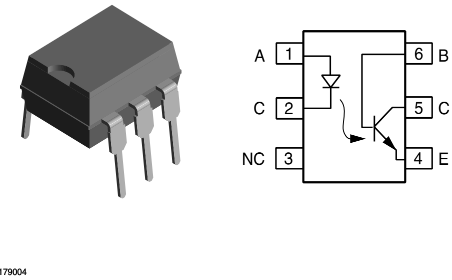
Optocoupler, Phototransistor Output, With Base Connection, 300 V BV_{CEO}

Features

- Good CTR Linearity with Forward Current
- Low CTR Degradation
- Very High Collector-emitter Breakdown Voltage, BV_{CER} = 300 V
- Isolation Test Voltage: 5300 V_{RMS}
- Low Coupling Capacitance
- High Common Mode Transient Immunity
- Phototransistor Optocoupler 6 Pin DIP Package with Base Connection
- 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
- DIN EN 60747-5-2 (VDE0884)
  DIN EN 60747-5-5 pending
  Available with Option 1
- CSA 93751
- BSI IEC60950 IEC60065

Description

The SFH 640 is an optocoupler with very high BV_{CER}, a minimum of 300 V. It is intended for telecommunications applications or any DC application requiring a high blocking voltage.

Order Information

Part	Remarks
SFH640-1	CTR 40 - 80 %, DIP-6
SFH640-2	CTR 63 - 125 %, DIP-6
SFH640-3	CTR 100 - 200 %, DIP-6
SFH640-2X007	CTR 63 - 125 %, SMD-6 (option 7)
SFH640-3X007	CTR 100 - 200 %, SMD-6 (option 7)
SFH640-3X009	CTR 100 - 200 %, SMD-6 (option 9)

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

Absolute Maximum Ratings

T_{amb} = 25 °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	6.0	V
DC Forward current		I_F	60	mA
Surge forward current	$t_p \leq 10\ \mu s$	I_{FSM}	2.5	A
Total power dissipation		P_{diss}	100	mW

Output

Parameter	Test condition	Symbol	Value	Unit
Collector-emitter voltage		V_{CE}	300	V
Collector-base voltage		V_{CBO}	300	V
Emitter-base voltage		V_{EBO}	7.0	V
Collector current		I_C	50	mA
Surge collector current	$t_p \leq 1.0$ ms	I_{FSM}	100	mA
Total power dissipation		P_{diss}	300	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}	5300/7500	V_{RMS}/V_{PK}
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	$\geq 10^{12}$	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	$\geq 10^{11}$	Ω
Insulation thickness between emitter and detector			≥ 0.4	mm
Creepage			≥ 7.0	mm
Clearance			≥ 7.0	mm
Comparative tracking index per DIN IEC 112/VDE 0303, part 1			175	
Storage temperature range		T_{stg}	- 55 to + 150	°C
Operating temperature range		T_{amb}	- 55 to + 100	°C
Junction temperature		T_j	100	°C
Soldering temperature	max. 10 s, dip soldering: distance to seating plane ≥ 1.5 mm	T_{sld}	260	°C

Electrical Characteristics

T_{amb} = 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

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	I_F = 10 mA	V_V		1.1	1.5	V
Reverse voltage	I_R = 10 µA	V_R	6.0			V
Reverse current	V_R = 6.0 V	I_R		0.01	10	µA
Capacitance	V_R = 0 V, f = 1.0 MHz	C_O		25		pF
Thermal resistance		R_{thja}		750		K/W

Output

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector-emitter breakdown voltage	I_{CE} = 1.0 mA, R_{BE} = 1.0 MΩ	BV_{CER}	300			V
Voltage emitter-base	I_{EB} = 10 µA	BV_{BEO}	7.0			V
Collector-emitter capacitance	V_{CE} = 10 V, f = 1.0 MHz	C_{CE}		7.0		pF

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector - base capacitance	V_{CB} = 10 V, f = 1.0 MHz	C_{CB}		8.0		pF
Emitter - base capacitance	V_{EB} = 5.0 V, f = 1.0 MHz	C_{EB}		38		pF
Thermal resistance		R_{thja}		250		K/W

Coupler

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Coupling capacitance			C_C		0.6		pF
Saturation voltage, collector-emitter	I_F = 10 mA, I_C = 2.0 mA	SFH640-1	V_{CEsat}		0.25	0.4	V
	I_F = 10 mA, I_C = 3.2 mA	SFH640-2	V_{CEsat}		0.25	0.4	V
	I_F = 10 mA, I_C = 5.0 mA	SFH640-3	V_{CEsat}		0.25	0.4	V
Collector-emitter leakage current	V_{CE} = 200 V, R_{BE} = 1.0 MΩ		I_{CER}		1.0	100	nA

Current Transfer Ratio

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
Current Transfer Ratio	I_F = 10 mA, V_{CE} = 10 V	SFH640-1	I_C/I_F	40		80	%
	I_F = 1.0 mA, V_{CE} = 10 V	SFH640-1	I_C/I_F	13	30		%
	I_F = 10 mA, V_{CE} = 10 V	SFH640-2	I_C/I_F	63		125	%
	I_F = 1.0 mA, V_{CE} = 10 V	SFH640-2	I_C/I_F	22	45		%
	I_F = 10 mA, V_{CE} = 10 V	SFH640-3	I_C/I_F	100		200	%
	I_F = 1.0 mA, V_{CE} = 10 V	SFH640-3	I_C/I_F	34	70		%

Switching Characteristics

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Turn-on time	I_C = 2.0 mA, R_L = 100 Ω, V_{CC} = 10 V	t_{on}		5.0		μs
Rise time	I_C = 2.0 mA, R_L = 100 Ω, V_{CC} = 10 V	t_r		2.5		μs
Turn-off time	I_C = 2.0 mA, R_L = 100 Ω, V_{CC} = 10 V	t_{off}		6.0		μs
Fall time	I_C = 2.0 mA, R_L = 100 Ω, V_{CC} = 10 V	t_f		5.5		μs

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

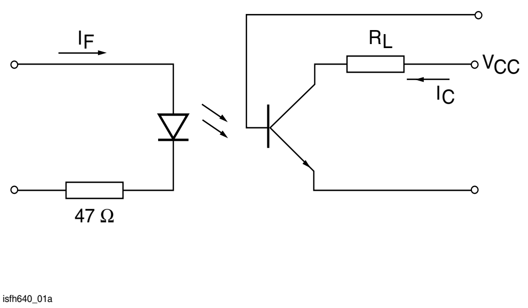


Figure 1. Switching Times Measurement-Test Circuit and Waveform

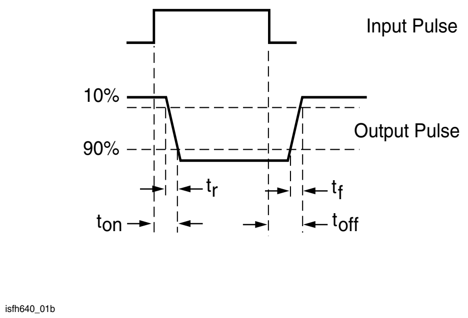


Figure 2. Switching Times Measurement-Test Circuit and Waveform

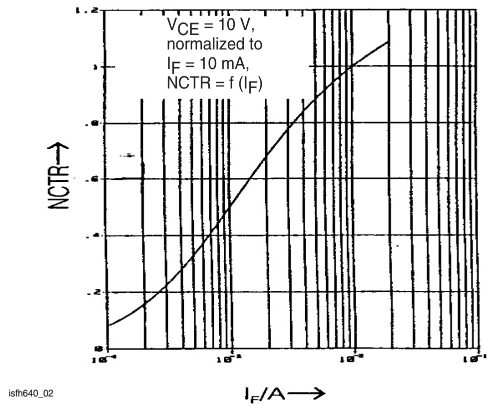


Figure 3. Current Transfer Ratio (typ.)

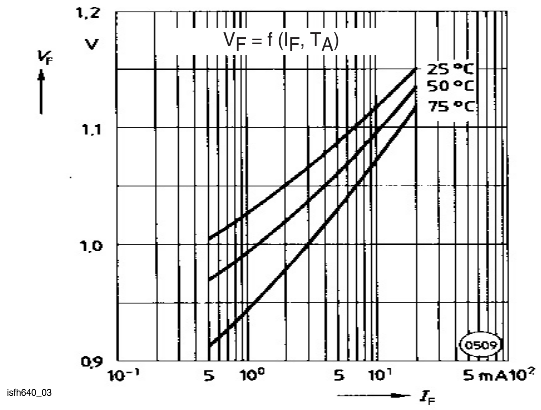


Figure 4. Diode Forward Voltage (typ.)

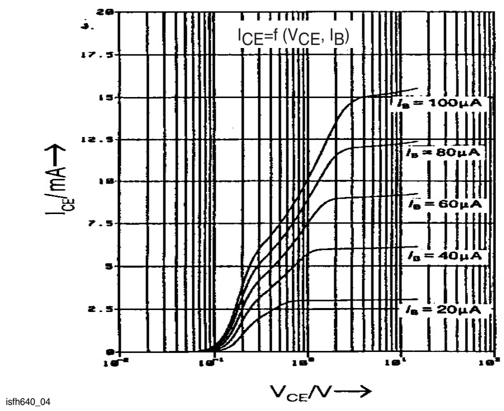


Figure 5. Output Characteristics (typ.)

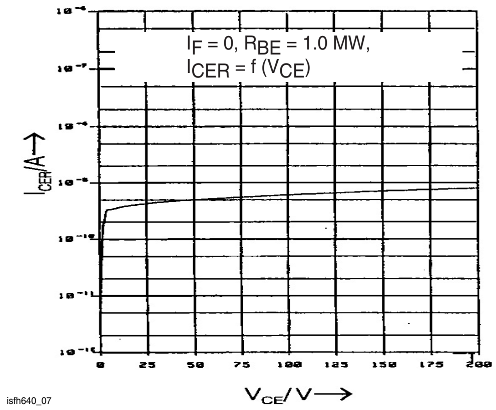


Figure 8. Collector-Emitter Leakage Current (typ.)

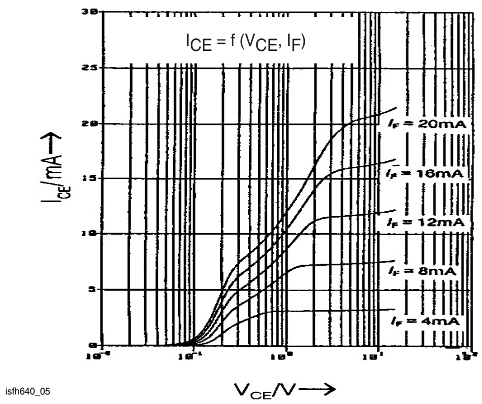


Figure 6. Output Characteristics (typ.)

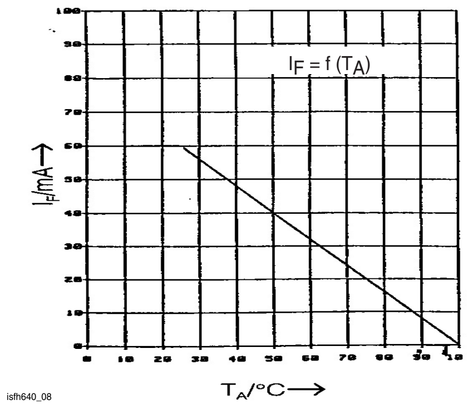


Figure 9. Permissible Loss Diode

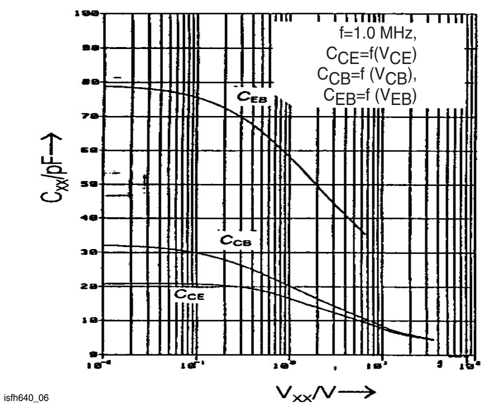


Figure 7. Transistor Capacitances (typ.)

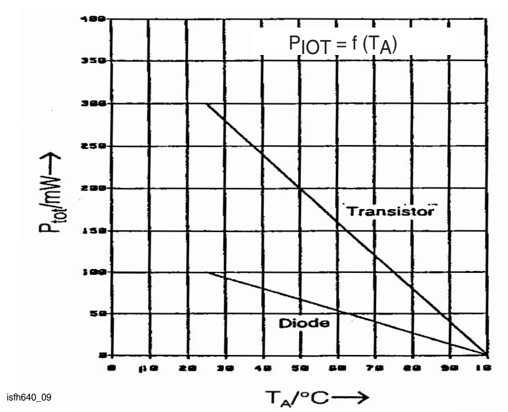
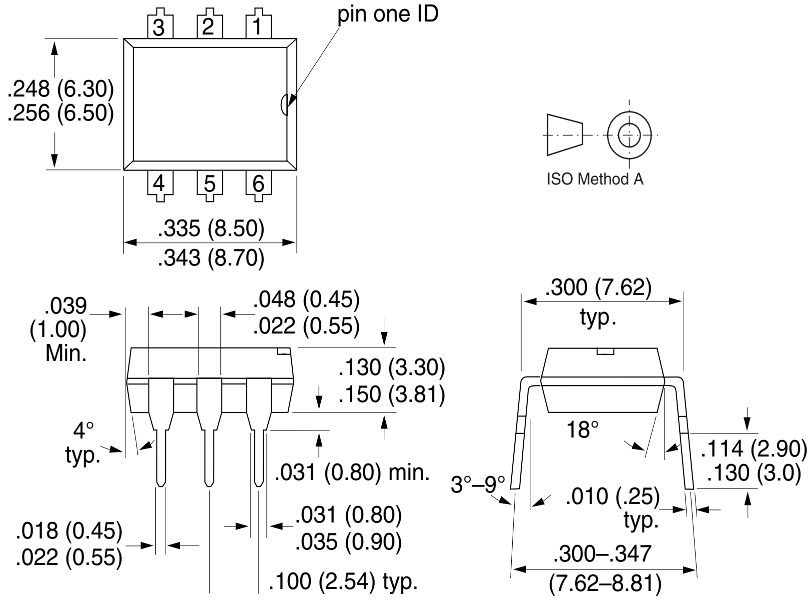


Figure 10. Permissible Power Dissipation

Package Dimensions in Inches (mm)



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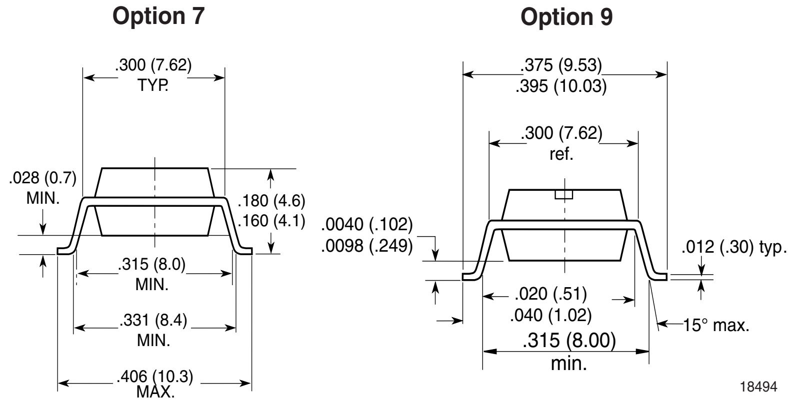

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Ozone Depleting Substances Policy Statement

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 operatingsystems 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.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany
Telephone: 49 (0)7131 67 2831, Fax number: 49 (0)7131 67 2423