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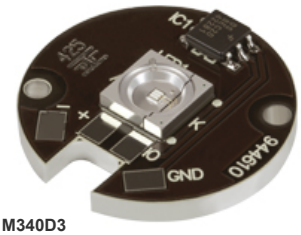
THORLABS

M450D3 - Jan 19, 2022

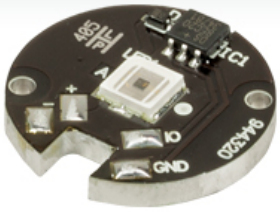
Item # M450D3 was discontinued on Jan 19, 2022. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

LEDS ON METAL-CORE PCBS

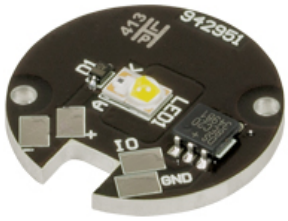
- ► UV, Visible, and IR Models Available
- ► LED Mounted on Metal-Core Printed Circuit Board
- ► Ideal for OEM Applications



M340D3
340 nm LED, Power
Output ≥ 53 mW



M1300D2
1300 nm LED, Power
Output ≥ 25 mW



M565D2
565 nm LED, Power
Output ≥ 880 mW

OVERVIEW

Features

- Nominal Wavelengths Ranging from 265 nm to 1650 nm
- White, Dual-Peak, and Broadband LEDs Also Available
- Minimum Outputs Ranging from 10 mW to 2000 mW
- LED Mounted on Metal-Core Printed Circuit Board for Excellent Heat Management
- Long Lifetimes (See *Specs* Tab for Details)

LED on MCPCB Quick Links
Deep UV (265 - 340 nm)
UV (365 - 405 nm)
Cold Visible (415 - 565 nm)
Warm Visible (590 - 730 nm)
IR (780 - 1650 nm)
Purple (455 nm / 640 nm)
White (400 - 700 nm)
Broadband LEDs
LED Connection Cable

Thorlabs' LEDs on Metal-Core Printed Circuit Boards (MCPCBs) are designed to provide high-power output in a compact package. Each LED package consists of a single LED that has been soldered to an MCPCB. These LEDs are ideal for OEM or custom applications; they should not be used for household illumination.

Thorlabs uses high-thermal-conductivity MCPCB materials. The MCPCB is designed to provide good thermal management. However, the LED must still be mounted onto an appropriate heat sink using thermal paste to ensure proper operation and to maximize operating lifetime. Mounting holes are provided on the MCPCB surface for attaching the LED to a heat sink; the Ø2 mm through holes are compatible with #1 (M2) screws (not included).

The spectrum of each LED and associated data file can be viewed by clicking on the links in the table to the right. Multiple windows can be opened simultaneously in order to compare LEDs.

Thorlabs also offers mounted LEDs with an integrated heat sink, as well as collimated mounted LEDs, which are compatible with microscopes from major manufacturers. For fiber applications, we also offer fiber-coupled LEDs. For questions on choosing an appropriate LED and to discuss mounting requirements, please contact Tech Support.

Optimized Thermal Management
These LEDs possess good thermal stability properties; hence, degradation of the optical output power due to increased LED temperature is not an issue when the LED is properly mounted to a heat sink using thermal paste, thermal epoxy, or thermally conductive double-sided tape.

White Light, Dual-Peak, and Broadband LEDs
Our warm, neutral, and cold white LEDs feature broad spectra that span several hundred nanometers. The difference in appearance amongst these three LEDs can be described using the correlated color temperature, which indicates that the LEDs color appearance is similar to a black body radiator at that temperature. In general, warm white LEDs offer a spectrum similar to a tungsten source, while cold white LEDs have a stronger blue component to the spectrum; neutral white LEDs provide a more even illumination spectrum over the visible range than warm white or cold white LEDs. Cold white LEDs are more suited for fluorescence microscopy applications or cameras with white balancing, because of a higher intensity at most wavelengths compared to warm white LEDs. Neutral white LEDs are ideal for horticultural applications.

For horticultural applications requiring illumination in both red and blue portions of the spectrum, Thorlabs offers the MPRP1D2. This purple LED features dual peaks at 455 nm and 640 nm, respectively, to stimulate photosynthesis (see graph to compare the absorption peaks of photosynthesis pigments with the LED spectrum). The LED was designed to maintain the red/blue ratio of the emission spectrum over its lifetime to provide high uniformity of plant growth.

The MBB1D1 broadband LED has a relatively flat spectral emission over a wide wavelength range. Its FWHM bandwidth ranges from 500 nm to 780 nm, while its 10 dB bandwidth ranges between 470 nm and 940 nm. The MBB2D1 broadband LED features a spectrum with peaks at approximately 770 nm, 860 nm, and 940 nm.

Soldering
These LEDs have been soldered to a metal core with low thermal resistance. While this feature allows for good thermal management, it can also prevent the metal pads from reaching the appropriate temperature for soldering when the package is connected to a heat sink. To properly solder wires to the pads, first make sure that the metal core is not in contact with a heat sink or a metal surface. We recommend using a small vise or similar device to hold the MCPCB during the soldering process and wires with a minimum gauge of 24 AWG (0.25 mm^2).

To solder wires to the MCPCB, first hold the copper bit of the soldering iron on one of the pads for approximately 30 seconds using a soldering temperature of about 350 °C. The soldering iron will heat the entire metal-core PCB, so do not touch the LED package until it has cooled down after the soldering process. Test the temperature by touching tin solder to the pad: the solder will melt and flow evenly over the entire pad at the correct temperature. Coat the other pads with tin solder. Now, solder the wires to the pads. Use tweezers or pliers to remove the MCPCB from the vise and place it on a heat sink or metal surface. The metal-core PCB will cool down in several seconds and is now ready for your application.

For convenient connection of the LEDs to the drivers listed on the *LED Drivers* tab, please order the optional CAB-LEDD1 LED connection cable below.

Driver Options and Pin Assignments
Thorlabs offers four drivers: LEDD1B, DC2200, DC4100, and DC4104 (the latter two require the DC4100-HUB). See the *LED Drivers* tab for compatibility information and a list of specifications. The LEDD1B is capable of providing LED modulation frequencies up to 5 kHz, while DC4100 and DC4104 can modulate the LED at a rate up to 100 kHz. The DC2200 can provide modulation at up to 250 kHz if driven by an external source. Please note that MCPCB LEDs are not compatible with the EEPROM feature of the DC2200, DC4100, and DC4104, which automatically adjusts for the current limits of our mounted LEDs. Therefore, care must be taken not to exceed the current limits of the LEDs offered on this page.

To connect the PCB to a controller, please note that the soldering pad labeled "+" is the Anode (+V), and the pad labeled "-" is the Cathode. Although it is not required to make any connections in order to operate the LED, the EEPROM IO and EEPROM GND connections can be used when any LED listed in the tables below is operated with a Thorlabs LED driver. The soldering pads on different items may be in different locations, but the labels are the same.

Specs

Item #	Color (Click for Spectrum and Data)[a]	Nominal Wavelength[a,b]	LED Output Power[a]		Max Current (CW)	Forward Voltage[c]	Bandwidth (FWHM)	Irradiance[d]	Electrical Power	Typical Lifetime	Viewing Angle (Full Angle at Half Max)	Emitter Size
			Min	Typ.								
M265D3[e]	Deep UV	265 nm	24 mW	35 mW	350 mA	6.0 V	6.8 nm	0.47 µW/mm^2	2.100 W	>1 000 h	120°	3.5 mm x 3.5 mm
M275D2[e]	Deep UV	275 nm	45 mW	80 mW	700 mA	7.3 V	11 nm	0.8 µW/mm^2	5.100 W	>1 000 h	118°	2 mm x 2 mm
M275D3[e]	Deep UV	275 nm	47.3 mW[f]	68.3 mW[f]	300 mA[f]	12 V[f]	10 nm[f]	0.5 µW/mm^2 [f]	3.600 W[f]	1 000 h[f]	120°	2.7 mm x 3.3 mm
M285D3[e]	Deep UV	285 nm	50 mW	70 mW	500 mA	5.9 V	13 nm	0.7 µW/mm^2	2.950 W	>10 000 h	120°	1 mm x 1 mm
M300D3[e]	Deep UV	300 nm	26 mW	32 mW	350 mA	8.0 V	20 nm	0.3 µW/mm^2	2.275 W	>1 000 h	130°	1 mm x 1 mm
M310D1[e]	Deep UV	308 nm	38.5 mW[f]	56.5 mW[f]	600 mA[f]	5 V[f]	30 nm[f]	0.76 µW/mm^2 [f]	3.000 W[f]	>10 000 h[f]	120°[f,g]	1 mm x 1 mm
M325D3[e]	Deep UV	325 nm	25 mW	35 mW	600 mA	5.2 V	12 nm	0.44 µW/mm^2 (Max)	3.120 W	>5 000 h	120°	1 mm x 1 mm
M340D3[e]	Deep UV	340 nm	53 mW	60 mW	700 mA	4.6 V	11 nm	2.22 µW/mm^2	3.220 W	>3 000 h	110°	1 mm x 1 mm
M365D2[e]	UV	365 nm	1150 mW[i]	1400 mW[i]	1700 mA	4.0 V	9 nm	17.6 µW/mm^2	6.800 W	>10 000 h	120°	1.4 mm x 1.4 mm
M375D4[e]	UV	375 nm	1270 mW	1540 mW	1400 mA	3.6 V	9 nm	19.2 µW/mm^2	5.040 W	>10 000 h	130°	1 mm x 1 mm
M385D1[e]	UV	385 nm	270 mW	430 mW	700 mA	4.3 V	10 nm	11.8 µW/mm^2	3.010 W	>10 000 h	120°	1 mm x 1 mm
M385D2[e]	UV	385 nm	1650 mW	1830 mW	1700 mA	3.9 V	12 nm	23.3 µW/mm^2	6.630 W	>10 000 h	120°	1.4 mm x 1.4 mm
M395D3[e]	UV	395 nm	400 mW	535 mW	500 mA	4.5 V	16 nm	6.7 µW/mm^2	2.250 W	>10 000 h	126°	1 mm x 1 mm
M395D4[e]	UV	395 nm	1420 mW	2050 mW	1400 mA	4.0 V	11 nm	22. 8 µW/mm^2	5.600 W	>10 000 h	120°	2.5 mm x 2.5 mm
M405D2[e]	UV	405 nm	1500 mW	1700 mW	1400 mA	3.45 V	12 nm	24.6 µW/mm^2	4.830 W	>10 000 h	120°	1.4 mm x 1.4 mm
M415D2[e]	Violet	415 nm	1640 mW	1940 mW	2000 mA	3.15 V	14 nm	19.5 µW/mm^2	6.300 W	>10 000 h	138°	1.4 mm x 1.4 mm
M430D3[e]	Violet	430 nm	529.2 mW[f]	757.6 mW[f]	500 mA[f]	3.66 V[f]	17 nm[f]	25.7 µW/mm^2 [f]	1.830 W[f]	>10 000 h	126°[f]	1 mm x 1 mm
M450D3	Royal Blue	450 nm	1850 mW	2100 mW	2000 mA	3.5 V	18 nm	35.6 µW/mm^2	7.000 W	1 000 h	120°	1.5 mm x 1.5 mm
M455D3	Royal Blue	455 nm	1150 mW	1445 mW	1000 mA	3.25 V	18 nm	32 µW/mm^2	3.250 W	>100 000 h	80°	1 mm x 1 mm
M470D4	Blue	470 nm[f]	809 mW[f]	1161.7 mW[f]	1000 mA[f]	3.8 V[f]	28 nm[f]	21.4 µW/mm^2 [f]	3.820 W[f]	>100 000 h[f]	80°[f]	1 mm x 1 mm
M490D3	Blue	490 nm	205 mW	240 mW	350 mA	3.8 V	26 nm	2.5 µW/mm^2	1.120 W	>10 000 h	128°	1 mm x 1 mm
M505D3	Cyan	505 nm	400 mW	520 mW	1000 mA	3.5 V	37 nm	5.94 µW/mm^2	3.500 W	>100 000 h	130°	1 mm x 1 mm
M530D3	Green	530 nm	370 mW	480 mW	1000 mA	3.6 V	35 nm	9.46 µW/mm^2	3.600 W	>100 000 h	80°	1 mm x 1 mm
MINTD3	Mint	554 nm	650 mW	815 mW	1225 mA	3.5 V	-	12.4 µW/mm^2	4.300 W	>10 000 h	120°	1 mm x 1 mm
M565D2[j]	Lime	565 nm	880 mW	979 mW	1000 mA	3.1 V (Max)	104 nm	11.7 µW/mm^2	3.100 W	50 000 h	125°	1 mm x 1 mm
M590D3	Amber	590 nm	230 mW	300 mW	1000 mA	2.5 V	15 nm	6.0 µW/mm^2	2.500 W	>100 000 h	80°	1 mm x 1 mm
M595D3[j]	Amber	595 nm	820 mW	1217 mW	1500 mA	3.0 V	64 nm	13.5 µW/mm^2	4.500 W	>50 000 h	120°	2.9 mm x 2.9 mm
M617D2	Orange	617 nm	600 mW	650 mW	1000 mA	2.2 V	18 nm	15.7 µW/mm^2	2.200 W	100 000 h	80°	1 mm x 1 mm
M617D3	Orange	617 nm	660 mW	860 mW	1000 mA	2.6 V	16 nm	19.86 µW/mm^2	2.600 W	>100 000 h	80°	1 mm x 1 mm
M625D3	Red	625 nm	700 mW	920 mW	1000 mA	2.5 V	17 nm	21.9 µW/mm^2	2.500 W	>100 000 h	80°	1 mm x 1 mm
M660D2	Deep Red	660 nm	940 mW	1050 mW	1200 mA	2.6 V	20 nm	20.88 µW/mm^2	3.120 W	>10 000 h	120°	1.5 mm x 1.5 mm
M680D2	Deep Red	680 nm	180 mW	210 mW	600 mA	2.5 V	22 nm	14.5 µW/mm^2	1.500 W	>10 000 h	18°	1 mm x 1 mm
M700D2	Deep Red	700 nm	80 mW	125 mW	500 mA	2.7 V	20 nm	1.0 µW/mm^2	1.350 W	>10 000 h	128°	1 mm x 1 mm
M730D3	Far Red	730 nm	540 mW	680 mW	1000 mA	2.9 V	40 nm	13.1 µW/mm^2	2.300 W	>10 000 h	80°	1 mm x 1 mm
M780D2	IR	780 nm	200 mW	300 mW	800 mA	2.0 V	28 nm	47.3 µW/mm^2	1.600 W	>10 000 h	20°	1 mm x 1 mm
M780D3	IR	780 nm	800 mW	950 mW	800 mA	7.8 V	30 nm	13.3 µW/mm^2	6.240 W	>10 000 h	120°	Ø3 mm (3 Emitters)
M810D2	IR	810 nm	325 mW	375 mW	500 mA	3.6 V	25 nm	61.8 µW/mm^2	1.800 W	>10 000 h	20°	1 mm x 1 mm
M810D3	IR	810 nm	363 mW	542 mW	1000 mA	3.55 V	32 nm	23.7 µW/mm^2	3.550 W	>10 000 h	80°	1 mm x 1 mm
M850D2	IR	850 nm	900 mW	1100 mW	1200 mA	2.95 V	30 nm	22.9 µW/mm^2	3.540 W	100 000 h	90°	1 mm x 1 mm
M850D3	IR	850 nm	1400 mW	1600 mW	1500 mA	3.85 V	30 nm	19.4 µW/mm^2	5.025 W	>10 000 h	150°	1 mm x 1 mm
M880D2	IR	880 nm	300 mW	350 mW	1000 mA	1.7 V	50 nm	5.6 µW/mm^2	1.700 W	>10 000 h	132°	1 mm x 1 mm
M940D2	IR	940 nm	800 mW	1000 mW	1000 mA	2.75 V	37 nm	19.1 µW/mm^2	2.750 W	100 000 h	90°	1 mm x 1 mm
M970D3	IR	970 nm	600 mW	720 mW	1000 mA	1.9 V	60 nm	7.4 µW/mm^2	1.900 W	>10 000 h	130°	1 mm x 1 mm
Item #	**Color (Click for**	**Nominal Wavelength[a,b]**	**LED Output Power[a]**		**Max Current (CW)**	**Forward Voltage[c]**	**Bandwidth (FWHM)**	**Irradiance[d]**	**Electrical Power**	**Typical Lifetime**	**Viewing Angle (Full**	**Emitter Size**

Item #	Spectrum and Data)[a] Color (Click for Spectrum and Data)[a]	Nominal Wavelength[a,b]	LED Output Power[a] Min	LED Output Power[a] Typ.	Max Current (CW)	Forward Voltage[c]	Bandwidth (FWHM)	Irradiance[d]	Electrical Power	Typical Lifetime	Viewing Angle (Full Angle at Half Max)	Emitter Size
			Min	Typ.							Angle at Half Max)	
M1050D1	IR	1050 nm	50 mW	70 mW	700 mA	1.5 V	60 nm	1.9 µW/mm^2	1.050 W	>10 000 h	120°	1 mm x 1 mm
M1050D3	IR	1050 nm	160 mW	210 mW	600 mA	1.4 V	37 nm	3.7 µW/mm^2	840 mW	>10 000 h	128°	1 mm x 1 mm
M1100D1	IR	1100 nm	168 mW[f]	252 mW[f]	1000 mA[f]	1.4 V[f]	50 nm[f]	18.1 µW/mm^2 [f]	1.800 W[f]	>10 000 h[f]	18°[f,k]	1 mm x 1 mm
M1200D2	IR	1200 nm	30 mW	35 mW	700 mA	1.4 V	80 nm	0.7 µW/mm^2	0.980 W	>10 000 h	134°	1 mm x 1 mm
M1300D2	IR	1300 nm	25 mW	30 mW	500 mA	1.4 V	80 nm	0.6 µW/mm^2	0.700 W	>10 000 h	134°	1 mm x 1 mm
M1450D3	IR	1450 nm	81.8 mW	120.7 mW	1000 mA[f]	1.88 V[f,o]	95 nm[f]	1.5 µW/mm^2 [f,o]	1.876 W	>10 000 h	130°	1 mm x 1 mm
M1550D2	IR	1550 nm	31 mW	36 mW	1000 mA	1.35 V	102 nm	0.5 µW/mm^2	1.485 W	>10 000 h	136°	1 mm x 1 mm
M1650D2	IR	1650 nm	13 mW	16 mW	600 mA	1.1 V	120 nm	1.2 µW/mm^2	660 mW	>10 000 h	20°	1 mm x 1 mm
MPRP1D2[j]	Purple	455 nm (12.5%[l]) / 640 nm	275 mW	325 mW	300 mA	3.1 V	N/A	3.7 µW/mm^2	930 mW	>10 000 h	115°	1 mm x 2 mm
MWWHD3[j]	Warm White	3000 K[m]	2000 mW	2300 mW	700 mA	11.7 V	N/A	37.0 µW/mm^2	8.200 W	>100 000 h	125°	3.5 mm x 3.5 mm
MWUVD1[j]	Neutral White	4000 K[m,n]	235 mW	338 mW	125 mA[f]	6.3 V[f,o]	N/A	4.0 µW/mm^2 [f,o]	790 mW[f]	>10 000 h[f]	120°[f,p]	2 mm x 1 mm
MNWHD2[j]	Neutral White	4900 K[m]	740 mW	880 mW	1225 mA	2.9 V	N/A	7.7 µW/mm^2	3.553 W	>10 000 h	150°	1 mm x 1 mm
MCWHD5[j]	Cold White	6500 K[m]	930 mW	1370 mW	1300 mA	3.3 V	N/A	25.9 uW/mm^2	4.290 W	>100 000 h	80°	1 mm x 1 mm
MCWHD6[j]	Cold White	6500 K[m]	942 mW	1353 mW	1300 mA	4.51 V	N/A	11.8 µW/mm^2	5.863 W	100 000 h	150°	1 mm x 1 mm
MBB1D1[q]	Broadband	470 - 850 nm[r]	70 mW	80 mW	500 mA	3.6 V	280 nm	0.9 µW/mm^2	1.800 W	>10 000 h	120°	1 mm x 1 mm
MBB2D1	Broadband	770 nm, 860 nm, 940 nm	740 mW	1090 mW	1000 mA[f]	4.8 V[f]	N/A	13.5 µW/mm^2 [f]	4800 mW[f]	>10 000 h[f]	120°[f]	1 mm x 1 mm

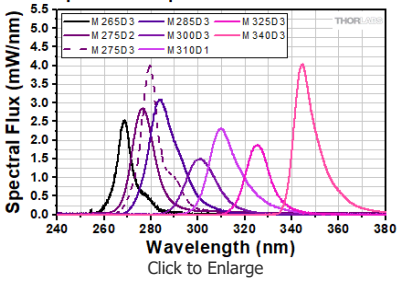
a. Due to variations in the manufacturing process and operating parameters such as temperature and current, the actual spectral output of any given LED will vary. These values were measured with the back side of the PCB at 25 °C at the maximum current, unless otherwise noted. Output plots and center wavelength specs are only intended to be used as a guideline.
b. For LEDs in the visible spectrum, the nominal wavelength indicates the wavelength at which the LED appears brightest to the human eye. The nominal wavelength for visible LEDs may not correspond to the peak wavelength as measured by a spectrograph.
c. Values are typical unless otherwise stated.
d. Irradiance is measured at a distance of 200 mm from the LED. Typical value unless otherwise noted.
e. Our 265 nm to 430 nm LEDs radiate intense UV light during operation. Precautions must be taken to prevent looking directly at the UV light and UV light protective glasses must be worn to avoid eye damage. Exposure of the skin and other body parts to the UV light should be avoided.
f. Measured at 25 °C
g. When driven with a current of 350 mA.
h. When driven with a current of 500 mA.
i. When driven with a current of 1000 mA.
j. These LEDs are phosphor-converted and may not turn off completely when modulated above 10 kHz at duty cycles below 50%.
k. When driven with a current of 100 mA.
l. Percentage of LED intensity that emits in the blue portion of the spectrum, from 400 nm to 525 nm. See spectrum graph for details.
m. Correlated Color Temperature
n. Neutral White LED Spectrum with a Peak at 406 nm
o. When Driven at the Maximum Current
p. When Driven with a Pulsed Forward Current of 75 mA
q. The MBB1D1 LED may not turn off completely when modulated at frequencies above 1 kHz with a duty cycle of 50%, as the broadband emission is produced by optically stimulating emission from phosphor. For modulation at frequencies above 1 kHz, the duty cycle may be reduced. For example, 10 kHz modulation is attainable with a duty cycle of 5%.
r. 10 dB Bandwidth

RELATIVE POWER

Relative Power

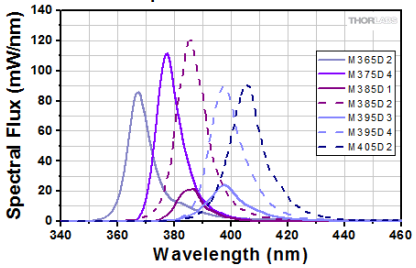
The actual spectral output and total output power of any given LED will vary due to variations in the manufacturing process and operating parameters, such as temperature and current. Both a typical and minimum output power are specified to help you select an LED that suits your needs. Each metal-core PCB LED will provide at least the minimum specified output power at the maximum current. In order to provide a point of comparison for the relative powers of LEDs with different nominal wavelengths, the spectra in the plots below have been scaled to the minimum output power for each LED. This data is representative, not absolute. An Excel file with normalized and scaled spectra for all of the unmounted LEDs can be downloaded here.

Deep UV LED Spectra Scaled to Min Power



Click to Enlarge

UV LED Spectra Scaled to Min Power



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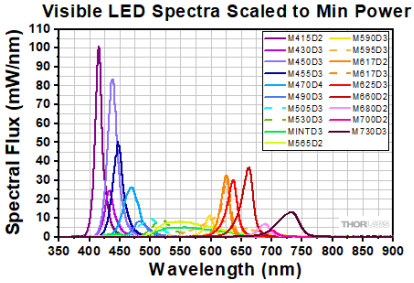
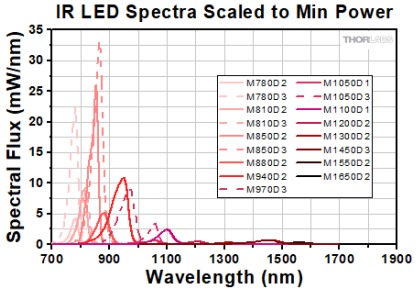
Visible LED Spectra Scaled to Min Power



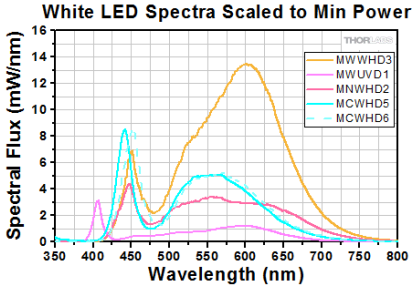
Click to Enlarge

IR LED Spectra Scaled to Min Power



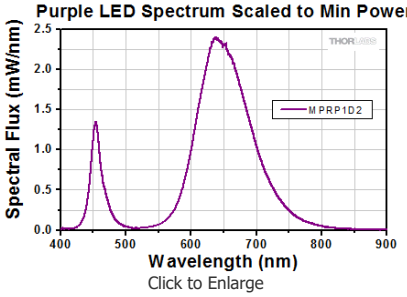
Click for Details

White LED Spectra Scaled to Min Power



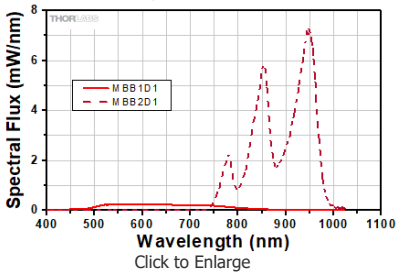
Click to Enlarge

Purple LED Spectrum Scaled to Min Power



Click to Enlarge

Broadband LED Spectra Scaled to Min Power



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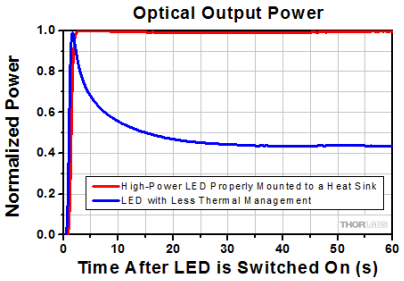
STABILITY

LED Lifetime and Long-Term Power Stability

One characteristic of LEDs is that they naturally exhibit power degradation with time. Often this power degradation is slow, but there are also instances where large, rapid drops in power, or even complete LED failure, occur. LED lifetimes are defined as the time it takes a specified percentage of a type of LED to fall below some power level. The parameters for the lifetime measurement can be written using the notation B_{XX}/L_{YY}, where XX is the percentage of that type of LED that will provide less than YY percent of the specified output power after the lifetime has elapsed. Thorlabs defines the lifetime of our LEDs as B_{50}/L_{50}, meaning that 50% of the LEDs with a given Item # will fall below 50% of the initial optical power at the end of the specified lifetime. For example, if a batch of 100 LEDs is rated for 150 mW of output power, 50 of these LEDs can be expected to produce an output power of ≤75 mW after the specified LED lifetime has elapsed.



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Optimizing Thermal Management

In order to achieve stable optical output power and maximize lifetime from your LED, the MCPCB must be properly mounted to a heat sink using thermally conductive paste in order to minimize the degradation of optical output power caused by increased LED junction temperature (see the graph to the right).

LED DRIVERS

Compatible Drivers	UPLED[a]	LEDD1B	DC2200[a]	DC4100[a,b,c]	DC4104[a,b,c]
Click Photos to Enlarge					
LED Driver Current Output (Max)	1.2 A	1.2 A	LED1 Terminal: 10.0 A LED2 Terminal: 2.0 A[d]	1.0 A per Channel	1.0 A per Channel
LED Driver Forward Voltage (Max)	8 V	12 V	50 V	5 V	5 V
Modulation Frequency Using External Input (Max)	-	5 kHz	250 kHz[e,f]	100 kHz[f] (Simultaneous Across all Channels)	100 kHz[f] (Independently Controlled Channels)
External Control Interface(s)	USB 2.0	Analog (BNC)	USB 2.0 and Analog (BNC)	USB 2.0 and Analog (BNC)	USB 2.0 and Analog (8-Pin)
Main Driver Features	USB-Controlled	Very Compact Footprint 60 mm x 73 mm x 104 mm (W x H x D)	Touchscreen Interface with Internal and External Options for Pulsed and Modulated LED Operation	4 Channels[c]	4 Channels[c]
EEPROM Compatible: Reads Out LED Data for LED Settings	✓	-	✓	✓	✓
LCD Display	-	-	✓	✓	✓

a. Automatically Adjusts the Driver's Current Limit via EEPROM Readout from LED
b. The DC4100 and DC4104 can power and control up to four LEDs simultaneously when used with the DC4100-HUB. The LEDs on this page all require the DC4100-HUB and the CAB-LEDD1 cable when used with the DC4100 or DC4104 drivers.
c. These LED drivers have a maximum forward voltage rating of 5 V and can provide a maximum current of 1000 mA. As a result, they cannot be used to drive LEDs which have forward voltage ratings greater than 5 V. LEDs with maximum current ratings higher than 1.0 A can be driven using this driver, but will not reach full power.
d. The MCPCB LEDs sold below are compatible with the LED2 Terminal via the CAB-LEDD1 (available separately below).
e. Small Signal Bandwidth: Modulation not exceeding 20% of full scale current. The driver accepts other waveforms, but the maximum frequency will be reduced.
f. Several of these LEDs produce light by stimulating emission from phosphor, which limits their modulation frequencies. The M565D2, M595D3, and all purple or white LEDs may not turn off completely when modulated above 10 kHz at duty cycles below 50%. The MBB1D1 LED may not turn off completely when modulated at frequencies above 1 kHz with a duty cycle of 50%. When the MBB1D1 is modulated at frequencies above 1 kHz, the duty cycle may be reduced; for example, 10 kHz modulation is attainable with a duty cycle of 5%.

RAY DATA

Ray data for Zemax is available for some of the bare LEDs incorporated into these high-powered light sources. This data is provided in a zipped folder that can be downloaded by clicking on the red document icons ( ) next to the part numbers in the pricing tables below. Every zipped folder contains an information file and one or more ray files for use with Zemax:

Item #	Information File	Available Ray Files	File Size	Click to Download
M385D1	M385_Info.pdf	1 Million Rays and 5 Million Rays	147 MB	
M450D3[a]	LD_CQAR_20150731_info.pdf	100,000 Rays, 500,000 Rays, and 5 Million Rays	123 MB	
M850D2[a]	SFH4715S_100413_info.pdf	100,000 Rays, 500,000 Rays, and 5 Million Rays	139 MB	
M940D2[a]	SFH_4725S_110413_info.pdf	100,000 Rays, 500,000 Rays, and 5 Million Rays	140 MB	

- A radiometric color spectrum, bare LED CAD file, and sample Zemax file are also available for these LEDs.

- **Information File:** This document contains a summary of the types of data files included in the zipped folder and some basic information about their use. It includes a table listing each document type and the corresponding filenames.
- **Ray Files:** These are binary files containing ray data for use with Zemax.

For the LEDs marked with an superscript "a" in the table to the right, the following additional pieces of information are also included in the zipped folder:

- **Radiometric Color Spectrum:** This .spc file is also intended for use with Zemax.
- **CAD Files:** A file indicating the geometry of the bare LED. For the dimensions of the high-power mounted LEDs that include the package, please see the support drawings provided by Thorlabs.
- **Sample Zemax File:** A sample file containing the recommended settings and placement of the ray files and bare LED CAD model when used with Zemax.

The table to the right summarizes the ray files available for each LED and any other supporting documentation provided.

LED Selection Guide

Light Emitting Diode (LED) Selection Guide

(Click Representative Photo to Enlarge; Not to Scale)										
Wavelength	**Unmounted LEDs**	**Pigtailed LEDs**	**LEDs in SMT Packages**	**PCB-Mounted LEDs**	**Heatsink-Mounted LEDs**	**Collimated LEDs for Microscopy[a]**	**Fiber-Coupled LEDs[b]**	**High-Power LEDs for Microsocopy**	**Multi-Wavelength LED Source Options[c]**	**LED Arrays**
Single Color LEDs										
250 nm	LED250J (1 mW Min)	-	-	-	-	-	-	-	-	-
255 nm	LED255W (0.4 mW) LED255J (1 mW Min)	-	-	-	-	-	-	-	-	-
260 nm	LED260W (1 mW) LED260J (1 mW Min)	-	-	-	-	-	-	-	-	-
265 nm	LED265W2 (1.6 mW)	-	-	M265D3 (24 mW Min)	M265L4 (24 mW Min)	-	-	-	-	-
275 nm	LED275W (1.6 mW) LED275J (1 mW Min)	-	-	M275D2 (45 mW Min) M275D3 (47.3 mW Min)[d]	M275L4 (45 mW Min)	-	-	-	-	-
280 nm	LED280W (2.3 mW)	-	-	-	M280L6 (78 mW Min)[d]	-	M280F5 (0.5 mW Min)[d]	-	-	-
285 nm	LED285W (1.6 mW) LED285J (1.3 mW)	-	-	M285D3 (50 mW Min)	-	-	-	-	-	-
290 nm	LED290W (1.6 mW)	-	-	-	-	-	-	-	-	-
295 nm	LED295W (1.2 mW)	-	-	-	-	-	-	-	-	-
300 nm	LED300W (1.2 mW)	-	-	M300D3 (26 mW Min)	M300L4 (26 mW Min)	-	M300F2 (320 µW)	-	-	-
308 nm	-	-	-	M310D1 (38.5 mW Min)[d]	M310L1 (38.5 mW Min)[d]	-	M310F1 (0.51 mW)[d]	-	-	-
310 nm	LED310W (1.5 mW)	-	-	-	-	-	-	-	-	-
325 nm	LED325W2 (1.7 mW)	-	-	M325D3 (25 mW Min)	M325L5 (25 mW Min)	-	M325F4 (350 µW)	-	-	-
340 nm	LED340W (1.7 mW) LED341W (0.33 mW)	-	-	M340D3 (53 mW Min)	M340L4 (53 mW Min)	-	M340F3 (1.06 mW)	-	-	-
365 nm	-	-	-	M365D2 (1150 mW Min)	M365L3 (880 mW Min) M365LP1 (1350 mW Min)	M365L2-Cx (60 mW)[e] M365LP1-Cx (350 mW)[e]	M365FP1 (15.5 mW)	SOLIS-365C (3.0 W)[f]	Chrolis (1130 mW) 4-Wavelength Source (85 mW)	LIU365A (31 mW)
375 nm	LED375L (1 mW) LED370E (2.5 mW)	-	-	M375D4 (1270 mW Min)	M375L4 (1270 mW Min)	-	M375F2 (4.23 mW)	-	-	-
385 nm	LED385L (5 mW)	-	-	M385D1 (270 mW Min)	M385L2 (270 mW Min) M385L3 (1240 mW Min)	M385L2-Cx (90 mW)[e] M385L3-Cx (450 mW)[e]	M385F1 (10.7 mW)	SOLIS-385C (5.8 W)[f]	Chrolis (1250 mW)	-

Light Emitting Diode (LED) Selection Guide										
				M385D2 (1650 mW Min)	M385LP1 (1650 mW Min)	M385LP1-Cx (520 mW)[e]	M385FP1 (23.2 mW)		4-Wavelength Source (95 mW)	
395 nm	LED395L (6 mW)	-	-	M395D3 (400 mW Min) M395D4 (1420 mW Min)	M395L4 (400 mW Min) M395L5 (1130 mW Min) M395LP1 (1420 mW Min)	-	M395F3 (6.8 mW) M395FP1 (29.8 mW)	-	-	-
Wavelength	**Unmounted LEDs**	**Pigtailed LEDs**	**LEDs in SMT Packages**	**PCB-Mounted LEDs**	**Heatsink-Mounted LEDs**	**Collimated LEDs for Microscopy[a]**	**Fiber-Coupled LEDs[b]**	**High-Power LEDs for Microsocopy**	**Multi-Wavelength LED Source Options[c]**	**LED Arrays**
Single Color LEDs										
405 nm	LED405L (6 mW) LED405E (10 mW)	-	-	M405D2 (1500 mW Min)	M405L4 (1000 mW Min) M405LP1 (1200 mW Min)	M405L4-Cx (510 mW)[g] M405LP1-Cx (450 mW)[e]	M405F1 (3.7 mW) M405FP1 (24.3 mW)	SOLIS-405C (3.9 W)[f]	Chrolis (900 mW) 4-Wavelength Source (290 mW)	-
415 nm	-	-	-	M415D2 (1640 mW Min)	M415L4 (1310 mW Min) M415LP1 (1640 mW Min)	-	M415F3 (21.3 mW)	SOLIS-415C (5.8 W)[f]	-	-
420 nm	-	-	-	-	-	-	-	-	Chrolis (710 mW) 4-Wavelength Source (95 mW)	-
430 nm	LED430L (8 mW)	-	-	M430D3 (529.2 mW Min)[d]	M430L5 (529.2 mW Min)[d]	-	M430F1 (7.5 mW)[d]	-	-	-
445 nm	-	-	-	-	-	-	-	SOLIS-445C (5.4 W)[f]	-	-
450 nm	LED450L (7 mW)	-	LEDS450 (250 mW)	M450D3 (1850 mW Min)	-	-	-	-	-	-
455 nm	-	-	-	M455D3 (1150 mW Min)	M455L4 (1150 mW Min)	M455L3-Cx (400 mW)[h] M455L4-Cx (490 mW)[e]	M455F3 (24.5 mW)	-	4-Wavelength Source (310 mW)	-
465 nm	LED465E (20 mW)	-	-	-	-	-	-	-	-	-
470 nm	LED470L (170 mW)	EP470S04 (18 mW Min) EP470S10 (100 mW Min)	-	M470D4 (809 mW Min)[d]	M470L5 (809 mW Min)[d]	M470L5-Cx (402 mW)[e]	M470F3 (21.8 mW)	SOLIS-470C (3.0 W)[f]	4-Wavelength Source (250 mW)	LIU470A (253 mW)
475 nm	-	-	-	-	-	-	-	-	Chrolis (630 mW)	-
490 nm	LED490L (3 mW)	-	-	M490D3 (205 mW Min)	M490L4 (205 mW Min)	-	M490F3 (3.1 mW)	-	Chrolis (120 mW) 4-Wavelength Source (50 mW)	-
505 nm	LED505L (4 mW)	-	-	M505D3 (400 mW Min)	M505L4 (400 mW Min)	M505L3-Cx (150 mW)[e] M505L4-Cx (170 mW)[e]	M505F3 (11.7 mW)	SOLIS-505C (1.0 W)[f]	4-Wavelength Source (170 mW)	-
525 nm	LED525E (2.6 mW Max) LED525L (4 mW) LED528EHP (7 mW)	-	-	-	-	-	-	SOLIS-525C (2.4 W)[f]	Chrolis (180 mW)	LIU525A (111 mW)

Light Emitting Diode (LED) Selection Guide										
530 nm	-	-	-	M530D3 (370 mW Min)	M530L4 (370 mW Min)	M530L4-Cx (160 mW)[e]	M530F2 (9.6 mW)	-	4-Wavelength Source (100 mW)	-
545 nm	LED545L (2.4 mW CW, 8.7 mW Pulsed)	-	-	-	-	-	-	-	-	-
554 nm	-	-	-	MINTD3 (650 mW Min)	MINTL5 (650 mW Min)	-	MINTF4 (28 mW)	-	-	-
562 nm	LED560L (0.15 mW)[d]	-	-	-	-	-	-	-	-	-
565 nm	-	-	-	M565D2 (880 mW Min)	M565L3 (880 mW Min)	-	M565F3 (13.5 mW)	SOLIS-565C (3.2 W)[f]	Chrolis (350 mW) 4-Wavelength Source (106 mW)	-
570 nm	LED570L (0.3 mW)	-	-	-	-	-	-	-	-	-
590 nm	LED590L (2 mW) LED591E (2 mW)	EP590S04 (3.5 mW Min) EP590S10 (18 mW Min)	-	M590D3 (230 mW Min)	M590L4 (230 mW Min)	M590L3-Cx (60 mW)[e] M590L4-Cx (100 mW)[e]	M590F3 (4.6 mW)	SOLIS-590C (350 mW)[f]	Chrolis (140 mW) 4-Wavelength Source (65 mW)	LIU590A (109 mW)
595 nm	-	-	-	M595D3 (820 mW Min)	M595L4 (820 mW Min)	-	M595F2 (11.5 mW)	SOLIS-595C (700 mW)[f]	-	-
Wavelength	**Unmounted LEDs**	**Pigtailed LEDs**	**LEDs in SMT Packages**	**PCB-Mounted LEDs**	**Heatsink-Mounted LEDs**	**Collimated LEDs for Microscopy[a]**	**Fiber-Coupled LEDs[b]**	**High-Power LEDs for Microscopy**	**Multi-Wavelength LED Source Options[c]**	**LED Arrays**
Single Color LEDs										
600 nm	LED600L (3 mW)	-	-	-	-	-	-	-	-	-
610 nm	LED610L (8 mW)	-	-	-	-	-	-	-	-	-
617 nm	-	-	-	M617D2 (600 mW Min) M617D3 (660 mW Min)	M617L3 (600 mW Min)	M617L3-Cx (230 mW)[e] M617L4-Cx (280 mW)[e]	M617F2 (13.2 mW)	SOLIS-617C (1.5 mW)[f]	4-Wavelength Source (210 mW)	-
620 nm	-	-	-	-	-	-	-	SOLIS-620D (3.47 W)[f]	-	-
625 nm	LED625L (12 mW)	-	-	M625D3 (700 mW Min)	M625L4 (700 mW Min)	M625L3-Cx (270 mW)[e] M625L4-Cx (490 mW)[e]	M625F1 (17.5 mW)	-	Chrolis (490 mW) 4-Wavelength Source (240 mW)	-
630 nm	LED630L (16 mW)	-	-	-	-	-	-	-	-	LIU630A (208 mW)
635 nm	LED631E (4 mW) LED635L (170 mW)	-	-	-	-	-	-	-	-	-
639 nm	LED630E (7.2 mW)	-	-	-	-	-	-	-	-	-
645 nm	LED645L (16 mW)	-	-	-	-	-	-	-	-	-
660 nm	LED660L (13 mW)	-	-	M660D2 (940 mW Min)	M660L4 (940 mW Min)	M660L4-Cx (400 mW)[e]	M660FP1 (15.5 mW)	SOLIS-660C (2.0 W)[f]	4-Wavelength Source (210 mW)	-
670 nm	LED670L (12 mW)	-	-	-	-	-	-	-	-	-
680 nm	LED680L (8 mW)	-	-	M680D2 (180 mW Min)	M680L4 (180 mW Min)	-	M680F3 (2.7 mW)	-	-	-

Light Emitting Diode (LED) Selection Guide										
700 nm	-	EP700S04 (5 mW Min) EP700S10 (30 mW Min)	-	M700D2 (80 mW Min)	M700L4 (80 mW Min)	-	M700F3 (1.7 mW)	-	-	-
730 nm	-	-	-	M730D3 (540 mW Min)	M730L5 (540 mW Min)	-	-	-	-	-
740 nm	-	-	-	-	-	-	M740F2 (6.0 mW)	SOLIS-740C (2.0 W)[f]	-	-
750 nm	LED750L (18 mW)	-	-	-	-	-	-	-	-	-
760 nm	LED760L (24 mW)	-	-	-	-	-	-	-	-	-
770 nm	LED770L (22 mW)	-	-	-	-	-	-	-	-	-
780 nm	LED780E (18 mW) LED780L (22 mW)	-	-	M780D2 (200 mW Min) M780D3 (800 mW Min)	M780L3 (200 mW Min) M780LP1 (800 mW Min)	M780L3-Cx (130 mW)[e]	M780F2 (7.5 mW)	-	Chrolis (40 mW)	LIU780A (315 mW)
800 nm	LED800L (20 mW)	-	-	-	-	-	-	-	-	-
810 nm	LED810L (22 mW)	EP810S04 (16 mW Min) EP810S10 (90 mW Min)	-	M810D2 (325 mW Min) M810D3 (363 mW Min)	M810L3 (325 mW Min) M810L4 (363 mW Min)	M810L3-Cx (210 mW)[e]	M810F2 (6.5 mW)	-	-	-
830 nm	LED830L (22 mW)	-	-	-	-	-	-	-	-	-
840 nm	LED840L (22 mW)	-	-	-	-	-	-	-	-	-
850 nm	LED851L (13 mW)	-	-	M850D2 (900 mW Min) M850D3 (1400 mW)	M850L3 (900 mW Min) M850LP1 (1400 mW Min)	M850L3-Cx (330 mW)[e]	M850F3 (8.6 mW Min)[d]	SOLIS-850C (2.7 W)[f]	-	LIU850A (322 mW)
870 nm	LED870E (22 mW) LED870L (24 mW)	-	-	-	-	-	-	-	-	-
880 nm	-	-	-	M880D2 (300 mW Min)	M880L3 (300 mW Min)	-	M880F2 (3.4 mW)	-	-	-
890 nm	LED890L (12 mW)	-	-	-	-	-	-	-	-	-
910 nm	LED910L (10 mW) LED910E (12 mW)	-	-	-	-	-	-	-	-	-
930 nm	LED930L (15 mW)	-	-	-	-	-	-	-	-	-
940 nm	LED940E (18 mW)	-	-	M940D2 (800 mW Min)	M940L3 (800 mW Min)	M940L3-Cx (320 mW)[e]	M940F3 (14.2 mW)	SOLIS-940C (2.5 W)[f]	-	-
970 nm	LED970L (5 mW)	-	-	M970D3 (600 mW Min)	M970L4 (600 mW Min)	-	M970F3 (8.1 mW)	-	-	-
Wavelength	**Unmounted LEDs**	**Pigtailed LEDs**	**LEDs in SMT Packages**	**PCB-Mounted LEDs**	**Heatsink-Mounted LEDs**	**Collimated LEDs for Microscopy[a]**	**Fiber-Coupled LEDs[b]**	**High-Power LEDs for Microscopy**	**Multi-Wavelength LED Source Options[c]**	**LED Arrays**
Single Color LEDs										
1050 nm	LED1050E (2.5 mW) LED1050L (4 mW) LED1050L2 (8 mW)[d]	-	-	M1050D1 (50 mW Min) M1050D3 (160 mW Min) -	M1050L2 (50 mW Min) M1050L4 (160 mW Min) -	-	- M1050F3 (3 mW) -	-	-	-
1070 nm	LED1070L (4 mW) LED1070E (7.5 mW)	-	-	-	-	-	-	-	-	-

Light Emitting Diode (LED) Selection Guide										
1085 nm	LED1085L (5 mW)	-	-	-	-	-	-	-	-	-
1100 nm	-	-	-	M1100D1 (168 mW Min)[d]	M1100L1 (168 mW Min)[d]	-	M1100F1 (5.4 mW)[d]	-	-	-
1200 nm	LED1200E (2.5 mW) LED1200L (5 mW)	-	-	M1200D2 (30 mW Min)	M1200L3 (30 mW Min)	-	-	-	-	-
1300 nm	LED1300E (2 mW) LED1300L (3.5 mW)	-	-	M1300D2 (25 mW Min)	M1300L3 (25 mW Min)	-	-	-	-	-
1450 nm	LED1450E (2 mW) LED1450L (5 mW)	-	-	-	-	-	-	-	-	-
1550 nm	LED1550E (2 mW) LED1550L (4 mW)	-	-	M1550D2 (31 mW Min)	M1550L3 (31 mW Min)	-	-	-	-	-
1600 nm	LED1600L (2 mW)	-	-	-	-	-	-	-	-	-
1650 nm	LED1600P (1.2 mW)	-	-	M1650D2 (13 mW Min)	M1650L4 (13 mW Min)	-	-	-	-	-
1750 nm	LED1700P (1.2 mW Quasi-CW, 30 mW Pulsed)	-	-	-	-	-	-	-	-	-
1850 nm	LED1800P (0.9 mW Quasi-CW, 20 mW Pulsed)	-	-	-	-	-	-	-	-	-
1950 nm	LED1900P (1.0 mW Quasi-CW, 25 mW Pulsed)	-	-	-	-	-	-	-	-	-
2050 nm	LED2050P (1.1 mW Quasi-CW, 28 mW Pulsed)	-	-	-	-	-	-	-	-	-
2350 nm	LED2350P (0.8 mW Quasi-CW, 16 mW Pulsed)	-	-	-	-	-	-	-	-	-
2700 nm	LED2700W (0.15 mW Quasi-CW, 1.0 mW Pulsed)	-	-	-	-	-	-	-	-	-
2800 nm	LED2800W (0.3 mW Quasi-CW, 2.0 mW Pulsed)	-	-	-	-	-	-	-	-	-
3400 nm	LED3400W (0.3 mW Quasi-CW, 2.0 mW Pulsed)	-	-	-	-	-	-	-	-	-
3800 nm	LED3800W (0.18 mW Quasi-CW, 1.5 mW Pulsed)	-	-	-	-	-	-	-	-	-
4200 nm	LED4300P (0.03 mW Quasi-CW, 0.2 mW Pulsed)	-	-	-	-	-	-	-	-	-

Light Emitting Diode (LED) Selection Guide										
4300 nm	LED4300W (0.18 mW Quasi-CW, 1.5 mW Pulsed)	-	-	-	-	-	-	-	-	-
4500 nm	LED4600P (0.006 mW Quasi-CW, 0.12 mW Pulsed)	-	-	-	-	-	-	-	-	-
Wavelength	**Unmounted LEDs**	**Pigtailed LEDs**	**LEDs in SMT Packages**	**PCB-Mounted LEDs**	**Heatsink-Mounted LEDs**	**Collimated LEDs for Microscopy[a]**	**Fiber-Coupled LEDs[b]**	**High-Power LEDs for Microscopy**	**Multi-Wavelength LED Source Options[c]**	**LED Arrays**
Multi-Color, Broadband, and White LEDs										
455 nm (12.5%[i]) and 640 nm	-	-	-	MPRP1D2 (275 mW Min)	MPRP1L4 (275 mW Min)	-	-	-	-	-
572 nm and 625 nm	LEDGR (0.09 mW and 0.19 mW)	-	-	-	-	-	-	-	-	-
588 nm and 617 nm	LEDRY (0.09 mW and 0.19 mW)	-	-	-	-	-	-	-	-	-
467.5 nm, 525 nm, and 627.5 nm	LEDRGBE (5.8 mW, 6.2 mW, and 3.1 mW)	-	-	-	-	-	-	-	-	-
430 - 660 nm (White)	LEDWE-15 (13 mW) LEDW7E (15.0 mW) LEDW25E (15.0 mW)	-	-	-	-	-	-	-	-	-
6500 K (Cold White)	-	-	-	MCWHD5 (930 mW Min) MCWHD6 (942 mW Min)[d]	MCWHL7 (930 mW Min) MCWHLP2 (942 mW Min)[d]	MCWHL5-Cx (340 mW)[h] MCWHL6-Cx (354 mW)[e]	-	SOLIS-1D (5.8 W)[f]	-	-
6200 K (Cold White)	-	-	-	-	-	-	MCWHF2 (27.0 mW)	-	-	-
5000 K (Cold White)	-	-	LEDSW50 (110 mW)	-	-	-	-	-	-	-
4600 - 9000 K (Cold White)	-	-	-	-	-	-	-	-	-	LIUCWHA (250 mW)
4000 K (Warm White)	-	-	LEDSW40 (115 mW)	-	-	-	MWWHF2 (23.1 mW)	-	-	-
3000 K (Warm White)	-	-	LEDSW30 (100 mW)	MWWHD3 (2000 mW Min)	MWWHL4 (570 mW Min) MWWHLP1 (2000 mW Min)	-	-	SOLIS-2C (3.2 W)[f]	-	-
5700 K (Day Light White)	-	-	-	-	-	-	-	SOLIS-3C (3.5 W)	-	-
470 - 850 nm (Broadband)	-	-	-	MBB1D1 (70 mW Min)	MBB1L3 (70 mW Min)	-	MBB1F1 (1.2 mW)	-	-	-
770 nm, 860 nm, & 940 nm (Broadband)	-	-	-	MBB2D1 (740 mW Min)[d]	MBB2L1 (650 mW Min)[d] MBB2LP1 (740 mW Min)[d]	-	-	-	-	-

a. These Collimated LEDs are compatible with the standard and epi-illumination ports on the following microscopes: Olympus BX/IX (Item # Suffix: -C1), Leica DMI (Item # Suffix: -C2), Zeiss Axioskop (Item # Suffix: -C4), and Nikon Eclipse (Bayonet Mount, Item # Suffix: -C5).
b. Typical power when used with MM Fiber with Ø400 µm core, 0.39 NA.
c. Our Multi-Wavelength LED Sources are available with select combinations of the LEDs at these wavelengths.
d. Measured at 25 °C
e. Typical power for LEDs with the Leica DMI collimation package (Item # Suffix: -C2).
f. Minimum power for the collimated output of these LEDs. The collimation lens is installed with each LED.
g. Typical power for LEDs with the Olympus BX and IX collimation package (Item # Suffix: -C1).

h. Typical power for LEDs with the Nikon Eclipse collimation package (Item # Suffix: -C5).
i. Percentage of LED intensity that emits in the blue portion of the spectrum, from 400 nm to 525 nm.
j. Typical power for LEDs with the Zeiss Axioskop collimation package (Item # Suffix: -C4).

Deep UV LEDs (265 - 340 nm)

Please note that our deep UV LEDs radiate intense UV light during operation. Precautions must be taken to prevent looking directly at the UV light, and UV light protective glasses must be worn to avoid eye damage. Exposure of the skin and other body parts to UV light should be avoided.

Item #	Nominal Wavelength[a,b]	LED Output Power[b,c]		Bandwidth (FWHM)	Irradiance[d]	Maximum Current (CW)	Forward Voltage[c]	Viewing Angle (Full Angle at Half Max)	Emitter Size	MCPCB Thickness
		Minimum	Typical							
M265D3	265 nm	24 mW	35 mW	6.8 nm	0.47 µW/mm^2	350 mA	6.0 V	120°	3.5 mm x 3.5 mm	1.6 mm
M275D2	275 nm	45 mW	80 mW	11 nm	0.8 µW/mm^2	700 mA	7.3 V	118°	2 mm x 2 mm	1.6 mm
M275D3	275 nm	47.3 mW[e]	68.3 mW[e]	10 nm[e]	0.5 µW/mm^2 [e]	300 mA[e]	12 V[e]	120°[e]	2.7 mm x 3.3 mm	1.6 mm
M285D3	285 nm	50 mW	70 mW	13 nm	0.7 µW/mm^2	500 mA	5.9 V	120°	1 mm x 1 mm	1.6 mm
M300D3	300 nm	26 mW	32 mW	20 nm	0.3 µW/mm^2	350 mA	8.0 V	130°	1 mm x 1 mm	1.6 mm
M310D1	310 nm	38.5 mW[e]	56.5 mW[e]	30 nm[e]	0.76 µW/mm^2 [e]	600 mA[e]	5 V[e]	120°[e,f]	1 mm x 1 mm	1.6 mm
M325D3	325 nm	25 mW	35 mW	12 nm	0.44 µW/mm^2 (Max)	600 mA	5.2 V	120°	1 mm x 1 mm	1.6 mm
M340D3	340 nm	53 mW	60 mW	11 nm	2.22 µW/mm^2	700 mA	4.6 V	110°	1 mm x 1 mm	2.4 mm

a. Click on the wavelength to view a typical spectrum for the LED.
b. Due to variations in the manufacturing process and operating parameters such as temperature and current, the actual spectral output of any given LED will vary. Output plots and nominal wavelength specs are only intended to be used as a guideline.
c. When Driven at the Maximum Current
d. Irradiance is measured at a distance of 200 mm from the LED. Typical value unless otherwise noted.
e. Measured at 25 °C
f. When driven at a current of 350 mA,

Part Number	Description	Price	Availability
M265D3	**265 nm, 24 mW (Min) LED on Metal-Core PCB, 350 mA**	**$779.00**	**7-10 Days**
M275D2	**275 nm, 45 mW (Min) LED on Metal-Core PCB, 700 mA**	**$244.67**	**Today**
M275D3	**275 nm, 47.3 mW (Min) LED on Metal-Core PCB, 300 mA**	**$143.16**	**Today**
M285D3	**285 nm, 50 mW (Min) LED on Metal-Core PCB, 500 mA**	**$532.00**	**Today**
M300D3	**300 nm, 26 mW (Min) LED on Metal-Core PCB, 350 mA**	**$374.89**	**Today**
M310D1	**308 nm, 38.5 mW (Min) LED on Metal-Core PCB, 600 mA**	**$462.49**	**Today**
M325D3	**325 nm, 25 mW (Min) LED on Metal-Core PCB, 600 mA**	**$497.13**	**Today**
M340D3	**340 nm, 53 mW (Min) LED on Metal-Core PCB, 700 mA**	**$207.41**	**Today**

UV LEDs (365 - 405 nm)

Please note that our UV LEDs radiate intense UV light during operation. Precautions must be taken to prevent looking directly at the UV light, and UV light protective glasses must be worn to avoid eye damage. Exposure of the skin and other body parts to UV light should be avoided.

Item #	Nominal Wavelength[a,b]	LED Output Power[b]		Bandwidth (FWHM)	Irradiance (Typical)[c]	Maximum Current (CW)	Forward Voltage	Viewing Angle (Full Angle at Half Max)	Emitter Size	MCPCB Thickness
		Minimum	Typical							
M365D2	365 nm	1150 mW[e]	1400 mW[e]	9 nm	17.6 µW/mm^2	1700 mA	4.0 V	120°	1.4 mm x 1.4 mm	2.4 mm
M375D4	375 nm	1270 mW[f]	1540 mW[f]	9 nm	19.2 µW/mm^2	1400 mA	3.6 V	130°	1 mm x 1 mm	2.4 mm
M385D1	385 nm	270 mW[f]	430 mW[f]	10 nm	11.8 µW/mm^2	700 mA	4.3 V	120°	1 mm x 1 mm	1.6 mm
M385D2	385 nm	1650 mW[f]	1830 mW[f]	12 nm	23.3 µW/mm^2	1700 mA	3.9 V	120°	1.4 mm x 1.4 mm	2.4 mm
M395D3	395 nm	400 mW[f]	535 mW[f]	16 nm	6.7 µW/mm^2	500 mA	4.5 V	126°	1 mm x 1 mm	2.4 mm
M395D4	395 nm	1420 mW[f]	2050 mW[f]	11 nm	22.8 µW/mm^2	1400 mA	4.0 V	120°	2.5 mm x 2.5 mm	2.4 mm
M405D2	405 nm	1500 mW[f]	1700 mW[f]	12 nm	24.6 µW/mm^2	1400 mA	3.45 V	120°	1.4 mm x 1.4 mm	2.5 mm

a. Click on the wavelength to view a typical spectrum for the LED.
b. Due to variations in the manufacturing process and operating parameters such as temperature and current, the actual spectral output of any given LED will vary. Output plots and nominal wavelength specs are only intended to be used as a guideline.
c. Irradiance is measured at a distance of 200 mm from the LED.
d. When Driven with a Current of 500 mA
e. When Driven with a Current of 1000 mA
f. When Driven at the Maximum Current

Part Number	Description	Price	Availability
M365D2	**365 nm, 1150 mW (Min) LED on Metal-Core PCB, 1700 mA**	**$207.41**	**7-10 Days**
M375D4	**375 nm, 1270 mW (Min) LED on Metal-Core PCB, 1400 mA**	**$59.81**	**Today**
M385D1	**385 nm, 270 mW (Min) LED on Metal-Core PCB, 700 mA**	**$168.59**	**Today**
M385D2	**385 nm, 1650 mW (Min) LED on Metal-Core PCB, 1700 mA**	**$207.41**	**Today**
M395D3	**395 nm, 400 mW (Min) LED on Metal-Core PCB, 500 mA**	**$139.76**	**7-10 Days**
M395D4	**395 nm, 1420 mW (Min) LED on Metal-Core PCB, 1400 mA**	**$207.41**	**Today**
M405D2	**405 nm, 1500 mW (Min) LED on Metal-Core PCB, 1400 mA**	**$207.41**	**Today**

Single-Color Cold Visible LEDs (415 - 565 nm)

Please note that the 415 nm (violet) and 430 nm (violet) LEDs radiate intense UV light during operation. Precautions must be taken to prevent looking directly at the UV light, and UV light protective glasses must be worn to avoid eye damage. Exposure of the skin and other body parts to the UV light should be avoided.

Item #	Nominal Wavelength[a,b,c]	LED Output Power[b,d]		Bandwidth (FWHM)	Irradiance (Typical)[e]	Maximum Current (CW)	Forward Voltage[d]	Viewing Angle (Full Angle at Half Max)	Emitter Size	MCPCB Thickness
		Minimum	Typical							
M415D2	415 nm	1640 mW	1940 mW	14 nm	19.5 µW/mm^2	2000 mA	3.15 V	138°	1.4 mm x 1.4 mm	2.4 mm
M430D3	430 nm	529.2 mW[f]	757.6 mW[f]	17 nm	25.7[f] µW/mm^2	500 mA	3.66 V[f]	126°[f,g]	1 mm x 1 mm	2.4 mm
M450D3	450 nm	1850 mW	2100 mW	18 nm	35.6 µW/mm^2	2000 mA	3.5 V	120°	1.5 mm x 1.5 mm	1.6 mm
M455D3	455 nm	1150 mW	1445 mW	18 nm	32 µW/mm^2	1000 mA	3.25 V	80°	1 mm x 1 mm	1.6 mm
M470D4	470 nm[f]	809 mW[f]	1161.7 mW[f]	28 nm[f]	21.4[f] µW/mm^2	1000 mA[f]	3.8 V[f]	80°[f]	1 mm x 1 mm	1.6 mm
M490D3	490 nm	205 mW	240 mW	26 nm	2.5 µW/mm^2	350 mA	3.8 V	128°	1 mm x 1 mm	2.4 mm
M505D3	505 nm	400 mW	520 mW	37 nm	5.94 µW/mm^2	1000 mA	3.5 V	130°	1 mm x 1 mm	1.6 mm
M530D3	530 nm	370 mW	480 mW	35 nm	9.46 µW/mm^2	1000 mA	3.6 V	80°	1 mm x 1 mm	1.6 mm
MINTD3	554 nm	650 mW	815 mW	-	12.4 µW/mm^2	1225 mA	3.5 V	120°	1 mm x 1 mm	2.4 mm
M565D2[h]	565 nm	880 mW	979 mW	104 nm	11.7 µW/mm^2	1000 mA	3.1 V (Max)	125°	1 mm x 1 mm	1.6 mm

a. Click on the wavelength to view a typical spectrum for the LED.
b. Due to variations in the manufacturing process and operating parameters such as temperature and current, the actual spectral output of any given LED will vary. Output plots and nominal wavelength specs are only intended to be used as a guideline.
c. The nominal wavelength indicates the wavelength at which the LED appears brightest to the human eye. The nominal wavelength for visible LEDs may not correspond to the peak wavelength as measured by a spectrometer.
d. When Driven at the Maximum Current
e. Irradiance is measured at a distance of 200 mm from the LED.
f. Measured at 25 °C
g. When driven with a Current of 100 mA
h. This LED is phosphor-converted and may not turn off completely when modulated above 10 kHz at duty cycles below 50%.

Part Number	Description	Price	Availability
M415D2	**415 nm, 1640 mW (Min) LED on Metal-Core PCB, 2000 mA**	**$76.12**	**Today**
M430D3	**430 nm, 529.2 mW (Min) LED on Metal-Core PCB, 500 mA**	**$85.19**	**Today**
M450D3	**450 nm, 1850 mW (Min) LED on Metal-Core PCB, 2000 mA**	**$71.53**	**Lead Time**
M455D3	**455 nm, 1150 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$75.98**	**Today**
M470D4	**NEW! 470 nm, 809 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$65.99**	**Lead Time**
M490D3	**490 nm, 205 mW (Min) LED on Metal-Core PCB, 350 mA**	**$79.30**	**7-10 Days**
M505D3	**505 nm, 520 mW (Typ.) LED on Metal-Core PCB, 1000 mA**	**$75.98**	**Today**
M530D3	**530 nm, 370 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$75.98**	**Today**
MINTD3	**554 nm, 650 mW (Min) LED on Metal-Core PCB, 1225 mA**	**$126.69**	**7-10 Days**
M565D2	**565 nm, 880 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$64.33**	**Today**

Single-Color Warm Visible LEDs (590 - 730 nm)

Item #	Nominal Wavelength[a,b,c]	LED Output Power[b,d]		Bandwidth (FWHM)	Irradiance (Typical)[e]	Maximum Current (CW)	Forward Voltage[d]	Viewing Angle (Full Angle at Half Max)	Emitter Size	MCPCB Thickness
		Minimum	Typical							
M590D3	590 nm	230 mW	300 mW	15 nm	6.0 µW/mm^2	1000 mA	2.5 V	80°	1 mm x 1 mm	1.6 mm
M595D3[f]	595 nm	820 mW	1217 mW	64 nm	13.5 µW/mm^2	1500 mA	3.0 V	120°	2.9 mm x 2.9 mm	2.4 mm
M617D2	617 nm	600 mW	650 mW	18 nm	15.7 µW/mm^2	1000 mA	2.2 V	80°	1 mm x 1 mm	1.6 mm
M617D3	617 nm	660 mW	860 mW	16 nm	19.86 µW/mm^2	1000 mA	2.6 V	80°	1 mm x 1 mm	1.6 mm
M625D3	625 nm	700 mW	920 mW	17 nm	21.9 µW/mm^2	1000 mA	2.5 V	80°	1 mm x 1 mm	1.6 mm
M660D2	660 nm	940 mW	1050 mW	20 nm	20.88 µW/mm^2	1200 mA	2.6 V	120°	1.5 mm x 1.5 mm	1.6 mm
M680D2	680 nm	180 mW	210 mW	22 nm	14.5 µW/mm^2	600 mA	2.5 V	18°	1 mm x 1 mm	2.4 mm
M700D2	700 nm	80 mW	125 mW	20 nm	1.0 µW/mm^2	500 mA	2.7 V	128°	1 mm x 1 mm	2.4 mm
M730D3	730 nm	540 mW	680 mW	40 nm	13.1 µW/mm^2	1000 mA	2.9 V	80°	1 mm x 1 mm	1.6 mm

a. Click on the wavelength to view a typical spectrum for the LED.
b. Due to variations in the manufacturing process and operating parameters such as temperature and current, the actual spectral output of any given LED will vary. Output plots and nominal wavelength specs are only intended to be used as a guideline.
c. The nominal wavelength indicates the wavelength at which the LED appears brightest to the human eye. The nominal wavelength for visible LEDs may not correspond to the peak wavelength as measured by a spectrometer.
d. When Driven at the Maximum Current
e. Irradiance is measured at a distance of 200 mm from the LED.
f. This LED is phosphor-converted and may not turn off completely when modulated above 10 kHz at duty cycles below 50%.

Part Number	Description	Price	Availability
M590D3	**590 nm, 230 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$69.68**	**Today**
M595D3	**595 nm, 820 mW (Min) LED on Metal-Core PCB, 1500 mA**	**$87.13**	**Today**
M617D2	**617 nm, 600 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$45.40**	**Today**
M617D3	**617 nm, 660 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$73.90**	**Today**
M625D3	**625 nm, 700 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$73.90**	**Today**
M660D2	**660 nm, 940 mW (Min) LED on Metal-Core PCB, 1200 mA**	**$71.53**	**Lead Time**
M680D2	**Customer Inspired! 680 nm, 180 mW (Min) LED on Metal-Core PCB, 600 mA**	**$84.85**	**Today**
M700D2	**700 nm, 80 mW (Min) LED on Metal-Core PCB, 500 mA**	**$84.85**	**Today**
M730D3	**730 nm, 540 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$79.18**	**Today**

IR LEDs (780 - 1650 nm)

Item #	Nominal Wavelength[a,b]	LED Output Power[b,c]		Bandwidth (FWHM)	Irradiance (Typical)[d]	Maximum Current (CW)	Forward Voltage[c]	Viewing Angle (Full Angle at Half Max)	Emitter Size	MCPCB Thickness
		Minimum	Typical							
M780D2	780 nm	200 mW	300 mW	28 nm	47.3 µW/mm^2	800 mA	2.0 V	20°	1 mm x 1 mm	2.4 mm
M780D3	780 nm	800 mW	950 mW	30 nm	13.3 µW/mm^2	800 mA	7.8 V	120°	Ø3 mm (3 Emitters)	1.6 mm
M810D2	810 nm	325 mW	375 mW	25 nm	61.8 µW/mm^2	500 mA	3.6 V	20°	1 mm x 1 mm	1.6 mm
M810D3	810 nm	363 mW	542 mW	32 nm	23.7 µW/mm^2	1000 mA	3.55 V	80°	1 mm x 1 mm	2.4 mm
M850D2	850 nm	900 mW	1100 mW	30 nm	22.9 µW/mm^2	1200 mA	2.95 V	90°	1 mm x 1 mm	1.6 mm
M850D3	850 nm	1400 mW	1600 mW	30 nm	19.4 µW/mm^2	1500 mA	3.85 V	150°	1 mm x 1 mm	1.6 mm
M880D2	880 nm	300 mW	350 mW	50 nm	5.6 µW/mm^2	1000 mA	1.7 V	132°	1 mm x 1 mm	2.4 mm
M940D2	940 nm	800 mW	1000 mW	37 nm	19.1 µW/mm^2	1000 mA	2.75 V	90°	1 mm x 1 mm	1.6 mm
M970D3	970 nm	600 mW	720 mW	60 nm	7.4 µW/mm^2	1000 mA	1.9 V	130°	1 mm x 1 mm	2.4 mm
M1050D1	1050 nm	50 mW	70 mW	60 nm	1.9 µW/mm^2	700 mA	1.5 V	120°	1 mm x 1 mm	2.4 mm
M1050D3	1050 nm	160 mW	210 mW	37 nm	3.7 µW/mm^2	600 mA	1.4 V	128°	1 mm x 1 mm	2.4 mm
M1100D1	1100 nm	168 mW[e]	252 mW[e]	50 nm[e]	18.1 µW/mm^2 [e]	1000 mA[e]	1.4 V[e]	18°[e]	1 mm x 1 mm	2.4 mm
M1200D2	1200 nm	30 mW	35 mW	80 nm	0.7 µW/mm^2	700 mA	1.4 V	134°	1 mm x 1 mm	2.4 mm
M1300D2	1300 nm	25 mW	30 mW	80 nm	0.6 µW/mm^2	500 mA	1.4 V	134°	1 mm x 1 mm	2.4 mm
M1450D3	1450 nm	81.8 mW	120.7 mW	95 nm	1.5 µW/mm^2	700 mA	1.88 V	130°	1 mm x 1 mm	2.4 mm
M1550D2	1550 nm	31 mW	36 mW	102 nm	0.5 µW/mm^2	1000 mA	1.35 V	136°	1 mm x 1 mm	2.4 mm
M1650D2	1650 nm	13 mW	16 mW	120 nm	1.2 µW/mm^2	600 mA	1.1 V	20°	1 mm x 1 mm	2.4 mm

a. Click on the wavelength to view a typical spectrum for the LED.
b. Due to variations in the manufacturing process and operating parameters such as temperature and current, the actual spectral output of any given LED will vary. Output plots and nominal wavelength specs are only intended to be used as a guideline.
c. When Driven at the Maximum Current
d. Irradiance is measured at a distance of 200 mm from the LED.
e. Measured at 25 °C

Part Number	Description	Price	Availability
M780D2	**780 nm, 200 mW (Min) LED on Metal-Core PCB, 800 mA**	**$64.33**	**Today**
M780D3	**780 nm, 800 mW (Min) LED on Metal-Core PCB, 800 mA**	**$115.35**	**Today**
M810D2	**810 nm, 325 mW (Min) LED on Metal-Core PCB, 500 mA**	**$69.32**	**Lead Time**
M810D3	**810 nm, 363 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$87.13**	**Today**
M850D2	**850 nm, 900 mW (Min) LED on Metal-Core PCB, 1200 mA**	**$64.33**	**Lead Time**
M850D3	**850 nm, 1400 mW (Min) LED on Metal-Core PCB, 1500 mA**	**$125.34**	**Today**
M880D2	**880 nm, 300 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$64.33**	**Today**
M940D2	**940 nm, 800 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$64.33**	**Today**
M970D3	**970 nm, 600 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$81.56**	**Today**
M1050D1	**1050 nm, 50 mW (Min) LED on Metal-Core PCB, 700 mA**	**$75.98**	**Today**
M1050D3	**1050 nm, 160 mW (Min) LED on Metal-Core PCB, 600 mA**	**$181.60**	**Today**
M1100D1	**1100 nm, 168 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$198.84**	**7-10 Days**
M1200D2	**Customer Inspired! 1200 nm, 30 mW (Min) LED on Metal-Core PCB, 700 mA**	**$139.76**	**7-10 Days**
M1300D2	**Customer Inspired! 1300 nm, 25 mW (Min) LED on Metal-Core PCB, 500 mA**	**$139.76**	**Today**
M1450D3	**NEW! 1450 nm, 81.8 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$152.37**	**Lead Time**
M1550D2	**Customer Inspired! 1550 nm, 31 mW (Min) LED on Metal-Core PCB, 1000 mA**	**$139.76**	**Today**
M1650D2	**1650 nm, 13 mW (Min) LED on Metal-Core PCB, 600 mA**	**$195.73**	**Today**

Purple LED (455 nm / 640 nm)

Our dual-peak LED was designed for applications requiring illumination in both red and blue portions of the spectrum, such as horticulture. This purple LED features dual peaks at 455 nm and 640 nm, respectively, to stimulate photosynthesis (see graph to compare the absorption peaks of photosynthesis pigments with the LED spectrum). The LED was designed to maintain the red/blue ratio of the emission spectrum over its lifetime to provide high uniformity of plant growth.

Item #	Nominal Wavelength[a,b]	LED Output Power[b,c]		Bandwidth (FWHM)	Irradiance (Typical)[d]	Maximum Current (CW)	Forward Voltage[c]	Viewing Angle (Full Angle at Half Max)	Emitter Size	MCPCB Thickness
		Minimum	Typical							
MPRP1D2[e]	455 nm (12.5%[f]) / 640 nm	275 mW	325 mW	N/A	3.7 µW/mm^2	300 mA	3.1 V	115°	1 mm x 2 mm	1.6 mm

a. Click on the wavelength to view a typical spectrum for the LED.
b. Due to variations in the manufacturing process and operating parameters such as temperature and current, the actual spectral output of any given LED will vary. Output plots and nominal wavelength specs are only intended to be used as a guideline.
c. When Driven at the Maximum Current
d. Irradiance is measured at a distance of 200 mm from the LED.
e. This LED is phosphor-converted and may not turn off completely when modulated above 10 kHz at duty cycles below 50%.
f. Percentage of LED intensity that emits in the blue portion of the spectrum, from 400 nm to 525 nm. Click on the wavelength for details.

Part Number	Description	Price	Availability
MPRP1D2	455 nm (12.5%) / 640 nm, 275 mW (Min) LED on Metal-Core PCB, 300 mA	$44.59	Today

White LEDs (400 - 700 nm Wavelength Range)

Our warm, neutral, and cold white LEDs feature broad spectra that span several hundred nanometers. The difference in appearance among these LEDs can be described using the correlated color temperature, which indicates that the LEDs color appearance is similar to a black body radiator at that temperature. In general, warm white LEDs offer a spectrum similar to a tungsten source, while cold white LEDs have a stronger blue component to the spectrum; neutral white LEDs provide a more even illumination spectrum over the visible range than warm white or cold white LEDs. Cold white LEDs are more suited for fluorescence microscopy applications or cameras with white balancing, because of a higher intensity at most wavelengths compared to warm white LEDs. Neutral white LEDs are ideal for horticultural applications.

Item #	Correlated Color Temperature[a,b]	LED Output Power[b,c]		Bandwidth (FWHM)	Irradiance (Typical)[d]	Maximum Current (CW)	Forward Voltage[c]	Viewing Angle (Full Angle at Half Max)	Emitter Size	MCPCB Thickness
		Minimum	Typical							
MWWHD3[e]	3000 K	2000 mW	2300 mW	N/A	37.0 µW/mm^2	700 mA	11.7 V	125°	3.5 mm x 3.5 mm	1.6 mm
MWUVD1[e]	4000 K[f]	235 mW	338 mW	N/A	4.0 µW/mm^2	125 mA	6.3 V	120°[g]	2 mm x 1 mm	1.6 mm
MNWHD2[e]	4900 K	740 mW	880 mW	N/A	7.7 µW/mm^2	1225 mA	2.9 V	150°	1 mm x 1 mm	2.4 mm
MCWHD5[e]	6500 K	930 mW	1370 mW	N/A	25.9 µW/mm^2	1300 mA	3.3 V	80°	1 mm x 1 mm	1.6 mm
MCWHD6[e]	6500 K	942 mW	1353 mW	N/A	11.8 µW/mm^2	1300 mA	4.51 V	150°	1 mm x 1 mm	1.6 mm

a. Click on the wavelength to view a typical spectrum for the LED.
b. Due to variations in the manufacturing process and operating parameters such as temperature and current, the actual spectral output of any given LED will vary. Output plots and correlated color temperature specs are only intended to be used as a guideline.
c. When Driven at the Maximum Current
d. Irradiance is measured at a distance of 200 mm from the LED.
e. This LED is phosphor-converted and may not turn off completely when modulated above 10 kHz at duty cycles below 50%.
f. Neutral White LED Spectrum with a Peak at 406 nm
g. When Driven with a Pulsed Forward Current of 75 mA

Part Number	Description	Price	Availability
MWWHD3	3000 K, 2000 mW (Min) LED on Metal-Core PCB, 700 mA	$84.85	Today
MWUVD1	NEW! 4000 K, 235 mW (Min) LED on Metal-Core PCB, 125 mA	$55.99	Today
MNWHD2	4900 K, 740 mW (Min) LED on Metal-Core PCB, 1225 mA	$48.93	Today
MCWHD5	6500 K, 930 mW (Min) LED on Metal-Core PCB, 1300 mA	$65.13	Lead Time
MCWHD6	6500 K, 942 mW (Min) LED on Metal-Core PCB, 1300 mA	$63.80	Lead Time

Broadband LEDs

The MBB1D1 broadband LED has a relatively flat spectral emission over a wide wavelength range. Its 10 dB bandwidth ranges between 470 nm and 850 nm. The MBB2D1 broadband LED features a spectrum with peaks at approximately 770 nm, 860 nm, and 940 nm.

Item #	Wavelength[a,b]	LED Output Power[b,c]		Bandwidth (FWHM)	Irradiance (Typical)[d]	Maximum Current (CW)	Forward Voltage[c]	Viewing Angle (Full Angle at Half Max)	Emitter Size	MCPCB Thickness
		Minimum	Typical							
MBB1D1[e]	470 - 850 nm (10 dB Bandwidth)	70 mW	80 mW	280 nm	0.9 µW/mm^2	500 mA	3.6 V	120°	1 mm x 1 mm	1.6 mm
MBB2D1	770 nm, 860 nm & 940 nm (Peak Wavelengths)	740 mW[f]	1090 mW[f]	N/A	13.5 µW/mm^2 [c,f]	1000 mA[f]	4.8 V[f]	120°[f]	1 mm x 1 mm	1.6 mm

a. Click on the wavelength to view a typical spectrum for the LED.
b. Due to variations in the manufacturing process and operating parameters such as temperature and current, the actual spectral output of any given LED will vary. Output plots and nominal wavelength specs are only intended to be used as a guideline.
c. When Driven at the Maximum Current
d. Irradiance is measured at a distance of 200 mm from the LED.
e. The LED may not turn off completely when modulated at frequencies above 1 kHz with a duty cycle of 50%, as the broadband emission is produced by optically stimulating emission from phosphor. For modulation at frequencies above 1 kHz, the duty cycle may be reduced. For example, 10 kHz modulation is attainable with a duty cycle of 5%
f. Measured at 25 °C

Part Number	Description	Price	Availability
MBB1D1	**470 - 850 nm Broadband LED, 70 mW (Min) on Metal-Core PCB, 500 mA**	**$414.83**	**Today**
MBB2D1	**IR Broadband LED (770 nm, 860 nm & 940 nm), 740 mW (Min) on Metal-Core PCB, 1000 mA**	**$459.57**	**Today**

LED Connection Cable

- 4-Pin M8 Connector on One Side
- 4 Bare Wires on Other Side
- 2 m Long, 24 AWG Wires

Male M8x1 Connector

Pin	Description	Wire Color
1	LED Anode	Brown
2	LED Cathode	White
3	EEPROM GND	Black
4	EEPROM IO	Blue

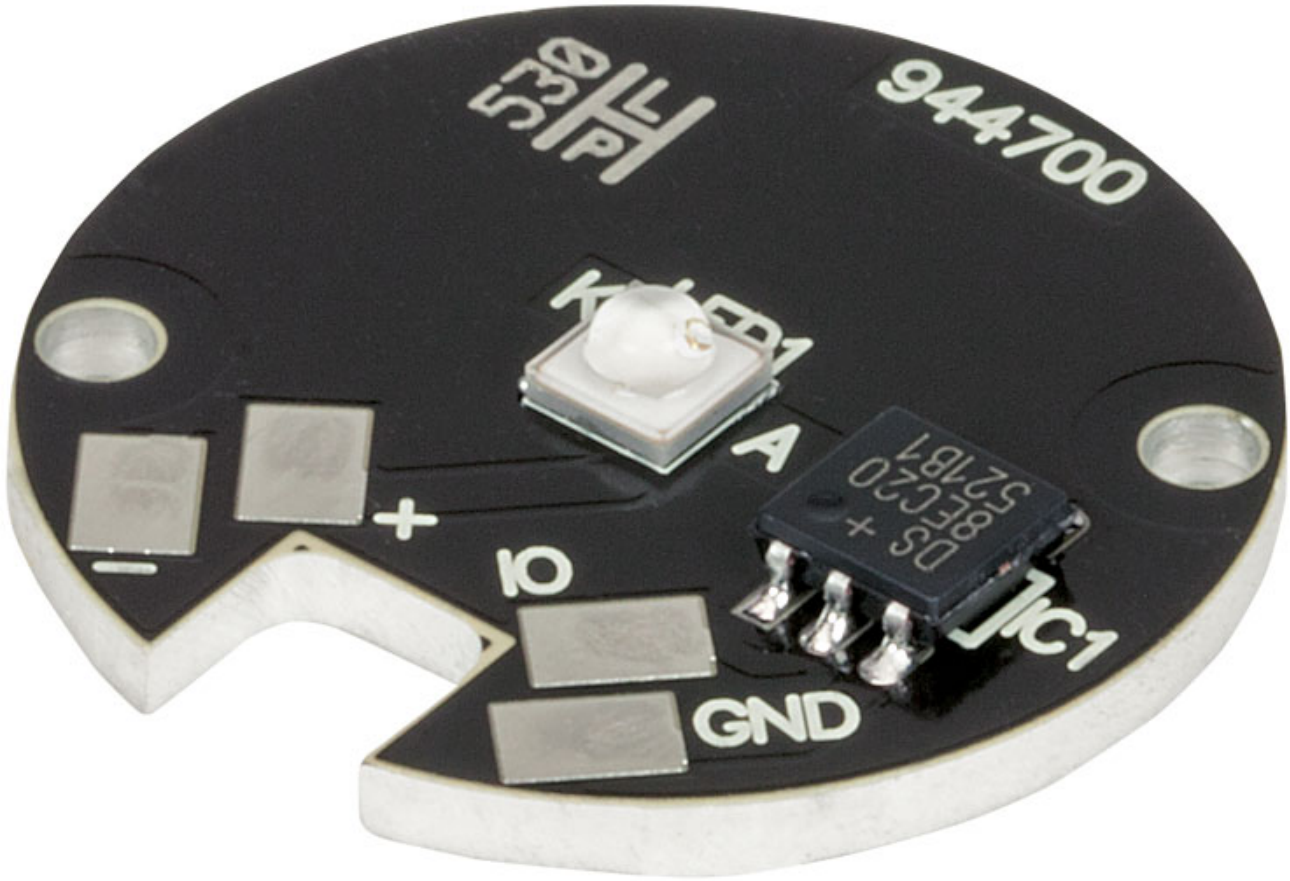
The 4-Pin M8 connection cable can be used to connect the LEDs on metal-core PCBs to the following Thorlabs LED drivers: LEDD1B, DC2100, DC4100, and DC4104 (the latter two require the DC4100-HUB).

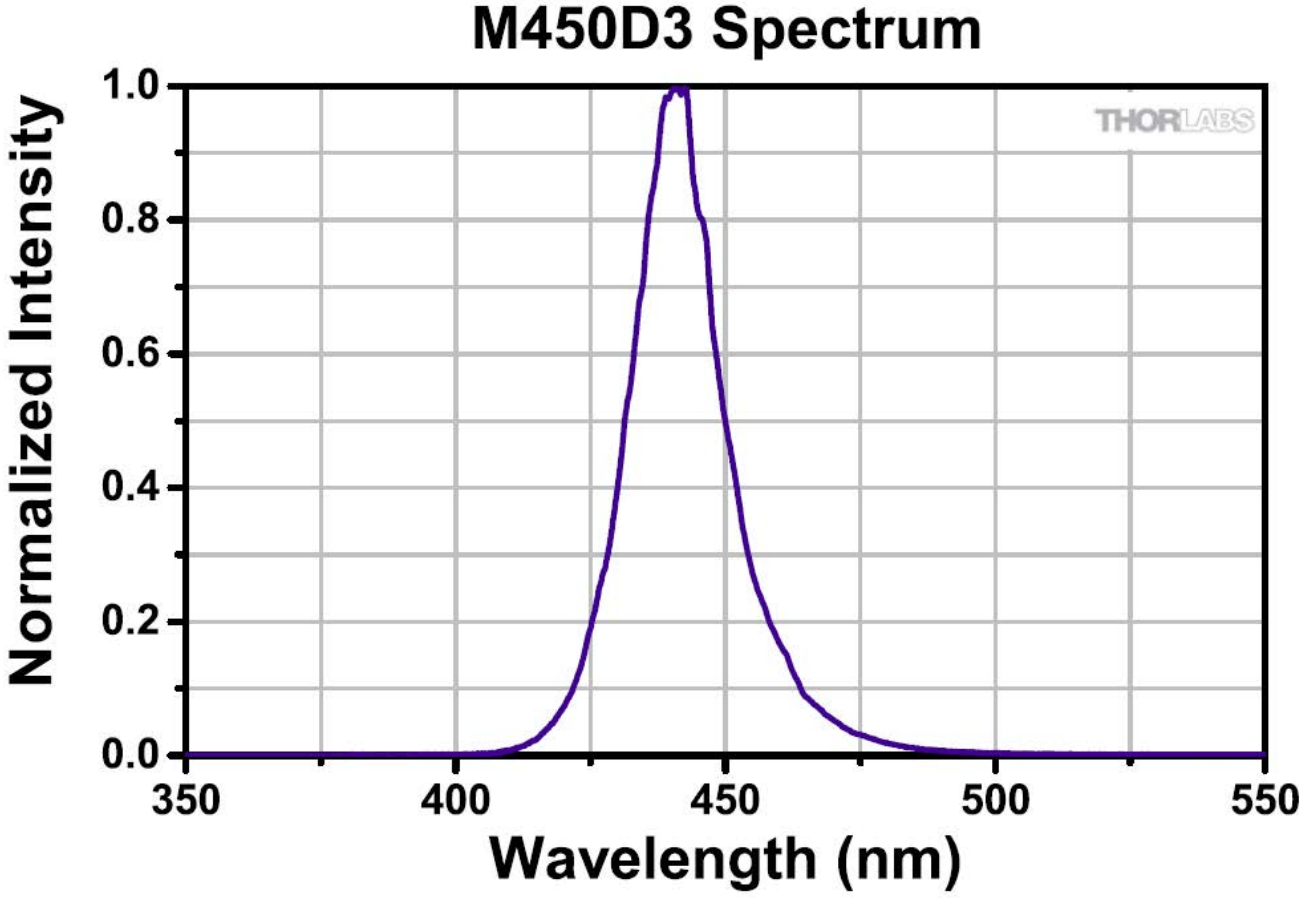
Pin Connections

The diagram above shows the male connector for use with the above Thorlabs LED drivers. The connector is a standard M8x1 sensor circular connector. Pins 1 and 2 are the connection to the LED. Please note that the bare PCB board LEDs shown on this page do not include an EEPROM like our mounted LEDs; hence pins 3 and 4 should not be connected. Also, note that the pin connection diagram shown here may not be valid for third-party LED drivers.

For customers using their own power supplies, we also offer a female 4-pin M8 connector cable (item # CON8ML-4).

Part Number	Description	Price	Availability
CAB-LEDD1	**LED Connection Cable, 2 m, M8 Connector, 4 Wires**	**$17.64**	**Today**


530
944700
LED1
A
+
–
IO
GND
IC1


M450D3 Spectrum
THORLABS
Normalized Intensity
1.0
0.8
0.6
0.4
0.2
0.0
350
400
450
500
550
Wavelength (nm)