

DATA SHEET

# DME, DMF, DMJ Series: Silicon Beam-Lead Schottky Mixer Diodes – Singles, Pairs & Quads, Bondable & Packaged Chips

## Applications

- Microwave Integrated Circuits
- Mixers
- Detectors

## Features

- Low 1/f noise
- Low intermodulation distortion
- Epoxy and hermetically sealed packages
- Statistical Process Control wafer fabrication
- Packages rated MSL1, 260 °C per JEDEC J-STD-020)

**NEW**

Skyworks offers lead (Pb)-free, RoHS (Restriction of Hazardous Substances) compliant packaging.

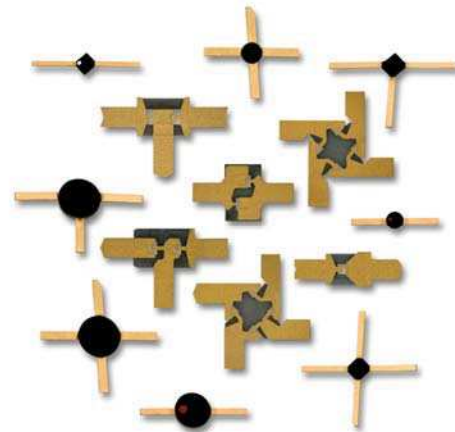


## Description

Skyworks beam-lead silicon Schottky barrier mixer diodes are designed for applications through 40 GHz. The beam-lead design reduces the problem of bonding to the very small area characteristic of low capacitance junctions.

Beam-lead Schottky barrier mixer diodes are made by the deposition of a suitable barrier metal on an epitaxial silicon substrate to form the junction. The process and choice of materials result in low series resistance with a narrow spread of capacitance values for close impedance control.

A variety of forward voltages are available ranging from low values for low, or starved, local oscillator drive levels to high values for high drive, low distortion mixer applications. Beam-lead diodes are available in a wide range of packages. Capacitance ranges and series resistances are comparable with the packaged devices that are available up to, and including, the Ka-band. Unpackaged diodes are well suited for use in Microwave Integrated Circuits (MICs). The packaged devices are designed to be inserted as hybrid elements in strip, transmission line applications.



Beam-lead Schottky barrier diodes are categorized by universal mixer applications in four frequency ranges: S, C, X, Ku, K, and Ka bands as noted in Table 1. They may also be used as modulators and high-speed switches.

Beam-lead diodes are suited for balanced mixers, due to their low parasitics and uniformity.

The absolute maximum ratings of the DME, DMF, and DMJ series of Schottky mixer diodes are provided in Table 2. Electrical and physical specifications are provided in Tables 3 through 15.

Typical performance characteristics are shown in Figures 1 through 3. Typical mixer circuits are shown in Figure 4.

**Table 1. Frequency Table**

Frequency Band	Frequency (GHz)
S	2 to 4
C	4 to 8
X	8.2 to 12.4
Ku	12.4 to 18.0
K	18.0 to 26.5
Ka	26.5 to 40.0

**Table 2. Absolute Maximum Ratings**

Parameter	Symbol	Minimum	Typical	Maximum	Units
Maximum current	I <sub>max</sub>			100	mA
Power dissipation (continuous wave)	P <sub>d</sub>			75	mW/junction
Storage temperature	T <sub>STG</sub>	-65		+175	°C
Operating temperature	T <sub>A</sub>	-65		+175	°C

**Note:** Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

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**CAUTION:** *Although these devices are designed to be as robust as possible, Electrostatic Discharge (ESD) can damage them. These devices must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.*

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**Table 3. Electrical Specifications: Beam-Lead Single N-Type Low, Medium, High Drive Schottky Diodes**



Part Number	Frequency Band	C <sub>J</sub> @ 0 V, 1 MHz (pF)	Rs @ 5 mA (Ω)	V <sub>B</sub> @ 10 μA (V)	V <sub>F</sub> @ 1 mA (mV)	Drive Level	Outline Drawing
			Max.	Min.			
DMF2820-000	S, C	0.30 to 0.50	5	2	200 to 260	low	491-011
DME2127-000	S, C	0.30 to 0.50	5	3	300 to 400	medium	491-011
DMJ2823-000	S, C	0.30 to 0.50	5	4	500 to 600	high	491-011
DMF2821-000	X	0.15 to 0.30	8	2	220 to 300	low	491-011
DME2957-000	X	0.15 to 0.30	8	3	325 to 425	medium	491-011
DMJ2777-000	X	0.15 to 0.30	8	4	550 to 650	high	491-011
DMF2344-000	Ku	0.05 to 0.15	13	2	260 to 330	low	491-011
DME2333-000	Ku	0.05 to 0.15	13	3	350 to 450	medium	491-011
DMJ2824-000	Ku	0.05 to 0.15	13	4	500 to 680	high	491-011
DMF2822-000	K, Ka	0.1 max	18	2	270 to 350	low	491-011
DME2458-000	K, Ka	0.1 max	18	3	375 to 550	medium	491-011
DMJ2825-000	K, Ka	0.1 max	18	4	600 to 700	high	491-011

**Table 4. Epoxy and Hermetic Packaged Beam-Lead Single N-Type Low, Medium, High Drive Schottky Diodes**

Part Numbers/Outline Drawings		
Epoxy Stripline 250	Epoxy Stripline 230	Hermetic Stripline 220
DMF2820-250	–	DMF2820-220
DME2127-250	–	DME2127-220
DMJ2823-250	–	DMJ2823-220
DMF2821-250	–	DMF2821-220
DME2957-250	–	DME2957-220
DMJ2777-250	–	DMJ2777-220
DMF2344-250	DMF2344-230	DMF2344-220
DME2333-250	DME2333-230	DME2333-220
DMJ2824-250	DMJ2824-230	DMJ2824-220
–	DMF2822-230	DMF2822-220
–	DME2458-230	DME2458-220
–	DMJ2825-230	DMJ2825-220

**Table 5. Electrical Specifications: Beam-Lead Series Pair, N-Type Low, Medium, High Drive Schottky Diodes**



Part Number	Frequency Band	C <sub>J</sub> @ 0 V, 1 MHz (pF)	Rs @ 5 mA (Ω)	V <sub>B</sub> @ 10 μA (V)	V <sub>F</sub> @ 1 mA (mV)	Drive Level	Outline Drawing
			Max.	Min.			
DMF2835-000	S, C	0.30 to 0.50	5	2	200 to 260	low	504-012
DME2050-000	S, C	0.30 to 0.50	5	3	300 to 400	medium	504-012
DMJ2092-000	S, C	0.30 to 0.50	5	4	500 to 600	high	504-012
DMF2826-000	X	0.15 to 0.30	8	2	220 to 300	low	504-012
DME2829-000	X	0.15 to 0.30	8	3	325 to 425	medium	504-012
DMJ2093-000	X	0.15 to 0.30	8	4	550 to 650	high	504-012
DMF2827-000	Ku	0.05 to 0.15	13	2	260 to 330	low	504-012
DME2830-000	Ku	0.05 to 0.15	13	3	350 to 450	medium	504-012
DMJ2832-000	Ku	0.05 to 0.15	13	4	500 to 680	high	504-012
DMF2828-000	K, Ka	0.1 max	18	2	270 to 350	low	504-012
DME2831-000	K, Ka	0.1 max	18	3	375 to 550	medium	504-012
DMJ2833-000	K, Ka	0.1 max	18	4	600 to 700	high	504-012

**Table 6. Epoxy and Hermetic Packaged Beam-Lead Series Pair N-Type Low, Medium, High Drive Schottky Diodes**

Part Numbers/Outline Drawings		
Epoxy Stripline 252	Epoxy Stripline 232	Hermetic Stripline 222
DMF2835-252	–	DMF2835-222
DME2050-252	–	DME2050-222
DMJ2092-252	–	DMJ2092-222
DMF2826-252	–	DMF2826-222
DME2829-252	–	DME2829-222
DMJ2093-252	–	DMJ2093-222
DMF2827-252	DMF2827-232	DMF2827-222
DME2830-252	DME2830-232	DME2830-222
DMJ2832-252	DMJ2832-232	DMJ2832-222
–	DMF2828-232	DMF2828-222
–	DME2831-232	DME2831-222
–	DMJ2833-232	DMJ2833-222

**Table 7. Electrical Specifications: Beam-Lead Common Cathode, N-Type Low, Medium, High Drive Schottky Diodes**

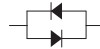


Part Number	Frequency Band	C <sub>J</sub> @ 0 V, 1 MHz (pF)	Rs @ 5 mA (Ω)	V <sub>B</sub> @ 10 μA (V)	V <sub>F</sub> @ 1 mA (mV)	Drive Level	Outline Drawing
			Max.	Min.			
DMF2182-000	S, C	0.30 to 0.50	5	2	200 to 260	low	504-013
DME2205-000	S, C	0.30 to 0.50	5	3	300 to 400	medium	504-013
DMJ2208-000	S, C	0.30 to 0.50	5	4	500 to 600	high	504-013
DMF2183-000	X	0.15 to 0.30	8	2	220 to 300	low	504-013
DME2206-000	X	0.15 to 0.30	8	3	325 to 425	medium	504-013
DMJ2209-000	X	0.15 to 0.30	8	4	550 to 650	high	504-013
DMF2184-000	Ku	0.05 to 0.15	13	2	260 to 330	low	504-013
DME2207-000	Ku	0.05 to 0.15	13	3	350 to 450	medium	504-013
DMJ2210-000	Ku	0.05 to 0.15	13	4	500 to 680	high	504-013
DMF2834-000	K, Ka	0.1 max	18	2	270 to 350	low	504-013
DME2864-000	K, Ka	0.1 max	18	3	375 to 550	medium	504-013
DMJ2836-000	K, Ka	0.1 max	18	4	600 to 700	high	504-013

**Table 8. Epoxy and Hermetic Packaged Beam-Lead Common Cathode N-Type Low, Medium, High Drive Schottky Diodes**

Part Numbers/Outline Drawings	
Epoxy Stripline 253	Hermetic Stripline 223
DMF2182-253	DMF2182-223
DME2205-253	DME2205-223
DMJ2208-253	DMJ2208-223
DMF2183-253	DMF2183-223
DME2206-253	DME2206-223
DMJ2209-253	DMJ2209-223
DMF2184-253	DMF2184-223
DME2207-253	DME2207-223
DMJ2210-253	DMJ2210-223
–	DMF2834-223
–	DME2864-223
–	DMJ2836-223

**Table 9. Electrical Specifications: Beam-Lead Anti-Parallel, N-Type Low, Medium, High Drive Schottky Diodes**



Part Number	Frequency Band	C <sub>J</sub> @ 0 V, 1 MHz (pF)	Rs @ 5 mA (Ω)	V <sub>B</sub> @ 10 μA (V)	V <sub>F</sub> @ 1 mA (mV)	Drive Level	Outline Drawing
			Max.	Min.			
DMF2185-000	S, C	0.30 to 0.50	5	2	200 to 260	low	522-025
DME2282-000	S, C	0.30 to 0.50	5	3	300 to 400	medium	522-025
DMJ2303-000	S, C	0.30 to 0.50	5	4	500 to 600	high	522-025
DMF2186-000	X	0.15 to 0.30	8	2	220 to 300	low	522-025
DME2283-000	X	0.15 to 0.30	8	3	325 to 425	medium	522-025
DMJ2304-000	X	0.15 to 0.30	8	4	550 to 650	high	522-025
DMF2187-000	Ku	0.05 to 0.15	13	2	260 to 330	low	522-025
DME2284-000	Ku	0.05 to 0.15	13	3	350 to 450	medium	522-025
DMJ2246-000	Ku	0.05 to 0.15	13	4	500 to 680	high	522-025
DMF2837-000	K, Ka	0.1 max	18	2	270 to 350	low	522-025
DME2838-000	K, Ka	0.1 max	18	3	375 to 550	medium	522-025
DMJ2839-000	K, Ka	0.1 max	18	4	600 to 700	high	522-025

**Table 10. Epoxy and Hermetic Packaged Beam-Lead Anti-Parallel N-Type Low, Medium, High Drive Schottky Diodes**

Part Numbers/Outline Drawings	
Epoxy Stripline 251	Hermetic Stripline 221
DMF2185-251	DMF2185-221
DME2282-251	DME2282-221
DMJ2303-251	DMJ2303-221
DMF2186-251	DMF2186-221
DME2283-251	DME2283-221
DMJ2304-251	DMJ2304-221
DMF2187-251	DMF2187-221
DME2284-251	DME2284-221
DMJ2246-251	DMJ2246-221
–	DMF2837-221
–	DME2838-221
–	DMJ2839-221

**Table 11. Electrical Specifications: Beam-Lead Ring Quad, N-Type Low, Medium, High Drive Schottky Diodes**



Part Number	Frequency Band	C <sub>J</sub> @ 0 V, 1 MHz (pF)	Rs @ 5 mA (Ω)	V <sub>B</sub> @ 10 μA (V)	V <sub>F</sub> @ 1 mA (mV)	Drive Level	Outline Drawing
			Max.	Min.			
DMF2865-000	S, C	0.30 to 0.50	5	2	200 to 260	low	488-002
DME2857-000	S, C	0.30 to 0.50	5	3	300 to 400	medium	488-002
DMJ2502-000	S, C	0.30 to 0.50	5	4	500 to 600	high	488-002
DMF2011-000	X	0.15 to 0.30	8	2	220 to 300	low	488-002
DME2858-000	X	0.15 to 0.30	8	3	325 to 425	medium	488-002
DMJ2990-000	X	0.15 to 0.30	8	4	550 to 650	high	488-002
DMF2012-000	Ku	0.05 to 0.15	13	2	260 to 330	low	488-002
DME2859-000	Ku	0.05 to 0.15	13	3	350 to 450	medium	488-002
DMJ2667-000	Ku	0.05 to 0.15	13	4	500 to 680	high	488-002
DMF2454-000	K, Ka	0.1 max	18	2	270 to 350	low	488-002
DME2459-000	K, Ka	0.1 max	18	3	375 to 550	medium	488-002
DMJ2455-000	K, Ka	0.1 max	18	4	600 to 700	high	488-002

**Table 12. Epoxy and Hermetic Packaged Beam-Lead Ring Quad N-Type Low, Medium, High Drive Schottky Diodes**

Part Numbers/Outline Drawings		
Epoxy Stripline 254	Epoxy Stripline 234	Hermetic Stripline 224
DMF2865-254	–	DMF2865-224
DME2857-254	–	DME2857-224
DMJ2502-254	–	DMJ2502-224
DMF2011-254	–	DMF2011-224
DME2858-254	–	DME2858-224
DMJ2990-254	–	DMJ2990-224
DMF2012-254	DMF2012-234	DMF2012-224
DME2859-254	DME2859-234	DME2859-224
DMJ2667-254	DMJ2667-234	DMJ2667-224
–	DMF2454-234	DMF2454-224
–	DME2459-234	DME2459-224
–	DMJ2455-234	DMJ2455-224

**Table 13. Electrical Specifications: Beam-Lead Bridge Quad, N-Type Low, Medium, High Drive Schottky Diodes**



Part Number	Frequency Band	C <sub>J</sub> @ 0 V, 1 MHz (pF)	Rs @ 5 mA (Ω)	V <sub>B</sub> @ 10 μA (V)	V <sub>F</sub> @ 1 mA (mV)	Drive Level	Outline Drawing
			Max.	Min.			
DMF2076-000	S, C	0.30 to 0.50	5	2	200 to 260	low	488-004
DME2029-000	S, C	0.30 to 0.50	5	3	300 to 400	medium	488-004
DMJ2312-000	S, C	0.30 to 0.50	5	4	500 to 600	high	488-004
DMF2077-000	X	0.15 to 0.30	8	2	220 to 300	low	488-004
DME2850-000	X	0.15 to 0.30	8	3	325 to 425	medium	488-004
DMJ2088-000	X	0.15 to 0.30	8	4	550 to 650	high	488-004
DMF2078-000	Ku	0.05 to 0.15	13	2	260 to 330	low	488-004
DME2031-000	Ku	0.05 to 0.15	13	3	350 to 450	medium	488-004
DMJ2768-000	Ku	0.05 to 0.15	13	4	500 to 680	high	488-004
DMF2848-000	K, Ka	0.1 max	18	2	270 to 350	low	488-004
DME2851-000	K, Ka	0.1 max	18	3	375 to 550	medium	488-004
DMJ2852-000	K, Ka	0.1 max	18	4	600 to 700	high	488-004

**Table 14. Epoxy and Hermetic Packaged Beam-Lead Bridge Quad N-Type Low, Medium, High Drive Schottky Diodes**

Part Numbers/Outline Drawings		
Epoxy Stripline 255	Epoxy Stripline 235	Hermetic Stripline 225
DMF2076-255	–	DMF2076-225
DME2029-255	–	DME2029-225
DMJ2312-255	–	DMJ2312-225
DMF2077-255	–	DMF2077-225
DME2850-255	–	DME2850-225
DMJ2088-255	–	DMJ2088-225
DMF2078-255	DMF2078-235	DMF2078-225
DME2031-255	DME2031-235	DME2031-225
DMJ2768-255	DMJ2768-235	DMJ2768-225
–	DMF2848-235	DMF2848-225
–	DME2851-235	DME2851-225
–	DMJ2852-235	DMJ2852-225

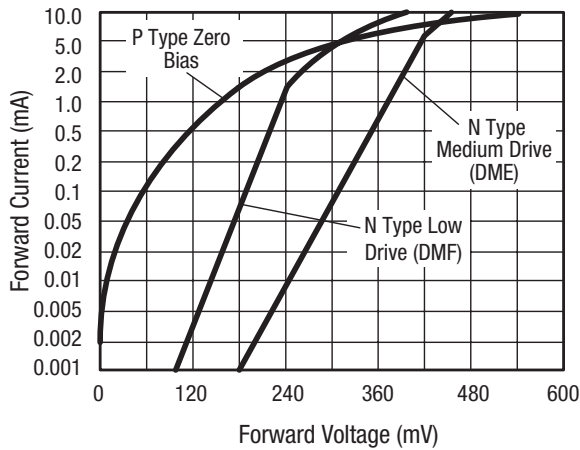


**Table 15. Electrical Specifications: Epoxy Packaged Octo Quad Ring, N-Type Low, Medium, High Drive Schottky Diodes**

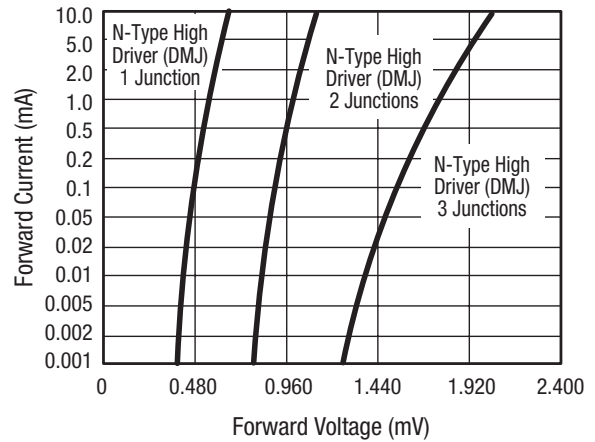


Part Number	Frequency Band	C <sub>J</sub> @ 0 V, 1 MHz (pF)	Rs @ 5 mA (Ω)	V <sub>B</sub> @ 10 μA (V)	V <sub>F</sub> @ 1 mA (mV)	Drive Level	Outline Drawing
			Max.	Min.			
DMF3938-257	S to X	0.15 to 0.30	16	4	400 to 520	low	-257
DME3939-257	S to X	0.15 to 0.30	16	6	600 to 800	medium	-257
DMJ3940-257	S to X	0.15 to 0.30	16	8	1000 to 1200	high	-257

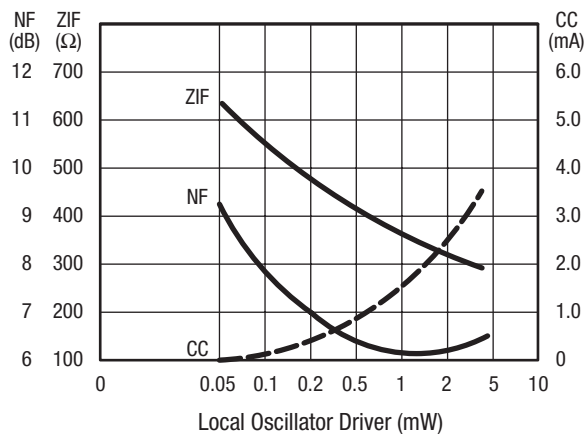
**Typical Performance Characteristics**



**Figure 1. Typical Forward DC Characteristic Curves (Voltage vs Current)**

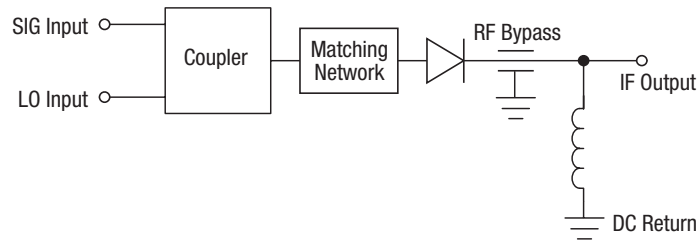


**Figure 2. Typical Forward DC Characteristic Curves (Voltage vs current)**

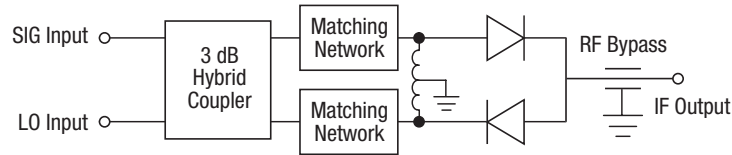


**Figure 3. Typical X-Band Low Drive Mixer Diode RF Parameters vs Local Oscillator Drive**

Single Ended Mixer



Balanced Mixer



Double Balanced Mixer

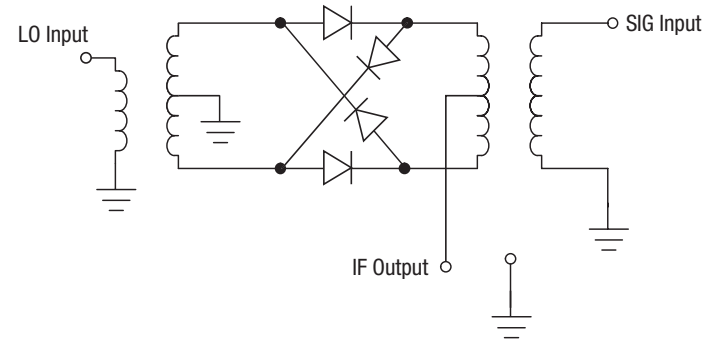
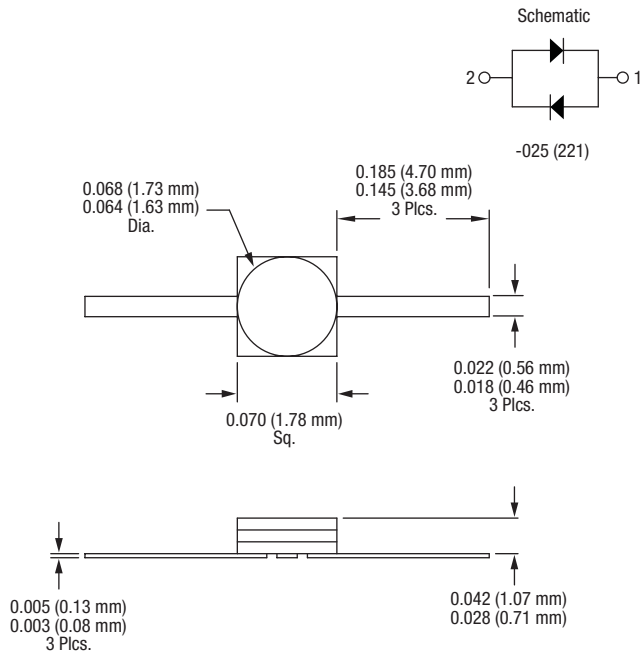
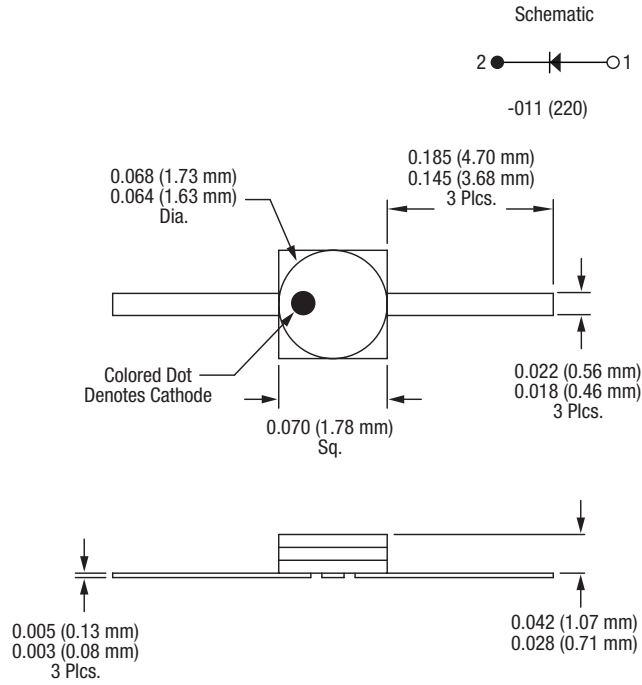


Figure 4. Typical Mixer Circuits

Shipping Information

To order a packaged diode, simply append the part number to the package outline number. For example, a Medium Drive Ring Quad Ku-band diode (part number DME2859-000) in a -234 package would be ordered as DME2859-234.

Package dimensions are provided in Figures 5 through 27.



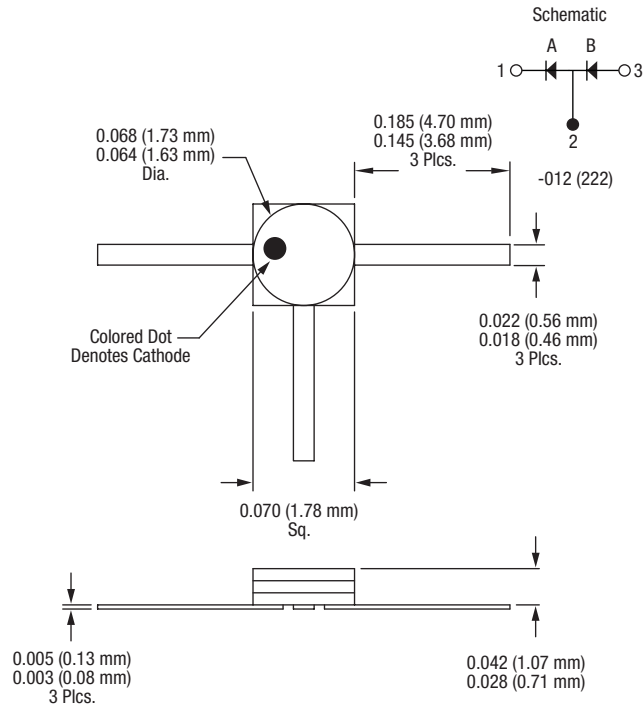


Figure 7. -222 Package Dimensions

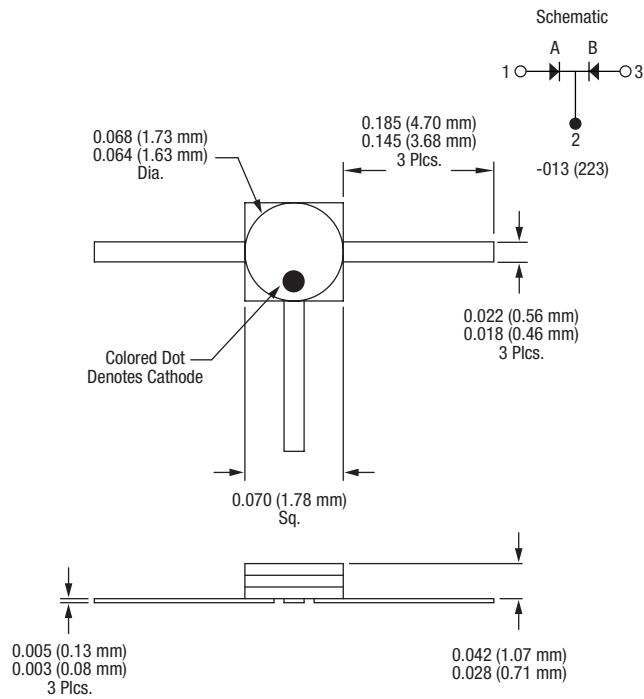


Figure 8. -223 Package Dimensions

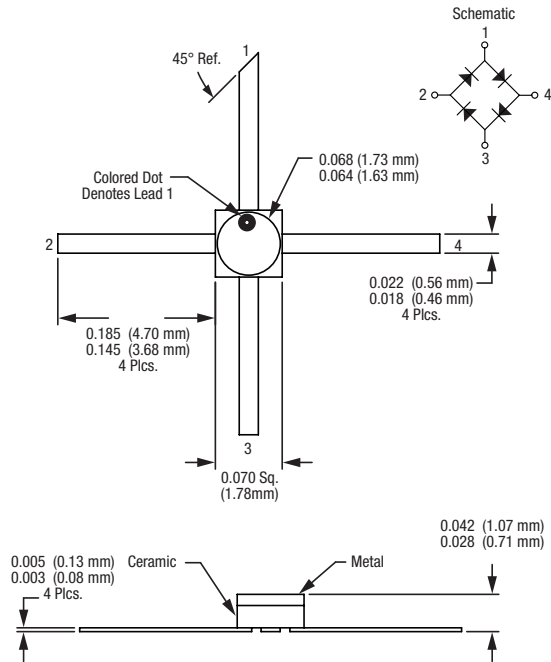


Figure 9. -224 Package Dimensions

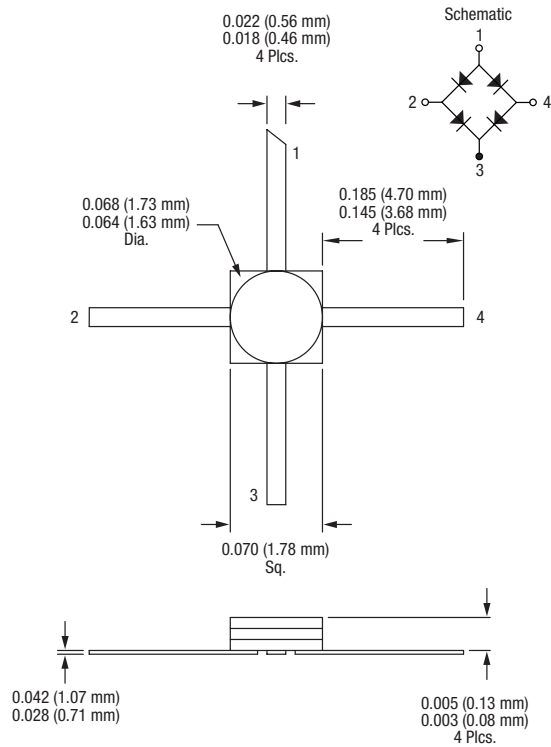
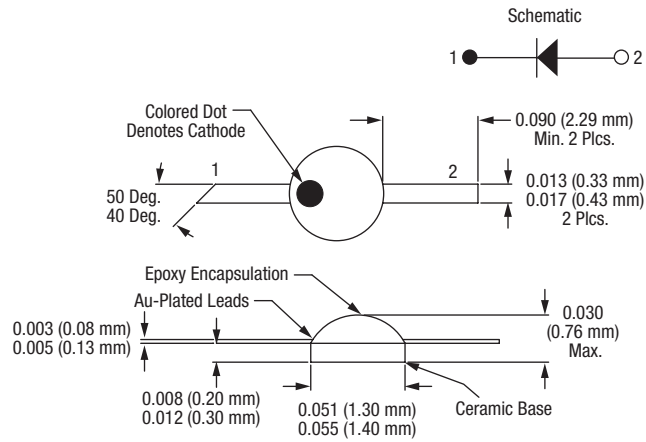
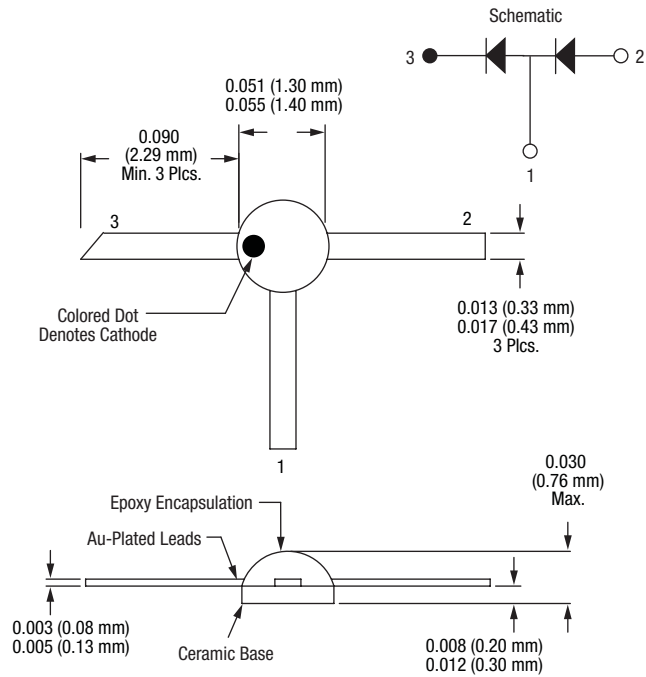


Figure 10. -225 Package Dimensions



**Figure 11. -230 Package Dimensions**



**Figure 12. -232 Package Dimensions**

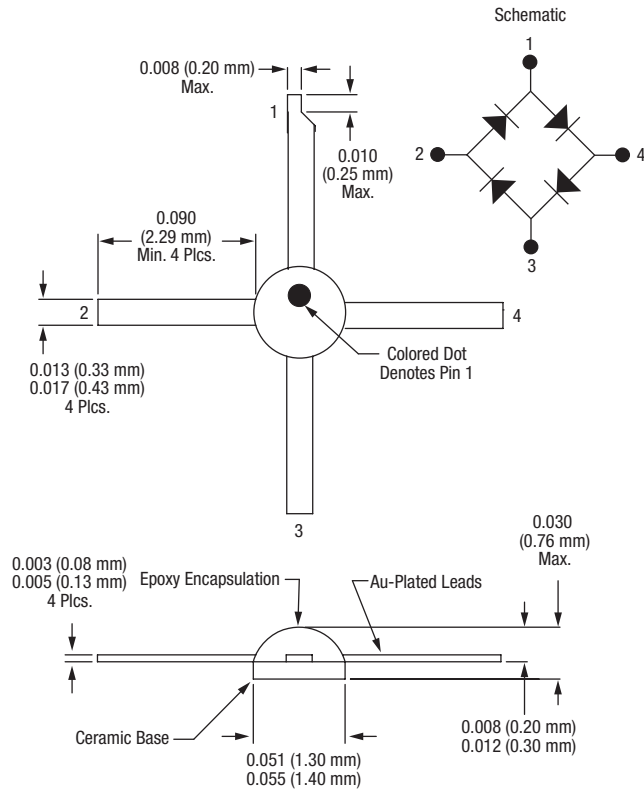


Figure 13. -234 Package Dimensions

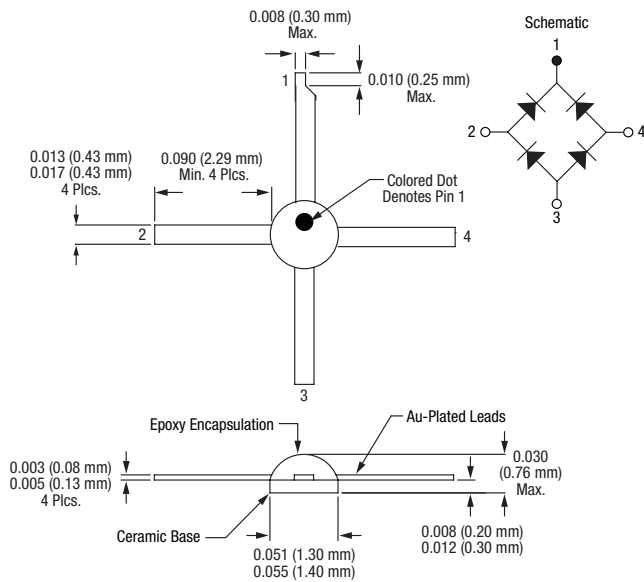


Figure 14. -235 Package Dimensions

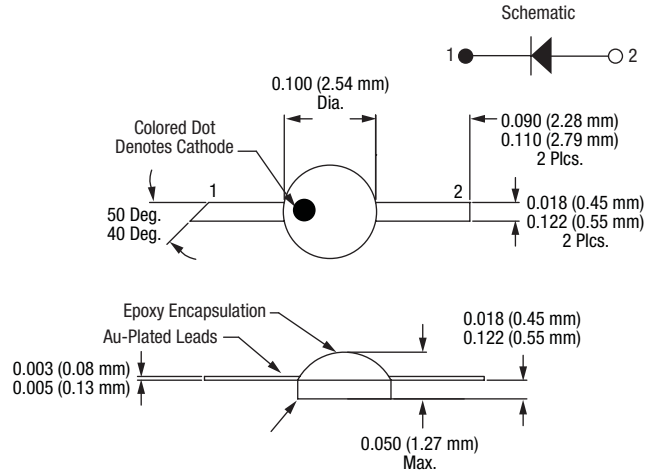


Figure 15. -250 Package Dimensions

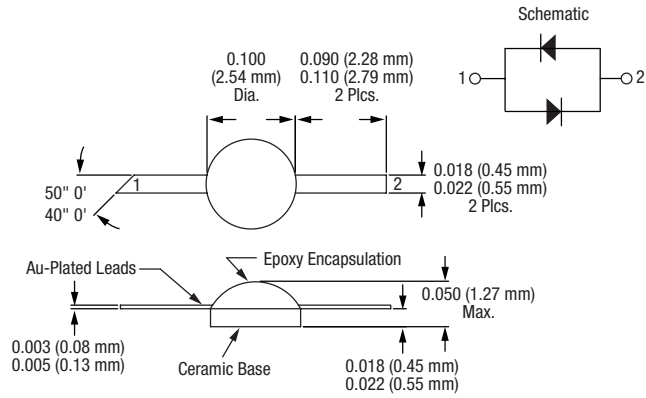


Figure 16. -251 Package Dimensions



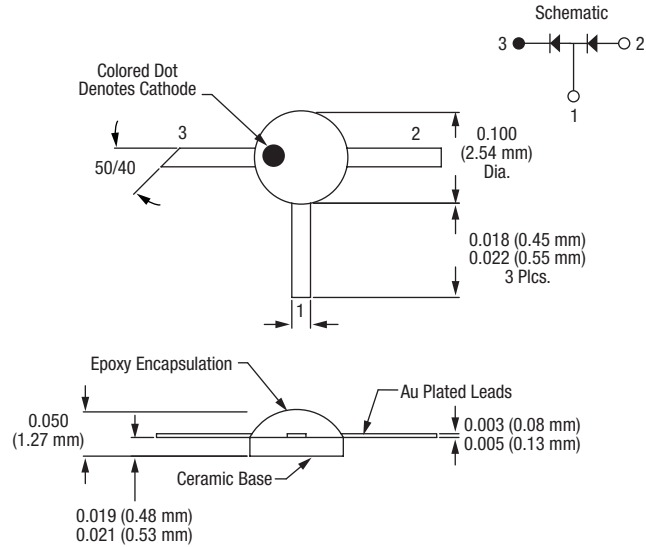


Figure 17. -252 Package Dimensions

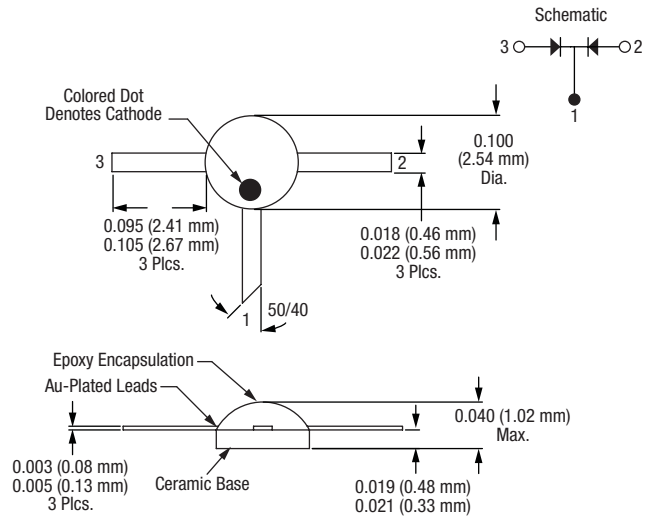


Figure 18. -253 Package Dimensions

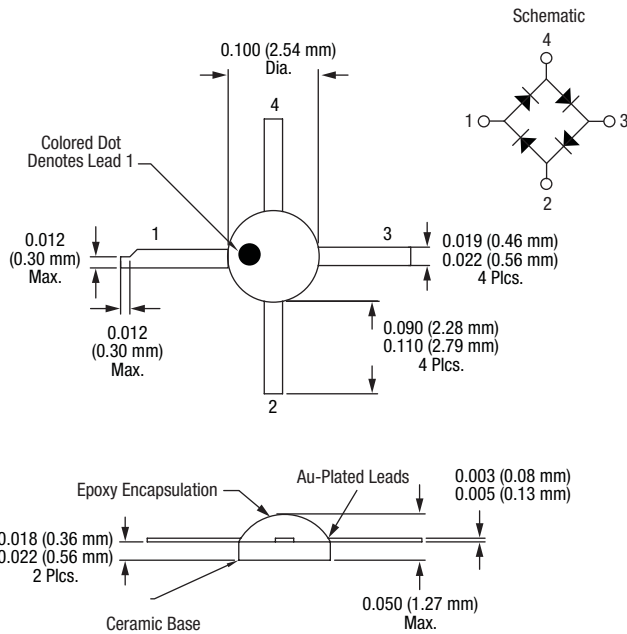


Figure 19. -254 Package Dimensions

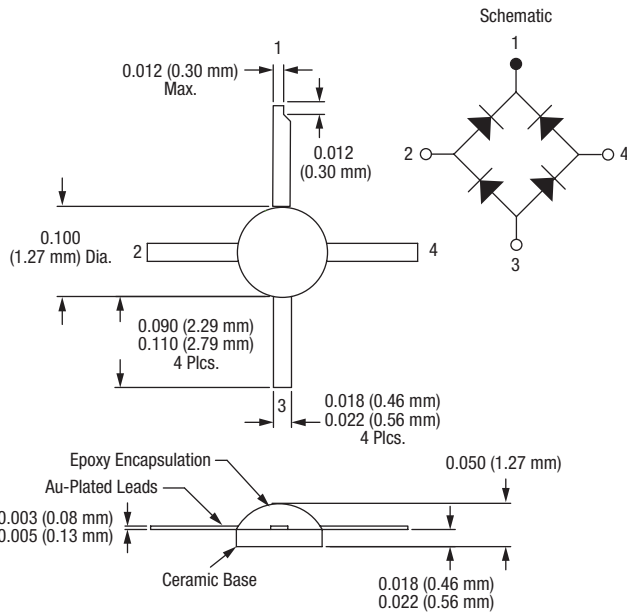


Figure 20. -255 Package Dimensions

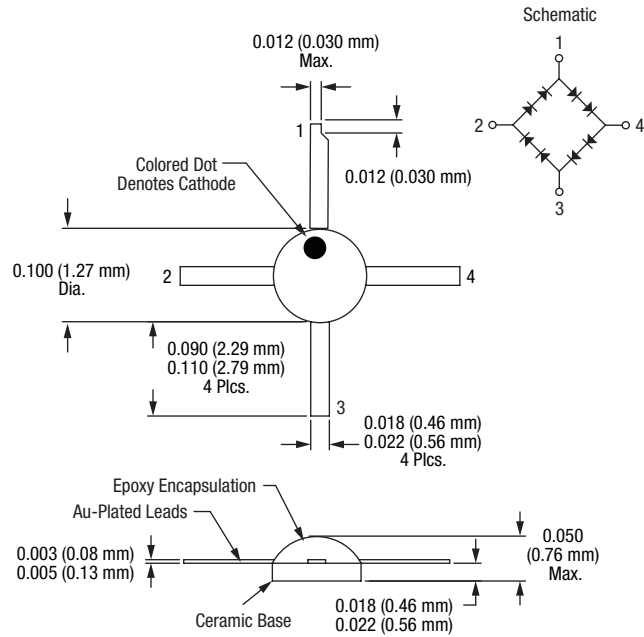


Figure 21. -257 Package Dimensions

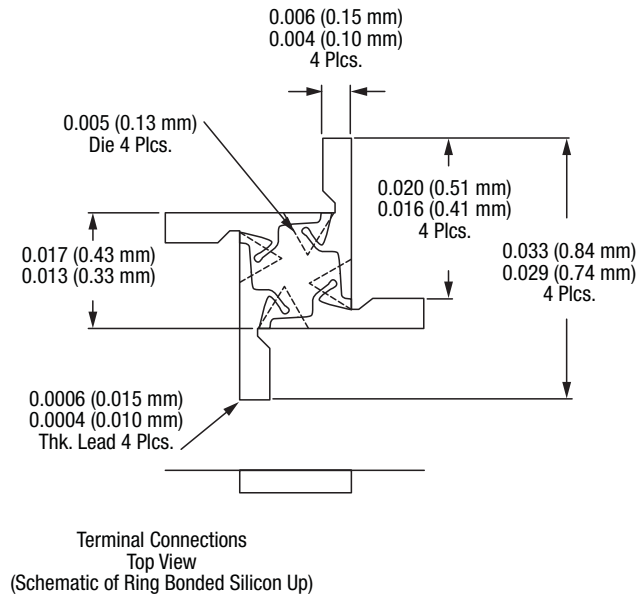


Figure 22. 488-002 Package Dimensions

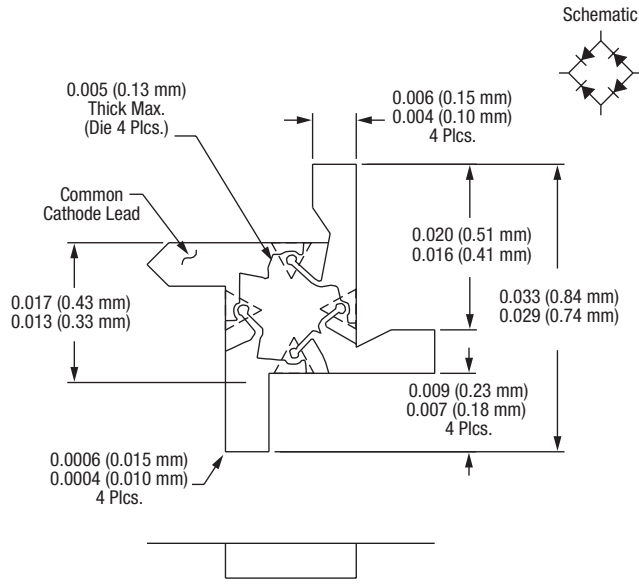


Figure 23. 488-004 Package Dimensions

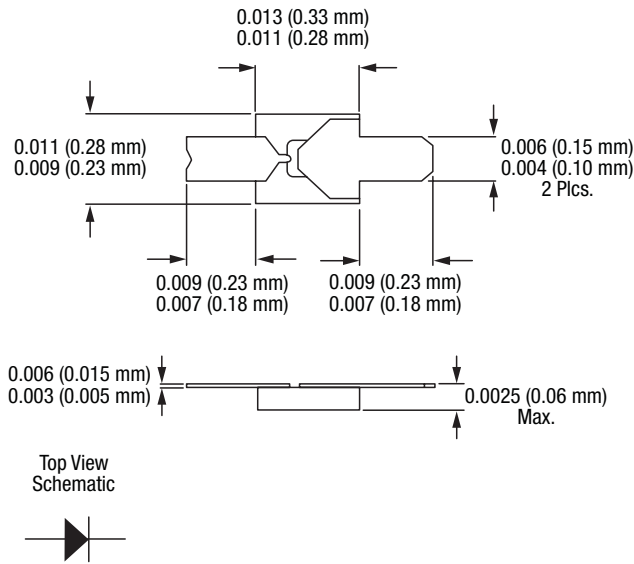
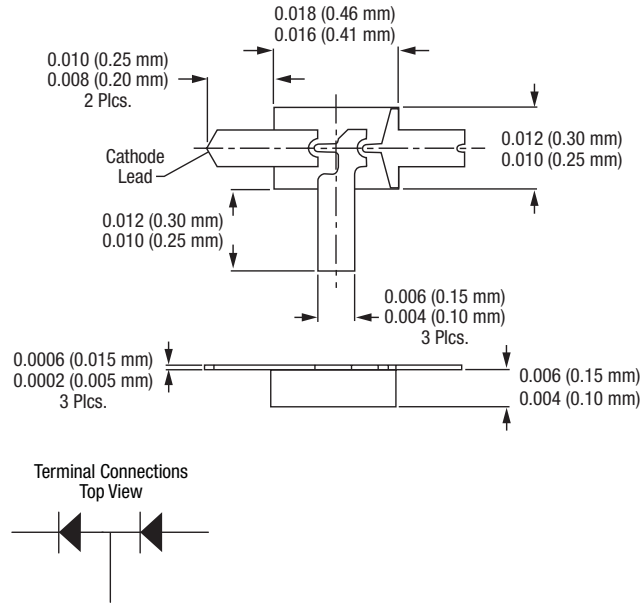
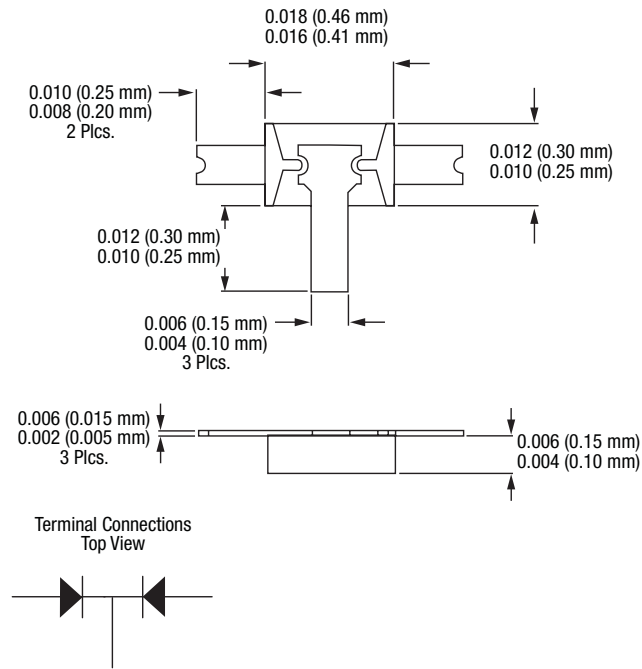


Figure 24. 491-011 Package Dimensions

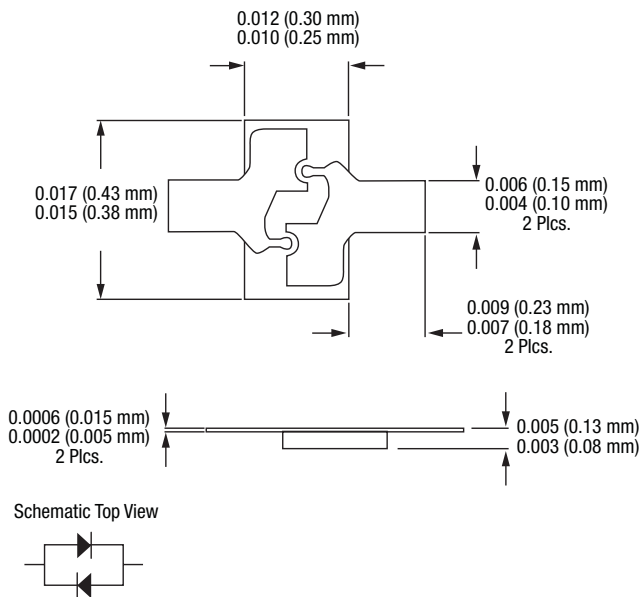


**Figure 25. 504-012 Package Dimensions**



**Figure 26. 504-013 Package Dimensions**

**DATA SHEET • DME, DMF, DMJ SERIES SCHOTTKY MIXER DIODES**



**Figure 27. 522-025 Package Dimensions**

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