DS3415-1.2

DC3000 Series

BROADBAND BACK DIODE DETECTORS

These detector modules consist of a germanium back diode chip with integrated thin film capacitor and broadband matching cicuit on a microstrip tile.

The MiMAC (Microwave Monolithic Alumina Circuit) technology employed offers high reliability and excellent tracking between devices. Back diode detectors have excellent temperature stability combined with good sensitivity but without the need for DC bias. Low video impedance gives excellent RF match, fast pulse response and extremely wide bandwidths (100MHz to 20GHz for the DC3033/34 tile version) without compromising output sensitivity.

These detectors are available as fully RF tested tiles or in various package configurations.

FEATURES

- **0.1 to 20GHz frequency range**
- **High reliability MiMAC technology**
- **High dynamic range**
- **Output variation <±0.5dB over 0.1 to 20GHz**
- **High zero bias sensitivity**
- **Excellent temperature stability**
- **Available in a variety of packages**

APPLICATIONS

These devices are designed for RF power monitoring and signal processing where a very flat, broadband frequency response over a wide temperature range is important. Typical applications include power monitors, detector log video amplifiers (DC and AC coupled), automatic levelling circuits and built-in test equipment (BITE) applications. Two basic configurations of input matching are available.

Resistive matching yields low VSWR and excellent flatness over a wide bandwidth, while reactive matching yields high sensitivity. Matched pairs and batches of detectors can also be supplied if required. In general, a wide variety of performance characteristics can be achieved by modifying device configurations, padding and load conditions.

LIMITING CONDITIONS OF USE

Operating Temperature Range	-55°C to +110°C
Storage Temperature Range	-65°C to +125°C
RF Power at 25°C	+17dBm
Soldering Temperature	230°C for 5 seconds

ELECTRICAL CHARACTERISTICS At T_{amb} = 25°C

Parameter	Typical Value Reactive Match	Typical Value Resistive Match	Test Conditions
Output Sensitivity (mV/mW)	900	450	f = 2-18GHz P_{IN} = -20dBm
Maximum Tangential Sensitivity T_{SS}, (dBm)	-52	-49	R_L = f = 9GHz R_L = 1MΩ NF = 4dB BW = 1MHz
VSWR Maximum	3.5:1	1.8:1 (Note 1)	f = 2-18GHz P_{IN} = -20dBm
Output Flatness (dB) Maximum	<±0.5	<±0.2 (Note 2)	f = 2-18GHz P_{IN} = -20dBm
Output Variation with Temperature (dB) Minimum	<±0.3	<±0.3	f = 10GHz -55°C to +100°C P_{IN} = -20dBm
1dB Compression-point (dB)	-5	-2.5	R_L = 430Ω f = 2-18GHz
RF/Video Isolation (dB)	20	20	P_{IN} = -20dBm f = 2-18GHz
Video Resistance R_V(Ω)	160	240	P_{IN} = -20dBm f = 1KHz
Video Capacitance (pF)	20	20	f = 1MHz

NOTES:
1. VSWR Maximum = 2:1 for DC3031/32 and 2.2:1 for DC3037/38
2. Output Flatness Maximum = <±0.3 for DC3031/32 and DC3037/38
3. This specification applies to the tile. Slight degradation may be expected beyond these results dependent on the package style employed. Devices are tested over 0.1 to 18GHz frequency range but the resistive type devices will operate over 0.1 to 20GHz.

DETECTOR TERMINOLOGY

Video Resistance: Measure of video source impedance of a detector which is determined by the AC slope of diode characteristic at a bias level set by external RF signal.

Tangential Sensitivity: Measure of input power relative to 0dBM as defined by a signal to noise ratio of 2.6:1, within a known bandwidth.

Output Sensitivity: Ratio of detector output voltage to RF input power in the square law region of the device, measured at a input power and frequency.

Flatness: Measure of the variation of RF input power required to maintain a constant output voltage over a known RF bandwidth.

Transfer Function: A plot of DC output voltage against RF input power. For low level signals (square law range) out voltage is proportional to input power and a liear plot is obtained on a log/log scale.

1dB Compression Point: Point at which output deviates from square law response by 1dB on a dynamic range curve.

ELECTRICAL CONFIGURATION

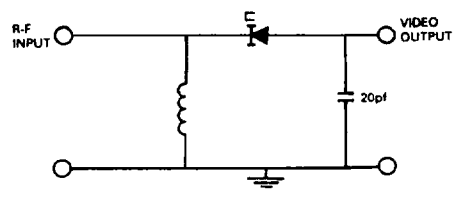


Figure 1. Reactive Input

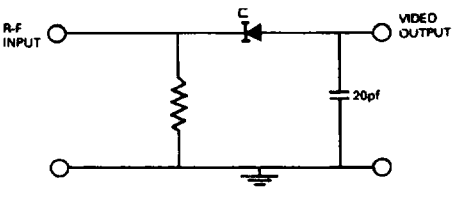
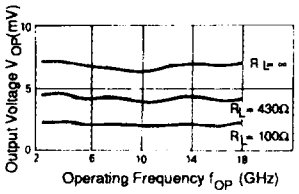


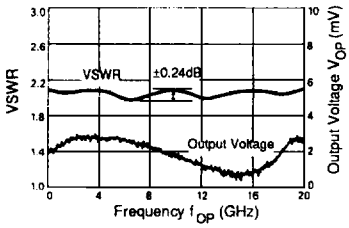
Figure 2. Resistive Input

TYPICAL PERFORMANCE

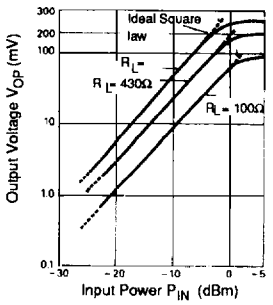
RESISTIVE MATCHING



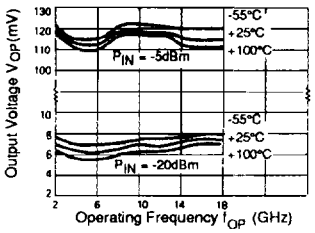
Graph 1. Output Voltage vs. Operating Frequency



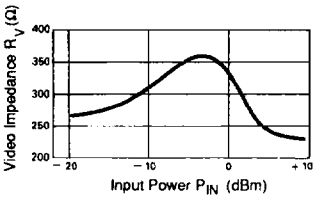
Graph 2. VSWR and Operating Output Voltage vs. Frequency



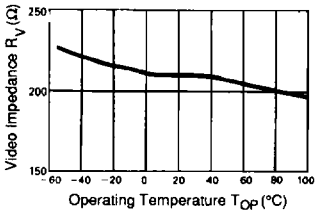
Graph 3. Output Voltage P_{IN} = -20dBm vs. Input Power F_{OP} = 10 GHz



Graph 4. Output Voltage vs. Operating Frequency

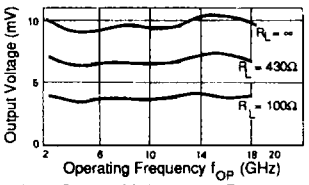


Graph 5. Video Impedance P_{IN} = -20dBm vs. Input Power T_{OP} = +25°C

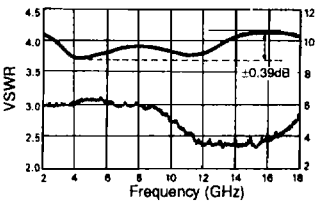


Graph 6. Video Impedance P_{IN} = -20dBm vs. Operating Temperature F_{OP} = 10 GHz

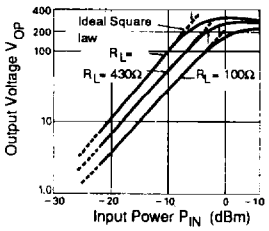
REACTIVE MATCHING



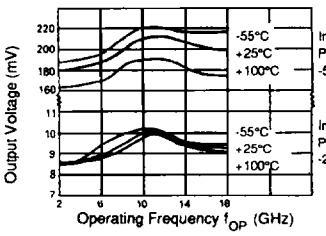
Graph 7. Output Voltage vs. P_{IN} = -20dBm Operating Frequency T_{OP} = +25°C



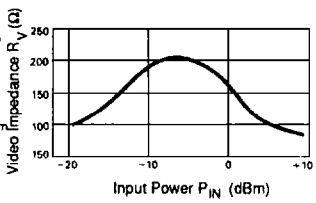
Graph 8. VSWR and Output Voltage vs. Frequency



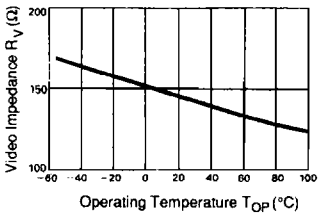
Graph 9. Output Voltage P_{IN} = -20dBm vs. Input Power F_{OP} = 10 GHz



Graph 10. Output Flatness vs. Operating Frequency



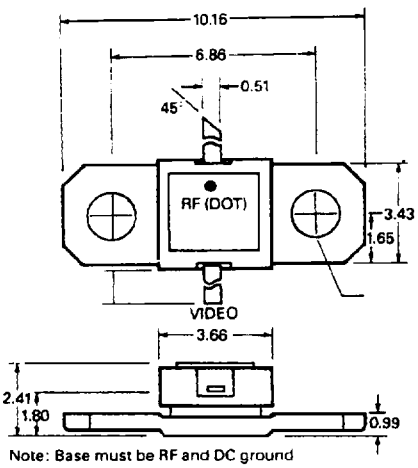
Graph 11. Video Impedance P_{IN} = -20dBm vs. Input Power T_{OP} = +25°C



Graph 12. Video Impedance P_{IN} = -20dBm vs. Operating Temperature F_{OP}= 10 GHz

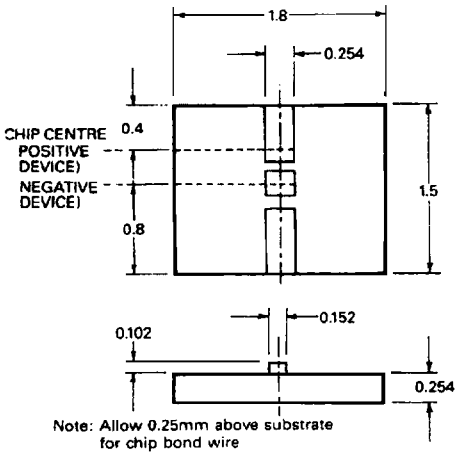
OUTLINES AND DIMENSIONS

OUTLINE 161
DC3031/DC3032 (Resistive matching)
DC3041/DC3042 (Reactive matching)



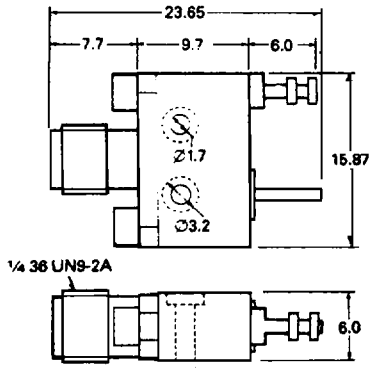
Note: Base must be RF and DC ground

OUTLINE 201
DC3033/DC3034 (Resistive matching)
DC3043/DC3044 (Reactive matching)



Note: Allow 0.25mm above substrate for chip bond wire

OUTLINE 221
DC3037/DC3038 (Resistive matching)
DC3047/DC3048 (Reactive matching)



OUTLINE 203
DC3039/DC3040 (Resistive matching)
DC3049/DC3050 (Reactive matching)