



## High Speed Optocoupler, 1 MBd, Transistor Output

### Features

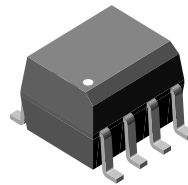
- Surface Mountable
- Industry Standard SOIC-8 Footprint
- Compatible with Infrared Vapor Phase Reflow and Wave Soldering Processes
- Isolation Test Voltage, 3000 V<sub>RMS</sub>
- Very High Common Mode Transient Immunity: 15000 V/ μs at V<sub>CM</sub> = 1500 V Guaranteed (SFH6343)
- High Speed: 1.0 Mb/s
- TTL Compatible
- Guaranteed AC and DC Performance Temperature: 0 °C to 70 °C
- Open Collector Output
- Pin Compatible with Agilent(HP) Optocouplers
  - SFH6315T-HCPL0500
  - SFH6316T-HCPL0501
  - SFH6343T-HCPL0453
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

### Agency Approvals

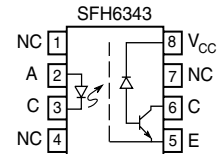
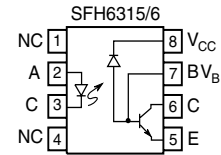
- UL1577, File No. E52744 System Code Y
- CSA 93751
- DIN EN 60747-5-2 (VDE0884)  
DIN EN 60747-5-5 pending  
Available with Option 1

### Applications

Line Receivers  
 Logic Ground Isolation  
 Analog Signal Ground Isolation  
 Replace Pulse Transformers



1179069



### Description

The SFH6315T/ SFH6316T/ SFH6343T, high speed optocouplers, each consists of a GaAlAs infrared emitting diode, optically coupled with an integrated photo detector and a high speed transistor. The photo detector is junction isolated from the transistor to reduce miller capacitance effects. The open collector output function allows circuit designers to adjust the load conditions when interfacing with different logic systems such as TTL, CMOS, etc.

Because the SFH6343T has a Faraday shield on the detector chip, it can also reject and minimize high input to output common mode transient voltages. There is no base connection, further reducing the potential electrical noise entering the package.

The SFH6315T/ SFH6316T/ SFH6343T are packaged in industry standard SOIC-8 packages and are suitable for surface mounting.

### Order Information

Part	Remarks
SFH6315T	CTR > 5.0 %, SOIC-8
SFH6316T	CTR > 15 %, SOIC-8
SFH6343T	CTR > 19 %, SOIC-8

For additional information on the available options refer to Option Information.

Note that product is available only on tape and reel.

### Absolute Maximum Ratings

$T_{amb} = 25\text{ °C}$ , unless otherwise specified

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 Rating for extended periods of the time can adversely affect reliability.

### Input

Parameter	Test condition	Symbol	Value	Unit
Reverse voltage		$V_R$	3.0	V
DC forward current		$I_F$	25	mA
Surge forward current	$t_p \leq 1.0\ \mu\text{s}$ , 300 pulses/s	$I_{FSM}$	1.0	A
Power dissipation	$T_{amb} \leq 70\text{ °C}$	$P_{diss}$	45	mW

### Output

Parameter	Test condition	Symbol	Value	Unit
Supply voltage		$V_S$	- 0.5 to 30	V
Output voltage		$V_O$	- 0.5 to 25	V
Output current		$I_O$	8.0	mA
Power dissipation	$T_{amb} \leq 70\text{ °C}$	$P_{diss}$	100	mW

### Coupler

Parameter	Test condition	Symbol	Value	Unit
Isolation test voltage between emitter and detector (refer to climate DIN 40046, part 2, Nov.74)		$V_{ISO}$	3000	$V_{RMS}$
Pollution degree (DIN VDE 0110)			2	
Creepage			$\geq 4.0$	mm
Clearance			$\geq 4.0$	mm
Comparative tracking index per DIN IEC 112/VDE 0303, part 1			175	
Isolation resistance	$V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ °C}$ , $R_{ISOL}$ (Note 2)	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ °C}$ , $R_{ISOL}$ (Note 2)	$R_{IO}$	$\geq 10^{11}$	$\Omega$
Storage temperature range		$T_{stg}$	-55 to +150	$^{\circ}\text{C}$
Ambient temperature range		$T_{amb}$	-55 to +100	$^{\circ}\text{C}$
Junction temperature		$T_j$	100	$^{\circ}\text{C}$
Soldering temperature	$t = 10\text{ s max.}$ , Dip soldering: distance to seating plane $\geq 1.5\text{ mm}$		260	$^{\circ}\text{C}$



### Electrical Characteristics

T<sub>amb</sub> = 25 °C, unless otherwise specified

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

### Input

Over recommend temperature (T<sub>amb</sub> = 0 °C to 70 °C) unless otherwise specified. See note 6. All typical values at T<sub>amb</sub> = 25 °.

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Input forward voltage	I <sub>F</sub> = 16 mA	V <sub>F</sub>		1.6	1.8	V
		V <sub>F</sub>		1.6	1.9	V
Input reverse current	V <sub>R</sub> = 3.0 V	I <sub>R</sub>		0.5	10	μA
Input capacitance	f = 1.0 MHz, V <sub>F</sub> = 0 V	C <sub>IN</sub>		75		pF
Temperature coefficient of forward voltage	I <sub>F</sub> = 16 mA	ΔV <sub>F</sub> /ΔT <sub>amb</sub>		-1.7		mV/°C

### Output

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Logic low supply current	I <sub>F</sub> = 16 mA, V <sub>O</sub> = Open, V <sub>CC</sub> = 15 V		I <sub>CCL</sub>		200		μA
Logic high supply current	I <sub>F</sub> = 0 mA, V <sub>O</sub> = Open, V <sub>CC</sub> = 15 V		I <sub>CCH</sub>		0.001	1.0	μA
			I <sub>CCH</sub>		0.001	2.0	μA
Logic low output voltage	I <sub>F</sub> = 16 mA, V <sub>CC</sub> = 4.5 V, I <sub>O</sub> = 1.1 mA	SFH6315T	V <sub>OL</sub>		0.15	0.4	V
	I <sub>F</sub> = 16 mA, V <sub>CC</sub> = 4.5 V, I <sub>O</sub> = 0.8 mA,	SFH6315T	V <sub>OL</sub>		0.15	0.5	V
	I <sub>F</sub> = 16 mA, V <sub>CC</sub> = 4.5 V, I <sub>O</sub> = 3.0 mA	SFH6316T	V <sub>OL</sub>		0.15	0.4	V
	I <sub>F</sub> = 16 mA, V <sub>CC</sub> = 4.5 V, I <sub>O</sub> = 2.4 mA,	SFH6343T	V <sub>OL</sub>		0.15	0.5	V
Logic high output current	I <sub>F</sub> = 0 mA, V <sub>O</sub> = V <sub>CC</sub> = 5.5 V		I <sub>OH</sub>		0.003	0.5	μA
	I <sub>F</sub> = 0 mA, V <sub>O</sub> = V <sub>CC</sub> = 15 V		I <sub>OH</sub>		0.01	1.0	μA
			I <sub>OH</sub>				50

### Coupler

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Capacitance (input-output). See note 6.	f = 1.0 MHz	C <sub>IO</sub>		0.4		pF

### Current Transfer Ratio

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Current Transfer Ratio See notes 1 and 6	V <sub>O</sub> = 0.4 V, I <sub>F</sub> = 16 mA, V <sub>CC</sub> = 4.5 V	SFH6315T	CTR	7	16	50	%
	V <sub>O</sub> = 0.5 V, I <sub>F</sub> = 16 mA, V <sub>CC</sub> = 4.5 V	SFH6315T	CTR	5	17		%
	V <sub>O</sub> = 0.4 V, I <sub>F</sub> = 16 mA, V <sub>CC</sub> = 4.5 V	SFH6316T	CTR	19	35	50	%
	V <sub>O</sub> = 0.5 V, I <sub>F</sub> = 16 mA, V <sub>CC</sub> = 4.5 V	SFH6343T	CTR	15	36		%

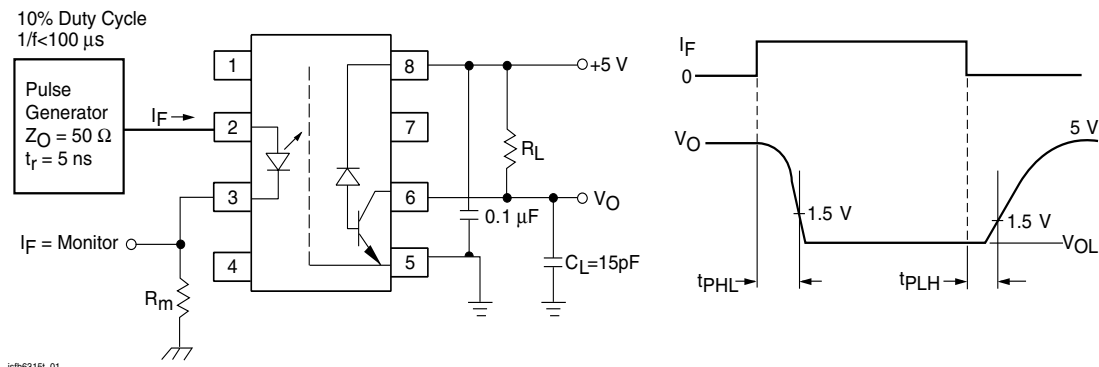


Figure 1. Test Circuit for Switching Times

## Switching Characteristics

Over recommended temperature ( $T_{amb} = 0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ ),  $V_{CC} = 5.0\text{ V}$ ,  $I_F = 16\text{ mA}$  unless otherwise specified. All typical values,  $T_{amb} = 25^{\circ}\text{C}$

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Propagation delay time to logic low at output See fig. 1 and notes 4 and 5	$R_L = 4.1\text{ K}\Omega$	SFH6315T	$t_{PHL}^*$		0.5	1.5	$\mu\text{s}$
		SFH6315T	$t_{PHL}$		0.5	2.0	$\mu\text{s}$
	$R_L = 1.9\text{ K}\Omega$	SFH6316T	$t_{PHL}$		0.25	0.8	$\mu\text{s}$
		SFH6343T	$t_{PHL}$		0.25	1.0	$\mu\text{s}$
Propagation delay time to logic high at output See fig. 1 and notes 4 and 5	$R_L = 4.1\text{ K}\Omega$	SFH6315T	$t_{PLH}^*$		0.5	1.5	$\mu\text{s}$
		SFH6315T	$t_{PLH}$		0.5	2.0	$\mu\text{s}$
	$R_L = 1.9\text{ K}\Omega$	SFH6316T	$t_{PLH}$		0.5	0.8	$\mu\text{s}$
	$R_L = 1.9\text{ K}\Omega$	SFH6343T	$t_{PLH}$		0.5	1.0	$\mu\text{s}$

\*  $T_{amb} = 25^{\circ}\text{C}$

## Common Mode Transient Immunity

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Common mode transient immunity at logic high level output See fig. 2 and notes 3,4 and 5	$R_L = 4.1\text{ K}\Omega$ , $I_F = 0\text{ mA}$ , $V_{CM} = 10\text{ V}_{P-P}$	SFH6315T	$ CM_H $		1.0		KV/ $\mu$ s
	$R_L = 1.9\text{ K}\Omega$ , $I_F = 0\text{ mA}$ , $V_{CM} = 1500\text{ V}_{P-P}$	SFH6316T	$ CM_H $		1.0		KV/ $\mu$ s
		SFH6343T	$ CM_H $	15	30		KV/ $\mu$ s
Common mode transient immunity at logic low level output See fig. 2 and notes 3,4 and 5	$R_L = 4.1\text{ K}\Omega$ , $I_F = 16\text{ mA}$ , $V_{CM} = 10\text{ V}_{P-P}$	SFH6315T	$ CM_L $		1.0		KV/ $\mu$ s
	$R_L = 1.9\text{ K}\Omega$ , $I_F = 16\text{ mA}$ , $V_{CM} = 10\text{ V}_{P-P}$	SFH6316T	$ CM_L $		1.0		KV/ $\mu$ s
	$R_L = 1.9\text{ K}\Omega$ , $I_F = 16\text{ mA}$ , $V_{CM} = 1500\text{ V}_{P-P}$	SFH6343T	$ CM_L $	15	30		KV/ $\mu$ s

- Current transfer ratio in percent equals the ratio of output collector current ( $I_O$ ) to the forward LED input current ( $I_F$ ) times 100
- Device considered a two-terminal device: pins 1, 2, 3, and 4 shorted together and pins 5, 6, 7, and 8 shorted together.
- Common mode transient immunity in a Logic High level is the maximum tolerable (positive)  $dV_{CM}/dt$  on the leading edge of the common mode pulse ( $V_{CM}$ ) to assure that the output will remain in a Logic High state (i.e.,  $V_O > 2.0\text{ V}$ ). Common mode transient immunity in a Logic Low level the maximum tolerable (negative)  $dV_{CM}/dt$  on the trailing edge of the common mode pulse signal ( $V_{CM}$ ) to assure that the output will remain in Logic Low state, i.e.,  $V_O > 0.8\text{ V}$ .
- The 1.9 k $\Omega$  load represents 1 TTL unit load of 1.6 mA and the 5.6 k $\Omega$  pull-up resistor.
- The 4.1 k $\Omega$  load represents 1 LSTTL unit load of 0.36 mA and the 6.1 k $\Omega$  pull-up resistor.
- A 0.1  $\mu$ f bypass capacitor connected between pins 5 and 8 is recommended.

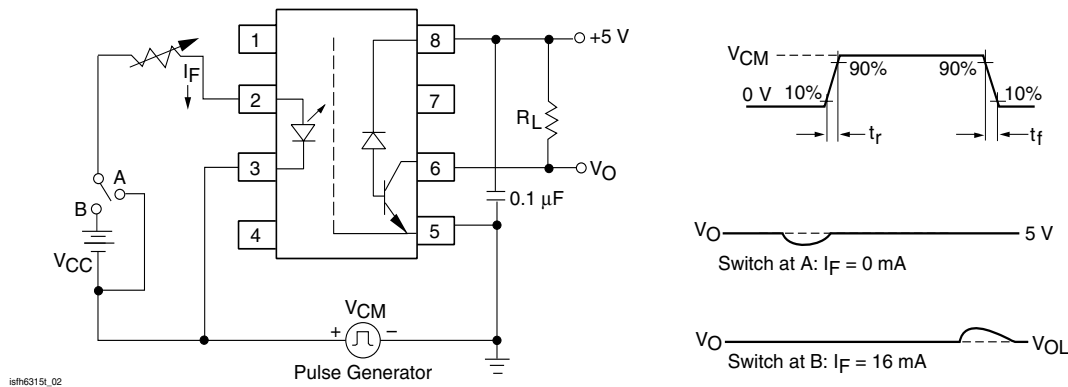
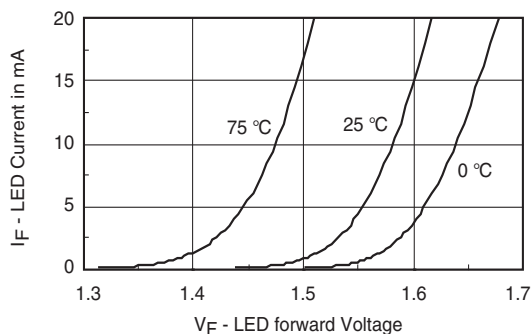


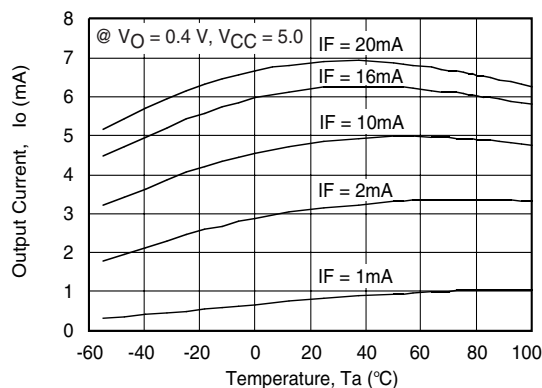
Figure 2. Test Circuit for Transient Immunity and Typical Waveforms

## Typical Characteristics (Tamb = 25 °C unless otherwise specified)



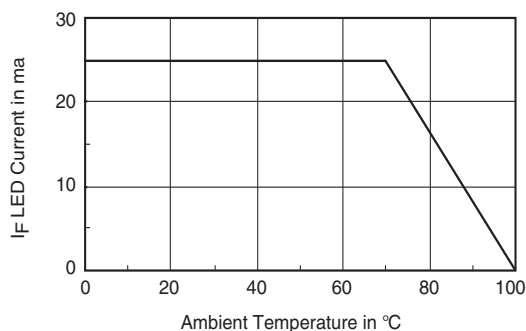
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Figure 3. LED Forward Current vs. Forward Voltage



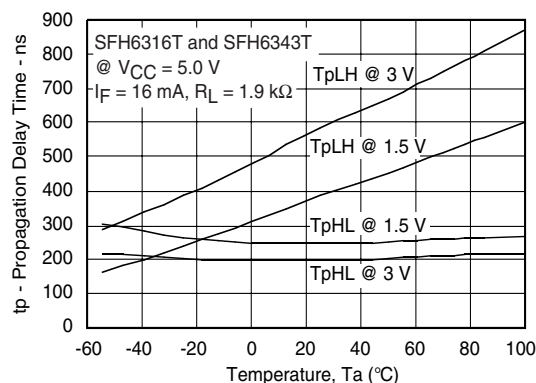
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Figure 6. Output Current vs. Temperature



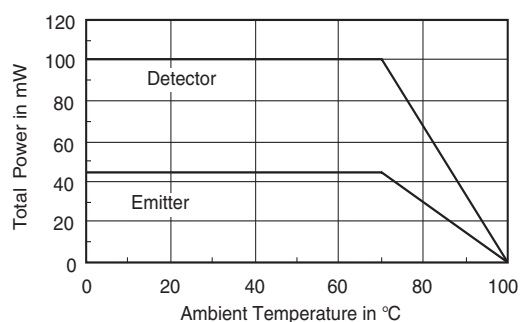
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Figure 4. Permissible Forward LED Current vs. Temperature



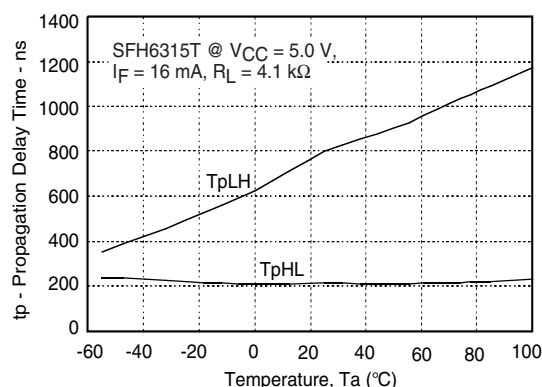
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Figure 7. Propagation Delay vs. Temperature-SFH6316T and SFH6343T



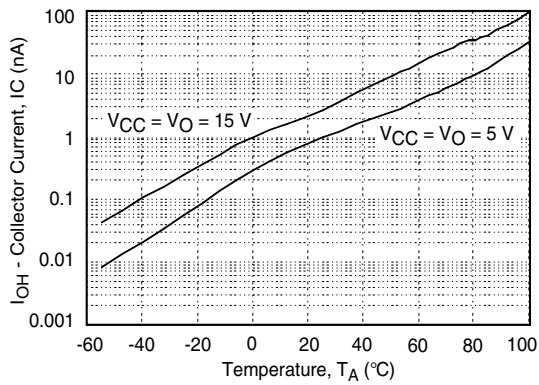
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Figure 5. Permissible Power Dissipation vs. Temperature



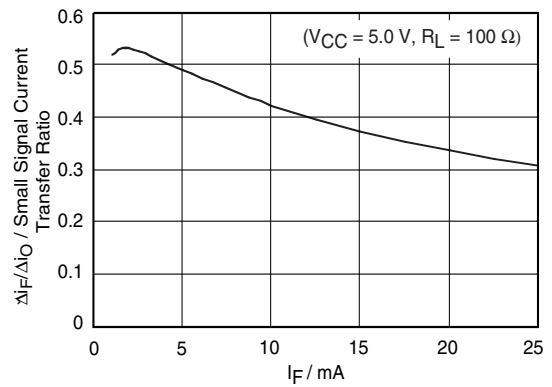
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Figure 8. Propagation Delay vs. Temperature-SFH6315T



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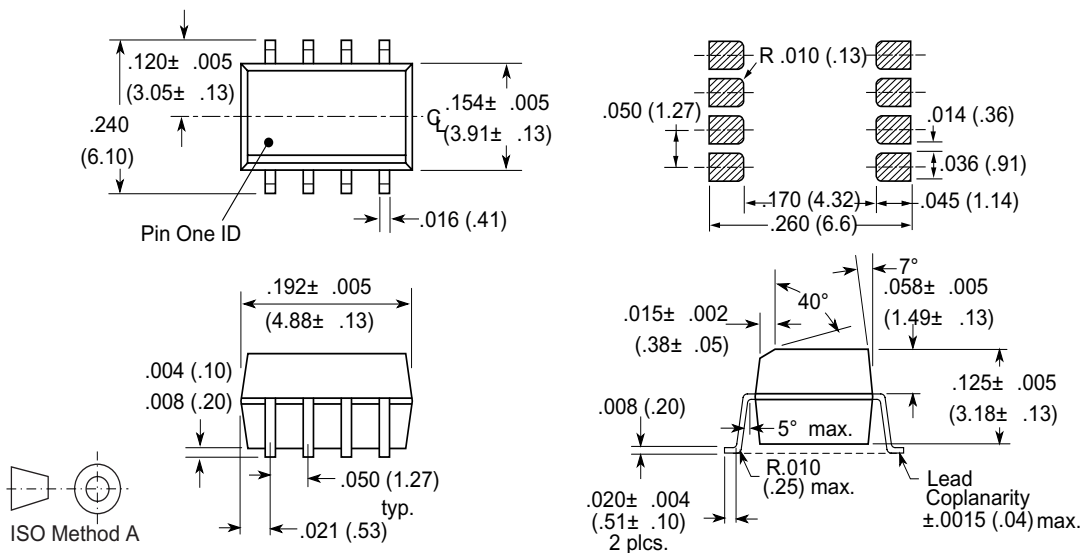
Figure 9. Logic High Output Current vs. Temperature



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Figure 10. Small Signal Current Transfer Ratio vs. Quiescent Input Current

## Package Dimensions in Inches (mm)



i178003

### Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

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.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

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.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

We reserve the right to make changes to improve technical design  
and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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