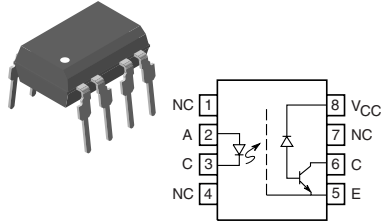


High Speed Optocoupler, 1 Mbd, 15 kV/μs CMR, Transistor Output



1179072

DESCRIPTION

The SFH6345 is an optocoupler with a GaAlAs infrared emitting diode, optically coupled to an integrated photo detector consisting of a photo diode and a high speed transistor in a DIP-8 plastic package. The device is similar to the 6N135 but has an additional faraday shield on the detector which enhances the input-output dV/dt immunity. Signals can be transmitted between two electrically separated circuits up to frequencies of 2 MHz. The potential difference between the circuits to be coupled should not exceed the maximum permissible reference voltages.

FEATURES

- Direct replacement for HCPL 4503
- High speed optocoupler without base connection
- Isolation test voltage: 5300 V_{RMS}
- GaAlAs emitter
- Integrated detector with photo diode and transistor
- High data transmission rate: 1.0 MBit/s
- TTL compatible
- Open collector output
- Good CTR linearity relative to forward current
- Field effect stable
- Low coupling capacitance
- Very high common mode transient immunity dV/dt: ≥ 15 kV/μs at V_{CM} = 1500 V
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC


RoHS
COMPLIANT

APPLICATIONS

- Data communications
- IGBT drivers
- Programmable controllers

AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 pending available with option 1

ORDER INFORMATION

PART	REMARKS
SFH6345	CTR 30 %, DIP-8
SFH6345-X006	CTR 30 %, DIP-8 400 mil (option 6)
SFH6345-X007	CTR 30 %, SMD-8 (option 7)
SFH6345-X009	CTR 30 %, SMD-9 (option 9)

Note

For additional information on the available options refer to option information.

ABSOLUTE MAXIMUM RATINGS (1)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Reverse voltage		V _R	3.0	V
DC forward current		I _F	25	mA
Surge forward current	t _p = 1 μs, 300 pulses/s	I _{FSM}	1.0	A
Power dissipation		P _{diss}	45	mW

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ABSOLUTE MAXIMUM RATINGS ⁽¹⁾				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
OUTPUT				
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		P_{diss}	100	mW
COUPLER				
Isolation test voltage between emitter and detector, refer to climate DIN 40046, part 2, Nov. 74		V_{ISO}	5300	V_{RMS}
Isolation resistance	$V_{IO} = 500\text{ V}, T_{amb} = 25\text{ }^\circ\text{C}$	R_{IO}	$\geq 10^{12}$	Ω
	$V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^\circ\text{C}$	R_{IO}	$\geq 10^{11}$	Ω
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 ⁽²⁾	max. 10 s, max. dip soldering: distance to seating plane $\geq 1.5\text{ mm}$	T_{sld}	260	$^\circ\text{C}$

Notes

⁽¹⁾ $T_{amb} = 25\text{ }^\circ\text{C}$, 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 ratings for extended periods of the time can adversely affect reliability.

⁽²⁾ Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP)

ELECTRICAL CHARACTERISTICS ⁽¹⁾							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
INPUT ⁽²⁾							
Forward voltage	$I_F = 16\text{ mA}$	V_F		1.6	1.9	V	
Reverse current	$V_R = 3.0\text{ V}$	I_R		0.5	10	μA	
Capacitance	$V_R = 0\text{ V}, f = 1.0\text{ MHz}$	C_O		75		pF	
Thermal resistance		R_{thja}		700		K/W	
OUTPUT							
Supply current, logic high	$I_F = 0\text{ V}, V_O = \text{open}, V_{CC} = 15\text{ V}$	I_{CCH}		0.01	1.0	μA	
		I_{CCH}		0.01	2.0	μA	
Output current, output high	$I_F = 0\text{ V}, V_O = V_{CC} = 5.5\text{ V}$	I_{OH}		0.003	0.5	μA	
		I_{OH}	$I_F = 0\text{ V}, V_O = V_{CC} = 15\text{ V}$		0.01	1.0	μA
						50	μA
Collector emitter capacitance	$V_{CE} = 5.0\text{ V}, f = 1.0\text{ MHz}$	C_{CE}		3.0		pF	
Thermal resistance		R_{thja}		300		K/W	
COUPLER							
Coupling capacitance		C_C		0.6		pF	
Collector emitter saturation voltage	$I_F = 16\text{ mA}, I_O = 2.4\text{ mA}, V_{CC} = 4.5\text{ V}$	V_{OL}		0.1	0.4	V	
Logic low supply current	$I_F = 16\text{ mA}, V_O = \text{open}, V_{CC} = 15\text{ V}$	I_{CCL}		80	200	μA	

Notes

⁽¹⁾ $T_{amb} = 25\text{ }^\circ\text{C}$, 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.

⁽²⁾ $T_{amb} = 0\text{ }^\circ\text{C}$ to $70\text{ }^\circ\text{C}$, unless otherwise specified, typical values $T_{amb} = 25\text{ }^\circ\text{C}$.

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CURRENT TRANSFER RATIO						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Current transfer ratio	$I_F = 16 \text{ mA}$, $V_O = 0.4 \text{ V}$, $V_{CC} = 4.5 \text{ V}$	I_C/I_F	19	30		%
	$I_F = 16 \text{ mA}$, $V_O = 0.5 \text{ V}$, $V_{CC} = 4.5 \text{ V}$, $T_{\text{amb}} = 0^\circ \text{ C to } 70^\circ \text{ C}$	I_C/I_F	15			%

SWITCHING CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Propagation delay time (high to low), see fig. 1	$I_F = 16 \text{ mA}$, $V_{CC} = 5.0 \text{ V}$, $R_L = 1.9 \text{ k}\Omega$	t_{PHL}		0.3	0.8	μ s
Propagation delay time (low to high), see fig. 1	$I_F = 16 \text{ mA}$, $V_{CC} = 5.0 \text{ V}$, $R_L = 1.9 \text{ k}\Omega$	t_{PLH}		0.3	0.8	μ s

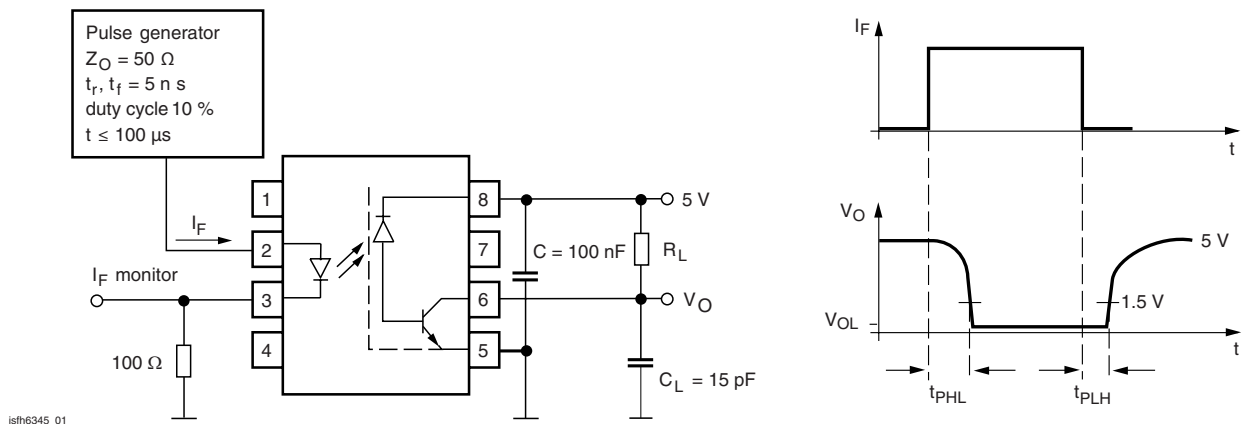


Fig. 1 - Switching Times (Typ.)

COMMON MODE TRANSIENT IMMUNITY						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Common mode transient immunity (high), see fig. 2	$I_O = 0 \text{ mA}$, $V_{\text{CM}} = 1500 \text{ V}_{\text{P-P}}$, $R_L = 1.9 \text{ k}\Omega$, $V_{CC} = 5.0 \text{ V}$	$ CM_H $	15	30		kV/ μ s
Common mode transient immunity (low), see fig. 2	$I_O = 16 \text{ mA}$, $V_{\text{CM}} = 1500 \text{ V}_{\text{P-P}}$, $R_L = 1.9 \text{ k}\Omega$, $V_{CC} = 5.0 \text{ V}$	$ CM_L $	15	30		kV/ μ s

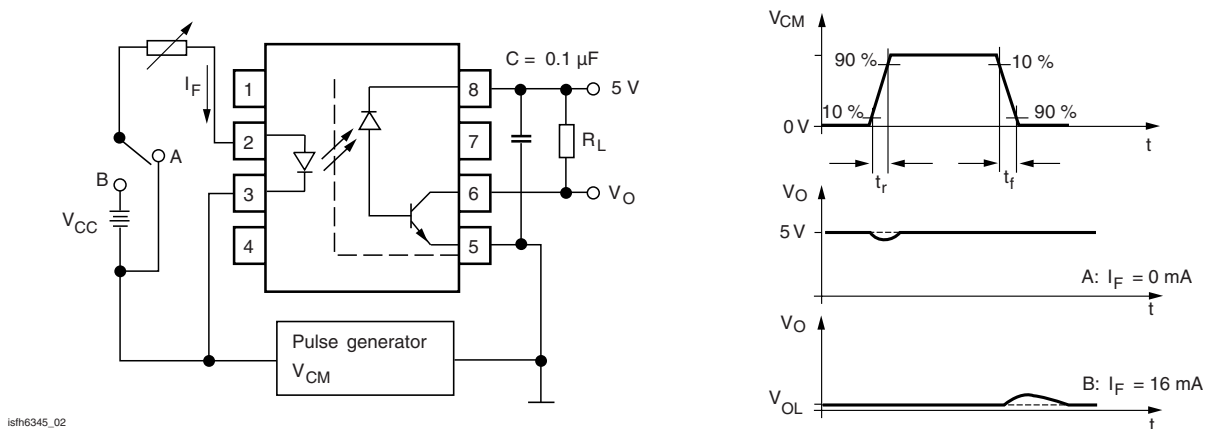


Fig. 2 - Common Mode Transient Immunity

SAFETY AND INSULATION RATINGS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Climatic classification	IEC 68 part 1			55/100/21		
Comparative tracking index		CTI	175		399	
V_{IOTM}			8000			V
V_{IORM}			890			V
P_{SO}					500	mW
I_{SI}					300	mA
T_{SI}					175	$^{\circ}$ C
Creepage distance	standard DIP-8		7			mm
Clearance distance	standard DIP-8		7			mm
Creepage distance	400 mil DIP-8		8			mm
Clearance distance	400 mil DIP-8		8			mm

Note

As per IEC 60747-5-2, § 7.4.3.8.1, 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.

TYPICAL CHARACTERISTICS

$T_{amb} = 25^{\circ}$ C, unless otherwise specified

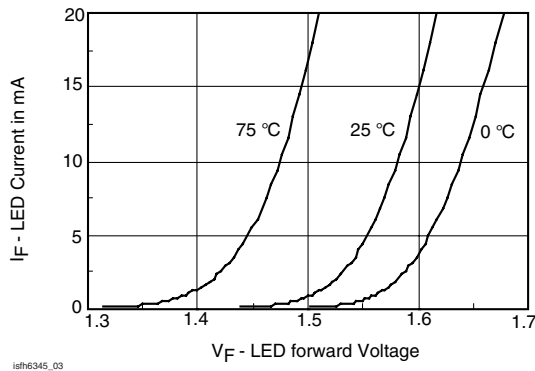


Fig. 3 - Logic High Output Current vs. Temperature

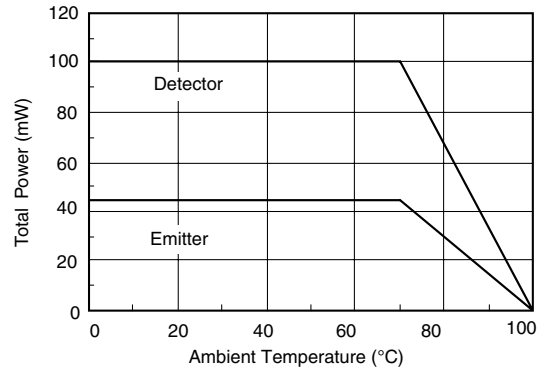


Fig. 5 - Permissible Power Dissipation vs. Temperature

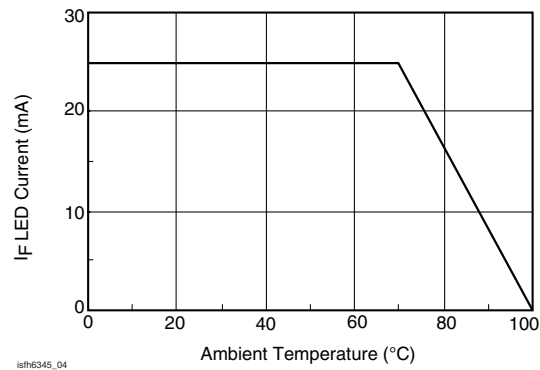


Fig. 4 - Permissible Forward LED Current vs. Temperature

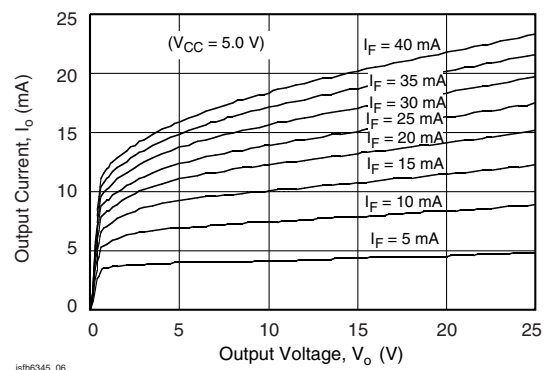
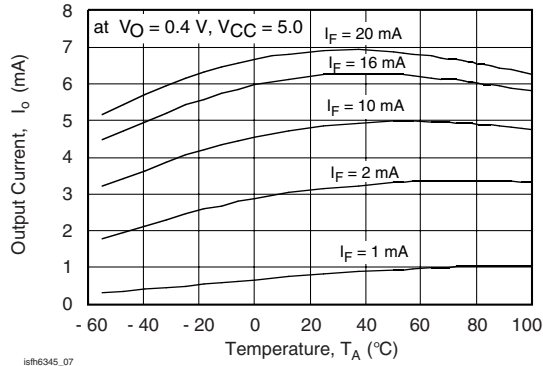


Fig. 6 - Output Current vs. Output Voltage

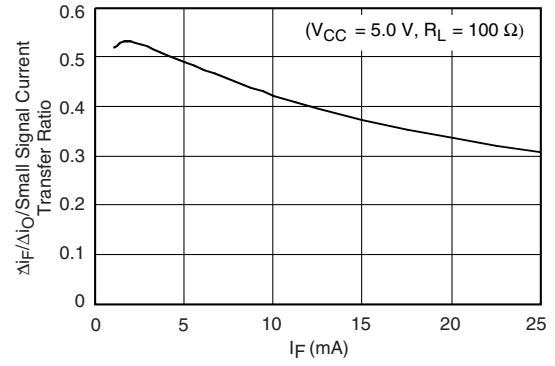


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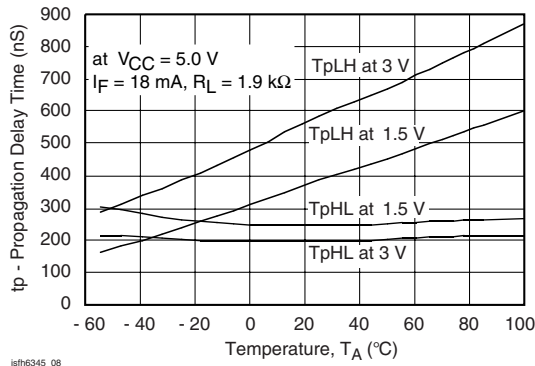
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Fig. 7 - Output Current vs. Temperature



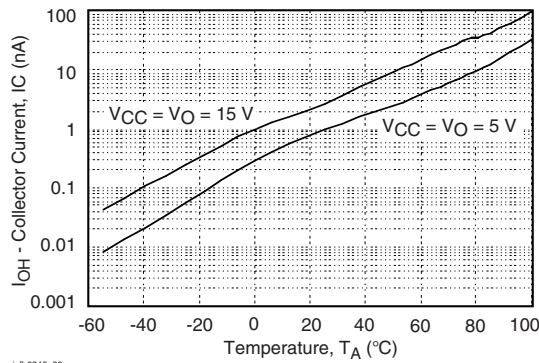
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Fig. 10 - Small Signal Current Transfer Ratio vs. Input Current



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Fig. 8 - Propagation Delay vs. Ambient Temperature



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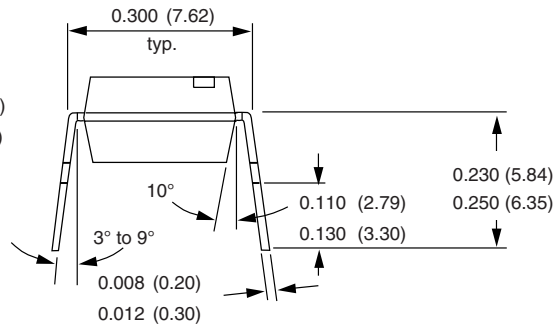
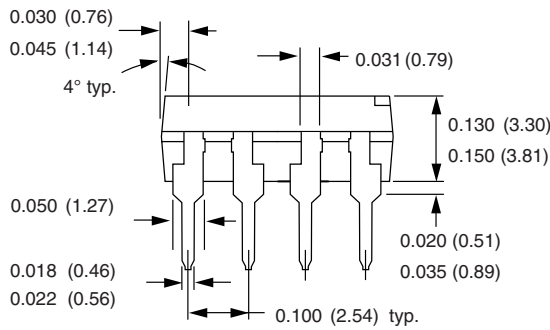
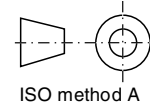
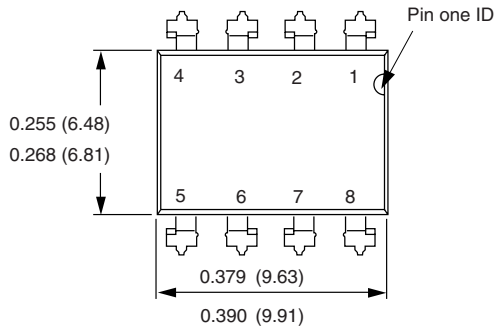
Fig. 9 - Logic High Output Current vs. Temperature

SFH6345



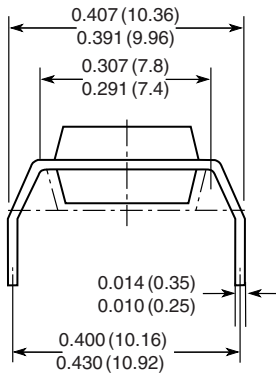
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PACKAGE DIMENSIONS in inches (millimeters)

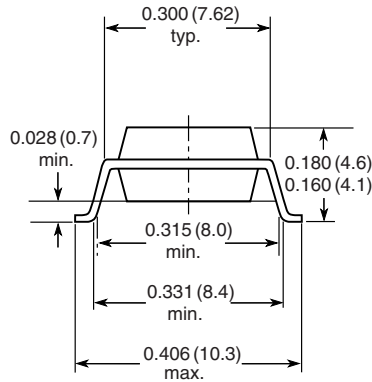


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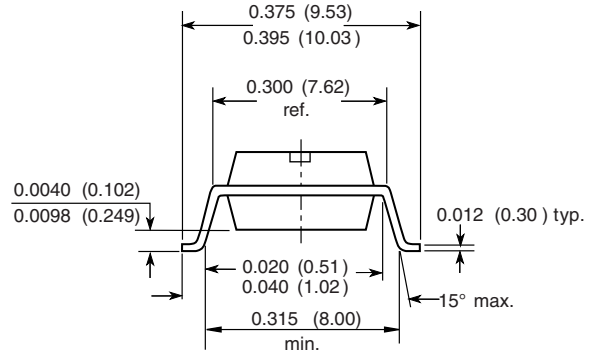
Option 6



Option 7



Option 9



18450

**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.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany



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