





ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
IRED continuous forward current		$I_F$	50	mA
IRED reverse voltage		$V_R$	5	V
Input power dissipation		$P_{diss}$	80	mW
Junction temperature		$T_J$	140	$^{\circ}\text{C}$
<b>OUTPUT</b>				
Load voltage		$V_L$	1500	V
Continuous load current		$I_L$	50	mA
SSR output power dissipation (continuous)		$P_{diss}$	550	mW
Junction temperature		$T_J$	140	$^{\circ}\text{C}$
<b>SSR</b>				
Ambient temperature range		$T_{amb}$	-40 to +125	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	-40 to +150	$^{\circ}\text{C}$
Soldering temperature	$t = 10\text{ s max.}$	$T_{sld}$	260	$^{\circ}\text{C}$
Repetitive avalanche rating	$t_p = 5\text{ s, duty cycle} < 8.3\% \text{ }^{(1)}$	$I_{AVA}$	0.9	mA
High pot pulse width	$R_L = 940\text{ k}\Omega, V_L = 2400\text{ V, 5 times over lifetime, recovery time } 60\text{ s}$	$t_{P\_HIPot}$	5	s

**Notes**

- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

<sup>(1)</sup> Cumulative of 5 min over lifetime with 60 s period.

ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	$I_F = 5\text{ mA}$	$V_F$	-	1.35	1.6	V
Reverse current	$V_R = 5\text{ V}$	$I_R$	-	-	10	$\mu\text{A}$
IRED forward current, switch turn - on	$I_L = 50\text{ mA}$	$I_{Fon}$	-	-	2	mA
IRED forward current, switch turn - off	$V_L = 1500\text{ V, } I_L = 50\text{ }\mu\text{A}$	$I_{Foff}$	150	200	-	nA
<b>OUTPUT</b>						
On-resistance	$I_F = 5\text{ mA, } I_L = 50\text{ mA}$	$R_{ON}$	-	100	200	$\Omega$
Off-state leakage current	$I_F = 0\text{ mA, } V_L = \pm 1500\text{ V}$	$I_O$	-	< 1	1	$\mu\text{A}$
	$I_F = 0\text{ mA, } V_L = \pm 1500\text{ V, } T_{amb} = 85\text{ }^{\circ}\text{C}$	$I_O$	-	0.05	-	$\mu\text{A}$
	$I_F = 0\text{ mA, } V_L = \pm 1200\text{ V, } T_{amb} = 100\text{ }^{\circ}\text{C}$	$I_O$	-	0.15	-	$\mu\text{A}$
	$I_F = 0\text{ mA, } V_L = \pm 1000\text{ V, } T_{amb} = 110\text{ }^{\circ}\text{C}$	$I_O$	-	0.5	-	$\mu\text{A}$
Output capacitance	$I_F = 0\text{ mA, } V_L = 25\text{ V, } f = 1\text{ MHz}$	$C_O$	-	10	-	pF
<b>TRANSFER</b>						
Capacitance (input to output)	$V_{IO} = 1\text{ V, } f = 1\text{ MHz}$	$C_{IO}$	-	0.4	-	pF

**Note**

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluations. Typical values are for information only and are not part of the testing requirements.

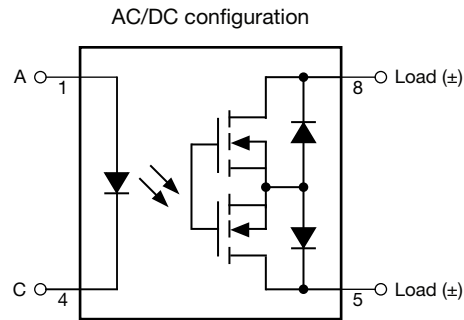
**PIN CONFIGURATION**


Fig. 1 - Pin Configuration

<b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	$I_F = 10\text{ mA}$ , $R_L = 20\text{ k}\Omega$ , $V_{DD} = 40\text{ V}$	$t_{on}$	-	50	150	$\mu\text{s}$
Turn-off time	$I_F = 10\text{ mA}$ , $R_L = 20\text{ k}\Omega$ , $V_{DD} = 40\text{ V}$	$t_{off}$	-	80	250	$\mu\text{s}$

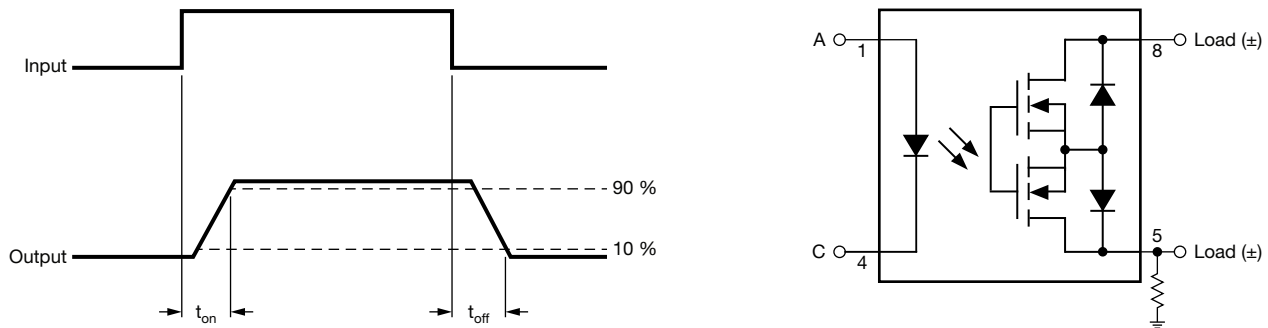


Fig. 2 - Timing Schematic

SAFETY AND INSULATION RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Climatic classification	According to IEC 68 part 1		40 / 125 / 21	
Pollution degree	According to DIN VDE 0109		2	
Comparative tracking index	Insulation group IIIa	CTI	600	
Maximum rated withstanding isolation voltage	According to UL1577, t = 1 min	V <sub>ISO</sub>	5300	V <sub>RMS</sub>
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V <sub>IOTM</sub>	8000	V <sub>peak</sub>
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V <sub>IORM</sub>	1414	V <sub>peak</sub>
Isolation resistance	V <sub>IO</sub> = 500 V, T <sub>amb</sub> = 25 °C	R <sub>IO</sub>	≥ 10 <sup>12</sup>	Ω
	V <sub>IO</sub> = 500 V, T <sub>amb</sub> = 125 °C	R <sub>IO</sub>	≥ 10 <sup>11</sup>	Ω
	V <sub>IO</sub> = 2000 V, T <sub>amb</sub> = 25 °C	R <sub>IO</sub>	≥ 10 <sup>12</sup>	Ω
	V <sub>IO</sub> = 2000 V, T <sub>amb</sub> = 125 °C	R <sub>IO</sub>	≥ 10 <sup>11</sup>	Ω
Output safety power		P <sub>SO</sub>	1000	mW
Input safety current		I <sub>SI</sub>	240	mA
Safety temperature		T <sub>S</sub>	175	°C
Creepage distance	SMD-8		≥ 8	mm
Clearance distance	SMD-8		≥ 8	mm
Insulation thickness		DTI	≥ 0.4	mm
Input to output test voltage, method B	V <sub>IORM</sub> × 1.875 = V <sub>PR</sub> , 100 % production test with t <sub>M</sub> = 1 s, partial discharge < 5 pC	V <sub>PR</sub>	2651	V <sub>peak</sub>
Input to output test voltage, method A	V <sub>IORM</sub> × 1.6 = V <sub>PR</sub> , sample test with t <sub>M</sub> = 10 s, partial discharge < 5 pC	V <sub>PR</sub>	2262	V <sub>peak</sub>

**Note**

- As per IEC 60747-5-5, this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

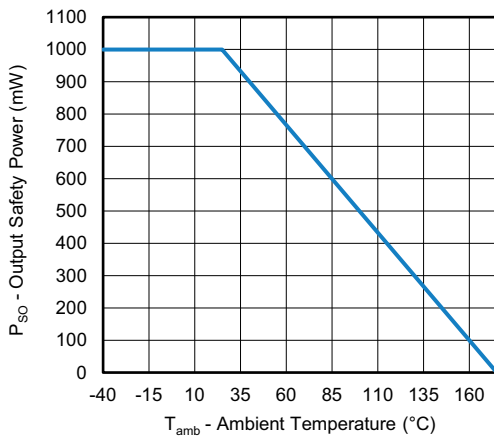


Fig. 3 - Safety Power Dissipation vs. Ambient Temperature

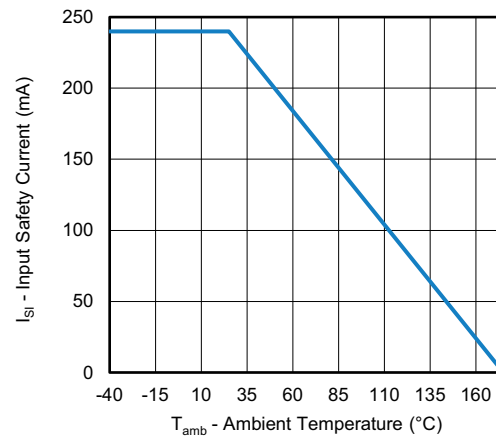


Fig. 4 - Safety Input Current vs. Ambient Temperature

**HIPOT TESTING AND AVALANCHE BREAKDOWN**

For the calculation of avalanche current flowing through the MOSFET of the solid-state relay and the respective power dissipated in the solid state relay below circuit is referred:

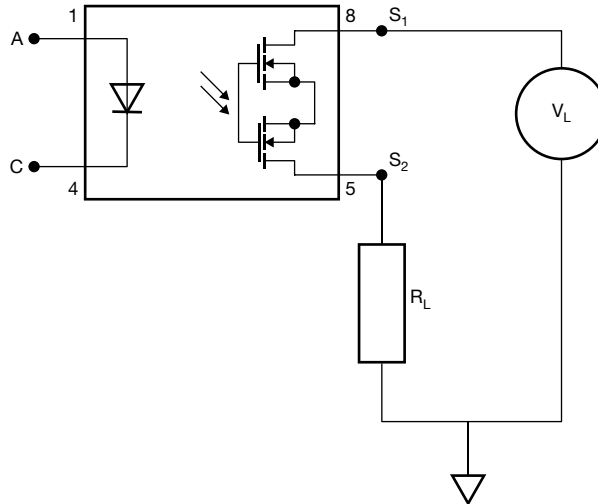


Fig. 5

For the below mentioned conditions, the current through the MOSFETs is calculated as:

Load resistance  $R_L = 940 \text{ k}\Omega \pm 5 \%$

$V_L = 2400 \text{ V}$

MOSFETs breakdown voltage  $V_{\text{BREAK}} = 1500 \text{ V (min.)}$

$$I_{\text{AVA}} = \frac{V_R}{R_L} = \frac{V_L - V_{\text{BREAK}}}{R_L} = \frac{2400 \text{ V} - 1500 \text{ V}}{893 \text{ k}\Omega} = 1 \text{ mA}$$

From the current the power dissipated in the solid-state relay can be calculated as:

$$P_{\text{MOS}} = V_{\text{BREAK}} \times I_{\text{AVA}} = 1500 \text{ V} \times 1 \text{ mA} = 1.5 \text{ W}$$

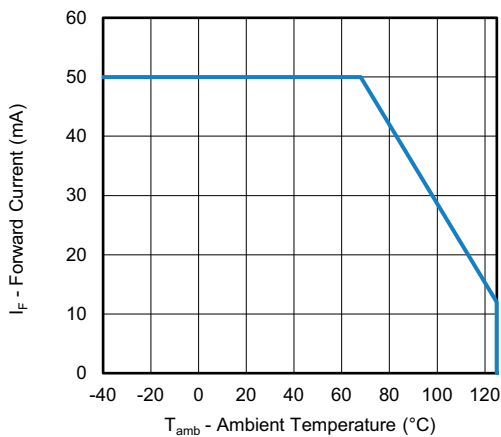
**TYPICAL CHARACTERISTICS** ( $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified)


Fig. 6 - Forward Current vs. Ambient Temperature

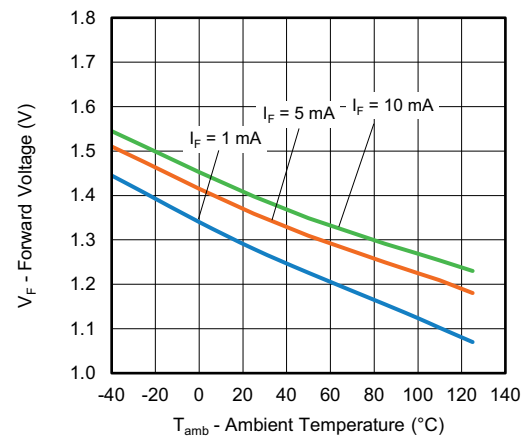


Fig. 7 - Forward Voltage vs. Ambient Temperature

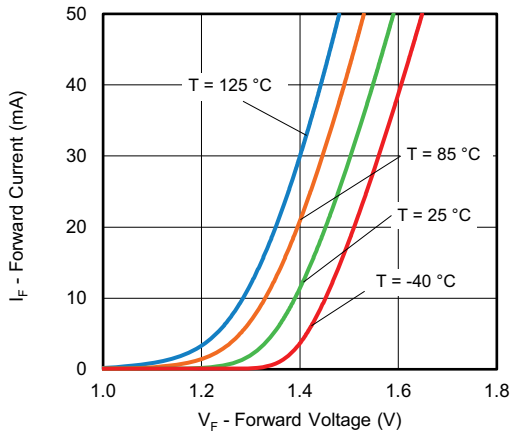


Fig. 8 - Forward Current vs. Forward Voltage

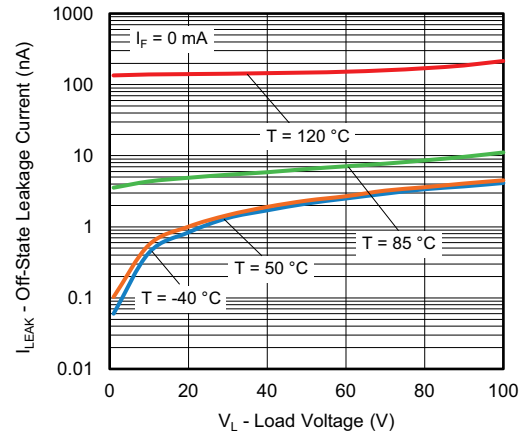


Fig. 11 - Off-State Leakage Current vs. Load Voltage

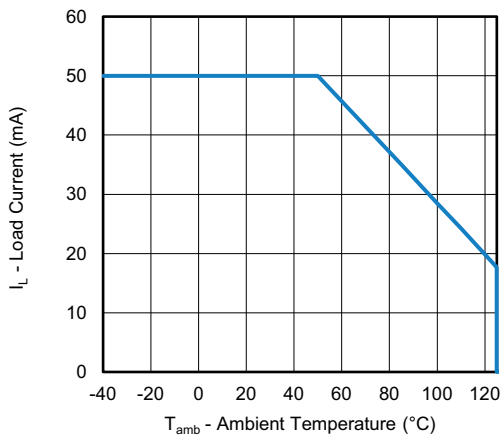


Fig. 9 - Maximum Load Current vs. Ambient Temperature

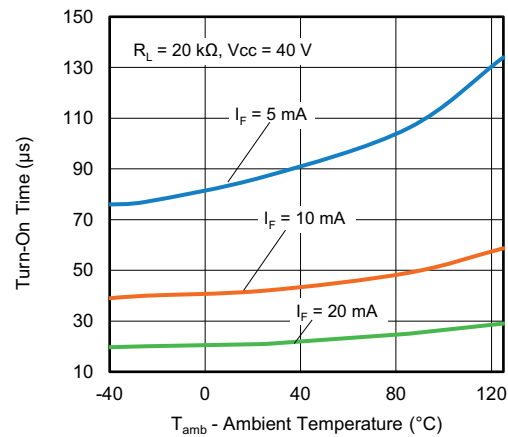


Fig. 12 - Turn-On Time vs. Ambient Temperature

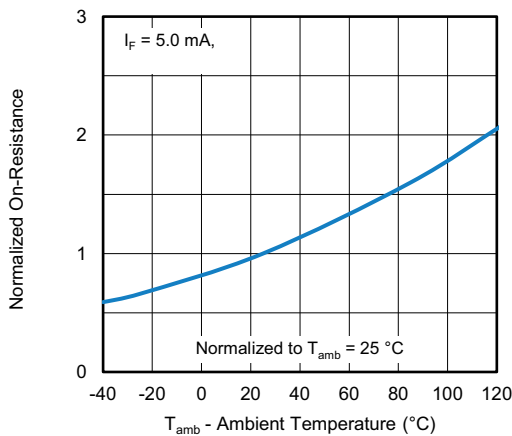


Fig. 10 - Normalized On-Resistance vs. Ambient Temperature

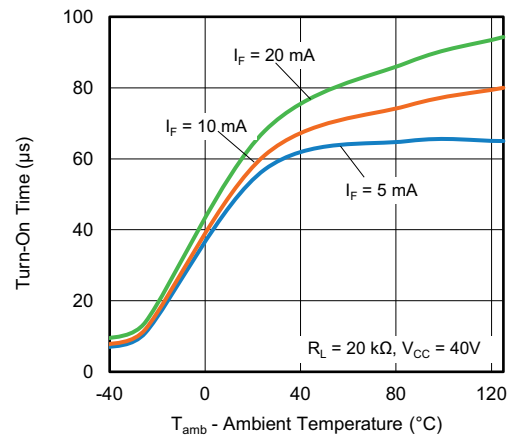


Fig. 13 - Turn-Off Time vs. Ambient Temperature

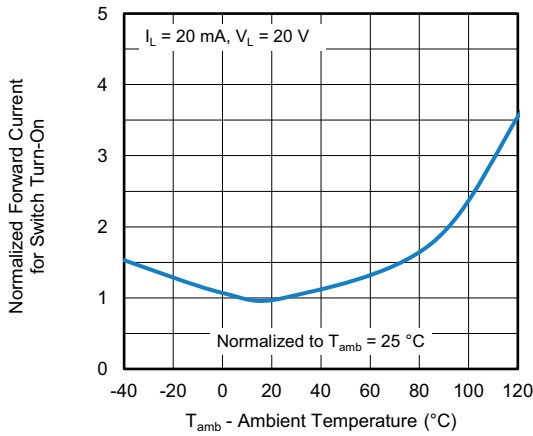


Fig. 14 - Normalized Forward Current for Switch Turn-On vs. Ambient Temperature

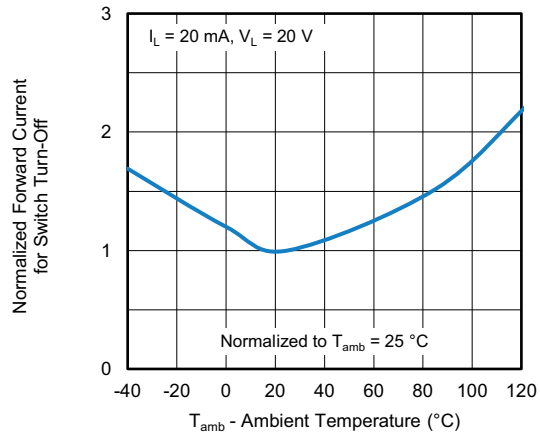


Fig. 15 - Normalized Forward Current for Switch Turn-Off vs. Ambient Temperature

**PACKAGE DIMENSIONS** (in millimeters)

**SMD-8**

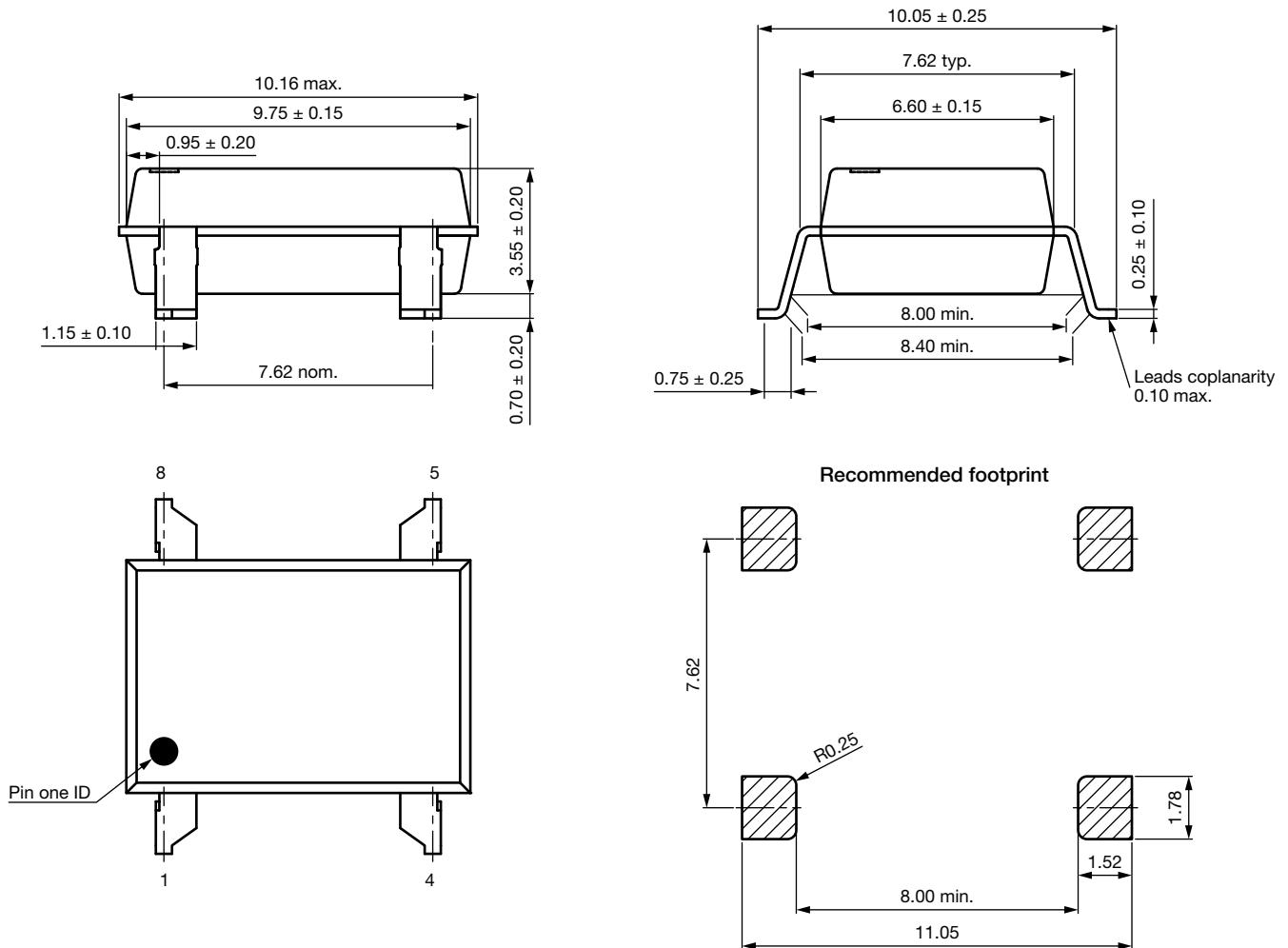


Fig. 16 - Package Drawings

**PACKAGE MARKING**

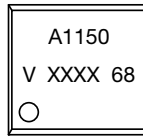
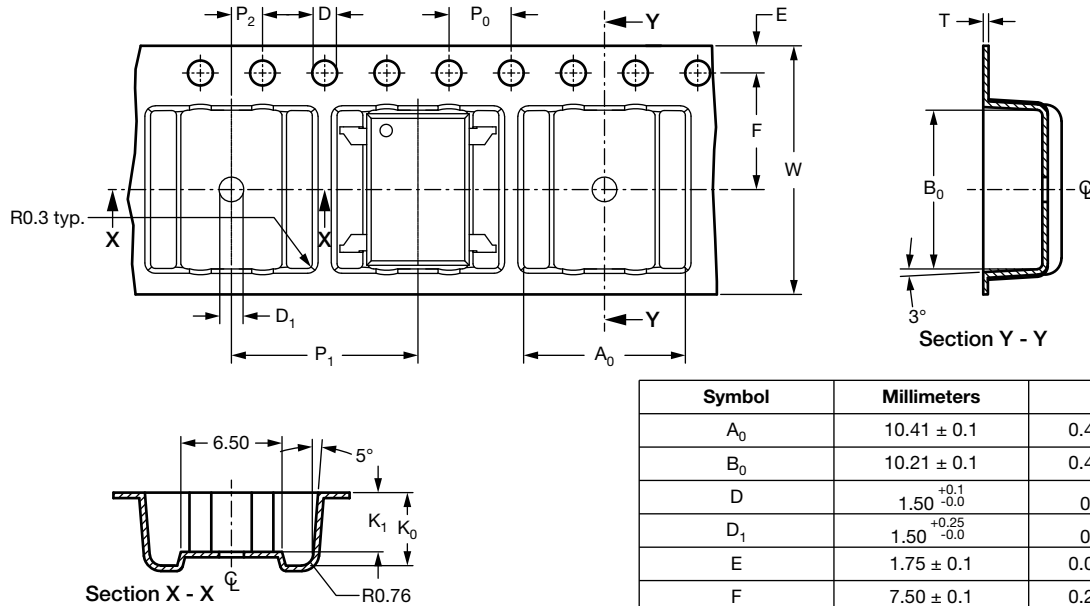


Fig. 17 - VORA1150

**PACKING INFORMATION** (in millimeters)



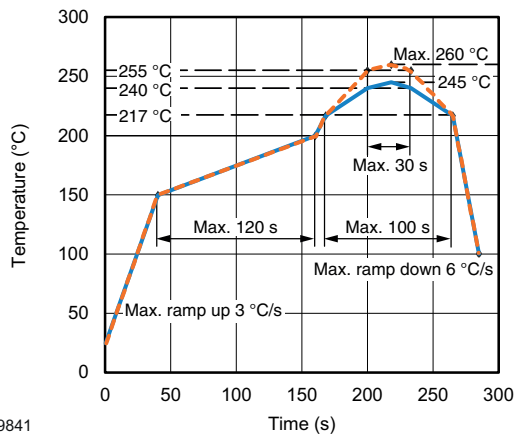
Symbol	Millimeters	Inches
A <sub>0</sub>	10.41 ± 0.1	0.410 ± 0.004
B <sub>0</sub>	10.21 ± 0.1	0.402 ± 0.004
D	1.50 <sup>+0.1</sup> <sub>-0.0</sub>	0.059 <sup>+0.004</sup> <sub>-0.0</sub>
D <sub>1</sub>	1.50 <sup>+0.25</sup> <sub>-0.0</sub>	0.059 <sup>+0.010</sup> <sub>-0.0</sub>
E	1.75 ± 0.1	0.069 ± 0.004
F	7.50 ± 0.1	0.295 ± 0.004
K <sub>0</sub>	4.70 ± 0.1	0.185 ± 0.004
K <sub>1</sub>	3.81 ± 0.1	0.150 ± 0.004
P <sub>1</sub>	12.00 ± 0.1	0.472 ± 0.004
P <sub>0</sub>	4.00 ± 0.1	0.157 ± 0.004
P <sub>2</sub>	2.00 ± 0.1	0.079 ± 0.004
T	0.35 ± 0.05	0.014 ± 0.002
W	16.00 ± 0.3	0.630 ± 0.012

**Notes**

- 10 sprocket hole pitch cumulative tolerances ± 0.2
- Camber not to exceed 1 mm in 100 mm
- Material: black conductive polystyrene
- K<sub>0</sub> measured from a plane on the inside bottom of the pocket to the top surface of the carrier
- Resistivity = 10<sup>4</sup> Ω/sq. to 10<sup>9</sup> Ω/sq.

Fig. 18 - Tape and Reel Packing (1000 pieces on reel)

**SOLDER PROFILES**



19841

Fig. 19 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

**HANDLING AND STORAGE CONDITIONS**

ESD level: HBM class 2

Floor life: 168 h

Conditions: T<sub>amb</sub> < 30 °C, RH < 85 %

Moisture sensitivity level 3, according to J-STD-020



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