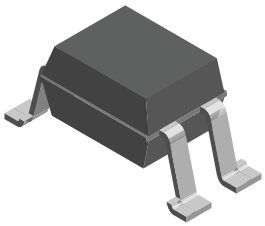
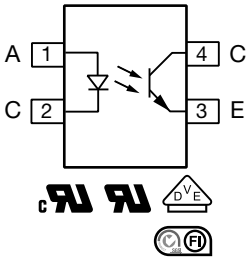
Optocoupler, Phototransistor Output, High Reliability, 5300 V_{RMS}





FEATURES

- Excellent CTR linearity depending on forward current
- Isolation test voltage, 5300 V_{RMS}
- Fast switching times
- Low CTR degradation
- Low coupling capacitance
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

LINKS TO ADDITIONAL RESOURCES

Product Page | Design Tools | 3D Models | SPICE Models

DESCRIPTION

The SFH615A-3X018T and SFH615A-4X018T features a variety of transfer ratios, low coupling capacitance and high isolation voltage. This coupler has a GaAs infrared diode emitter, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a plastic SMD package.

The coupling devices are designed for signal transmission between two electrically separated circuits.

APPLICATIONS

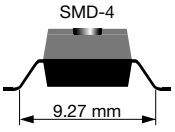
- Switchmode power supply
- Telecom
- Battery powered equipment

AGENCY APPROVALS

- UL 1577
- cUL
- DIN EN 60747-5-5 (VDE0884-5) available with option 1
- BSI
- FIMKO

ORDERING INFORMATION

S	F	H	6	1	5	A	-	#	X	0	1	8	T
PART NUMBER								CTR BIN	PACKAGE OPTION				TAPE AND REEL



AGENCY CERTIFIED / PACKAGE	CTR (%)	
	10 mA	
UL, cUL, BSI, FIMKO	**100 to 200**	**160 to 320**
SMD-4, option 8	SFH615A-3X008T	SFH615A-4X008T
UL, cUL, BSI, FIMKO, VDE (option 1)	**100 to 200**	**160 to 320**
SMD-4, option 8	SFH615A-3X018T [1]	SFH615A-4X018T

Note

[1] Also available in tubes; do not add “T” to end

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6	V
DC forward current		I_F	60	mA
Surge forward current	$t_p \leq 10$ µs	I_{FSM}	2.5	A
OUTPUT				
Collector emitter voltage		V_{CEO}	70	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
	$t_p \leq 1$ ms	I_C	100	mA
COUPLER				
Storage temperature range		T_{stg}	-55 to +150	°C
Ambient temperature range		T_{amb}	-55 to +100	°C
Soldering temperature [1]	max. 10 s	T_{sld}	260	°C

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.

(1) Refer to reflow profile for soldering conditions for surface mounted devices (SMD)

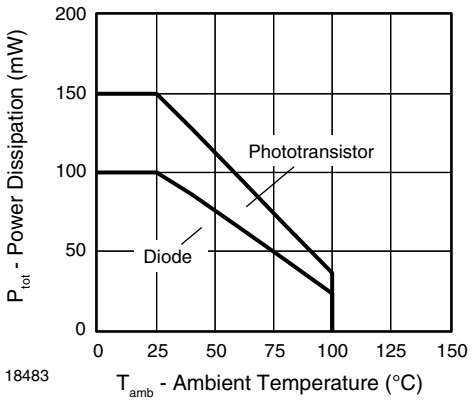
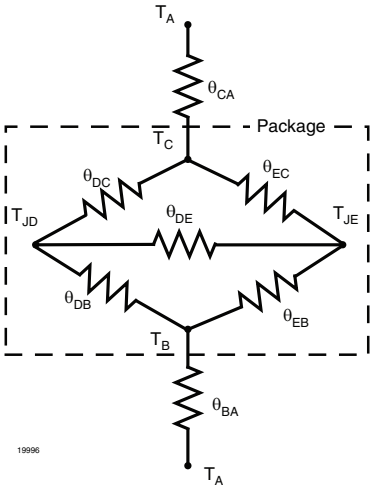


Fig. 1 - Permissible Power Dissipation vs. Ambient Temperature

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	VALUE	UNIT
LED power dissipation	P_{diss}	100	mW
Output power dissipation	P_{diss}	150	mW
Maximum LED junction temperature	$T_{jmax.}$	125	°C
Maximum output die junction temperature	$T_{jmax.}$	125	°C
Thermal resistance, junction emitter to board	θ_{EB}	173	°C/W
Thermal resistance, junction emitter to case	θ_{EC}	149	°C/W
Thermal resistance, junction detector to board	θ_{DB}	111	°C/W
Thermal resistance, junction detector to case	θ_{DC}	127	°C/W
Thermal resistance, junction emitter to junction detector	θ_{ED}	95	°C/W
Thermal resistance, board to ambient (1)	θ_{BA}	195	°C/W
Thermal resistance, case to ambient (1)	θ_{CA}	3573	°C/W



Notes

- The thermal model is represented in the thermal network below. Each resistance value given in this model can be used to calculate the temperatures at each node for a given operating condition. The thermal resistance from board to ambient will be dependent on the type of PCB, layout and thickness of copper traces. For a detailed explanation of the thermal model, please reference Vishay's thermal characteristics of optocouplers application note.

(1) For 2 layer FR4 board (4" x 3" x 0.062")

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT						
Forward voltage	I_F = 60 mA	V_F	-	1.25	1.65	V
Reverse current	V_R = 6 V	I_R	-	0.01	10	µA
Capacitance	V_R = 0 V, f = 1 MHz	C_O	-	13	-	pF
OUTPUT						
Collector emitter capacitance	V_{CE} = 5 V, f = 1 MHz	C_{CE}	-	5.2	-	pF
Collector emitter leakage current	V_{CE} = 10 V	I_{CEO}	-	5	100	nA
COUPLER						
Collector emitter saturation voltage	I_F = 10 mA, I_C = 2.5 mA	V_{CEsat}	-	0.25	0.4	V
Coupling capacitance		C_C	-	0.4	-	pF

Note

- 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.

CURRENT TRANSFER RATIO

PARAMETER	TEST CONDITION	SYMBOL	BIN	MIN.	TYP.	MAX.	UNIT
I_C/I_F	I_F = 10 mA, V_{CE} = 5 V	CTR	3	100	-	200	%
		CTR	4	160	-	320	%
	I_F = 1 mA, V_{CE} = 5 V	CTR	3	34	70	-	%
		CTR	4	56	90	-	%

SWITCHING CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
NON-SATURATED						
Rise time	I_F = 10 mA, V_{CC} = 5 V, T_A = 25 °C, R_L = 75 Ω	t_r	-	2	-	µs
Fall time	I_F = 10 mA, V_{CC} = 5 V, T_A = 25 °C, R_L = 75 Ω	t_f	-	2	-	µs
Turn-on time	I_F = 10 mA, V_{CC} = 5 V, T_A = 25 °C, R_L = 75 Ω	t_{on}	-	3	-	µs
Turn-off time	I_F = 10 mA, V_{CC} = 5 V, T_A = 25 °C, R_L = 75 Ω	t_{off}	-	2.3	-	µs
Cut-off frequency	I_F = 10 mA, V_{CC} = 5 V, T_A = 25 °C, R_L = 75 Ω	f_{ctr}	-	250	-	kHz
SATURATED						
Rise time	V_{CC} = 5 V, T_A = 25 °C, R_L = 1 kΩ, I_F = 10 mA	t_r	-	3	-	µs
Fall time	V_{CC} = 5 V, T_A = 25 °C, R_L = 1 kΩ, I_F = 10 mA	t_f	-	14	-	µs
Turn-on time	V_{CC} = 5 V, T_A = 25 °C, R_L = 1 kΩ, I_F = 10 mA	t_{on}	-	4.2	-	µs
Turn-off time	V_{CC} = 5 V, T_A = 25 °C, R_L = 1 kΩ, I_F = 10 mA	t_{off}	-	23	-	µs

SAFETY AND INSULATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		55 / 100 / 21	
Pollution degree	According to DIN VDE 0109		2	
Comparative tracking index	Insulation group IIIa	CTI	175	
Maximum rated withstanding isolation voltage	According to UL1577, t = 1 min	V_{ISO}	4420	V_{RMS}
Tested withstanding isolation voltage	According to UL1577, t = 1 s	V_{ISO}	5300	V_{RMS}
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V_{IOTM}	10 000	V_{peak}
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V_{IORM}	890	V_{peak}
Isolation resistance	T_{amb} = 25 °C, V_{IO} = 500 V	R_{IO}	≥ 10^{12}	Ω
	T_{amb} = 100 °C, V_{IO} = 500 V	R_{IO}	≥ 10^{11}	Ω
Output safety power		P_{SO}	400	mW
Input safety current		I_{SI}	275	mA
Input safety temperature		T_S	175	°C
Creepage distance			≥ 8	mm
Clearance distance			≥ 8	mm
Insulation thickness		DTI	≥ 0.4	mm

Note

- As per IEC 60747-5-5, § 7.4.3.8.2, 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 °C, unless otherwise specified)

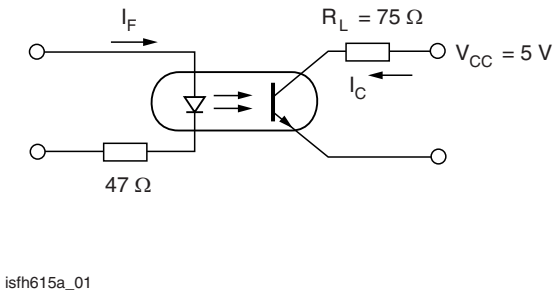


Fig. 2 - Linear Operation (without Saturation)

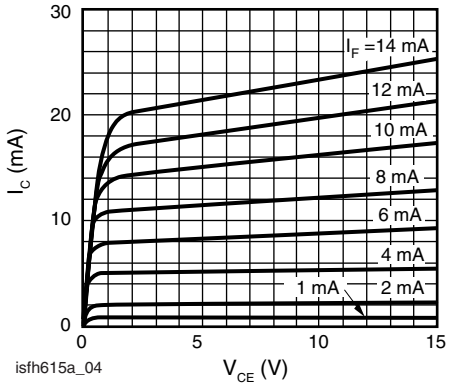


Fig. 5 - Output Characteristics (Typ.) Collector Current vs. Collector Emitter Voltage

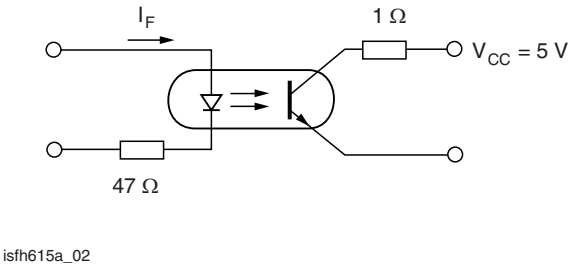


Fig. 3 - Switching Operation (with Saturation)

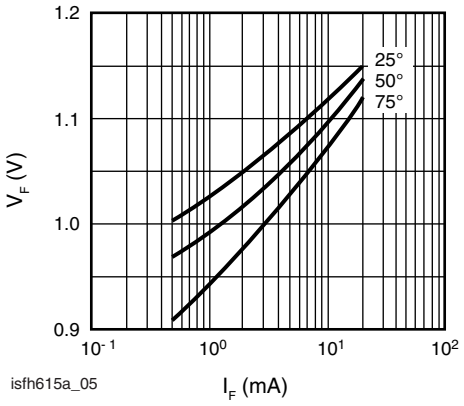


Fig. 6 - Diode Forward Voltage (Typ.) vs. Forward Current

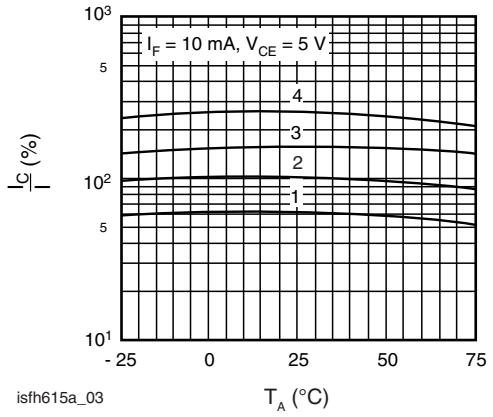


Fig. 4 - Current Transfer Ratio (Typ.) vs. Temperature

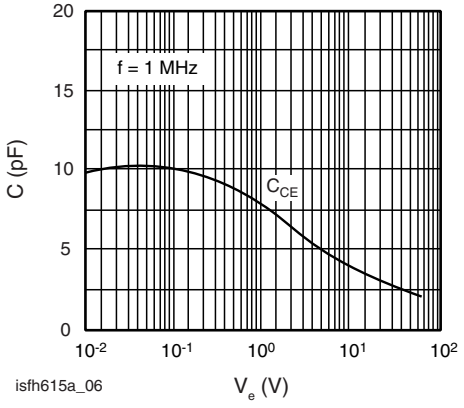


Fig. 7 - Transistor Capacitance (Typ.) vs. Collector Emitter Voltage

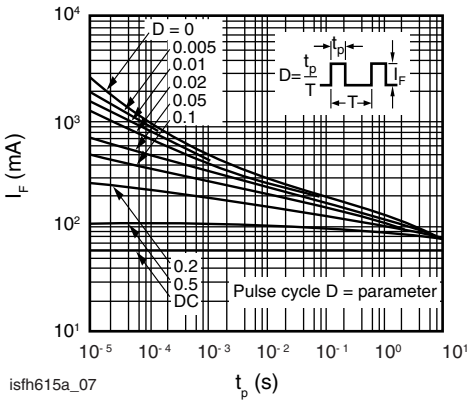
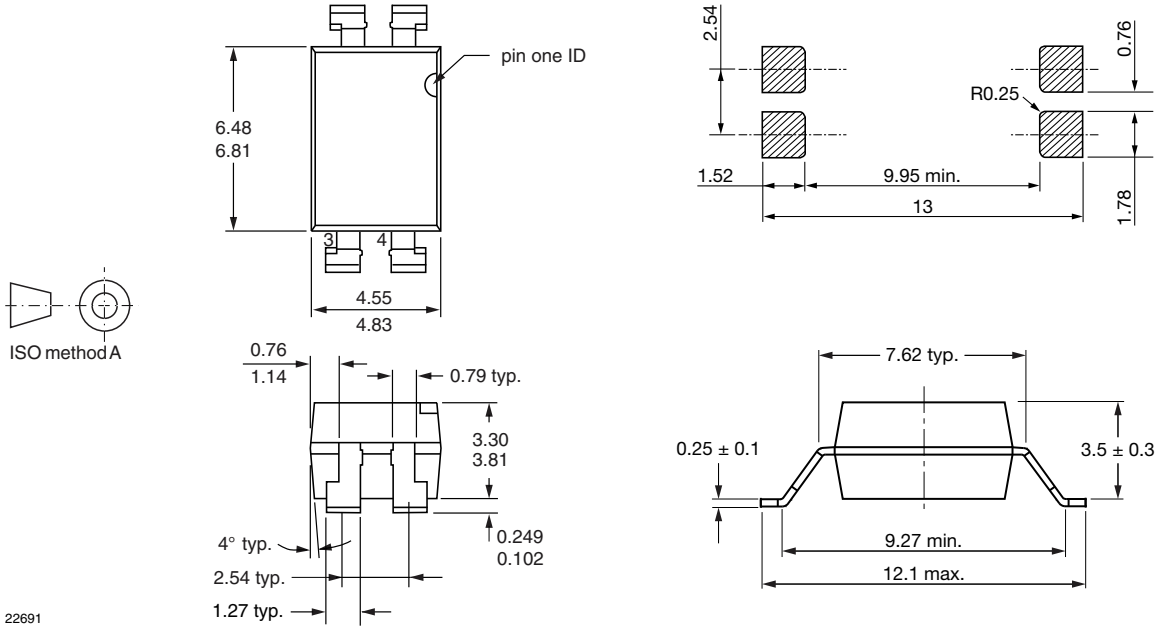
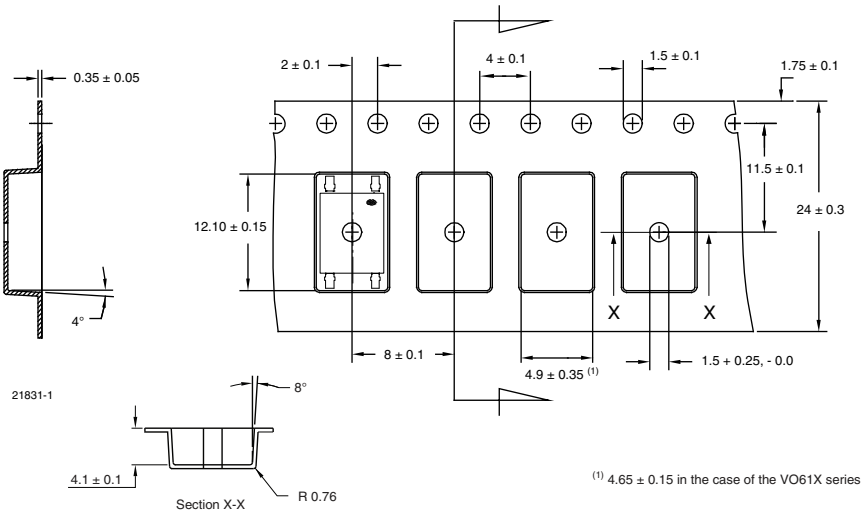


Fig. 8 - Permissible Pulse Handling Capability Forward Current vs. Pulse Width

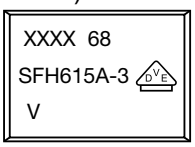
PACKAGE DIMENSIONS millimeters



SMD-4, Option 8



PACKAGE MARKING (example of SFH615A-3X018T)



Notes

- XXXX = LMC (lot marking code)
- VDE logo is only marked on option 1 parts
- Tape and reel suffix (T) is not part of the package marking

TAPE AND REEL PACKING	
TYPE	**UNITS/REEL**
SMD-4	1000

SOLDER PROFILES

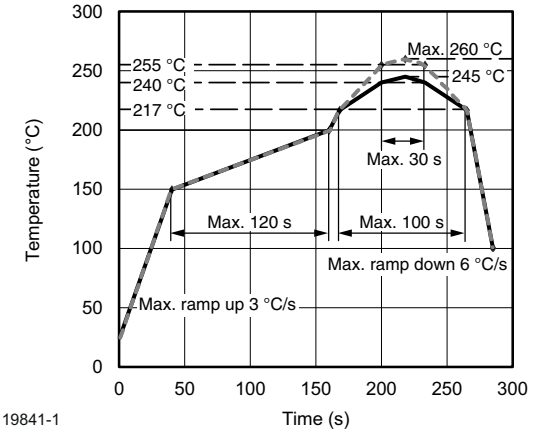


Fig. 9 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions: T_{amb} < 30 °C, RH < 85 %

Moisture sensitivity level 1, according to J-STD-020

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.