DM314: Fast Temperature-Stable 5.8 GHz Microwave Detector

General Description

DM314 is a small-housing, tunnel diode coaxial microwave detector intended primarily for 5800 MHz industrial applications. The detector delivers well-scaled DC voltage approximately proportional to the input power. The tunnel diode ensures high temperature stability of the output voltage and low video resistance for fast pulse rise/fall times.

Fig. 1. Microwave detector DM314.

Specifications

Frequency range	5500 − 6100 MHz
Frequency response variation (max)	±0.5 dB
Typical output voltage for $P = 0.1$ mW, $R_{LOAD} = 33$ kΩ	150 mV
VSWR max	2
VSWR typ	1.3
Statistical spread of output voltage	±1 dB (3-σ deviation)
Output voltage polarity	Negative
Output voltage temperature variation (5 to 65 °C)	< 0.5 dB
Video resistance (typ)	250 Ω
Max input working power	1 mW
Max input power (destruction limit)	20 mW
Input RF connector	SMA-male
Output DC connector	SMA-female
Dimensions (L × W × H)	38.7 × 18 × 11 mm
Mass	15 g
Operating temperature range	-10 °C to +65 °C
Storage temperature range	-20 °C to +80 °C

Typical Transfer Characteristic

Fig. 2 below shows typical detector transfer characteristic for frequency 5800 MHz, ambient temperature T_a = 25 °C and load resistance R_L = 33 kΩ, where P is the input microwave power in dBm and V is the (negative) output DC voltage in mV. Note that P_{dBm} = 10*log(P_{mW}).
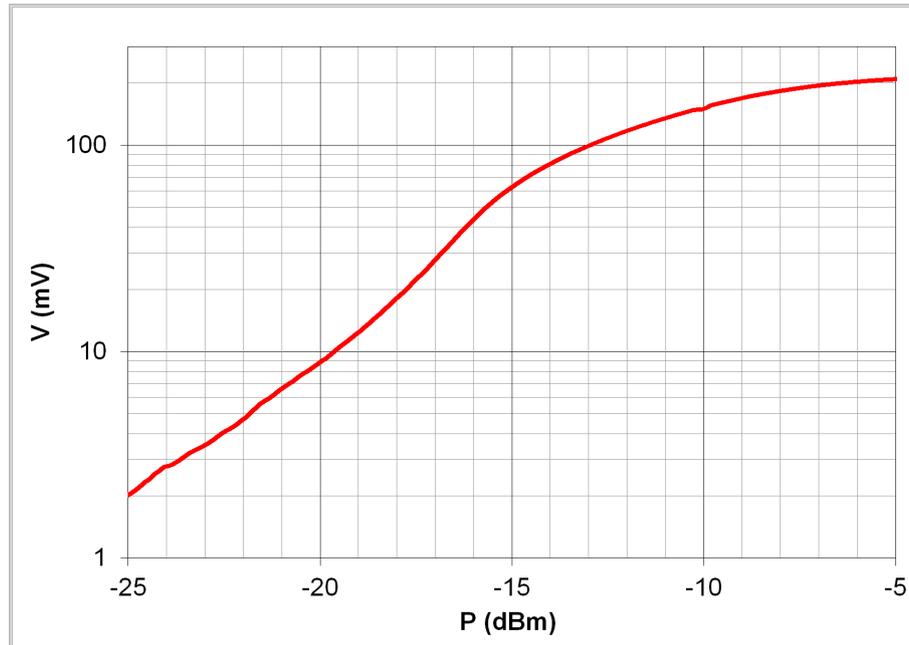

Fig. 2. Typical DM314 transfer characteristic.

Detector Correction Curve

A detector correction curve is the inverse of the transfer curve. It can serve, in particular in its mathematical form, for determining the input power from the output voltage. A typical DM314 correction curve in lin-lin format is shown in Fig. 3 on the next page.

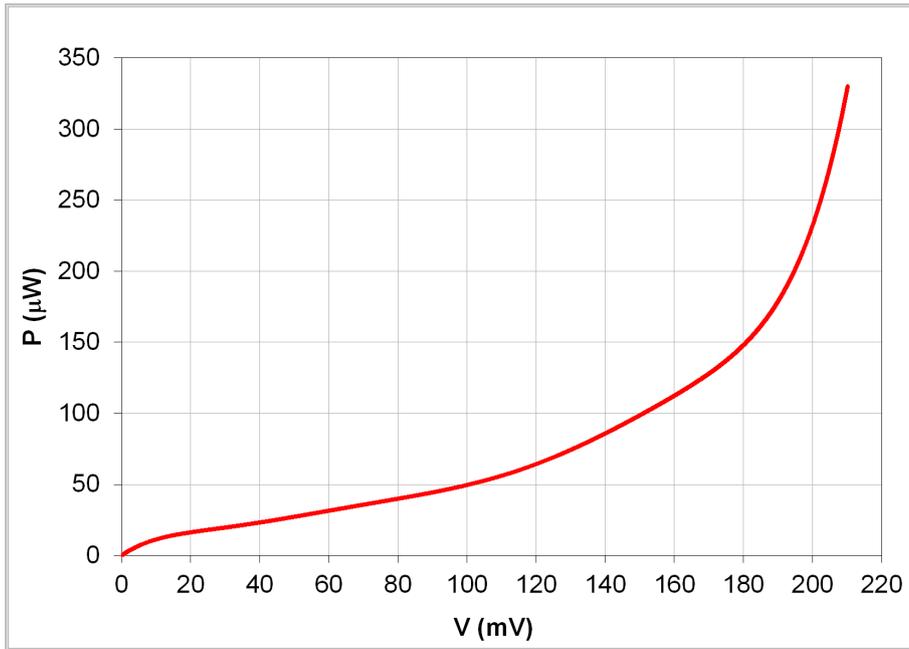**Fig. 3.** Typical DM314 correction curves.

The curve can be approximated by the polynomial

$$P = d_1V + d_2V^2 + d_3V^3 + ... + d_nV^n$$

where P is the input microwave power in milliwatts, V is the output voltage in millivolts, and d_i are the polynomial coefficients listed below. The correction curves and the polynomial coefficients are valid for $T_a = 25\ ^\mathrm{O}C$, $R_L = 33\ k\Omega$, and for **output voltages not exceeding about 210 mV**.

Tab. 1. Polynomial coefficients for the DM314 detector correction curves.

Coefficient	Value
d_1	1.5252655E-03
d_2	-5.2885074E-05
d_3	1.1919122E-06
d_4	-1.5035940E-08
d_5	1.0864016E-10
d_6	-4.1176271E-13
d_7	6.3670404E-16

Please be aware that this function is a statistical average based on evaluation of a number of detectors. The behavior of individual detectors may vary.
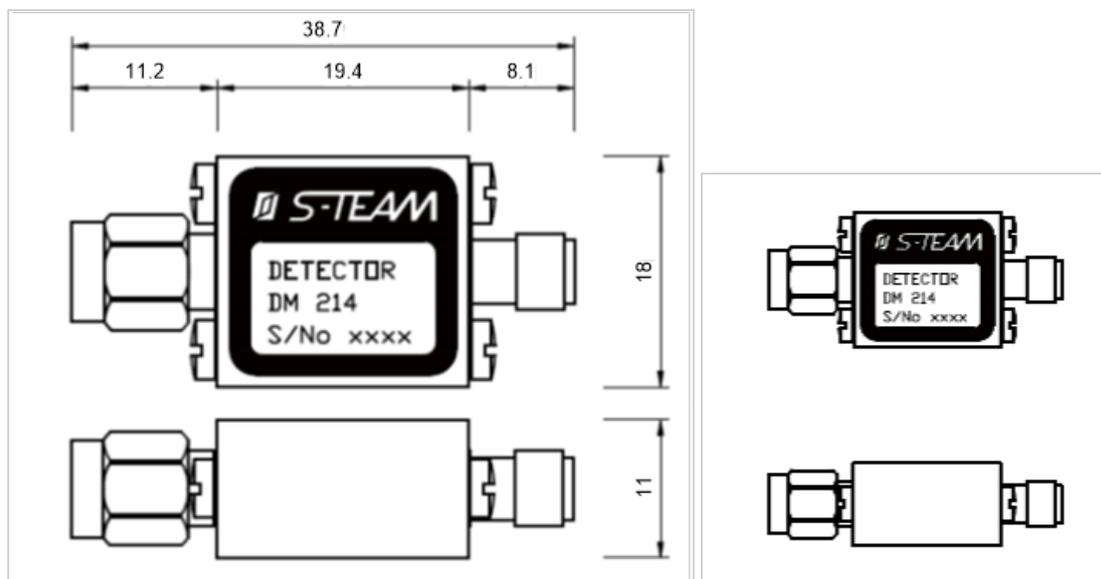
Dimensional Drawing

Fig. 4. Basic DM314 dimensions in millimeters (the dimensions are the same as for the DM214 shown). Right: Actual size.