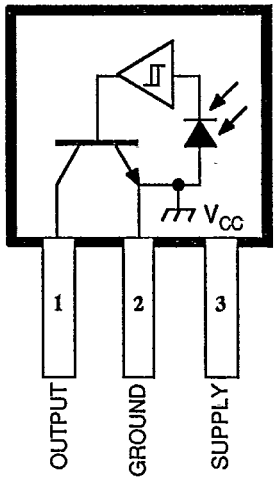
3330, 3360, 3363

T-41-67

OPTOELECTRONIC SWITCHES

ULN3330/60/63T



Dwg. PH-009

The ULN3330T/TA, ULN3360T, and ULN3363T optoelectronic switches provide light detection and low-level signal processing in single three-lead packages. The monolithic integrated circuits, requiring no external components, meet the need for cost-effective, light-sensing devices in consumer and industrial applications. Their high sensitivity makes them ideal for low-level light detection in optically noise-free environments.

Each optoelectronic IC includes a 0.030" x 0.030" (0.76 x 0.76 mm) photodiode, a high-gain current amplifier, a comparator with 12% hysteresis, output driver stage, and voltage regulator.

The ULN3330T/TA and ULN3360T switches turn ON as illumination of the photodiode falls below 55 $\mu W/cm^2$ at 880 nm. An internal latch provides hysteresis: The output turns OFF when illumination exceeds the turn-on threshold by approximately 12%.

The ULN3363T switch has an inverted output characteristic. It turns OFF as illumination falls below 55 $\mu W/cm^2$ at 880 nm; it remains OFF until increasing illumination at the photodiode typically reaches 62 $\mu W/cm^2$.

The ULN3330T/TA and ULN3363T have buffered open-collector outputs for current-sink applications. Typical loads include incandescent lamps, LEDs, sensitive relays, or dc motors.

Output circuitry for the ULN3360T includes an internal 5.4 kΩ pull-up resistor that enables its direct use with microprocessors and TTL logic.

FEATURES

- Photodiode with:
  - On-Chip Amplifier
  - On-Chip Comparator with Hysteresis
  - On-Chip Power Driver
  - On-Chip Voltage Regulator
- Sensitive Switch Points
- Operation to 30 kHz

ABSOLUTE MAXIMUM RATINGS

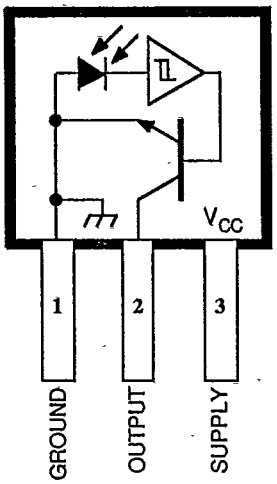
Supply Voltage, V_{CC} ..... **15 V**
Output Voltage, V_{OUT} ..... **15 V**
Output Current, I_{OUT} ..... **25 mA**
Operating Temperature Range,
T_A ..... **-40°C to +70°C**
Storage Temperature Range,
T_S ..... **-55°C to +110°C**

Always order by complete part number, e.g., **ULN3330T**.
See matrix on next page.

3330, 3360, 3363
OPTOELECTRONIC SWITCHES

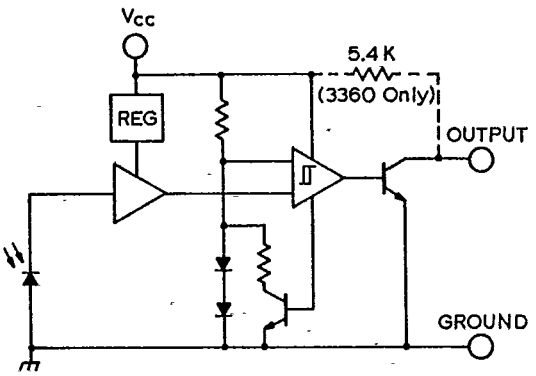
T-41-67

ULN3330TA



Dwg. PH-010

FUNCTIONAL BLOCK DIAGRAM



Dwg. No. A-13,264

Device Type	Output	Package	Pinout (1-2-3)
ULN3330T	Open Collector	T	OUT-GND-V_{CC}
ULN3330TA	Open Collector	TA	GND-OUT-V_{CC}
ULN3360T	5.4 kΩ Pull-Up	T	OUT-GND-V_{CC}
ULN3363T	Inv. Open Collector	T	OUT-GND-V_{CC}

ELECTRICAL CHARACTERISTICS at T_A = +25°C, V_{CC} = 6.0 V, λ = 880 nm

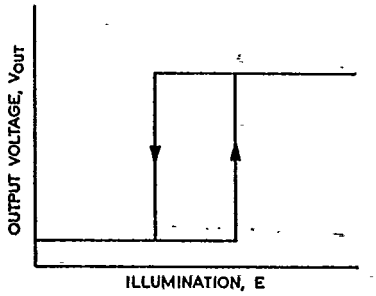
Characteristic	Symbol	Test Conditions	Limits			Units
			Min.	Typ.	Max.	
Supply Voltage Range	V_{CC}		4.0	6.0	15	V
Supply Current	I_{CC}		—	4.0	8.0	mA
Light Threshold Level	E_{ON}	Output ON	45	55	65	μW/cm²
	E_{OFF}	Output OFF	—	62	—	μW/cm²
Hysteresis	ΔE	$(E_{OFF} - E_{ON})/E_{OFF}$	10	13	16	%
Output ON Voltage	V_{OUT}	I_{OUT} = 15 mA	—	300	500	mV
		I_{OUT} = 25 mA	—	500	800	mV
Output OFF Current	I_{OUT}	V_{OUT} = 15 V	—	—	1.0	μA
Output Fall Time	t_f	90% to 10%	—	200	500	ns
Output Rise Time	t_r	10% to 90%	—	200	500	ns

3330, 3360, 3363
OPTOELECTRONIC SWITCHES

T-41-67-1

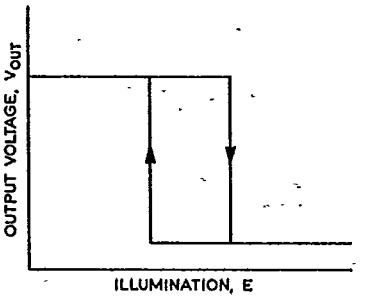
TYPICAL TRANSFER CHARACTERISTICS

ULN3330T/TA AND ULN3360T



Dwg. No. A-11,128

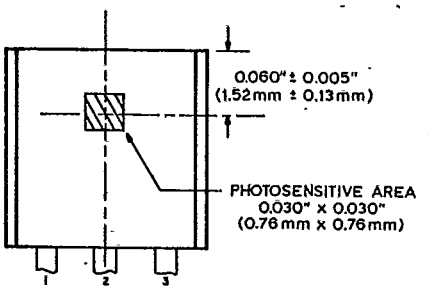
ULN3363T



Dwg. No. A-13,265

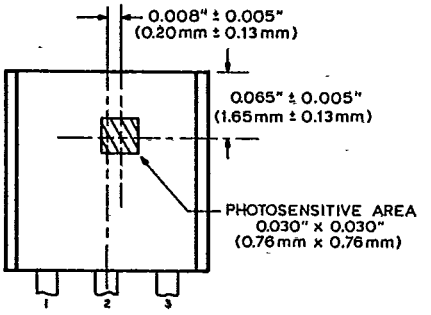
SENSOR LOCATIONS

SUFFIX 'T'



Dwg. No. A-13,301

SUFFIX 'TA'

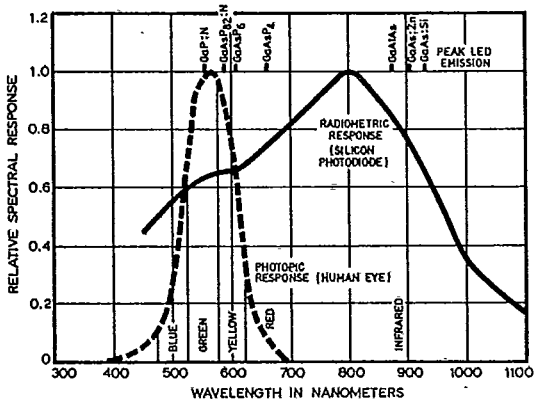


Dwg. No. A-11,994C

3330, 3360, 3363*
OPTOELECTRONIC SWITCHES

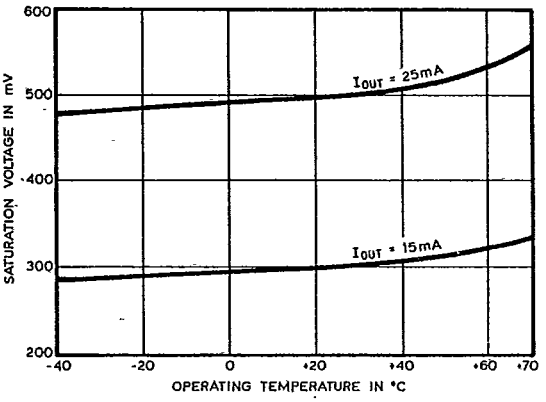
T-41-67

RELATIVE SPECTRAL RESPONSE AT T_A = +25°C AS A FUNCTION OF WAVELENGTH OF LIGHT



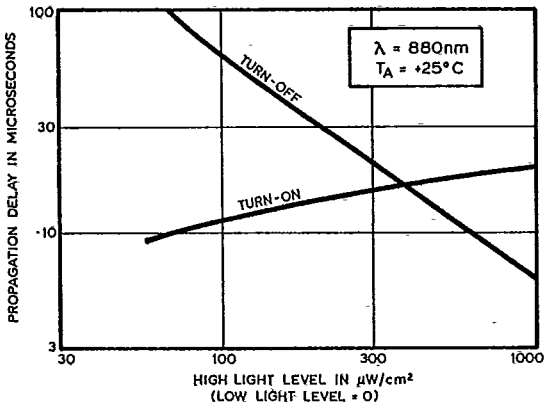
Dwg. No. A-12,135A

OUTPUT SATURATION VOLTAGE AS A FUNCTION OF OPERATING TEMPERATURE



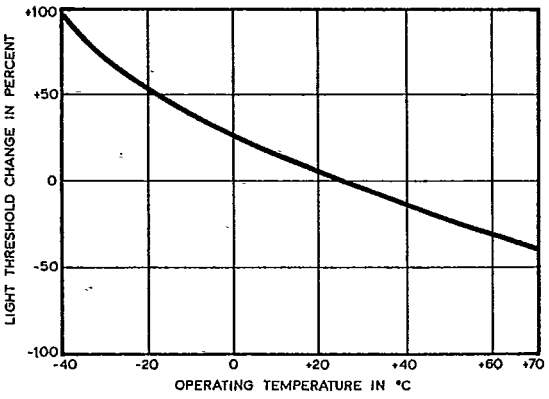
Dwg. No. A-12,307

PROPAGATION DELAY AS A FUNCTION OF LIGHT LEVEL



Dwg. No. A-12,308

LIGHT-THRESHOLD CHANGE AS A FUNCTION OF OPERATING TEMPERATURE



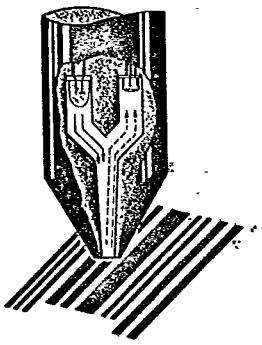
Dwg. No. A-12,309

3330, 3360, 3363 OPTOELECTRONIC SWITCHES

T-41-67

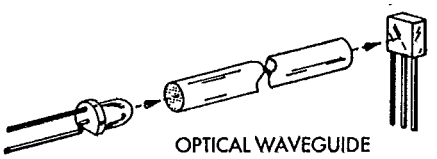
TYPICAL APPLICATIONS*

BAR CODE READER



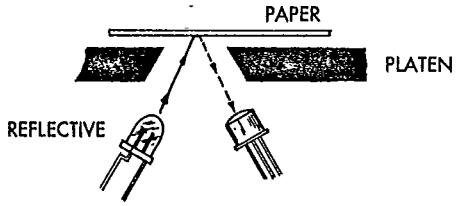
Dwg. No. A-13,266

OPTICAL ISOLATOR

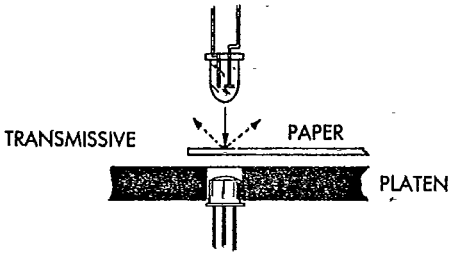


Dwg. No. A-13,267

SHEET DETECTOR

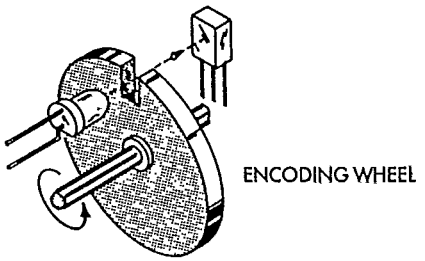


Dwg. No. A-13,268



Dwg. No. A-13,269

OPTICAL ENCODER



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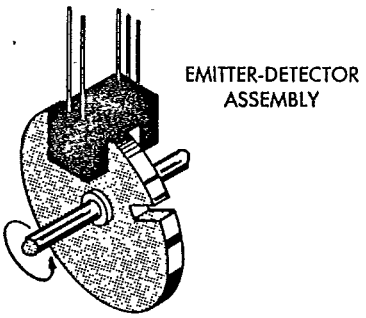

Dwg. No. A-13,271

*Optics and ambient light shields omitted for clarity.