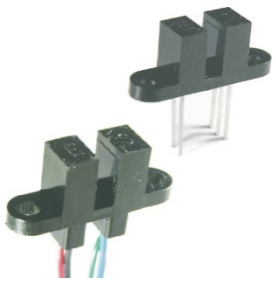
Photologic® Slotted Optical Switch

OPB960, OPB970, OPB980, OPB990 Series



Features:

- Choice of logic and output driver circuits
- Choice of aperture size, covered or open
- #26 AWG UL Rated Wire or printed circuit board leads
- Choice of mounting features
- Direct TTL, LSTTL, CMOS Interface

ESD HBM >4kV (Class 3A)

Description:

The OPB960 / 970 / 980 / 990 series of non-contact Photologic® slotted optical switches provide flexibility in meeting application specific requirements for the design engineer.

Building from a standard housing with a 0.125” (3.18 mm) wide slot, the user can specify output logic state, output driver circuit, aperture width, aperture surface and mounting tab locations. Furthermore, an option of #26 AWG UL rated wire or printed circuit board leads allows electrical interface flexibility.

The device body is an opaque plastic which minimizes sensitivity to both visible and near-infrared external light sources which may impact operation. Aperture width choices provide different optical resolutions for motion sensing. A covered aperture provides dust protection, while an open aperture provides maximum protection against external light sources.

Electrical operation is over a wide supply voltage range. LED emissions are near-infrared (890 nm).
Detector digital output logic choices of buffered or inverted with totem-pole or open-collector driver circuit simplify interface for various electrical requirements.

Custom electrical, wire and cabling services are available. Contact your local representative or OPTEK for more information.

Compliant to EU RoHS Directive 2011/65/EU

Applications:

- Speed and direction indication
- Rotary encoders
- Mechanical switch replacement
- Mechanical limit indication
- Printers – Top of form, End of travel, Home position
- Sliding Door Automotive and Lift gate applications

OPB 9 X X X X X X

Optek Assembly

Photologic® Sensor Family

Slot Aperture Surface and Lead Options:
6 – Covered (apertures not visible), PCB leads
7 – Open (apertures visible), PCB leads
8 – Covered (apertures not visible), Wires
9 – Open (apertures visible), Wires

Logic and Output Driver Types:
0 – Buffered Totem-Pole
1 – Buffered Open-Collector
2 – Inverted Totem-Pole
3 – Inverted Open-Collector

Z = Wires only, None for PCB leads

Aperture Width Guide Options:
55, 51, 11 (See Aperture Width Guide on next page)

Mounting Tab Location:
L –Emitter
N –None
P – Sensor
T – Sensor/Emitter

Logic Type	Input LED	Output Logic State
Buffered	OFF	LOW = 0
Inverted	OFF	HIGH = 1

General Note
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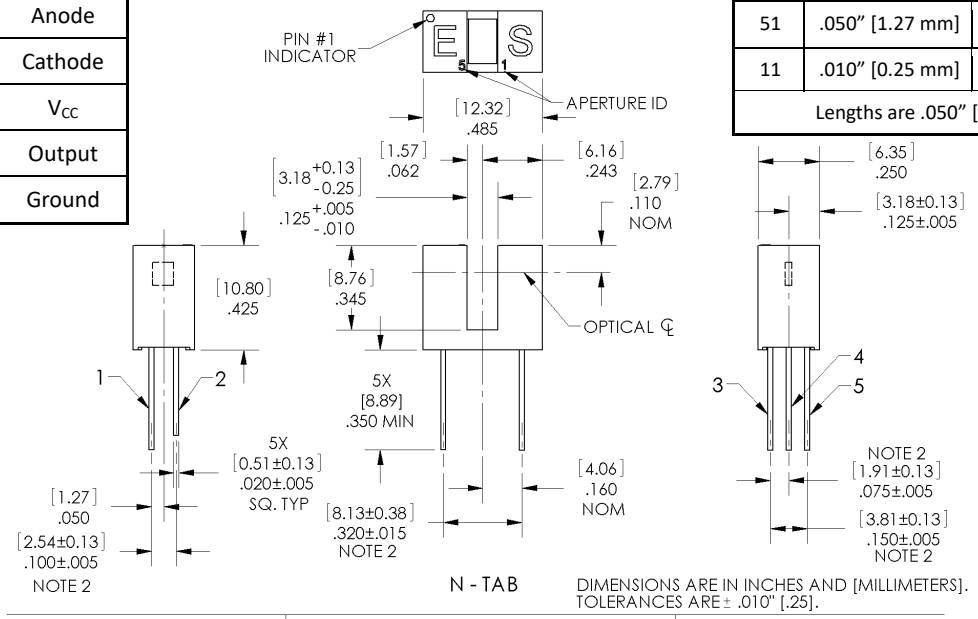
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PACKAGE OUTLINE for OPB960 and OPB970 Series

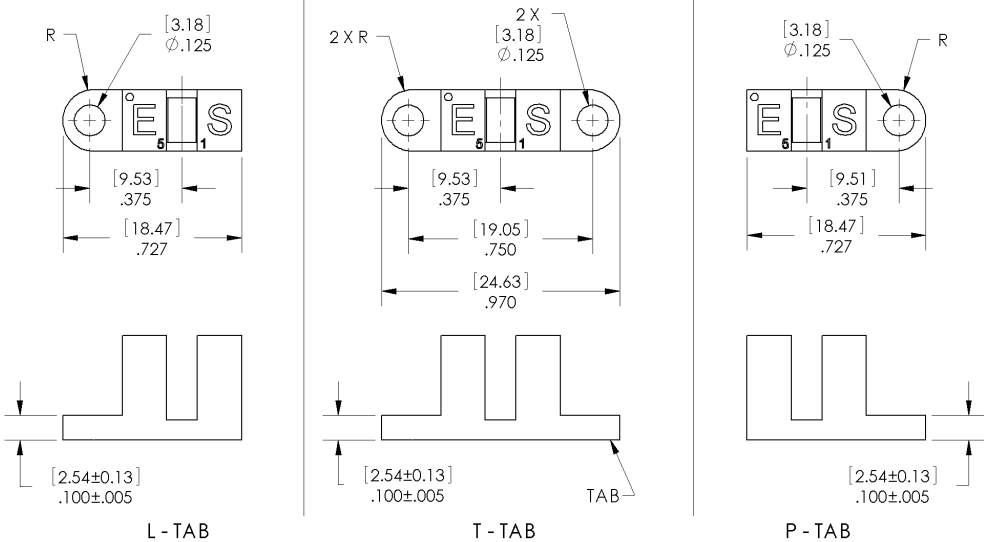
TABLE 1

Lead No.	Function
1	Anode
2	Cathode
3	V_{CC}
4	Output
5	Ground

APERTURE WIDTH GUIDE		
CODE	LED	SENSOR
55	.050" [1.27 mm]	.050" [1.27 mm]
51	.050" [1.27 mm]	.010" [0.25 mm]
11	.010" [0.25 mm]	.010" [0.25 mm]
Lengths are .050" [1.27 mm]		



DIMENSIONS ARE IN INCHES AND [MILLIMETERS].
TOLERANCES ARE ± .010" [.25].



Notes:

(1) RMA flux recommended. Duration can be extended to 10 seconds max.
(2) Feature controlled at body.
(3) Highly activated water-soluble fluxes may attack plastic. Recommend trial to verify application.
(4) Maximum lead soldering temperature [1.6 mm from case for 5 seconds with soldering iron] 260° C.
(5) Cathode lead may be shorter.
(6) Part number marking may be on any side.

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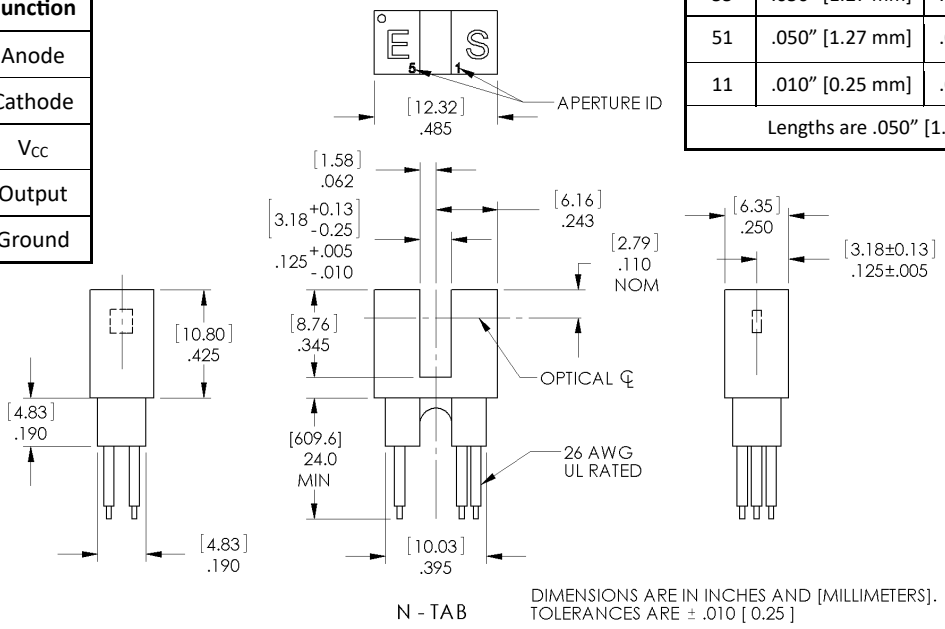
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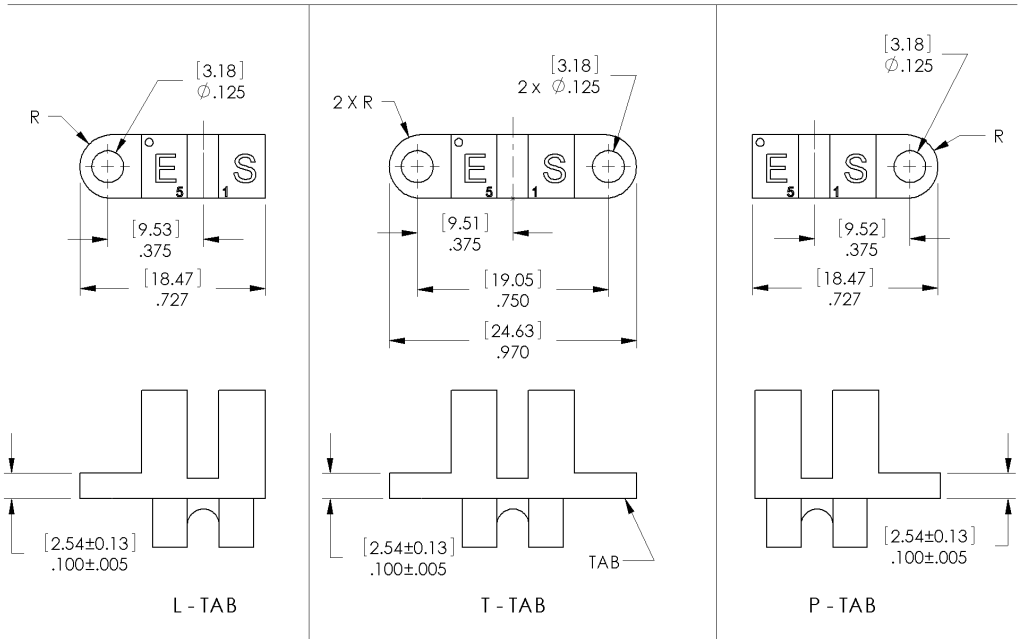
PACKAGE OUTLINE for OPB980 and OPB990 Series

TABLE 2

Wire Color	Function
Red	Anode
Black	Cathode
White	V_{CC}
Blue	Output
Green	Ground

APERTURE WIDTH GUIDE		
CODE	LED	SENSOR
55	.050" [1.27 mm]	.050" [1.27 mm]
51	.050" [1.27 mm]	.010" [0.25 mm]
11	.010" [0.25 mm]	.010" [0.25 mm]
Lengths are .050" [1.27 mm]		





Notes:

(7) Wire is #26 AWG, UL Rated PVC insulation.

(8) Ideal torque for bolt or screw 0,45 to 0,68 Nm (4 to 6 Lb-in).

(9) When using a thread lock compound, ND Industries "ND Vibra-Tite® Formula 3" will avoid stress cracking plastic.

(10) Plastic is soluble in chlorinated hydrocarbons and ketones. Methanol or isopropanol are recommended as cleaning agents.

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Electrical Specifications

Absolute Maximum Ratings (T_A = 25° C unless otherwise noted)

Storage Temperature Range	-40° C to +85° C
Operating Temperature Range	-40° C to +70° C
Input Diode (E)	
Input Diode Power Dissipation (11)	100 mW
Input Diode Forward D.C. Current, T_A = 25° C (12)	40 mA
Input Diode Reverse D.C. Voltage, T_A = 25° C	2 V
Sensor (S)	
Supply Voltage (V_{CC} to Ground)	18 V
Output Photologic® Power Dissipation (11)	200 mW
Voltage at Output Lead (Open-Collector Output), T_A = 25° C	35 V
Short Circuit Output Current to Ground (I_{OS}) 1 sec Max.	30 mA

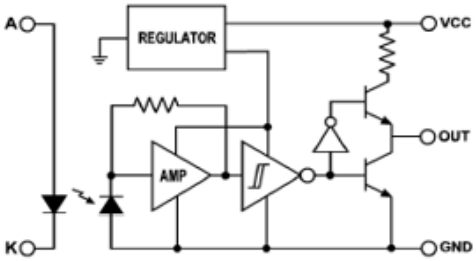
Notes:

(11) Derate linearly 1.77 mW /° C above 25° C.

(12) Do not connect LED directly to a voltage source without an external current limiting resistor.

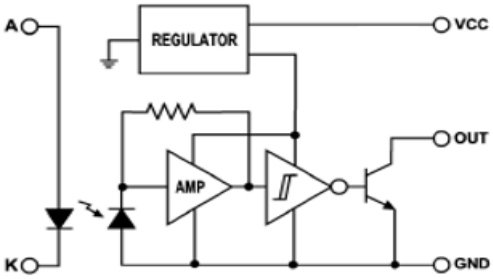
Schematics

Buffered Totem-Pole
OPB960/ OPB970/ OPB980/ OPB990

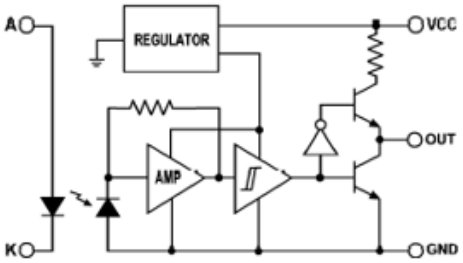


With Light Output — High

Buffered Open-Collector
OPB961/ OPB971/ OPB981/ OPB991

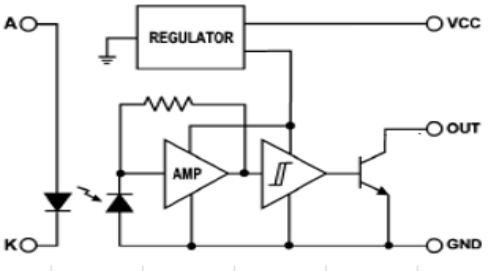


Inverted Totem-Pole
OPB962/ OPB972/ OPB982/ OPB992



With Light Output — Low

Inverted Open-Collector
OPB963/ OPB973/ OPB983/ OPB993



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Electrical Specifications

Electrical Characteristics (T_A = 25° C unless otherwise noted)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Input Diode						
V_F	Forward Voltage	1.0	-	1.70	V	I_F = 20 mA, T_A = 25° C
I_R	Reverse Current	-	-	100	µA	V_R = 2.0 V, T_A = 25° C
Coupled						
V_{CC}	Operating D.C. Supply Voltage	4.5	-	16	V	-
I_{CC}	Supply Current	-	-	12	mA	V_{CC} = 4.5 V to 16 V
V_{OL}	Low Level Output Voltage: Buffered Totem-Pole OPB960, OPB970 OPB980, OPB990 Buffered Open-Collector OPB961, OPB971 OPB981, OPB991	-	-	0.4	V	V_{CC} = 4.5 V, I_{OL} = 12.8 mA, I_F = 0 mA (13)
	Inverted Totem-Pole OPB962, OPB972 OPB982, OPB992 Inverted Open-Collector OPB963, OPB973 OPB983, OPB993					V_{CC} = 4.5 V, I_{OL} = 12.8 mA I_F = 15 mA
V_{OH}	High Level Output Voltage: Buffered Totem-Pole OPB960, OPB970 OPB980, OPB990	V_{CC} - 2.1	-	-	V	V_{CC} = 4.5 V to 16 V, I_{OH} = 800 µA I_F = 15 mA
	Inverted Totem-Pole (13) OPB962, OPB972 OPB982, OPB992					V_{CC} = 4.5 V to 16 V, I_{OH} = 800 µA I_F = 0 mA
I_{OH}	High Level Output Current: Buffered Open-Collector OPB961, OPB971 OPB981, OPB991	-	-	100	µA	V_{CC} = 4.5 V to 16 V, V_{OH} = 30 V I_F = 15 mA
	Inverted Open-Collector (13) OPB963, OPB973 OPB981, OPB991					V_{CC} = 4.5 V to 16 V, V_{OH} = 30 V I_F = 0 mA
$I_F(+)$	LED Positive-Going Threshold Current (15)	-	-	15	mA	V_{CC} = 5.0 V, T_A = 25° C
$I_F(+)/I_F(-)$	Hysteresis Ratio	-	1.5	-	-	V_{CC} = 5.0 V
t_r, t_f	Output Rise Time, Output Fall Time	-	70	-	ns	V_{CC} = 5.0 V, $I_{F\ peak}$ = 15 mA, T_A = 25° C 100 kHz square wave, C = 10 pF max. R_L = 360 Ω to GND (Totem-Pole) R_L = 1 KΩ pull-up (Open-Collector)
t_{PLH}, t_{PHL}	Propagation Delay Time Low to High, High to Low	-	5.0	-	µs	

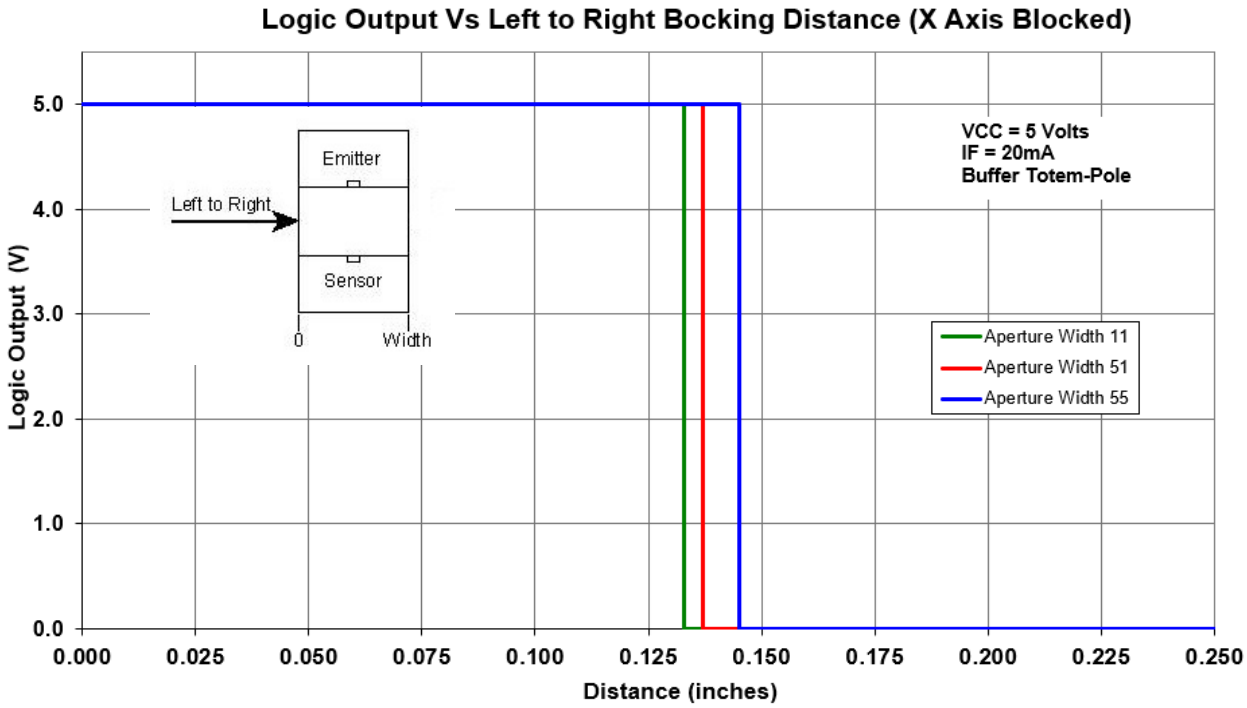
Notes:
(13) Normal application would be with light source blocked, simulated by I_F = 0 mA.
(14) All parameters are tested using pulse techniques.
(15) An increasing current applied to the LED which causes the output logic state to change. For proper application $I_{F(+)}$, LED current, should be more than the stated maximum.

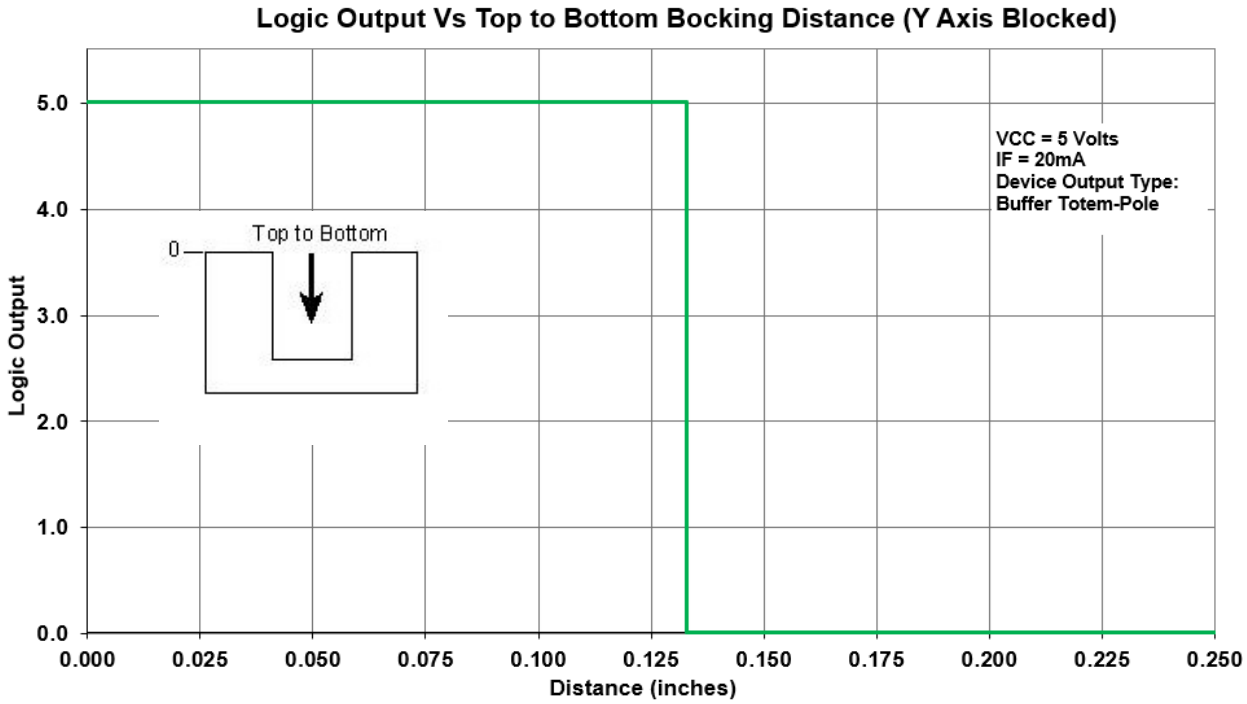
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Typical Performance





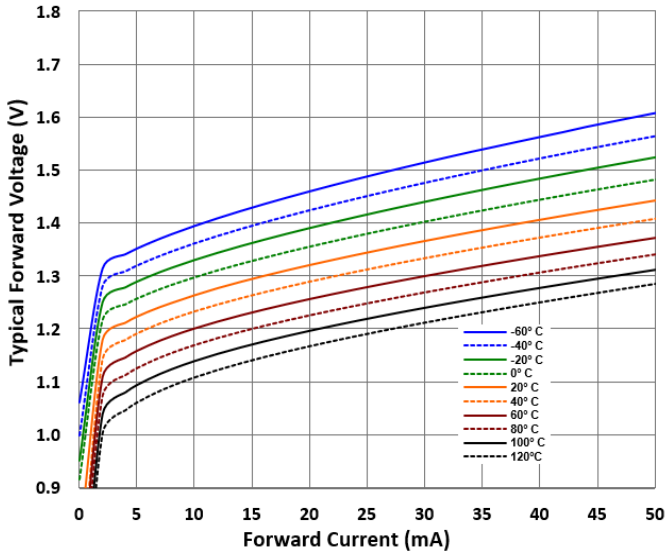
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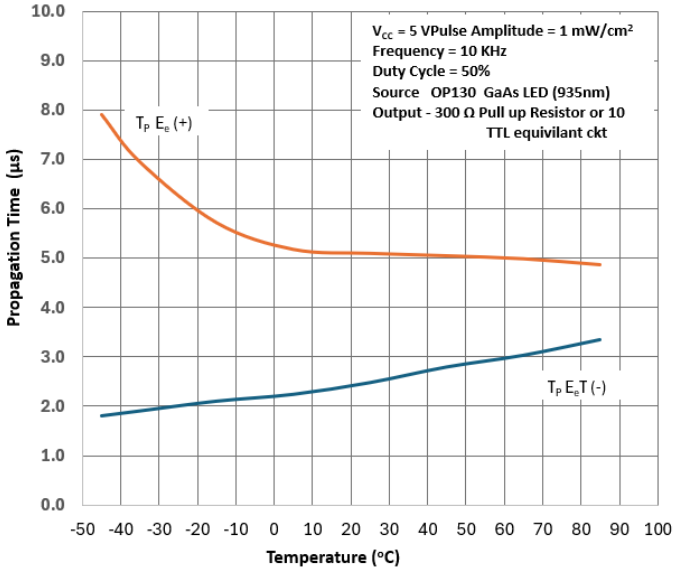
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Typical Performance

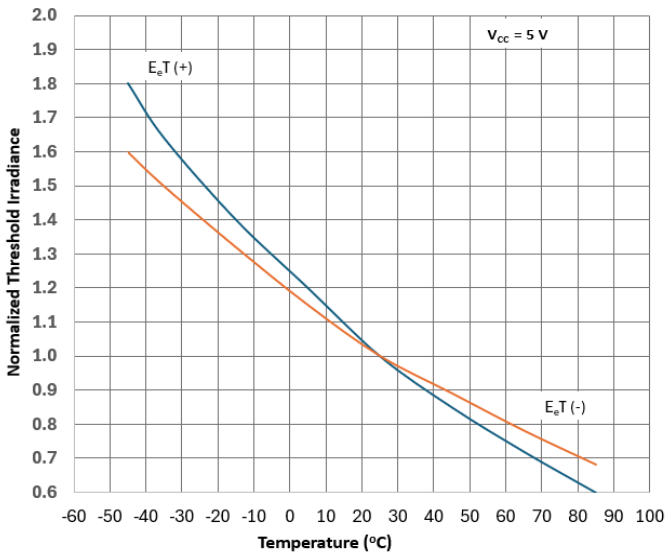
LED Forward Voltage vs I_F vs Temperature



Propagation Time vs Temperature



Normalized Threshold Irradiance vs T_A



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