requiring low leakage, low impedance, and low noise.

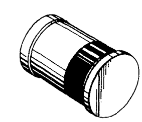
- Leadless Package for Surface Mount Technology
- Voltage Range from 1.8 to 100 Volts
- First Leadless Zener Diode Series to Specify Noise — 50% Lower than Conventional Diffused Zeners
- Zener Impedance and Zener Voltage Specified for Low-Level Operation at I_{ZT} = 250 μA
- Low Leakage Current — I_R from 0.01 to 10 μA over Voltage Range
- Available in 8mm Tape and Reel
  T1 Cathode Facing Sprocket Holes
  T2 Anode Facing Sprocket Holes

SILICON LEADLESS GLASS ZENER DIODES

(±5.0% TOLERANCE)

250 MILLIWATTS
1.8–100 VOLTS

SILICON NITRIDE PASSIVATED JUNCTION

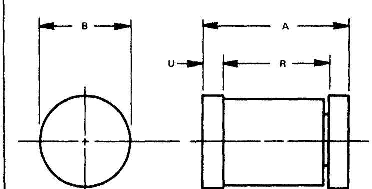


MAXIMUM RATINGS

Rating	Symbol	Value	Unit
DC Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	250 1.43	mW mW/°C
Junction and Storage Temperature Range	T_J, T_{stg}	−65 to +200	°C

MECHANICAL CHARACTERISTICS

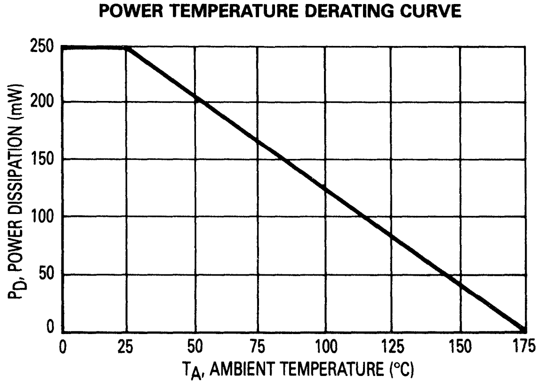
CASE: Double slug, hermetically sealed glass
MAXIMUM LEAD TEMPERATURE FOR SOLDERING PURPOSES: 230°C for 10 seconds
FINISH: All external surfaces are corrosion resistant and readily solderable
POLARITY: Cathode indicated by color band. When operated in the zener mode, cathode will be positive with respect to anode
MOUNTING POSITION: Any



DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	3.30	3.70	0.130	0.146
B	1.60	1.70	0.063	0.067
R	2.49	2.59	0.098	0.102
U	0.41	0.55	0.016	0.022

CASE 362-01

POWER TEMPERATURE DERATING CURVE



ELECTRICAL CHARACTERISTICS

(At 25°C Ambient temperature unless otherwise specified) I_{ZT} = 250 μA and V_F = 1.0 V max @ I_F = 200 mA on all Types

Type Number (Note 1)	Nominal Zener Voltage V_Z (Note 1) (Volts)	Max Zener Impedance Z_{ZT} (Note 2) (Ohms)	Max Reverse Current I_R (μA) (Note 3)	Test Voltage V_R (Volts)	Max Noise Density At I_{ZT} = 250 μA N_D (Fig 1) (micro-volts per Square Root Cycle)	Max Zener Current I_{ZM} (Note 4) (mA)
MLL4614	1.8	1200	7.5	1.0	1.0	120
MLL4615	2.0	1250	5.0	1.0	1.0	110
MLL4616	2.2	1300	4.0	1.0	1.0	100
MLL4617	2.4	1400	2.0	1.0	1.0	95
MLL4618	2.7	1500	1.0	1.0	1.0	90
MLL4619	3.0	1600	0.8	1.0	1.0	85
MLL4620	3.3	1650	7.5	1.5	1.0	80
MLL4621	3.6	1700	7.5	2.0	1.0	75
MLL4622	3.9	1650	5.0	2.0	1.0	70
MLL4623	4.3	1600	4.0	2.0	1.0	65
MLL4624	4.7	1550	10	3.0	1.0	60
MLL4625	5.1	1500	10	3.0	2.0	55
MLL4626	5.6	1400	10	4.0	4.0	50
MLL4627	6.2	1200	10	5.0	5.0	45
MLL4099	6.8	200	10	5.2	40	35
MLL4100	7.5	200	10	5.7	40	31.8
MLL4101	8.2	200	1.0	6.3	40	29.0
MLL4102	8.7	200	1.0	6.7	40	27.4
MLL4103	9.1	200	1.0	7.0	40	26.2
MLL4104	10	200	1.0	7.6	40	24.8
MLL4105	11	200	0.05	8.5	40	21.6
MLL4106	12	200	0.05	9.2	40	20.4
MLL4107	13	200	0.05	9.9	40	19.0
MLL4108	14	200	0.05	10.7	40	17.5
MLL4109	15	100	0.05	11.4	40	16.3
MLL4110	16	100	0.05	12.2	40	15.4
MLL4111	17	100	0.05	13.0	40	14.5
MLL4112	18	100	0.05	13.7	40	13.2
MLL4113	19	150	0.05	14.5	40	12.5
MLL4114	20	150	0.01	15.2	40	11.9
MLL4115	22	150	0.01	16.8	40	10.8
MLL4116	24	150	0.01	18.3	40	9.9
MLL4117	25	150	0.01	19.0	40	9.5
MLL4118	27	150	0.01	20.5	40	8.8
MLL4119	28	200	0.01	21.3	40	8.5
MLL4120	30	200	0.01	22.8	40	7.9
MLL4121	33	200	0.01	25.1	40	7.2
MLL4122	36	200	0.01	27.4	40	6.6
MLL4123	39	200	0.01	29.7	40	6.1
MLL4124	43	250	0.01	32.7	40	5.5
MLL4125	47	250	0.01	35.8	40	5.1
MLL4126	51	300	0.01	38.8	40	4.6
MLL4127	56	300	0.01	42.6	40	4.2
MLL4128	60	400	0.01	45.6	40	4.0
MLL4129	62	500	0.01	47.1	40	3.8
MLL4130	68	700	0.01	51.7	40	3.5
MLL4131	75	700	0.01	57.0	40	3.1
MLL4132	82	800	0.01	62.4	40	2.9
MLL4133	87	1000	0.01	66.2	40	2.7
MLL4134	91	1200	0.01	69.2	40	2.6
MLL4135	100	1500	0.01	76.0	40	2.3

NOTE 1: TOLERANCE AND VOLTAGE DESIGNATION

The type numbers shown have a standard tolerance of ±5.0% on the nominal zener voltage.

NOTE 2: ZENER IMPEDANCE (Z_{ZT}) DERIVATION

The zener impedance is derived from the 1000 cycle ac voltage, which results when an ac current having an rms value equal to 10% of the dc zener current (I_{ZT}) is superimposed on I_{ZT}.

NOTE 3: REVERSE LEAKAGE CURRENT I_R

Reverse leakage currents are guaranteed and are measured at V_R as shown on the table.

NOTE 4: MAXIMUM ZENER CURRENT RATINGS (I_{ZM})

Maximum zener current ratings are based on maximum zener voltage of the individual units.

ZENER NOISE DENSITY

A zener diode generates noise when it is biased in the zener direction. A small part of this noise is due to the internal resistance associated with the device. A larger part of zener noise is a result of the zener breakdown phenomenon and is called microplasma noise. This microplasma noise is generally considered "white" noise with equal amplitude for all frequencies from about zero cycles to approximately 200,000 cycles. To eliminate the higher frequency components of noise a small shunting capacitor can be used. The lower frequency noise generally must be tolerated since a capacitor required to eliminate the lower frequencies would degrade the regulation properties of the zener in many applications.

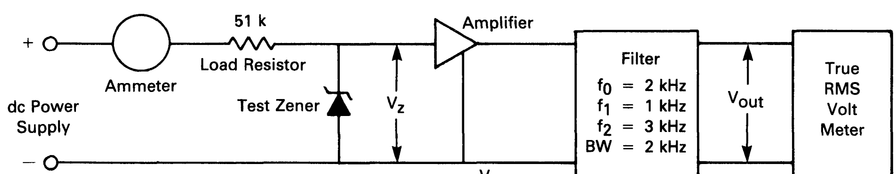
Motorola is rating this series with a maximum noise density at 250 microamperes. The rating of microvolts RMS per square root cycle enables calculation of the maximum RMS noise for any bandwidth.

Noise density decreases as zener current increases. This can be seen by the graph in Figure 2 where a typical noise density is plotted as a function of zener current.

The junction temperature will also change the zener noise levels. Thus the noise rating must indicate bandwidth, current level and temperature.

The block diagram given in Figure 1 shows the method used to measure noise density. The input voltage and load resistance is high so that the zener is driven from a constant current source. The amplifier must be low noise so that the amplifier noise is negligible compared to the test zener. The filter bandpass is known so that the noise density in volts RMS per square root cycle can be calculated.

FIGURE 1 — NOISE DENSITY MEASUREMENT METHOD



$$\text{Noise Density (volts per square root cycle)} = \frac{V_{out}}{\text{Overall Gain}\ \sqrt{BW}}$$

Where: BW = Filter Bandwidth (Cycles)
V_{out} = Output Noise (Volts RMS)

FIGURE 2 — TYPICAL NOISE DENSITY versus ZENER CURRENT

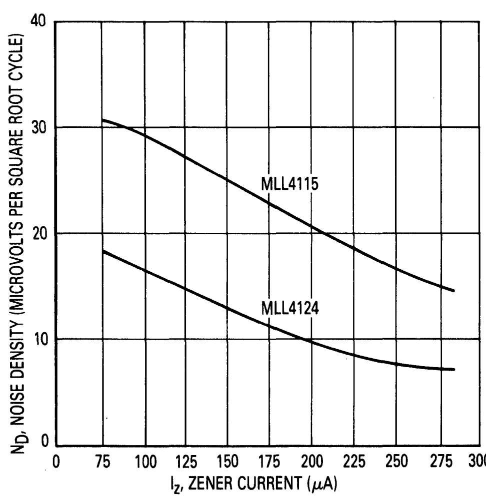


FIGURE 3 — TYPICAL CAPACITANCE

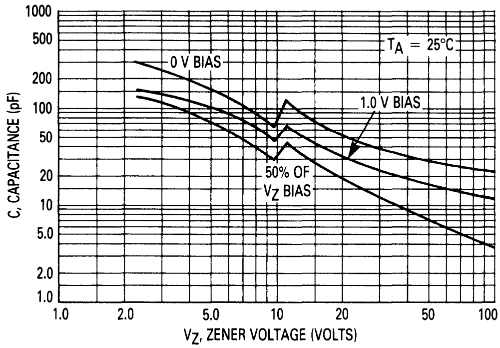


FIGURE 4 — TYPICAL FORWARD CHARACTERISTICS