

Multimeter diode check mode

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How does the “diode check” mode of a multimeter work?

agnd.net/valpo/340/diode-check

1. Equivalent circuit

From the [Keysight 34450A 5½-digit multimeter manual](#) :

Page 8: Continuity/diode test Uses $0.5\text{ mA} \pm 0.2\%$ constant current source

In this mode, the display shows units of volts until the voltage between the leads is greater than about 1.1 V above which the display shows **OPEN**. The open-circuit voltage was measured with a $10\text{ M}\Omega$ input resistance meter to be about 2.4 V.

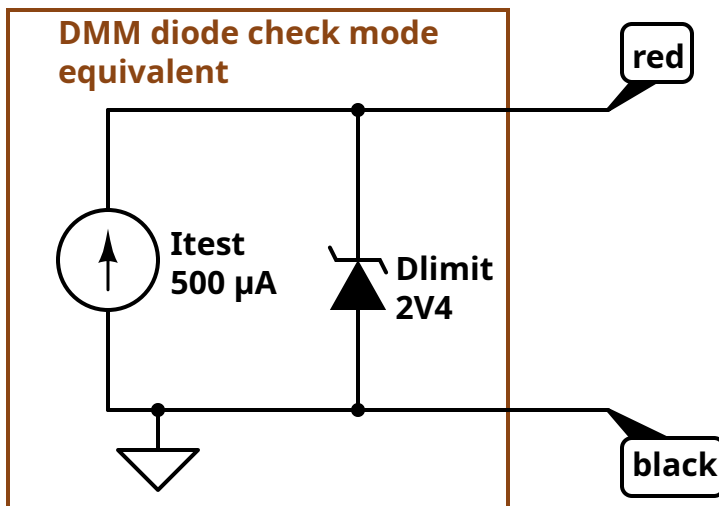
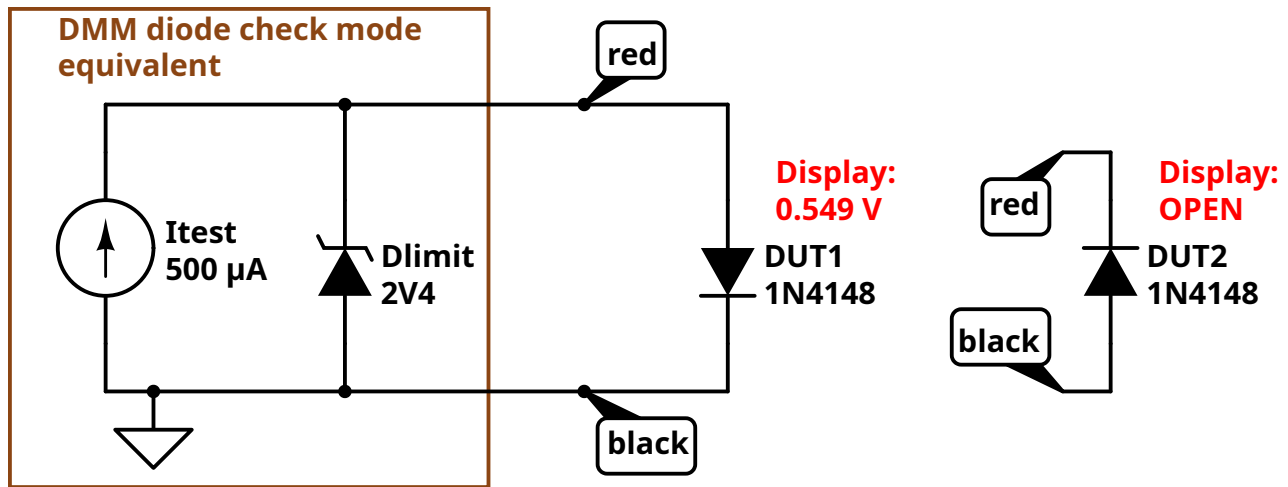


Figure 1. Equivalent circuit. [CircuitLab link](#)

Figure 1 shows a simple equivalent circuit to emulate this behavior. When the meter leads are not connected to a device, the test current source is forced through the zener diode, which breaks down at 2.4 V. Since this is larger than the 1.1 V threshold, the meter displays **OPEN**.

- What is the largest value of resistance that will cause the meter to display a voltage instead of **OPEN**. ?
- Think first, then click to view the answer

2. Diode check(ing)



DUT frequently stands for “device under test”

Given the equivalent circuit, you can see how to interpret the display of a multimeter in this mode.

This particular meter will *not* show the forward voltage of diodes with large forward voltages, such as LEDs.

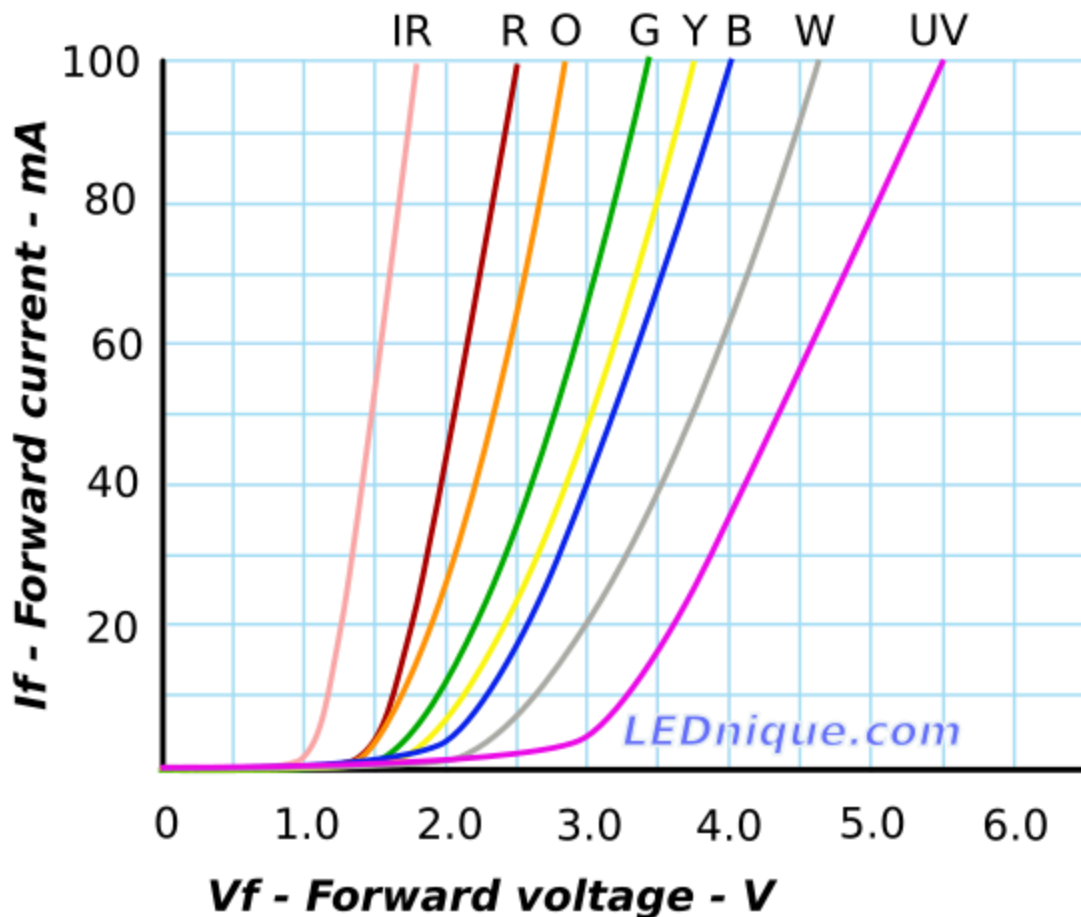


Figure 2. From LEDnique.com



Notice how the forward voltages are inversely proportional to wavelength?

The energy of a single photon is $E = \frac{hc}{\lambda}$, where h is the Planck constant 6.626×10^{-34} J s.

The bandgap of a semiconductor sets the lowest photon energy or longest wavelength (for a direct-bandgap material) of possible.

What wavelength of photons would silicon emit?

► Compute first, then click to check your answer

LED P/N Suffix	Color	Description	Chemistry	# of Elements	Temperature (CCT Typ)	Peak Wavelength (λ/xcoord)	Dominant Wavelength (λ/ycoord)	Forward Voltage		Brightness
								(Vf Typ)	(Vf Max)	
H	Red	High Efficiency Red	GaP	2	~	700	660	2.0V	2.5V	Standard
SR	Red	Super Red	GaAlAs	3	~	660	640	1.7V	2.2V	High
SR	Red	Super Red	AlInGaP	4	~	660	640	2.1V	2.5V	High
SI	Red	Super High Intensity Red	AlInGaP	4	~	636	628	2.0V	2.6V	High
I	Red	High Intensity Red	GaAsP	3	~	635	625	2.0V	2.5V	Standard
ZI	Red	TS AlInGaP Red	AlInGaP	4	~	640	630	2.2V	2.8V	High
SO	Orange	Super Orange	AlInGaP	4	~	610	602	2.0V	2.5V	Standard
A	Orange	Amber	GaAsP	3	~	605	610	2.0V	2.5V	Standard
SY	Yellow	Super Yellow	AlInGaP	4	~	590	588	2.0V	2.5V	Standard
ZY	Yellow	TS AlInGaP Yellow	AlInGaP	4	~	590	589	2.3V	2.8V	High
Y	Yellow	Yellow	GaAsP	3	~	590	588	2.1V	2.5V	Standard
SUG	Green	Super Ultra Green	AlInGaP	4	~	574	568	2.2V	2.6V	High
G	Green	Green	GaP	2	~	565	568	2.2V	2.6V	Standard
SG	Green	Super Green	GaP	2	~	565	568	2.2V	2.6V	Standard
PG	Green	Pure Green	GaP	2	~	555	555	2.1V	2.5V	Standard
UPG	Green	Ultra Pure Green	InGaN	3	~	525	520	3.5V	4.0V	High
UEG	Green	Ultra Emerald Green	InGaN	3	~	500	505	3.5V	4.0V	High
USB	Blue	Ultra Super Blue	InGaN	3	~	470	470	3.5V	4.0V	High
UV	Violet	Ultra Violet	InGaN	3	~	410	~	3.5V	4.0V	Standard
SUV	Violet	Super Violet	InGaN	3	~	380	~	3.4V	3.9V	Standard
T	Turquoise	Turquoise	InGaN	3	~	019	0.41	3.2V	4.0V	Standard
V	Violet/Purple	Violet/Purple	InGaN	3	~	0.22	0.11	3.2V	4.0V	Standard
P	Pink	Pink	InGaN	3	~	0.33	0.21	3.2V	4.0V	Standard
MW(Warm)	White	Warm White	InGaN	3	3000K	~	~	3.3V	4.0V	High
NW(Neutral)	White	Neutral White	InGaN	3	4000K	~	~	3.3V	4.0V	High
UW(Cool)	White	Cool White	InGaN	3	6000K	~	~	3.3V	4.0V	High

Figure 3. From *Lumex LED Color Guide*