

## 5 Amp SOLID STATE RELAYS

### DEVICES

**MHS Series**  
 (Consult Table 3 for Part Number Designations)

### LEVELS AVAILABLE

**COTS**  
**CLASS H**  
**CLASS K**

### FEATURES

- Operates from 3.3V to 5V logic levels
- Internal Switch rated for 175°C T<sub>j</sub>
- 250V Operation (Note 1)
- Total dose capable > 300 Krads (Note 3)
- Available normally open or normally closed
- > 1000V of I/O isolation
- Buffered input
- Inputs protected against over voltage (ESD rating of 1C)
- SE results show no SEB through an LET of 85 (MeV / (mg / cm<sup>2</sup>)) at a fluence of 2e<sup>6</sup> ions / cm<sup>2</sup>
- Preliminary

### DESCRIPTION:

The MHS series are Solid State Relays, where the input and output circuitry are isolated from each other. The series consists of both singles and duals, and provides both the normally open (N.O.) function as well as the normally closed (N.C.) function. Packaging one of each (a N.O. and a N.C.) in a package creates the SPDT function.

**Table 1 – ABSOLUTE MAXIMUM RATINGS (T<sub>c</sub> = +25°C unless otherwise noted)**

Parameters / Test Conditions	Symbol	Value	Unit
Input Voltage	V <sub>in</sub> , V <sub>L</sub>	+15	Vdc
Output Current	I <sub>o</sub>	Figure 3	A
Output Voltage (Note 1)	V <sub>o</sub>	250	Vdc
Weight		10	Grams
Temperature Range, Base of Package	T <sub>C</sub>	-55 to +125	°C
Storage Temperature Range	T <sub>stg</sub>	-65 to +150	°C
Lead Temperature	T <sub>L</sub>	300	°C
Junction Temperature	T <sub>j</sub>	125	°C

### THERMAL CHARACTERISTICS

Parameters / Test Conditions	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	R <sub>θJC</sub>	1.25	°C/W

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**Table 2 – ELECTRICAL CHARACTERISTICS, PER CHANNEL**

( $T_c = +25^\circ\text{C}$ ,  $V_L = 5$  Volts,  $V_{in} = 0$  V or 3.3V as appropriate, unless otherwise noted)

Parameters / Test Conditions	Symbol	Min.	Nom	Max.	Unit
Minimum Input Activation Voltage $I_o = 5\text{A}$ , $T_c = -55$ to $+125^\circ\text{C}$	$V_{in(\text{min})}$	3.0			V
Iio Leakage (Note 4) $V_{io} = 1\text{kV}$ for 5 sec.	$I_{io}$			1	$\mu\text{A}$
Output Capacitance (Note 4) $V_{ds} = 100\text{V}$	$C_{oss}$		65		pF
Output on Resistance $I_d = 5\text{A}$	$R_{ds(\text{on})}$		0.115	0.150	$\Omega$
Output on Resistance $I_d = 5\text{A}$ , $T_j = 125^\circ\text{C}$	$R_{ds(\text{on})}$		0.345	0.400	$\Omega$
Output Leakage $V_{in} = 0$ , $V_o = 100\text{V}$	$I_{o1}$		1	100	$\mu\text{A}$
Output Leakage $V_{in} = 0$ , $V_o = 80\text{V}$ , $T_j = 125^\circ\text{C}$	$I_{o2}$		1	100	$\mu\text{A}$
Input Buffer Supply Current $V_L = 5\text{V}$ , $T_c = 25^\circ\text{C}$ , $125^\circ\text{C}$	$I_h$		50	75	mA
Input Current to Activate $V_L = 5\text{V}$ , $T = -55$ to $+125^\circ\text{C}$ ( $V_{in} = 5\text{V}$ )	$I_{in}$		500	1000	$\mu\text{A}$
Turn On Delay (Figure 7) $V_s = 28\text{V}$ , $R_L = 30\Omega$ $T_c = -55^\circ\text{C}$ to $+125^\circ\text{C}$	$t_{on}$		60	125	$\mu\text{s}$
Turn Off Delay (Figure 7) $V_s = 28\text{V}$ , $R_L = 30\Omega$ $T_c = -55^\circ\text{C}$ to $+125^\circ\text{C}$	$t_{off}$		30	75	$\mu\text{s}$
Rise Time (Figure 7) $V_s = 28\text{V}$ , $R_L = 30\Omega$ (Note 4)	$t_r$		90	250	$\mu\text{s}$
Fall Time (Figure 7) $V_s = 28\text{V}$ , $R_L = 30\Omega$ (Note 4)	$t_f$		20	75	$\mu\text{s}$

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Table 3 – MODEL NUMBER FUNCTIONALITY CHART

MODEL NUMBER	ELECTRICAL RATINGS		RELAY CONFIGURATION			PACKAGE TYPE	
	Voltage	Amps	SPDT	Dual SPST N.O.	Dual SPST N.C.	8 PIN SIP with Backtab	8 PIN SIP Tabless
MHS2505SR \$ &	250	5	✓			✓	
MHS2505SS \$ &	250	5	✓				✓
MHS2505DR \$ &	250	5		✓		✓	
MHS2505DS \$ &	250	5		✓			✓
MHS2505CR \$ &	250	5			✓	✓	
MHS2505CS \$ &	250	5			✓		✓

**Replace “\$” with letter to denote required screening level**  
 C = COTS  
 H = CLASS H  
 K = CLASS K

**Replace “&” with lead bend option**  
 = No lead bend  
 -1 = SMT lead bend  
 -2 = lead bend up  
 -3 = lead bend down

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**Table 4 – RELIABILITY SCREENING OPTIONS**

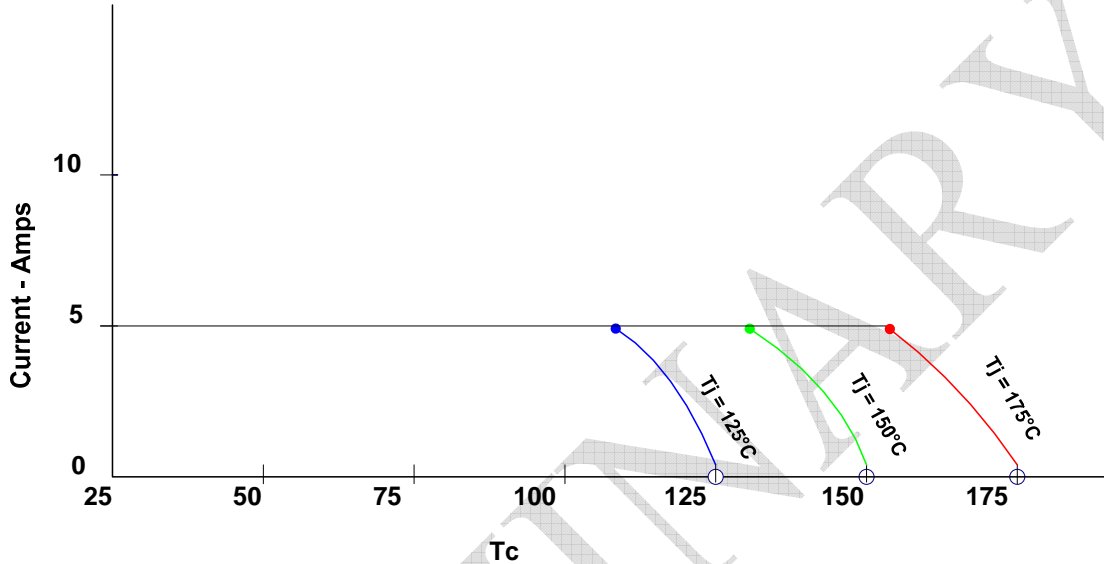
	C	H	K	MIL-STD-883 METHOD
	COTS	EQUIVALENT MIL-PRF-38534 (Note 3)		
Element Evaluation	N/A	Class H	Class K	
Non-Destruct Wirebond Pull	N/A	Sample	100%	2023
Pre-Cap Visual	N/A	100%	100%	2017
Temperature Cycle	N/A	100%	100%	1010
Constant Acceleration	N/A	100%	100%	2001
PIND	N/A		100%	2020
Pre-Burn In Electrical	N/A	100%	100%	
Burn In	N/A	100% (160 hours)	100% (320 hours)	1015
Final Electrical Tests	100% (25C)	100%	100%	
Hermeticity (Fine and Gross Leak)	100%	100%	100%	1014
X-Ray	N/A	N/A	Yes	2012
External Visual	Sample	100%	100%	2009
Certified	N/A	Yes	Yes	

**NOTE:**

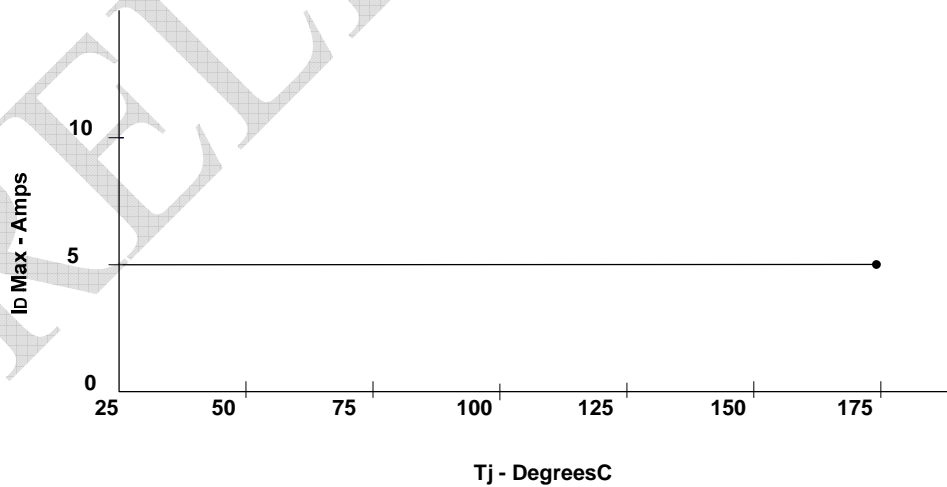
- (1) Internal switch is rated for > 1000 Volts breakdown. Consult factory for use at Voltages greater than 250 Volts.
- (2) Current handling capability depends upon allowable T<sub>case</sub> and allowable T<sub>j</sub>. See Figure 1.
- (3) Microsemi does not at this time have a MIL-PRF-38534 qualified radiation hardness assurance program.
- (4) Not tested.
- (5) Because of the relatively slow switching times involved in power SSRs, it is important to stay within the allowances of the device performance curves.

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**Figure 1: Maximum Switch Current as a Function of Case Temperature (per Channel) (Note 2)**



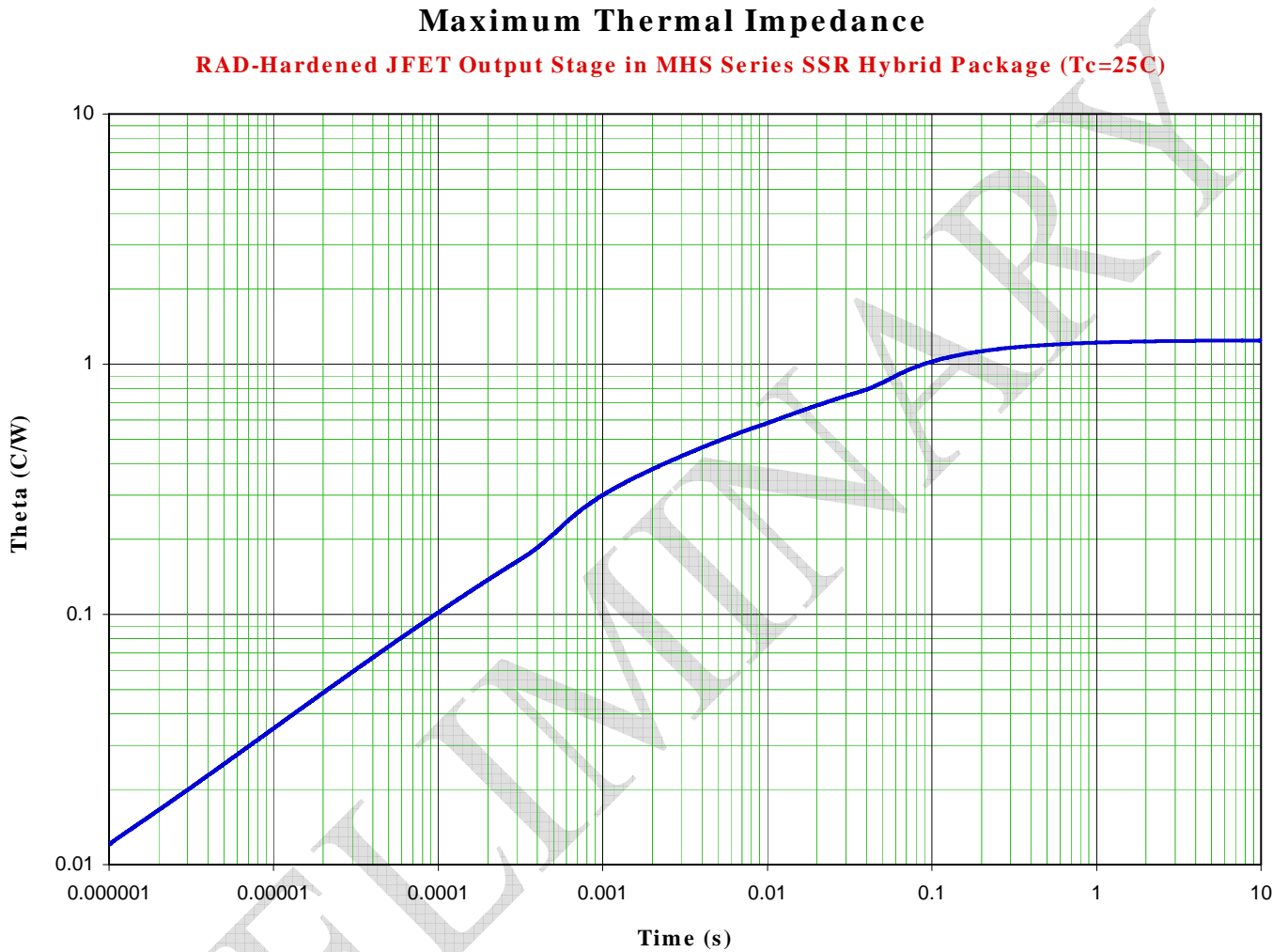
**Figure 3: Maximum Switch Current as a Function of Junction Temperature (per channel)**



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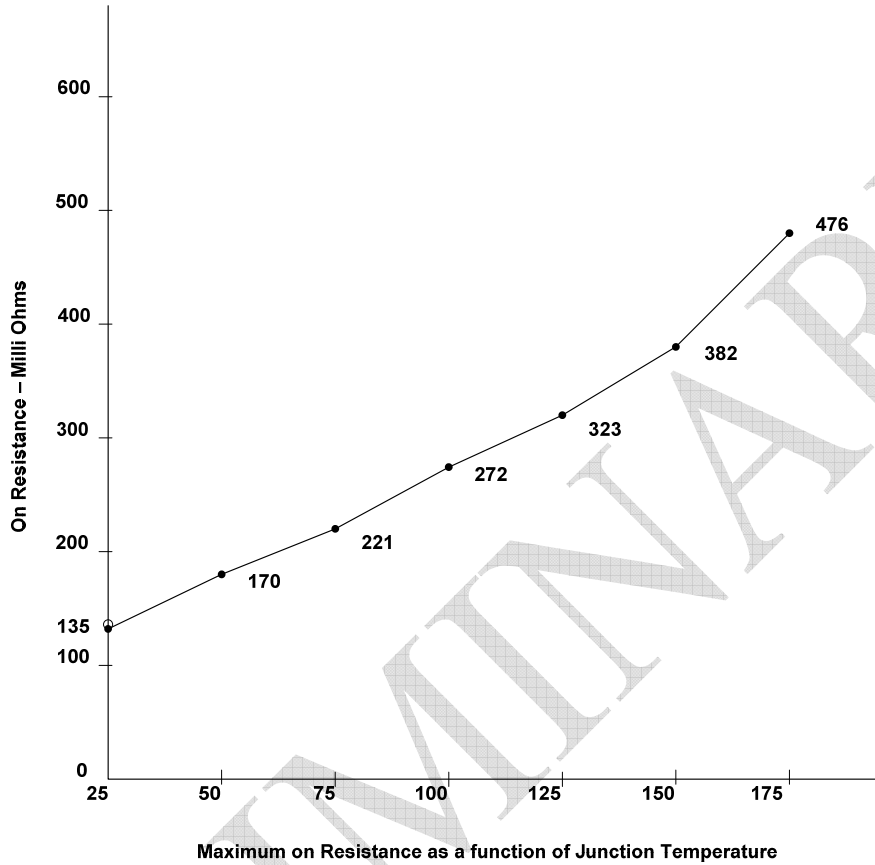
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Figure 4: Transient Thermal Impedance (Note 5)

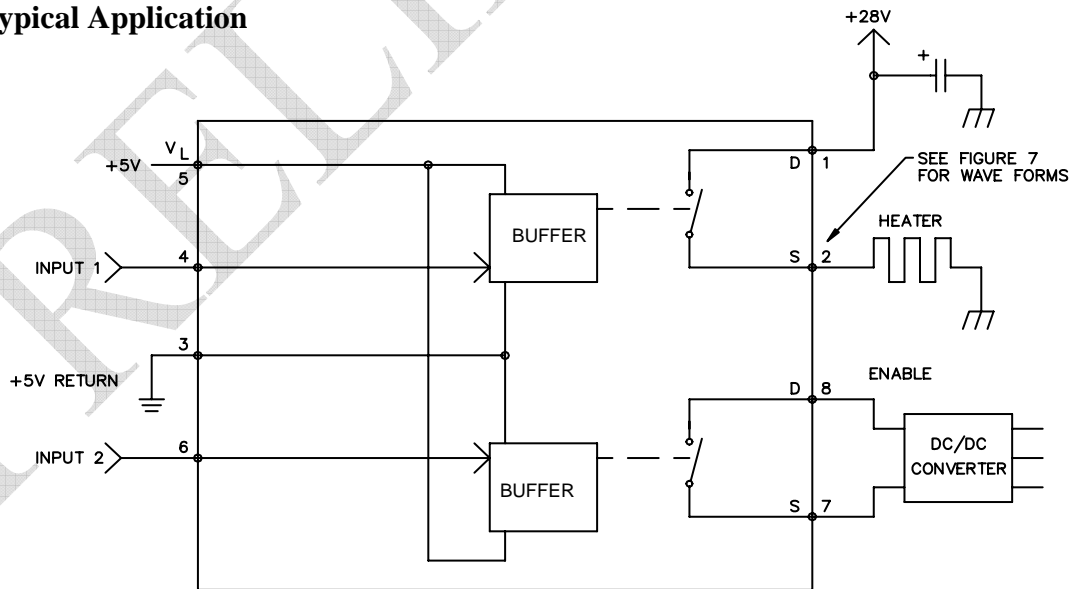


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**Figure 5: On Resistance as a Function of Junction Temperature**

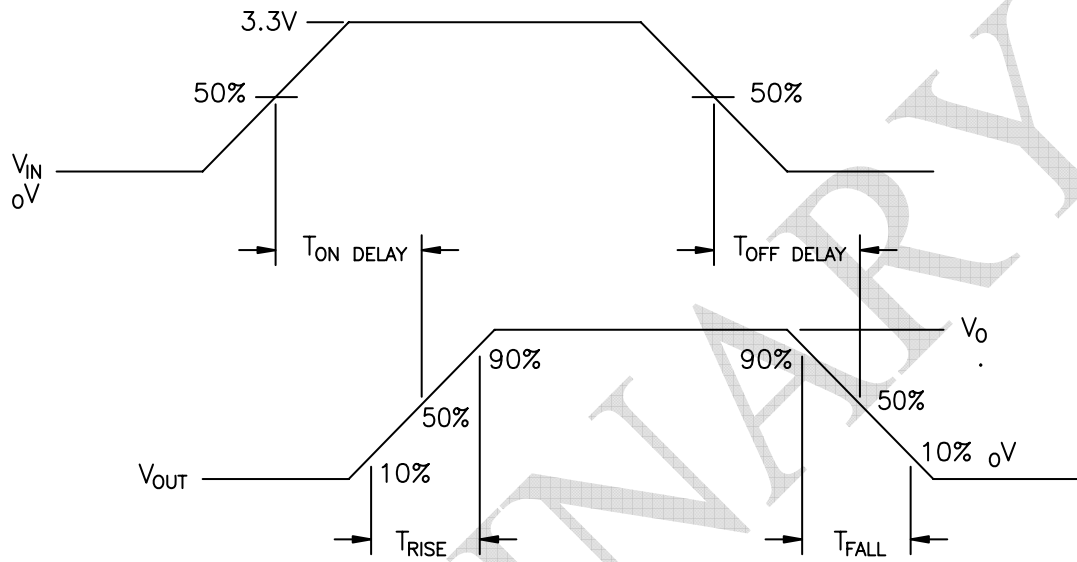


**Figure 6: Typical Application**



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Figure 7: Switching Wave Forms with Circuit per Figure 6, Pin 2

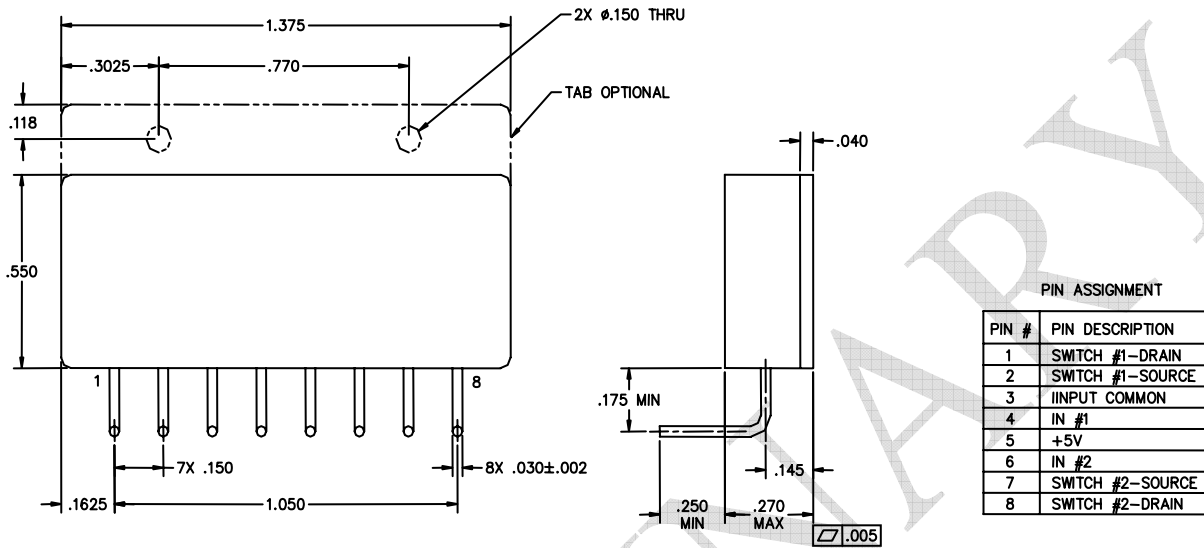


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### PACKAGE OUTLINES, INCLUDING LEAD BEND OPTIONS AND PINOUT CONFIGURATIONS

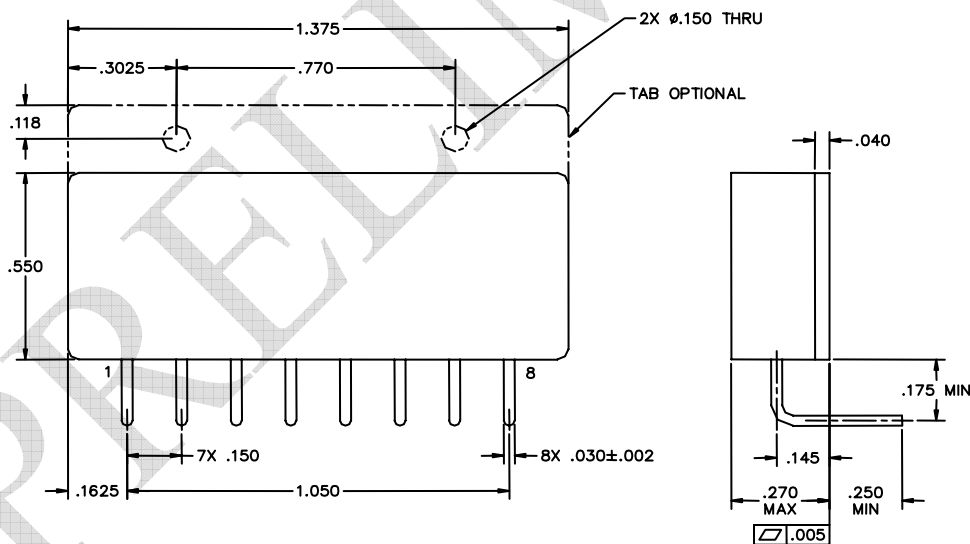
#### Case Outline and Dimensions – 8 PIN Package, Lead Bend Up



**NOTES**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5SM1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN INCHES.
4. TOLERANCES ARE +/- .005 UOS.

#### Case Outline and Dimensions – 8 PIN Package, Lead Bend Down



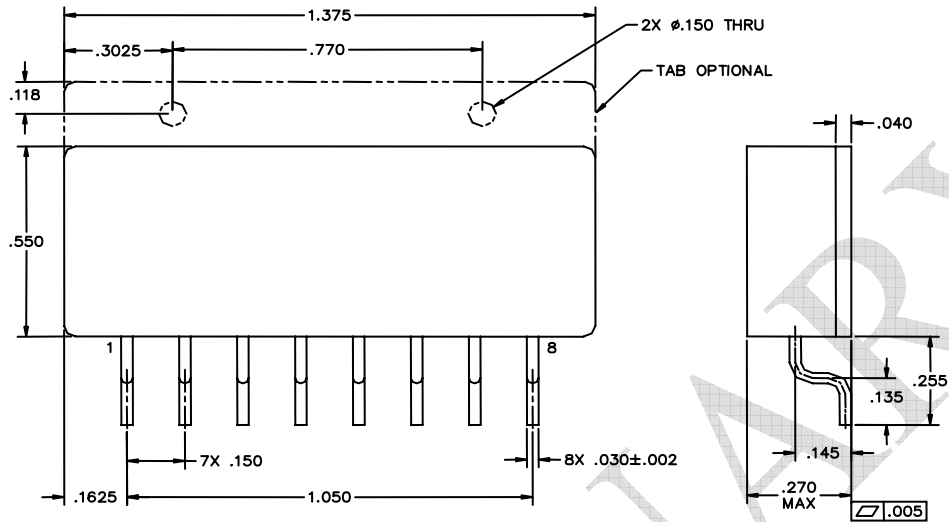
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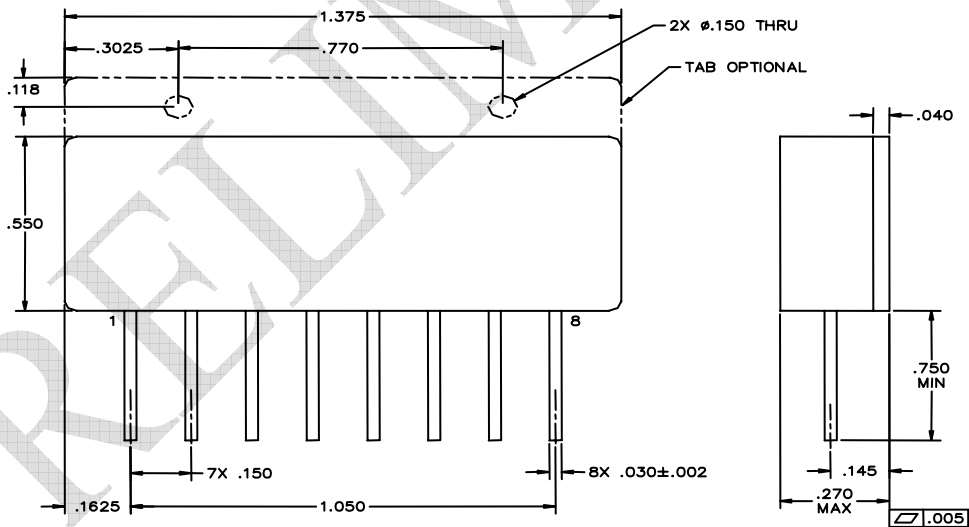
### Case Outline and Dimensions – 8 PIN Surface Mount Package



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3. DIMENSIONS ARE SHOWN IN INCHES.
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### Case Outline and Dimensions – 8 PIN Package, No Lead Bend



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