

## Dual 1 Form A Solid State Relay

### Features

- Two Independent Relays
  - Current Limit Protection
  - Isolation Test Voltage 5300 V<sub>RMS</sub>
  - Typical R<sub>ON</sub> 15 Ω
  - Load Voltage 250 V
  - Load Current 120 mA
  - High Surge Capability
  - Clean Bounce Free Switching
  - Low Power Consumption
  - High Reliability Monolithic Receptor
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- SMD Lead Available on Tape and Reel
  - Lead-free component
  - Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

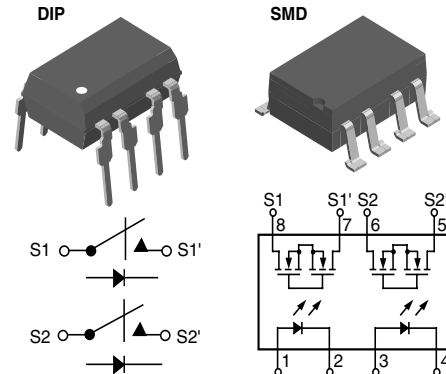
### Agency Approvals

- UL1577, File No. E52744 System Code H or J, Double Protection
- CSA - Certification 093751
- BSI/BABT Cert. No. 7980
- DIN EN 60747-5-2 (VDE0884)  
DIN EN 60747-5-5 pending
- FIMKO Approval

### Applications

General Telecom Switching

- On/off Hook Control
- Ring Delay
- Dial Pulse
- Ground Start
- Ground Fault Protection



1179034



Instrumentation  
Industrial Controls

### Description

The LH1505 contains two normally open switches that can be used as two independent SPST relays or as one DPST relay. The relay is constructed using a GaAlAs LED for actuation control and integrated monolithic dies for the switch outputs. The die, fabricated in a high-voltage dielectrically isolated technology, is comprised of a photodiode array, switch control circuitry, and DMOS switches. In addition, the LH1505 relay employs current limiting circuitry, enabling it to pass FCC 68.302 and other regulatory voltage surge requirements when overvoltage protection is provided.

### Order Information

Part	Remarks
LH1505AAC	Tubes, SMD-8
LH1505AACTR	Tape and Reel, SMD-8
LH1505AB	Tubes, SMD-8

### Absolute Maximum Ratings, $T_{amb} = 25\text{ }^{\circ}\text{C}$

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 time can adversely affect reliability.

### SSR

Parameter	Test condition	Symbol	Value	Unit
LED continuous forward current		$I_F$	50	mA
LED reverse voltage	$I_R \leq 10\text{ }\mu\text{A}$	$V_R$	8.0	V
DC or peak AC load voltage	$I_L \leq 50\text{ }\mu\text{A}$	$V_L$	250	V
Continuous DC load current , one pole operating		$I_L$	130	mA
Continuous DC load current , two poles operating		$I_L$	120	mA
Peak load current (single shot), Form B	$t = 100\text{ ms}$	$I_P$	2)	
Ambient operating temperature range		$T_{amb}$	- 40 to + 85	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	- 40 to + 150	$^{\circ}\text{C}$
Pin soldering temperature	$t = 10\text{ s max}$	$T_{sld}$	260	$^{\circ}\text{C}$
Input/output isolation test voltage	$t = 1.0\text{ s}, I_{ISO} = 10\text{ }\mu\text{A max}$	$V_{ISO}$	5300	$V_{RMS}$
Pole-to-pole isolation voltage (S1 to S2) <sup>1)</sup> , (dry air, dust free, at sea level)			1600	V
Output power dissipation (continuous)		$P_{diss}$	600	mW

<sup>1)</sup> Breakdown occurs between the output pins external to the package.

<sup>2)</sup> Refer to Current Limit Performance Application Note for a discussion on relay operation during transient currents.

### Electrical Characteristics, $T_{amb} = 25\text{ }^{\circ}\text{C}$

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.

### Input

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
LED forward current, switch turn-on	$I_L = 100\text{ mA}, t = 10\text{ ms}$	$I_{Fon}$		1.0	2.0	mA
LED forward current, switch turn-off	$V_L = \pm 200\text{ V}$	$I_{Foff}$	0.2	0.9		mA
LED forward voltage	$I_F = 10\text{ mA}$	$V_F$	1.15	1.26	1.45	V

### Output

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
ON-resistance	$I_F = 5.0\text{ mA}, I_L = 50\text{ mA}$	$R_{ON}$	10	15	20	$\Omega$
OFF-resistance	$I_F = 0\text{ mA}, V_L = \pm 100\text{ V}$	$R_{OFF}$	0.5	5000		$G\Omega$
Current limit	$I_F = 5.0\text{ mA}, t = 5.0\text{ ms},$ $V_L = \pm 6.0\text{ V}$	$I_{LMT}$	170	200	280	mA
Off-state leakage current	$I_F = 0\text{ mA}, V_L = \pm 100\text{ V}$	$I_O$		0.02	200	nA
	$I_F = 0\text{ mA}, V_L = \pm 250\text{ V}$	$I_O$			1.0	$\mu\text{A}$

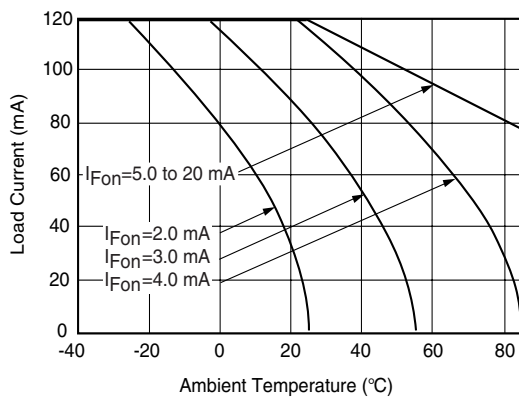
Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Output capacitance	$I_F = 0 \text{ mA}, V_L = 1.0 \text{ V}$	$C_O$		55		pF
	$I_F = 0 \text{ mA}, V_L = 50 \text{ V}$	$C_O$		10		pF
Pole-to-pole capacitance (S1 to S2)	$I_F = 5.0 \text{ mA}$			0.5		pF
Switch offset	$I_F = 5.0 \text{ mA}$	$V_{OS}$		0.15		V

## Transfer

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Capacitance (input-output)	$V_{ISO} = 1.0 \text{ V}$	$C_{IO}$		1.1		pF
Turn-on time	$I_F = 5.0 \text{ mA}, I_L = 50 \text{ mA}$	$t_{on}$		1.4 <sup>1)</sup>	4.0 <sup>1)</sup>	ms
Turn-off time	$I_F = 5.0 \text{ mA}, I_L = 50 \text{ mA}$	$t_{off}$		0.7 <sup>1)</sup>	4.0 <sup>1)</sup>	ms

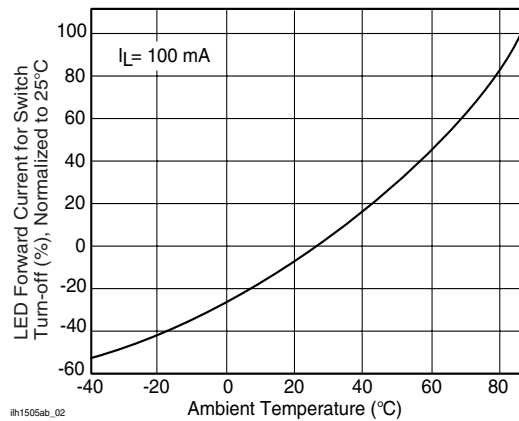
<sup>1)</sup>  $I_L = 100 \text{ mA}$

## Typical Characteristics ( $T_{amb} = 25^\circ\text{C}$ unless otherwise specified)



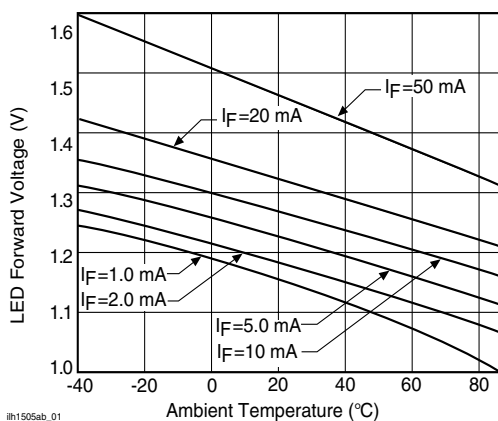
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Figure 1. Recommended Operating Conditions



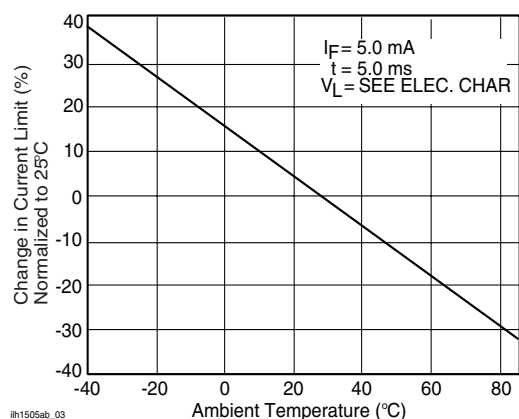
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Figure 3. LED Current for Switch Turn-on vs. Temperature



ih1505ab\_01

Figure 2. LED Voltage vs. Temperature



ih1505ab\_03

Figure 4. Current Limit vs. Temperature

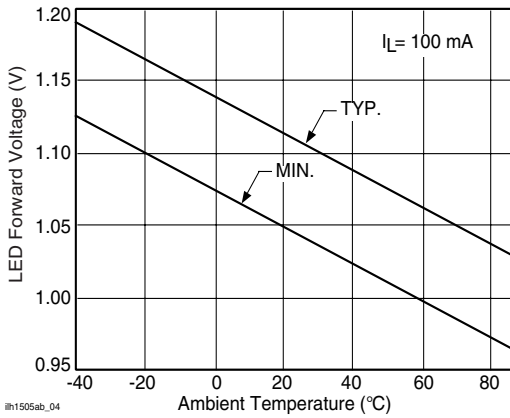


Figure 5. LED Dropout Voltage vs. Temperature

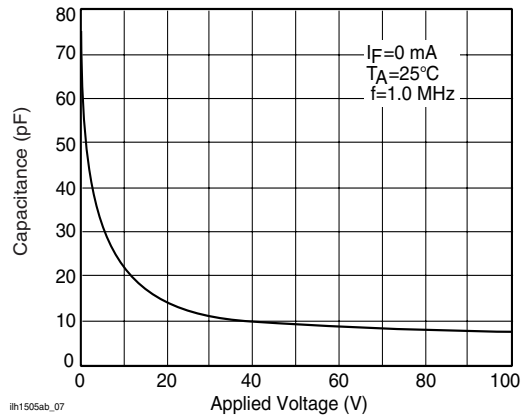


Figure 8. Switch Capacitance vs. Applied Voltage

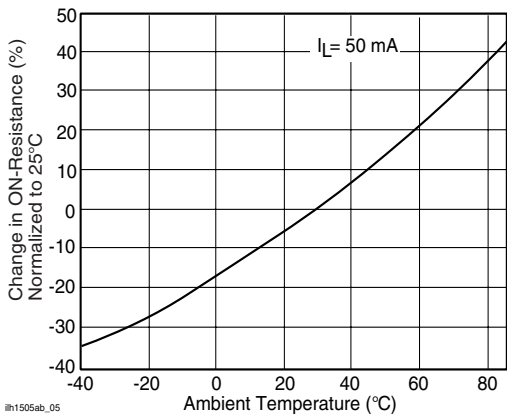


Figure 6. ON-Resistance vs. Temperature

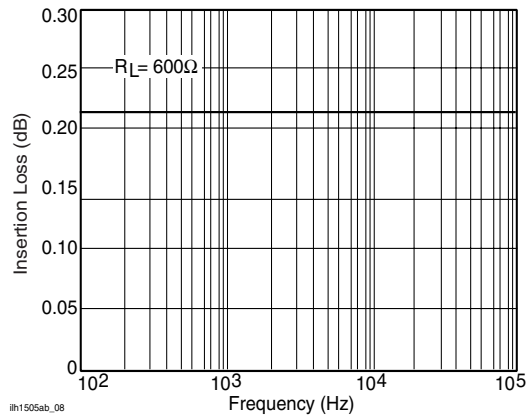


Figure 9. Insertion Loss vs. Frequency

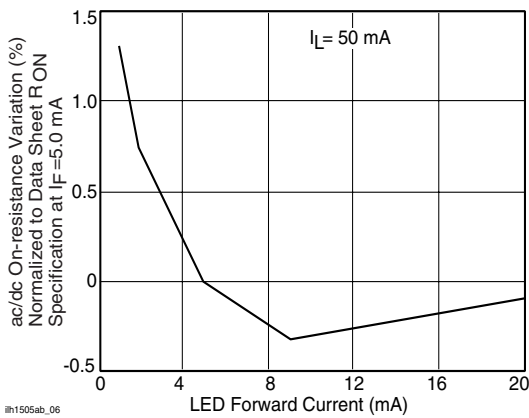


Figure 7. Variation in ON-Resistance vs. LED Current

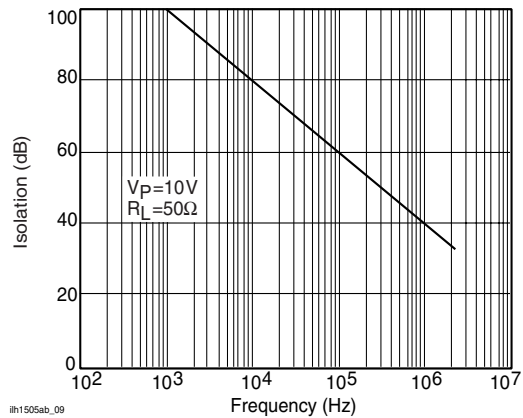


Figure 10. Output Isolation

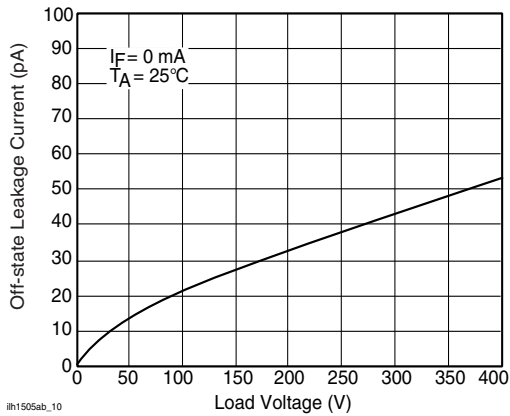


Figure 11. Leakage Current vs. Applied Voltage

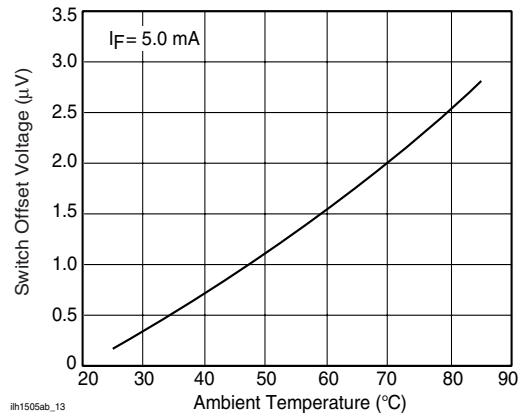


Figure 14. Switch Offset Voltage vs. Temperature

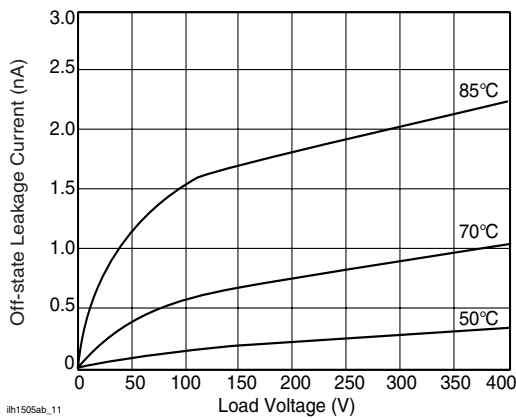


Figure 12. Leakage Current vs. Applied Voltage at Elevated Temperatures

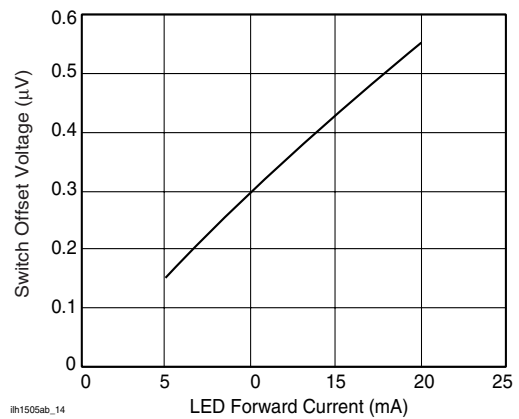


Figure 15. Switch Offset Voltage vs. LED Current

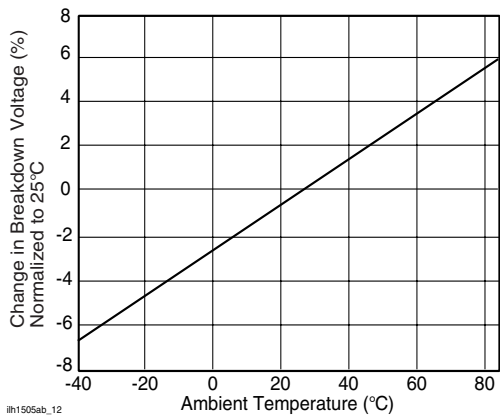


Figure 13. Switch Breakdown Voltage vs. Temperature

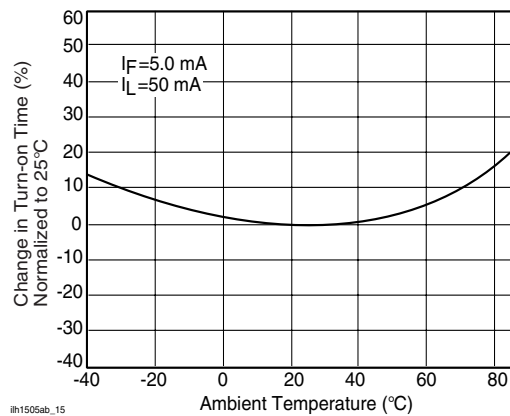


Figure 16. Turn-on Time vs. Temperature

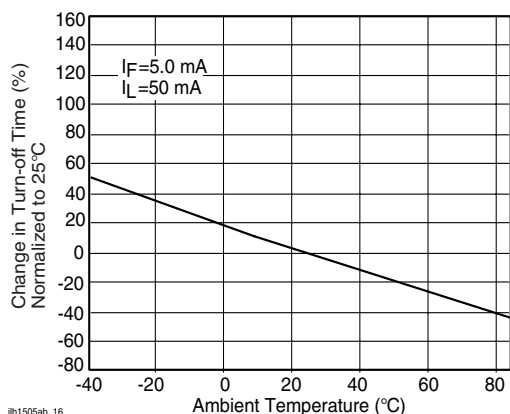


Figure 17. Turn-off Time vs. Temperature

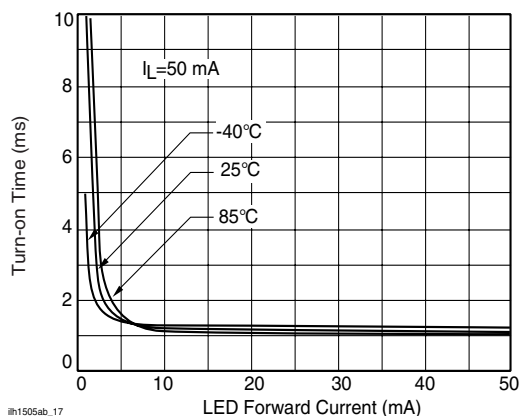


Figure 18. Turn-on Time vs. LED Current

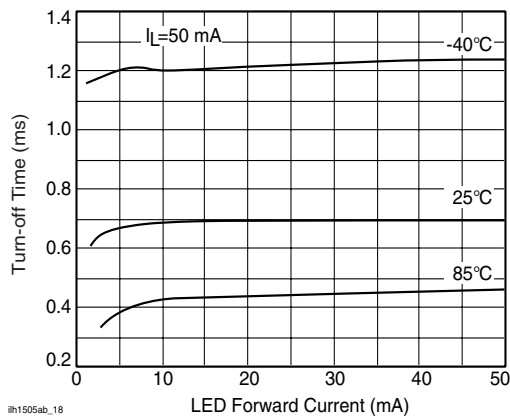
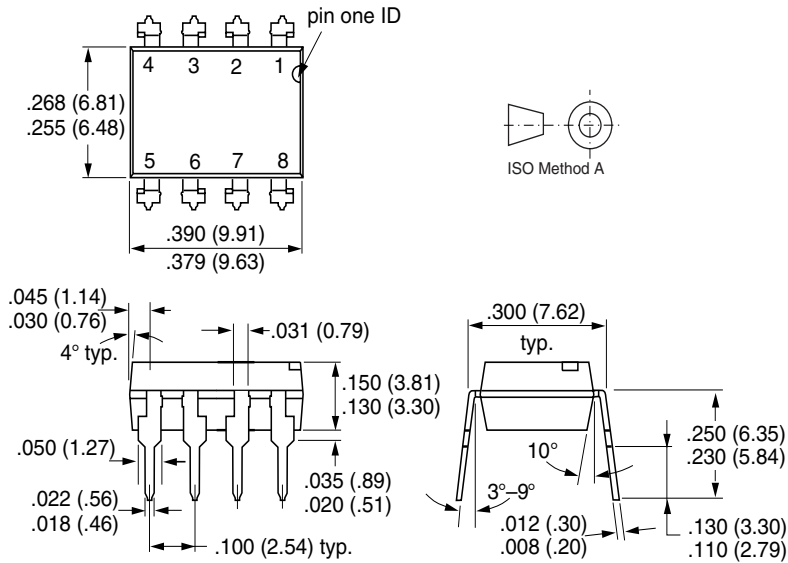


Figure 19. Turn-off Time vs. LED Current

## Package Dimensions in Inches (mm)

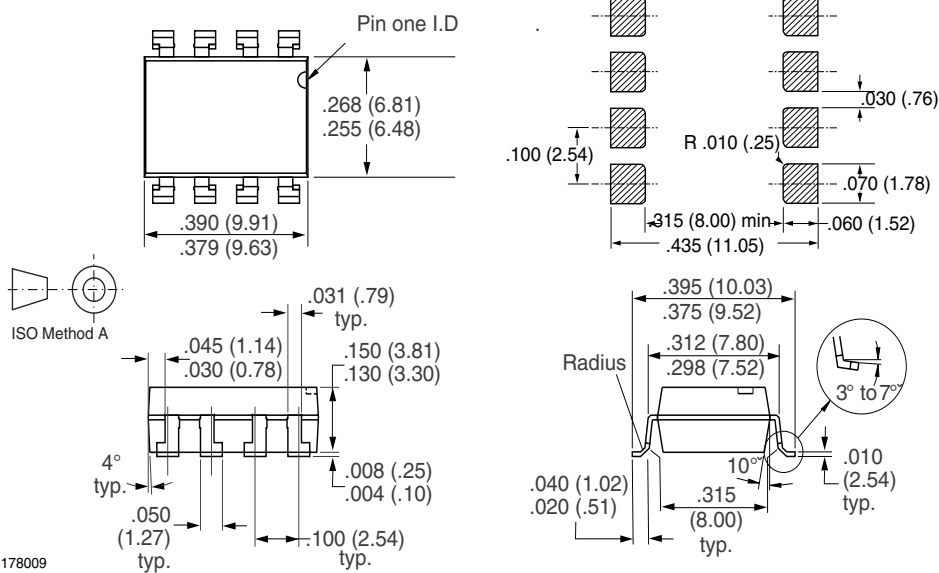
### DIP



i178008

## Package Dimensions in Inches (mm)

### SMD



i178009

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1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

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1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

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