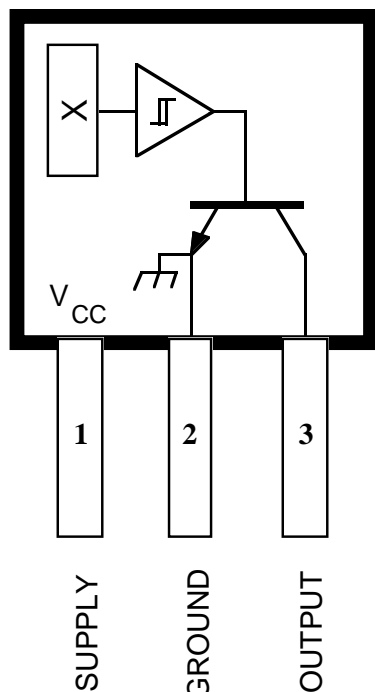




3141 THRU 3144

SENSITIVE HALL-EFFECT SWITCHES FOR HIGH-TEMPERATURE OPERATION



Dwg. PH-003A

Pinning is shown viewed from branded side.

ABSOLUTE MAXIMUM RATINGS at $T_A = +25^\circ\text{C}$

Supply Voltage, V_{CC}	28 V
Reverse Battery Voltage, V_{RCC}	-35 V
Magnetic Flux Density, B	Unlimited
Output OFF Voltage, V_{OUT}	28 V
Reverse Output Voltage, V_{OUT}	-0.5 V
Continuous Output Current, I_{OUT}	25 mA
Operating Temperature Range, T_A	
Suffix 'E-'	-40°C to +85°C
Suffix 'L-'	-40°C to +150°C
Storage Temperature Range, T_S	-65°C to +170°C

These Hall-effect switches are monolithic integrated circuits with tighter magnetic specifications, designed to operate continuously over extended temperatures to +150°C, and are more stable with both temperature and supply voltage changes. The unipolar switching characteristic makes these devices ideal for use with a simple bar or rod magnet. The four basic devices (3141, 3142, 3143, and 3144) are identical except for magnetic switch points.

Each device includes a voltage regulator for operation with supply voltages of 4.5 to 24 volts, reverse battery protection diode, quadratic Hall-voltage generator, temperature compensation circuitry, small-signal amplifier, Schmitt trigger, and an open-collector output to sink up to 25 mA. With suitable output pull up, they can be used with bipolar or CMOS logic circuits. The A3141- and A3142- are improved replacements for the UGN/UGS3140-; the A3144- is the improved replacement for the UGN/UGS3120-.

The first character of the part number suffix determines the device operating temperature range. Suffix 'E-' is for the automotive and industrial temperature range of -40°C to +85°C. Suffix 'L-' is for the automotive and military temperature range of -40°C to +150°C. Three package styles provide a magnetically optimized package for most applications. Suffix '-LT' is a miniature SOT89/TO-243AA transistor package for surface-mount applications; suffix '-UA' is a three-lead ultra-mini-SIP.

FEATURES and BENEFITS

- Superior Temp. Stability for Automotive or Industrial Applications
- 4.5 V to 24 V Operation ... Needs Only An Unregulated Supply
- Open-Collector 25 mA Output ... Compatible with Digital Logic
- Reverse Battery Protection
- Activate with Small, Commercially Available Permanent Magnets
- Solid-State Reliability
- Small Size
- Resistant to Physical Stress

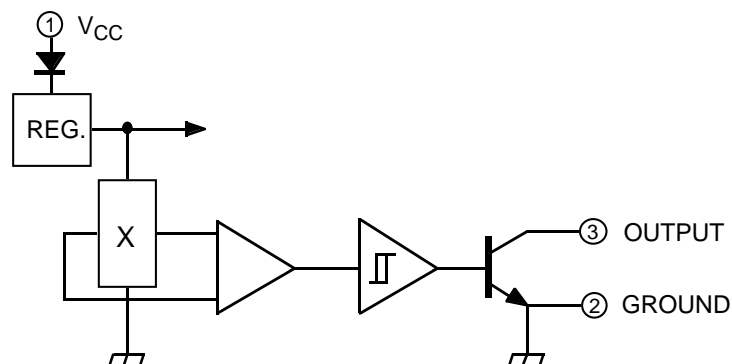
Always order by complete part number, e.g., **A3141ELT**.



11 THRU 3144

SENSITIVE HALL-EFFECT SWITCHES FOR HIGH-TEMP. OPERATION

FUNCTIONAL BLOCK DIAGRAM



Dwg. FH-005-2

ELECTRICAL CHARACTERISTICS at $V_{CC} = 8\text{ V}$ over operating temperature range.

Characteristic	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Supply Voltage	V_{CC}	Operating	4.5	—	24	V
Output Saturation Voltage	$V_{OUT(SAT)}$	$I_{OUT} = 20\text{ mA}$, $B > B_{OP}$	—	175	400	mV
Output Leakage Current	I_{OFF}	$V_{OUT} = 24\text{ V}$, $B < B_{RP}$	—	<1.0	10	μA
Supply Current	I_{CC}	$B < B_{RP}$ (Output OFF)	—	4.4	9.0	mA
Output Rise Time	t_r	$R_L = 820\ \Omega$, $C_L = 20\text{ pF}$	—	0.04	2.0	μs
Output Fall Time	t_f	$R_L = 820\ \Omega$, $C_L = 20\text{ pF}$	—	0.18	2.0	μs

MAGNETIC CHARACTERISTICS in gauss over operating supply voltage range.

Characteristic	Part Numbers*											
	A3141—			A3142—			A3143—			A3144—		
	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
B_{OP} at $T_A = 25^\circ\text{C}$	50	100	160	130	180	230	220	280	340	70	—	350
over operating temp. range	30	100	175	115	180	245	205	280	355	35	—	450
B_{RP} at $T_A = 25^\circ\text{C}$	10	45	130	75	125	175	165	225	285	50	—	330
over operating temp. range	10	45	145	60	125	190	150	225	300	25	—	430
B_{hys} at $T_A = 25^\circ\text{C}$	20	55	80	30	55	80	30	55	80	20	55	—
over operating temp. range	20	55	80	30	55	80	30	55	80	20	55	—

NOTES: Typical values are at $T_A = +25^\circ\text{C}$ and $V_{CC} = 8\text{ V}$.

B_{OP} = operate point (output turns ON); B_{RP} = release point (output turns OFF); B_{hys} = hysteresis ($B_{OP} - B_{RP}$).

1 gauss (G) is exactly equal to 0.1 millitesla (mT).

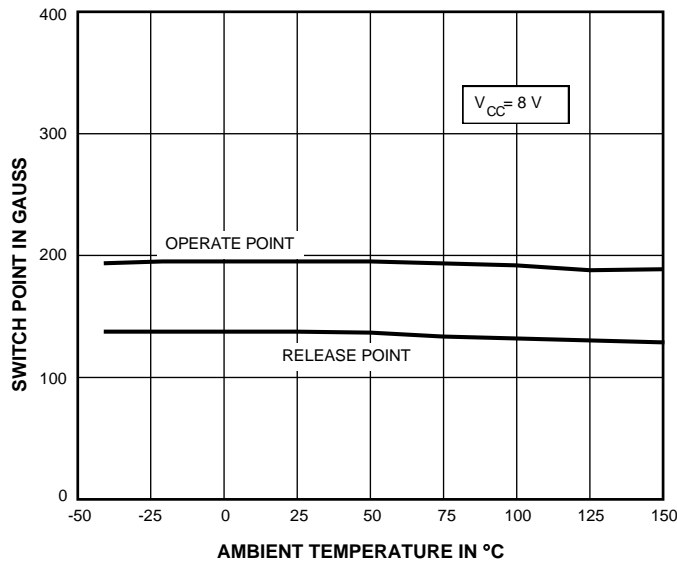
*Complete part number includes a suffix to identify operating temperature range (E- or L-) and package type (-LT or -UA).



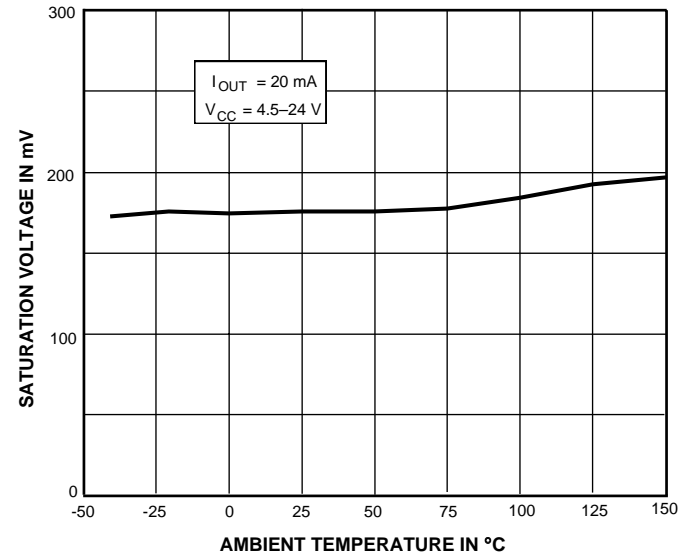
3141 THRU 3144 SENSITIVE HALL-EFFECT SWITCHES FOR HIGH-TEMP. OPERATION

TYPICAL OPERATING CHARACTERISTICS

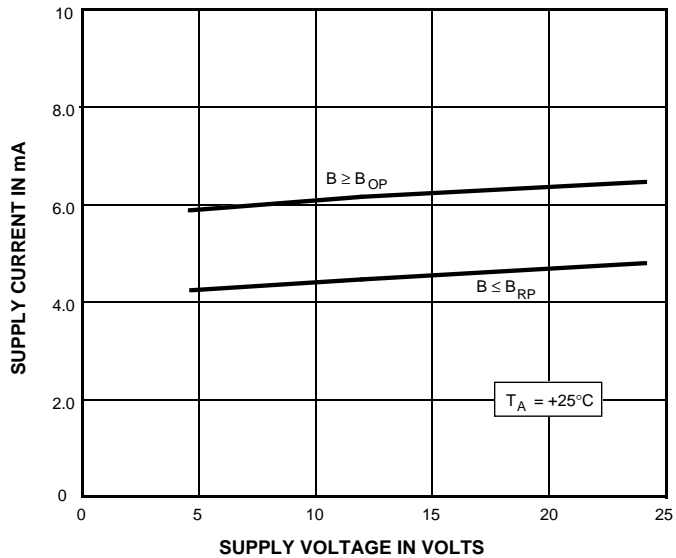
A3142- SWITCH POINTS



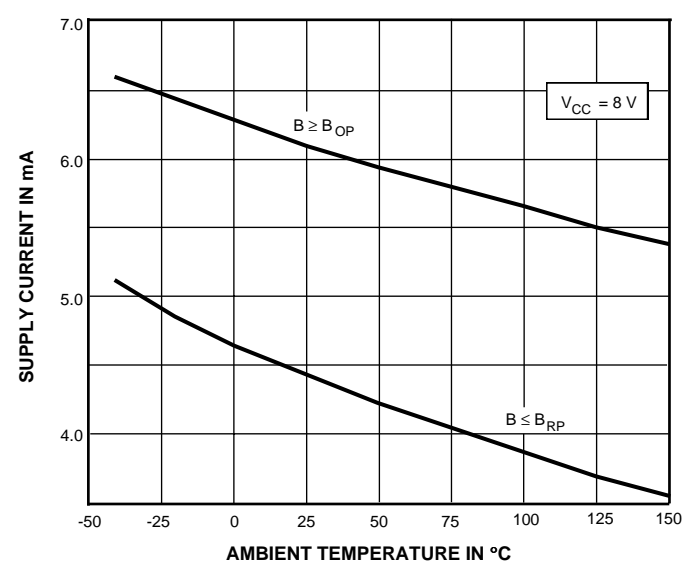
OUTPUT SATURATION VOLTAGE



SUPPLY CURRENT



SUPPLY CURRENT



* Complete part number includes a suffix denoting operating temperature range (E- or L-) and package type (-LT, -U, or -UA).



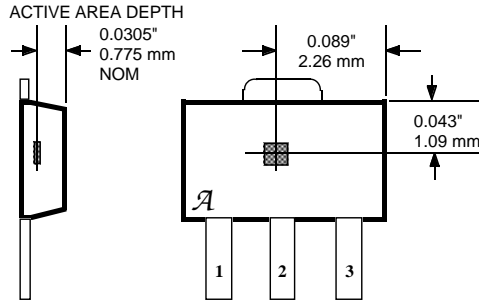
11 THRU 3144

SENSITIVE HALL-EFFECT SWITCHES FOR HIGH-TEMP. OPERATION

SENSOR LOCATIONS

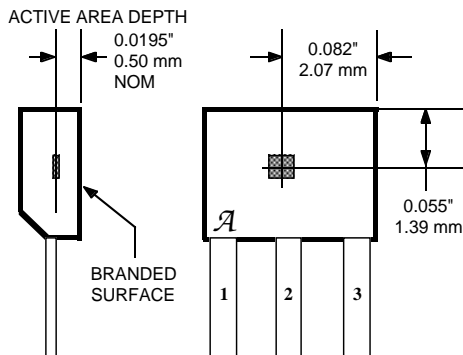
($\pm 0.005"$ [0.13 mm] die placement)

Suffix "LT"



Dwg. MH-008-2D

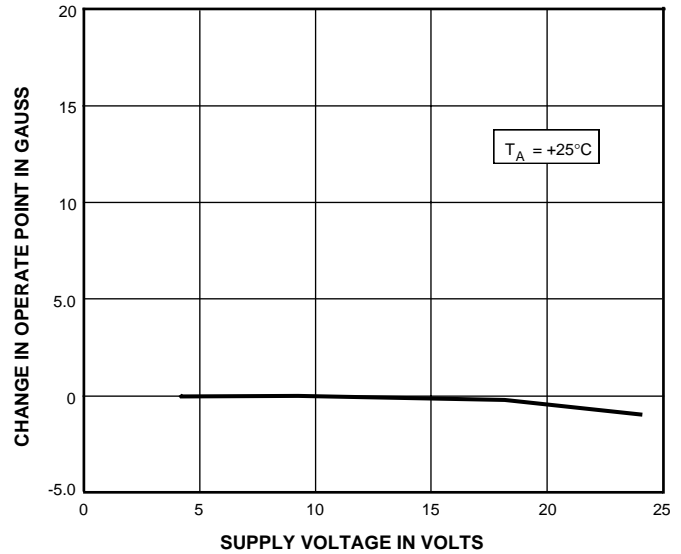
Suffix "UA"



Dwg. MH-011-10A

TYPICAL OPERATING CHARACTERISTICS (cont.)

CHANGE IN OPERATE POINT



Dwg. GH-042-1

OPERATION

The output of these devices (pin 3) switches low when the magnetic field at the Hall sensor exceeds the operate point threshold (B_{OP}). At this point, the output voltage is $V_{OUT(SAT)}$. When the magnetic field is reduced to below the release point threshold (B_{RP}), the device output goes high. The difference in the magnetic operate and release points is called the hysteresis (B_{hys}) of the device. This built-in hysteresis allows clean switching of the output even in the presence of external mechanical vibration and electrical noise.

Extensive applications information for Hall-effect sensors is available in:

- *Hall-Effect IC Applications Guide*, Application Note 27701;
- *Hall-Effect Devices: Soldering, Gluing, Potting, Encapsulating, and Lead Forming*, Application Note 27703.1;
- *Soldering of Through-Hole Hall-Sensor Devices*, Application Note 27703;
- and
- *Soldering of Surface-Mount Hall-Sensor Devices*, Application Note 27703.2.

All are provided in *Allegro Electronic Data Book*, AMS-702. or at

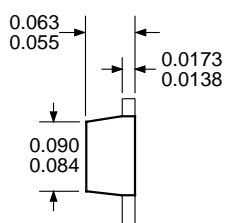
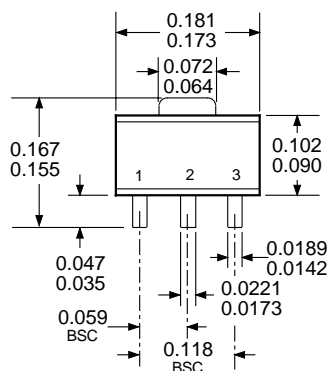
www.allegromicro.com



3141 THRU 3144 SENSITIVE HALL-EFFECT SWITCHES FOR HIGH-TEMP. OPERATION

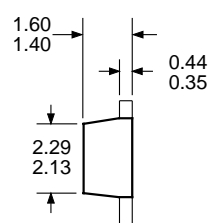
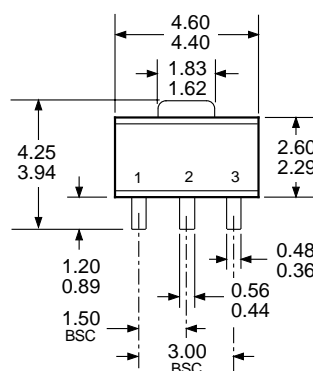
PACKAGE DESIGNATOR 'LT' (SOT89/TO-243AA)

Dimensions in Inches
(for reference only)

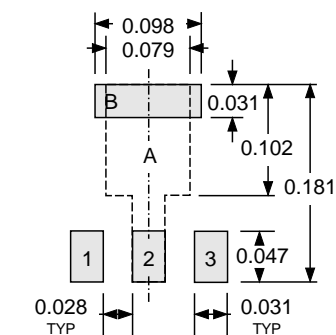


Dwg. MA-009-3A in

Dimensions in Millimeters
(controlling dimensions)

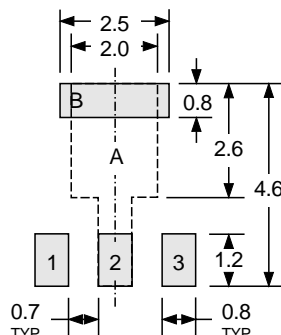


Dwg. MA-009-3A mm



Pads 1, 2, 3, and A — Standard SOT89 Layout
Pads 1, 2, 3, and B — Low-Stress Version
Pads 1, 2, and 3 only — Lowest Stress, But Not Self Aligning

Dwg. MA-012-3 in



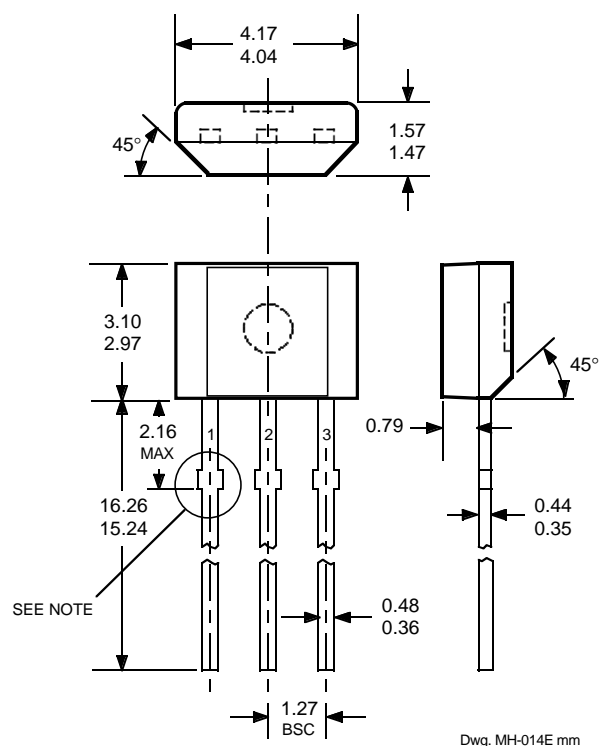
Pads 1, 2, 3, and A — Standard SOT89 Layout
Pads 1, 2, 3, and B — Low-Stress Version
Pads 1, 2, and 3 only — Lowest Stress, But Not Self Aligning

Dwg. MA-012-3 mm

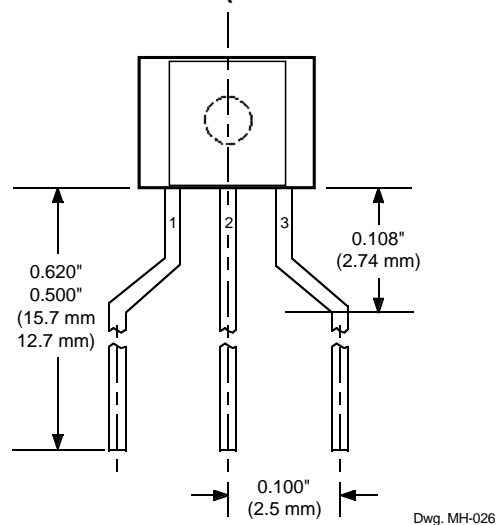
- NOTES:
- Exact body and lead configuration at vendor's option within limits shown.
 - Supplied in bulk pack (500 pieces per bag) or add "TR" to part number for tape and reel.
 - Only low-temperature ($\leq 240^{\circ}\text{C}$) reflow-soldering techniques are recommended for SOT89 devices.

SENSITIVE HALL-EFFECT SWITCHES FOR HIGH-TEMP. OPERATION

Dimensions in Millimeters
(for reference only)



- ### Radial Lead Form (order A314xxUA-LC)



NOTE: Lead-form dimensions are the nominals produced on the forming equipment. No dimensional tolerance is implied or guaranteed for bulk packaging (500 pieces per bag).



3141 THRU 3144 SENSITIVE HALL-EFFECT SWITCHES FOR HIGH-TEMP. OPERATION

HALL-EFFECT SENSORS

UNIPOLAR HALL-EFFECT DIGITAL SWITCHES						
Partial Part Number	Operate Point (G) Over Oper. Voltage & Temp.	Release Point (G) Voltage & Temp.	Hysteresis (G) Range	Oper. Temp.	Packages	Replaces and Comments
A3121x	220 to 500	80 to 410	60 to 150	E, L	LT, UA	3019, 3113, 3119
A3122x	260 to 430	120 to 360	70 to 140	E, L	LT, UA	
A3123x	230 to 470	160 to 330	70 to 140	E, L	LT, UA	
A3141x	30 to 175	10 to 145	20 to 80	E, L	LT, UA	3040, 3140
A3142x	115 to 245	60 to 190	30 to 80	E, L	LT, UA	
A3143x	205 to 355	150 to 300	30 to 80	E, L	LT, UA	
A3144x	35 to 450	25 to 430	>20	E, L	LT, UA	3020, 3120
A3161E	<160 (Typ 130)	>30 (Typ 110)	5 to 80	E	LT, UA	2-wire operation
A3163E	<160 (Typ 98)	>30 (Typ 79)	5 to 40	E	LT, UA	2-wire
A3240x	<50 (Typ 35)	>5 (Typ 25)	Typ 10	E, L	LH, LT, UA	chopper stabilized
A3250x	<50 to >350	—	5 to 35	J, L	UA	programmable, chopper stabilized
A3251x	<50 to >350	—	5 to 35	J, L	UA	programmable, chopper stabilized
A3361E	<125	>40	5 to 30	E	LH, LT, UA	2-wire, chopper stabilized, output normally high
A3362E	<125	>40	5 to 30	E	LH, LT, UA	2-wire, chopper stabilized, output normally low
MICROPOWER OMNIPOLAR HALL-EFFECT DIGITAL SWITCHES						
Partial Part Number	Operate Points (G) Over Oper. Voltage & Temp.	Release Points (G) Voltage & Temp.	Hysteresis (G) Range	Oper. Temp.	Packages	Average Supply Current (μA)
A3209E	>-60, <60	<-5, >5	Typ 7.7	E	LH, UA	<425 (Typ 145)
A3210E	>-60, <60	<-5, >5	Typ 7.7	E	LH, UA	<60 (Typ 8.8)
A3212E	>-55, <55	<-10, >10	Typ. 8	E	LH, UA	<10 (Typ 4.2)
BIPOLAR HALL-EFFECT DIGITAL SWITCHES						
Partial Part Number	Operate Point (G) Over Oper. Voltage & Temp.	Release Point (G) Voltage & Temp.	Hysteresis (G) Range	Oper. Temp.	Packages	Replaces and Comments
UGx3132	<95 (Typ 32)	>-95 (Typ -20)	>30 (Typ 52)	K, L, S	LT, UA	3030, 3130, 3131
UGx3133	<75 (Typ 32)	>-75 (Typ -20)	>30 (Typ 52)	K, L, S	LT, UA	
UGx3134	-40 to 50	-50 to 40	5 to 55	E, L	LT, UA	
A3260x	<30 (Typ 10)	>-30 (Typ -10)	Typ 20	E, L	LH, LT, UA	2 wire, chopper stabilized

Notes: 1) Typical data is at $T_A = +25^\circ\text{C}$ and nominal operating voltage.

2) "x" = Operating Temperature Range [suffix letter or (prefix)]: S (UGN) = -20°C to $+85^\circ\text{C}$, E = -40°C to $+85^\circ\text{C}$, J = -40°C to $+115^\circ\text{C}$, K (UGS) = -40°C to $+125^\circ\text{C}$, L (UGL) = -40°C to $+150^\circ\text{C}$.



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