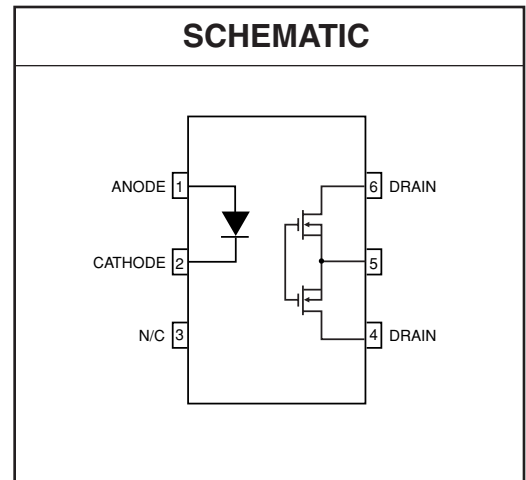
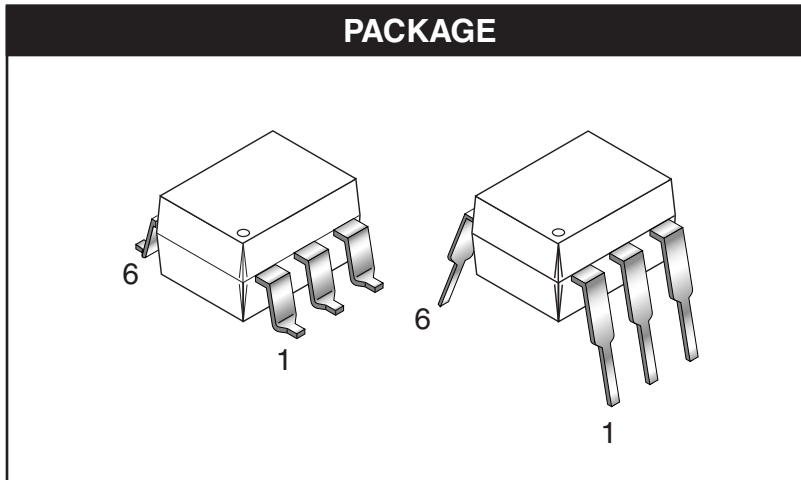


HSR312

HSR312L

HSR412

HSR412L



DESCRIPTION

The HSR312 and HSR412 devices consist of a AlGaAs infrared emitting diode optically coupled to a power MOSFET detector which is driven by a photovoltaic generator. The devices are housed in a 6-pin dual-in-line package. The HSR312L and HSR412L employ an active current limit circuitry enabling the device to withstand current surge transients.

FEATURES

- 4,000 VRMS Isolation
- Wide operating voltage range
 - 250 V (HSR312, HSR312L)
 - 400 V (HSR412, HSR412L)
- Solid-State Reliability
- Bounce-Free Operation
- 4000 V ESD Rating (HBM)
- UL, CSA and BABT approval pending

APPLICATIONS

- On/Off Hook Switch
- Dial Out Relay
- General Switching
- Replacement for Mechanical Relays
- Ring Injection Relay
- Ground Start

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)				
Parameters	Symbol	Device	Value	Units
TOTAL DEVICE				
Storage Temperature	T_{STG}	All	-40 to +100	$^\circ\text{C}$
Operating Temperature	T_{OPR}	All	-40 to +85	$^\circ\text{C}$
Lead Solder Temperature	T_{SOL}	All	260 for 10 sec	$^\circ\text{C}$
Isolation Surge Voltage	V_{ISO}	All	4000	Vac(RMS)
Maximum Input/Output Capacitance	C_{IO}	All	1.0	pF
Maximum Input/Output Resistance	R_{IO}	All	10^{12}	Ω

HSR312

HSR312L

HSR412

HSR412L

ELECTRICAL CHARACTERISTICS ($T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ Unless otherwise specified)

INPUT CHARACTERISTICS

Parameters/Test Conditions	Connection	Symbol	Limit	HSR312	HSR312L	HSR412	HSR412L	Units
Control Current	Series or Parallel	$I_{F(ON)}$	Max	2.0	2.0	3.0	3.0	mA
Control Current for Off-State Resistance	Series or Parallel	$I_{F(OFF)}$	Min	0.4	0.4	0.4	0.4	mA
Control Current Range	Series or Parallel	I_F	Min	2.0	2.0	3.0	3.0	mA
			Max	25	25	25	25	
Reverse Voltage	Series or Parallel	V_R	Min	7	7	7	7	V
Forward Voltage ($I_F=10$ mA)	Series or Parallel	V_F	Max	1.6	1.6	1.6	1.6	V

OUTPUT CHARACTERISTICS

Parameters / Test Conditions	Connection	Symbol	Limit	HSR312	HSR312L	HSR412	HSR412L	Units
Operating Voltage Range	Series or Parallel	V_{OPR}	Max	250	250	400	400	V_{DC} or $V_{AC(PEAK)}$
Load Current $T_A = +40^\circ\text{C}$, 5mA control (see fig. 1 & 2)	Series	I_L	Max	190	170	140	120	mA
	Parallel		Max	320	300	210	200	
On-State Resistance $T_A = 25^\circ\text{C}$, 50mA pulsed load, 5mA control	Series	R_{ON}	Max	10	15	27	35	Ω
	Parallel		Max	3	4.25	7	9	
Off-State Leakage Current $T_A = 25^\circ\text{C}$, $\pm 250\text{V}$ for HSR312/L, $\pm 400\text{V}$ for HSR412/L	Series or Parallel	—	Max	1.0	1.0	1.0	1.0	μA
Current Limit $T_A = +25^\circ\text{C}$, 5mA control	Series	I_{LMT}	Min	N/A	190	N/A	130	mA
			Max	N/A	300	N/A	220	
	Parallel		Min	N/A	330	N/A	260	
			Max	N/A	560	N/A	440	
Turn-On Time $T_A = +25^\circ\text{C}$ for 50mA, 100VDC load, 5mA control	Series or Parallel	T_{ON}	Max	3.0	3.0	2.0	2.0	mS
Turn-Off Time $T_A = +25^\circ\text{C}$ for 50mA, 100VDC load, 5mA control	Series or Parallel	T_{OFF}	Max	0.5	0.5	0.5	0.5	mS
Thermal Offset Voltage 5mA control	Series or Parallel	—	Max	N/A	N/A	0.5	0.5	mV
Output Capacitance $5V_{DC}$	Series or Parallel	C_O	Max	50	50	12	12	pF

ISOLATION CHARACTERISTICS

Characteristics	Test Conditions	Symbol	Limit	HSR312	HSR312L	HSR412	HSR412L	Units
Input-Output Isolation Voltage		V_{ISO}	Max	4000	4000	4000	4000	V

HSR312

HSR312L

HSR412

HSR412L

Figure 1. Forward Current vs. Forward Voltage

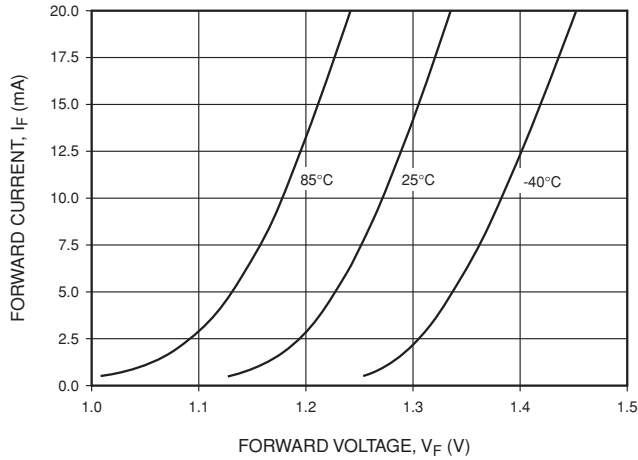


Figure 2. Normalized on Resistance vs. Ambient Temperature

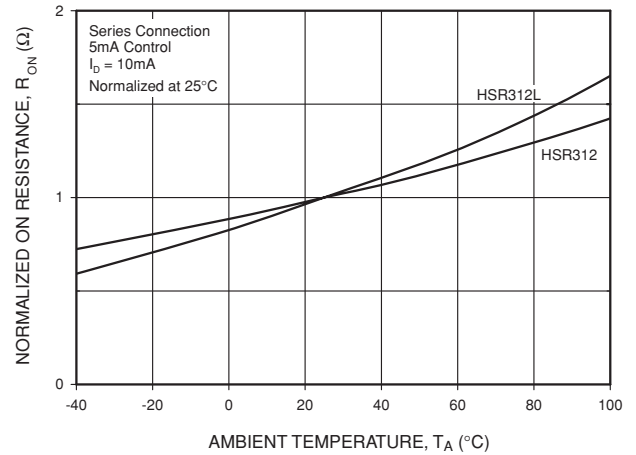


Figure 3. Normalized on Resistance vs. Ambient Temperature

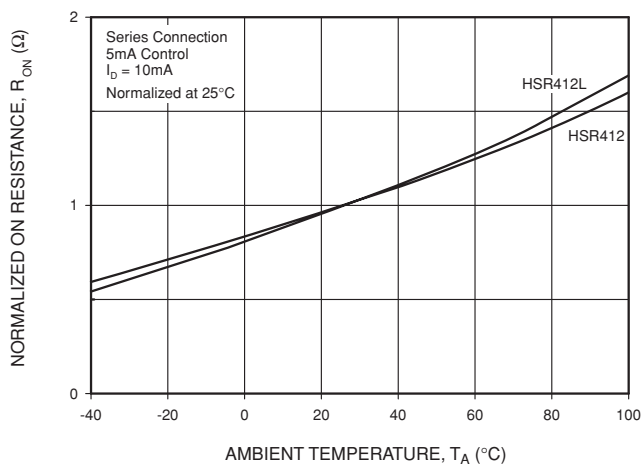


Figure 4. Load Current vs. Voltage Drop

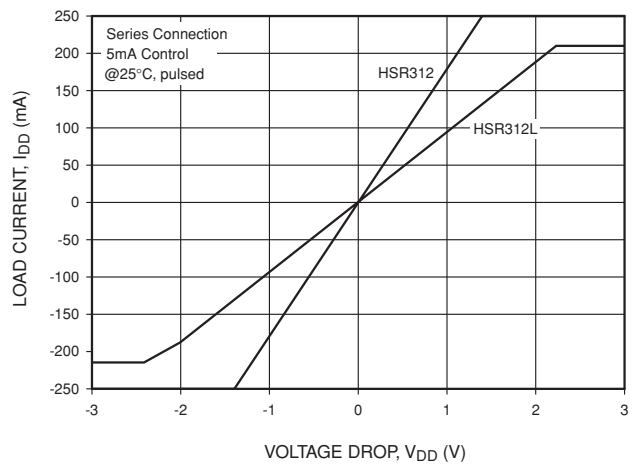


Figure 5. Load Current vs. Voltage Drop

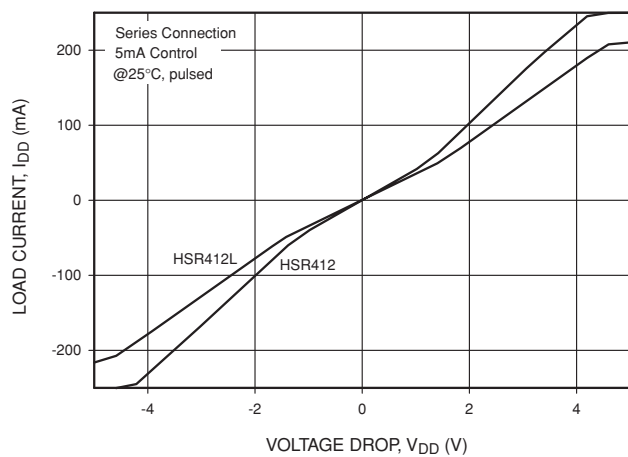
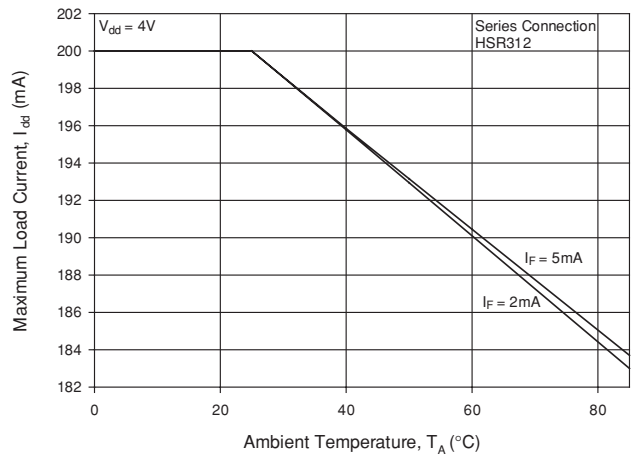


Figure 6. Maximum Load Current Vs Ambient Temperature



HSR312

HSR312L

HSR412

HSR412L

Figure 7. Maximum Load Current Vs Ambient Temperature

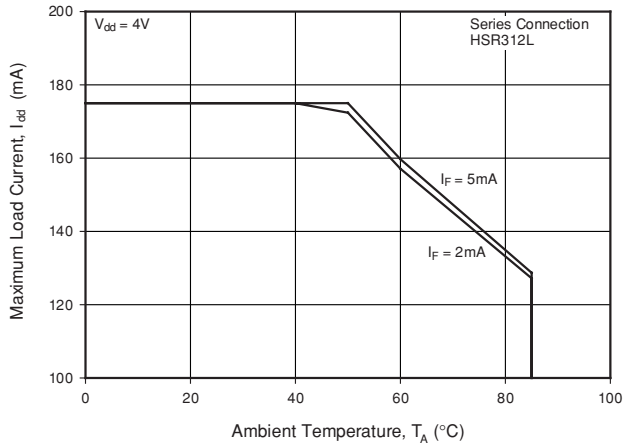


Figure 8. Maximum Load Current Vs Ambient Temperature

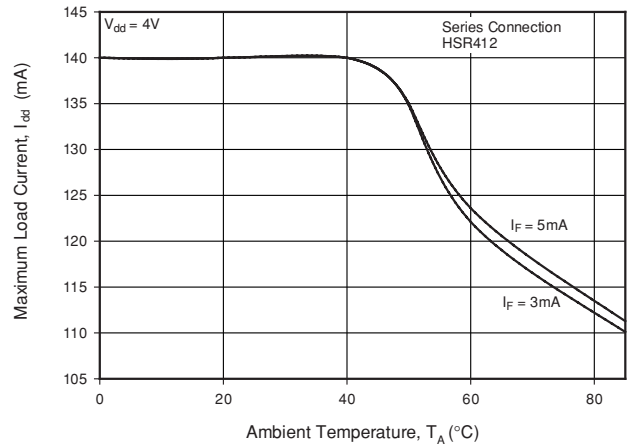


Figure 9. Maximum Load Current Vs Ambient Temperature

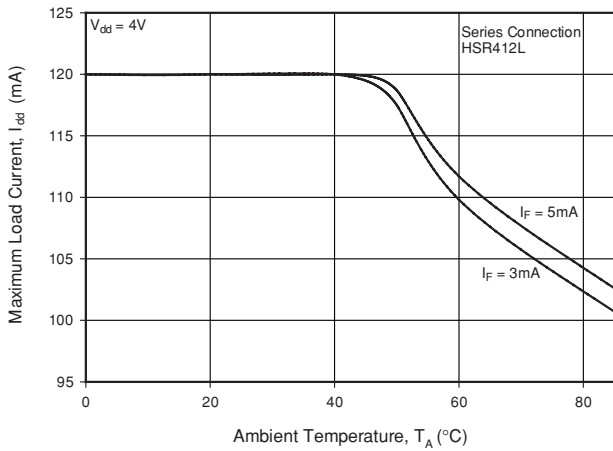


Figure 10. Off State Current vs. Ambient Temperature

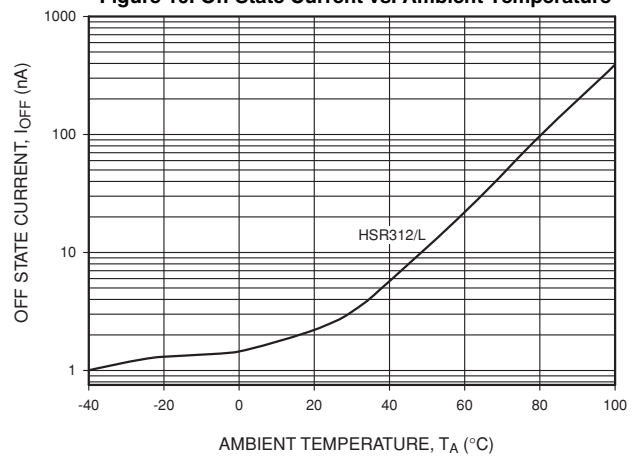


Figure 11. Off State Current vs. Ambient Temperature

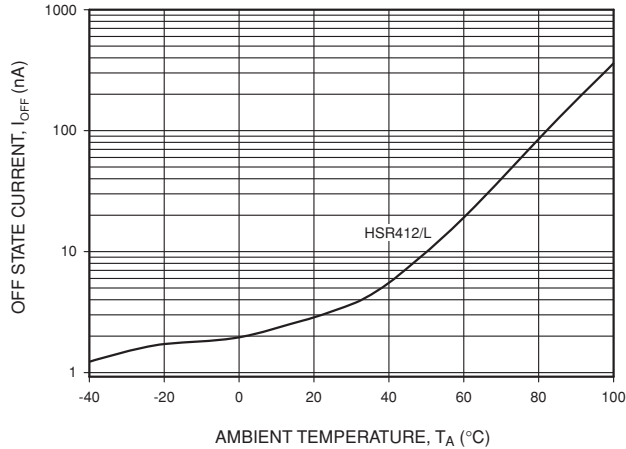
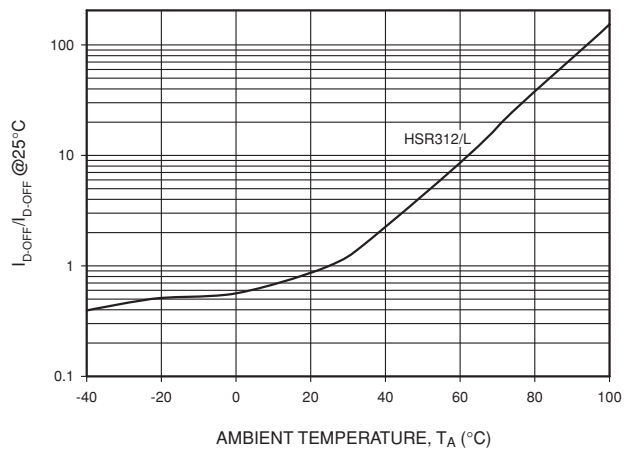


Figure 12. Normalized Off State Leakage vs. Ambient Temperature



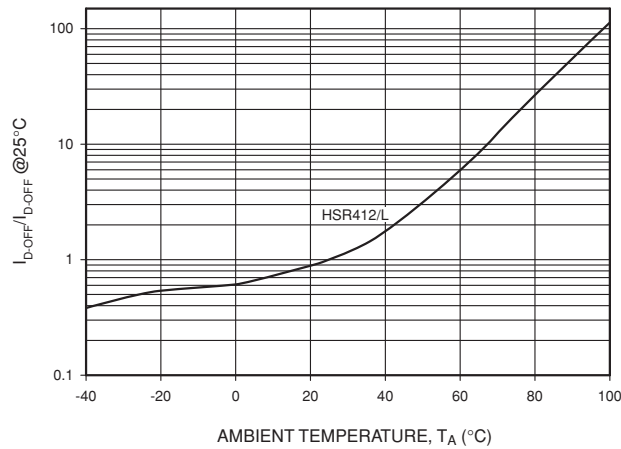
HSR312

HSR312L

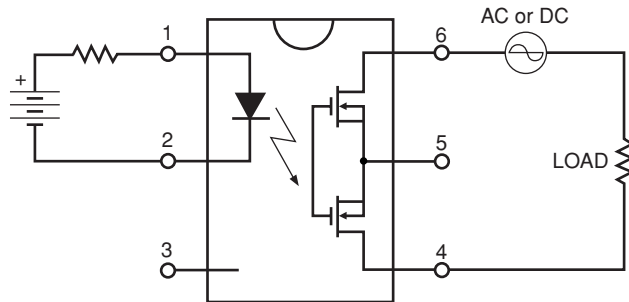
HSR412

HSR412L

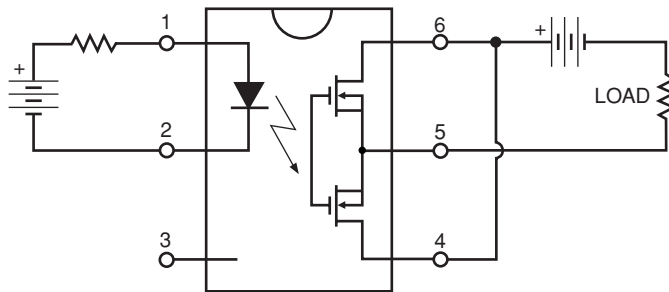
Figure 13. Normalized Off State Leakage vs. Ambient Temperature



Series Connection



Parallel Connection



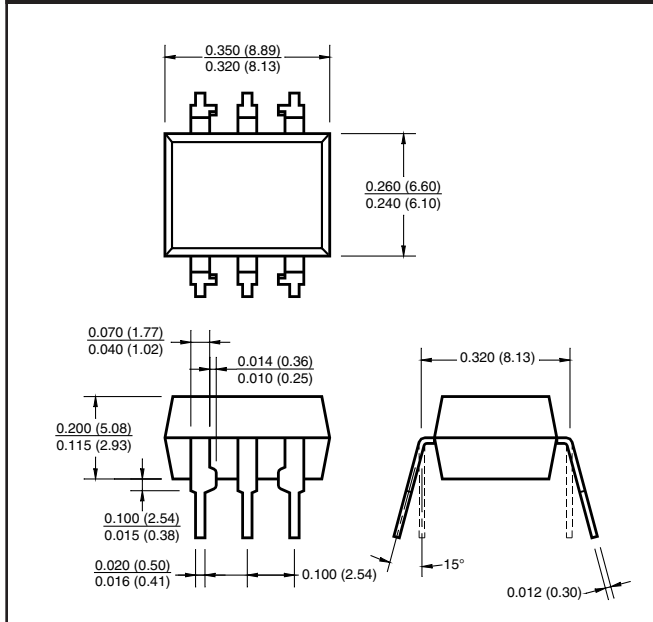
HSR312

HSR312L

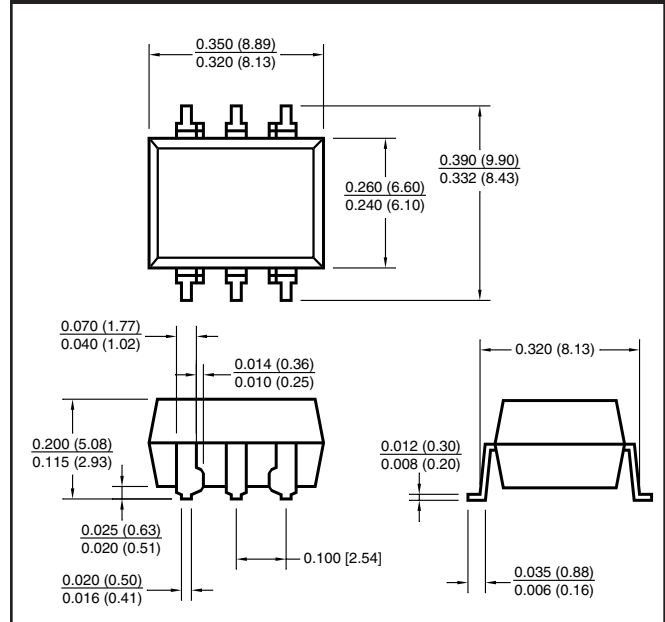
HSR412

HSR412L

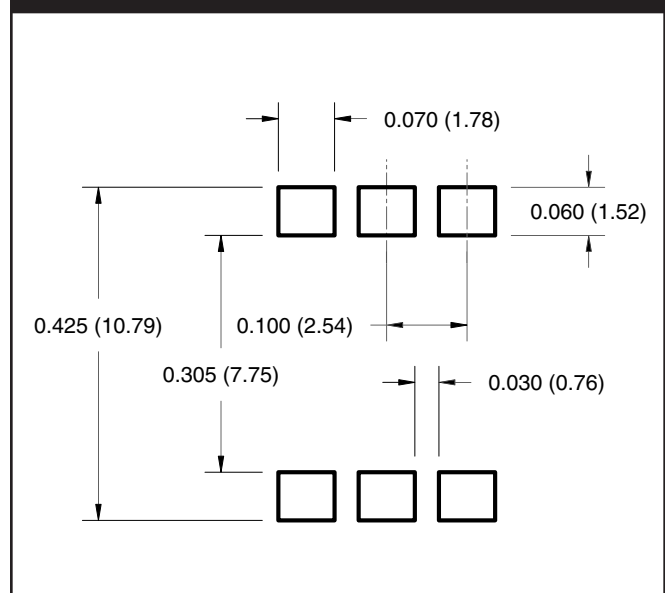
Package Dimensions (Through Hole)



Package Dimensions (Surface Mount)



**Recommended Pad Layout for
Surface Mount Leadform**



NOTE

All dimensions are in inches (millimeters)

HSR312

HSR312L

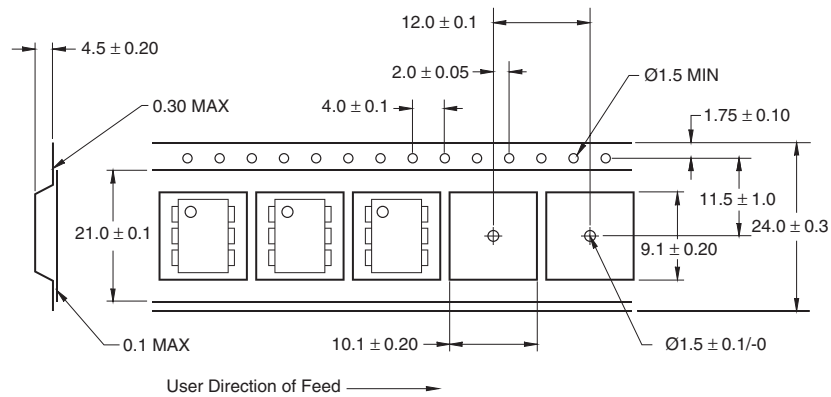
HSR412

HSR412L

ORDERING INFORMATION

Option	Order Entry Identifier	Description
S	S	Surface Mount Lead Bend
SR2	SR2	Surface Mount; Tape and reel

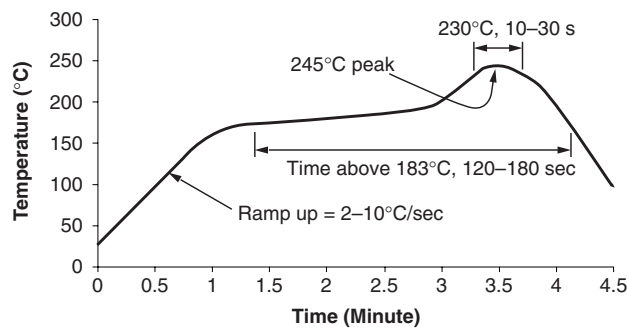
Carrier Tape Specifications ("D" Tapin Orientation)



NOTE

All dimensions are in inches (millimeters)

Reflow Profile



- Peak reflow temperature: 245°C (package surface temperature)
- Time of temperature higher than 183°C for 120–180 seconds
- One time soldering reflow is recommended

HSR312

HSR312L

HSR412

HSR412L

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