

ULN-3332M AND ULN-3333M MULTICHANNEL OPTOELECTRONIC SWITCHES

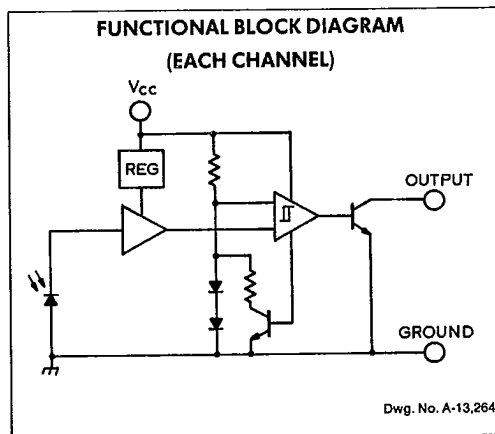
ULN-3332M AND ULN-3333M MULTICHANNEL OPTOELECTRONIC SWITCHES

FEATURES (Each Channel)

- Photodiode with On-Chip Amplifier
- On-Chip Comparator with Hysteresis
- On-Chip Output Driver
- On-Chip Voltage Regulator
- Sensitive Switch Points
- Accurate Element Placement
- Operation to 30 kHz

Sprague ULN-3332M and ULN-3333M optoelectronic switches provide multichannel light detection and low-level signal processing in a single eight-lead package. These monolithic integrated circuits, requiring no external components, meet the need for accurate cost-effective light-sensing devices. Their high sensitivities and narrow switch point ranges make them ideal devices for use in optical encoding applications.

Each optoelectronic IC includes a 30-mil by 30-mil photodiode, a high-gain current amplifier, a comparator with 13 percent hysteresis, an output driver stage, and a voltage regulator. Each channel turns ON as the illumination of the photodiode falls below 55 $\mu\text{W}/\text{cm}^2$ at 880 nm. An internal latch provides hys-

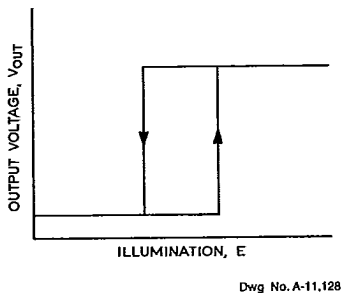


teresis. The output turns OFF when the illumination surpasses the turn-ON threshold by typically 13 percent. The ULN-3332M has two channels, while the ULN-3333M offers three channels. These devices also have a low-power analog output per channel for phase detection.

Each channel in the ULN-3332M and the ULN-3333M have buffered open-collector outputs for current-sink applications. Typical loads include incandescent lamps, LED's sensitive relays, and microprocessor inputs. Both devices are supplied in a miniature, clear plastic, eight-lead dual in-line package.

5

TYPICAL TRANSFER CHARACTERISTICS



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

ULN-3332M AND ULN-3333M
MULTICHANNEL OPTOELECTRONIC SWITCHES

ELECTRICAL CHARACTERISTICS at $T_A = +25^\circ\text{C}$, $V_{CC} = 6.0\text{ V}$, $\lambda = 880\text{ nm}$ (Each Channel)

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	$\mu\text{W}/\text{cm}^2$
	E_{OFF}	Output OFF	—	62	—	$\mu\text{W}/\text{cm}^2$
Hysteresis	ΔE	$(E_{OFF} - E_{ON})/E_{OFF}$	10	13	16	%
Analog Output	V_{ON}	$E \leq E_{OFF}$	—	22	—	$\mu\text{V}/\mu\text{W}/\text{cm}^2$
Analog Output Voltage Range	V_{ON}		0	—	2.1	V
Output ON Voltage	V_{OUT}	$I_{OUT} = 15\text{ mA}$	—	300	500	mV
		$I_{OUT} = 25\text{ mA}$	—	500	800	mV
Output OFF Current	I_{OUT}	$V_{OUT} = 15\text{ V}$	—	—	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

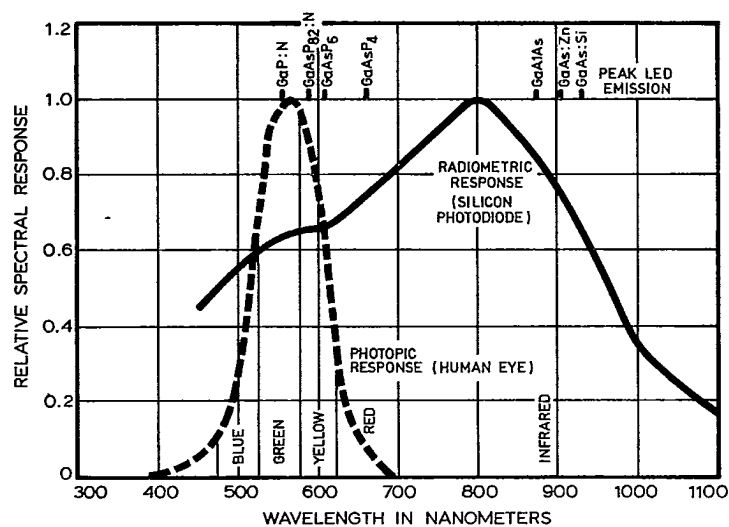
PINOUT

Pin #	Device Type	
	ULN-3332M	ULN-3333M
1	Analog Out 1	Digital Out 1
2	Digital Out 1	Analog Out 2
3	GND 2	Digital Out 2
4	Analog Out 2	Analog Out 3
5	Digital Out 2	Digital Out 3
6	No Connection	V_{CC}
7	V_{CC}	GND
8	GND 1	Analog Out 1

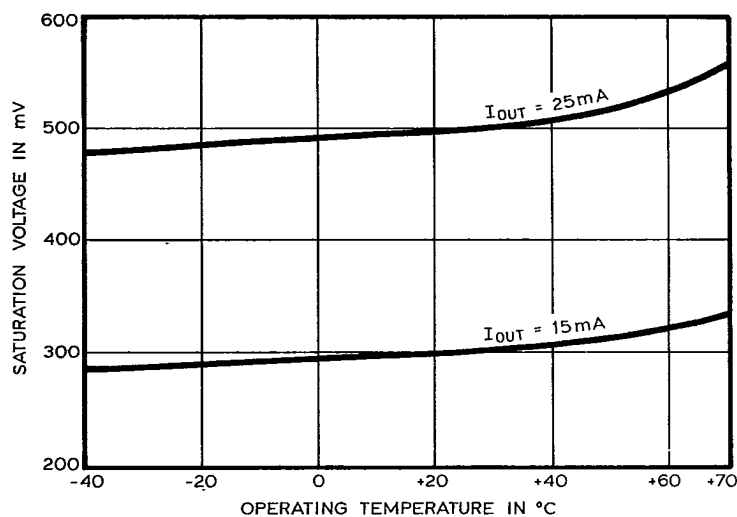
8514019 SPRAGUE/ SEMICONDUCTORS/ICS

03E 04703

DT-41-67

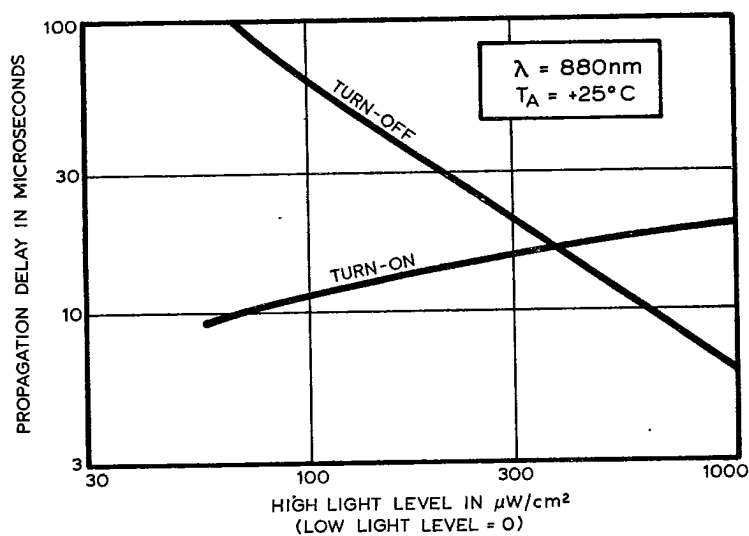
ULN-3332M AND ULN-3333M
MULTICHANNEL OPTOELECTRONIC SWITCHESRELATIVE SPECTRAL RESPONSE AT $T_A = +25^\circ\text{C}$
AS A FUNCTION OF WAVELENGTH OF LIGHT

Dwg. No. A-12,135A

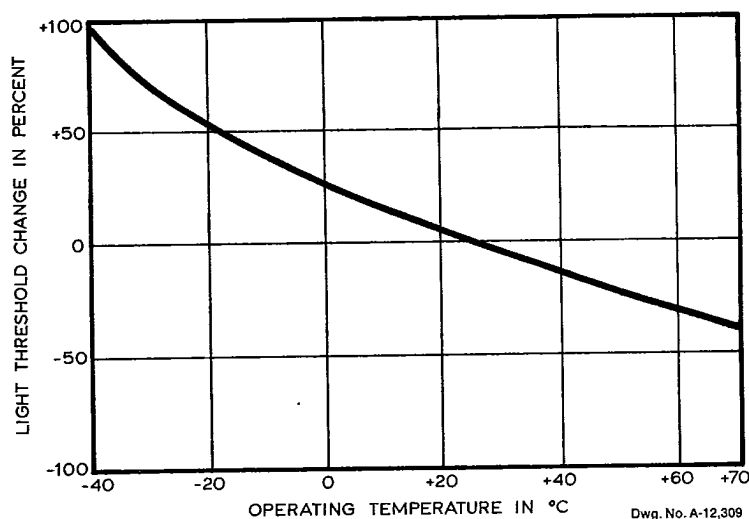
OUTPUT SATURATION VOLTAGE
AS A FUNCTION OF OPERATING TEMPERATURE
(EACH CHANNEL)

Dwg. No. A-12,307

5

ULN-3332M AND ULN-3333M
MULTICHANNEL OPTOELECTRONIC SWITCHESPROPAGATION 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

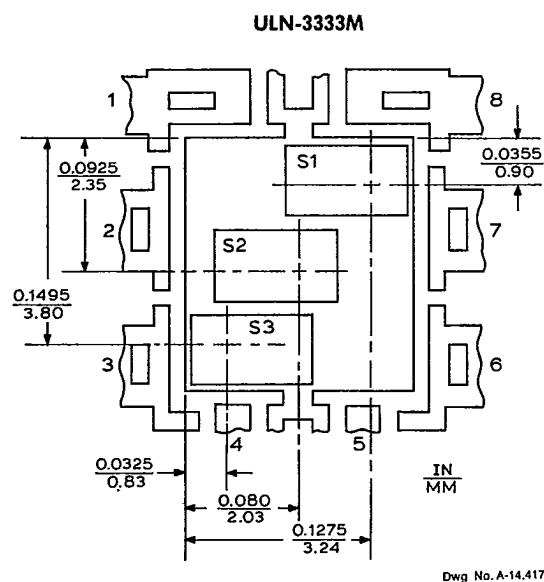
Technical drawing of a mechanical part, ULN-3332M, showing a cross-section with dimensions and labels.

Dimensions and Tolerances:

- Top horizontal dimension: 0.040 ± 1.02
- Left vertical dimension: 0.141 ± 1.58
- Bottom horizontal dimension: 0.080 ± 2.03

Labels and Features:

- Part Number: ULN-3332M
- Section Labels: S1, S2
- Feature Numbers: 1, 2, 3, 4, 5, 6, 7, 8
- Unit: $\frac{IN}{MM}$
- Drawing Number: Dwg No. A-14,416



5