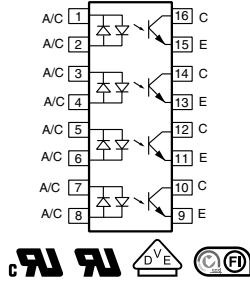
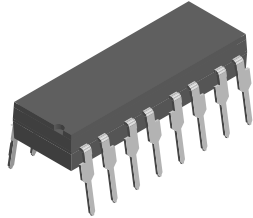


## Optocoupler, Phototransistor Output, AC Input (Quad Channel)



### LINKS TO ADDITIONAL RESOURCES



**SPICE**  
Models

### DESCRIPTION

The TCET4600 consists of a phototransistor optically coupled to 2 gallium arsenide infrared-emitting diodes in 16 pin lead plastic dual inline package.

### FEATURES

- Extra low coupling capacity - typical 0.2 pF
- High common mode rejection
- Low temperature coefficient of CTR
- Rated impulse voltage (transient overvoltage)  $V_{IOTM} = 10$  kV peak
- Isolation test voltage (partial discharge test voltage)  $V_{pd} = 1.6$  kV peak
- Rated isolation voltage (RMS includes DC)  $V_{IOWM} = 600$  V<sub>RMS</sub>
- Rated recurring peak voltage (repetitive)  $V_{IORM} = 890$  V<sub>peak</sub>
- Thickness through insulation  $\geq 0.4$  mm
- Creepage current resistance according to VDE 0303 / IEC 60112 comparative tracking index: CTI  $\geq 175$
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

### AGENCY APPROVALS

- [UL 1577](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884\)](#)
- [FIMKO](#)

ORDERING INFORMATION	
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">T</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">C</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">E</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">T</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">4</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">6</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">0</div> <div style="border: 1px solid black; padding: 2px 5px; margin: 2px;">0</div> </div> <p style="text-align: center; margin-top: 5px;">PART NUMBER</p>	
<b>AGENCY CERTIFIED / PACKAGE</b>	<b>CTR (%)</b>
	<b>± 5 mA</b>
<b>UL, cUL, VDE, FIMKO</b>	<b>20 to 300</b>
DIP-16, quad channel	TCET4600



ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
Reverse voltage		V <sub>R</sub>	6	V
Forward current		I <sub>F</sub>	± 60	mA
Forward surge current	t <sub>p</sub> ≤ 10 μs	I <sub>FSM</sub>	± 1.5	A
Power dissipation		P <sub>diss</sub>	100	mW
Junction temperature		T <sub>j</sub>	125	°C
<b>OUTPUT</b>				
Collector emitter voltage		V <sub>CEO</sub>	70	V
Emitter collector voltage		V <sub>ECO</sub>	7	V
Collector current		I <sub>C</sub>	50	mA
Collector peak current	t <sub>p</sub> /T = 0.5, t <sub>p</sub> ≤ 10 ms	I <sub>CM</sub>	100	mA
Power dissipation		P <sub>diss</sub>	150	mW
Junction temperature		T <sub>j</sub>	125	°C
<b>COUPLER</b>				
Total power dissipation		P <sub>tot</sub>	250	mW
Operating ambient temperature range		T <sub>amb</sub>	-55 to +100	°C
Storage temperature range		T <sub>stg</sub>	-55 to +150	°C
Soldering temperature <sup>(1)</sup>	2 mm from case, t ≤ 10 s	T <sub>slid</sub>	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 Rating for extended periods of the time can adversely affect reliability

<sup>(1)</sup> Refer to wave profile for soldering conditions for through hole devices

ELECTRICAL CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	I <sub>F</sub> = ± 50 mA	V <sub>F</sub>	-	1.25	1.6	V
Junction capacitance	V <sub>R</sub> = 0 V, f = 1 MHz	C <sub>j</sub>	-	50	-	pF
<b>OUTPUT</b>						
Collector emitter voltage	I <sub>C</sub> = 100 μA	V <sub>CEO</sub>	70	-	-	V
Emitter collector voltage	I <sub>E</sub> = 100 μA	V <sub>ECO</sub>	7	-	-	V
Collector dark current	V <sub>CE</sub> = 20 V, I <sub>F</sub> = 0 A, E = 0	I <sub>CEO</sub>	-	-	100	nA
<b>COUPLER</b>						
Collector emitter saturation voltage	I <sub>F</sub> = 10 mA, I <sub>C</sub> = 1 mA	V <sub>CEsat</sub>	-	-	0.3	V
Cut-off frequency	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 10 mA, R <sub>L</sub> = 100 Ω	f <sub>c</sub>	-	100	-	kHz
Coupling capacitance	f = 1 MHz	C <sub>k</sub>	-	0.3	-	pF

**Note**

- Minimum and maximum values were tested 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

CURRENT TRANSFER RATIO						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
I <sub>C</sub> /I <sub>F</sub>	V <sub>CE</sub> = 5 V, I <sub>F</sub> = ± 5 mA	CTR	20	-	300	%

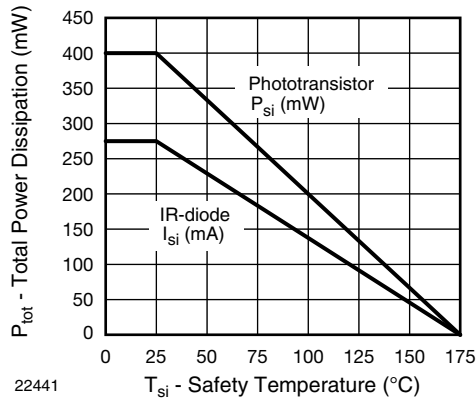


Fig. 1 - Derating Diagram

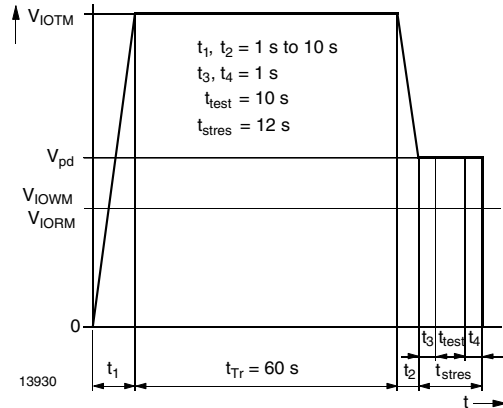


Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-2 (VDE 0884); IEC 60747-5-5

SWITCHING CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Delay time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ $\Omega$ , (see Fig. 3)	$t_d$	-	3	-	$\mu$ s
Rise time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ $\Omega$ , (see Fig. 3)	$t_r$	-	3	-	$\mu$ s
Fall time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ $\Omega$ , (see Fig. 3)	$t_f$	-	4.7	-	$\mu$ s
Storage time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ $\Omega$ , (see Fig. 3)	$t_s$	-	0.3	-	$\mu$ s
Turn-on time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ $\Omega$ , (see Fig. 3)	$t_{on}$	-	6	-	$\mu$ s
Turn-off time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ $\Omega$ , (see Fig. 3)	$t_{off}$	-	5	-	$\mu$ s
Turn-on time	$V_S = 5$ V, $I_F = 10$ mA, $R_L = 1$ k $\Omega$ , (see Fig. 4)	$t_{on}$	-	9	-	$\mu$ s
Turn-off time	$V_S = 5$ V, $I_F = 10$ mA, $R_L = 1$ k $\Omega$ , (see Fig. 4)	$t_{off}$	-	10	-	$\mu$ s

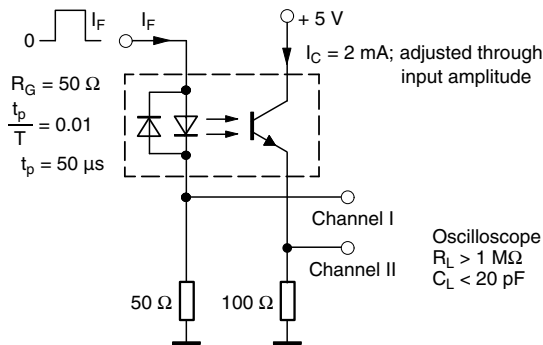


Fig. 3 - Test Circuit, Non-Saturated Operation

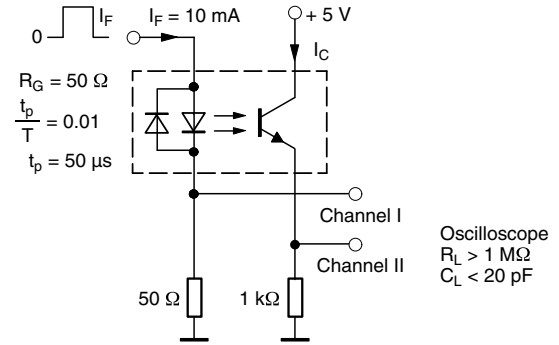


Fig. 4 - Test Circuit, Saturated Operation

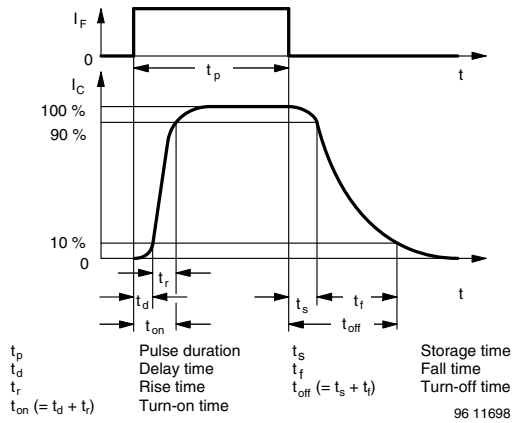


Fig. 5 - Switching Times

SAFETY AND INSULATION RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Climatic classification	According to IEC 68 part 1		55 / 100 / 21	
Comparative tracking index		CTI	175	
Maximum rated withstanding isolation voltage	$t = 1 \text{ min}$	$V_{ISO}$	4420	$V_{RMS}$
Maximum transient isolation voltage		$V_{IOTM}$	10 000	$V_{peak}$
Maximum repetitive peak isolation voltage		$V_{IORM}$	890	$V_{peak}$
Isolation resistance	$V_{IO} = 500 \text{ V}, T_{amb} = 25 \text{ }^\circ\text{C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500 \text{ V}, T_{amb} = 100 \text{ }^\circ\text{C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$
	$V_{IO} = 500 \text{ V}, T_{amb} = 150 \text{ }^\circ\text{C}$ (construction test only)	$R_{IO}$	$\geq 10^9$	$\Omega$
Output safety power		$P_{SO}$	400	mW
Input safety current		$I_{SI}$	275	mA
Safety temperature		$T_S$	175	$^\circ\text{C}$
Creepage distance	Standard DIP-16		$\geq 7$	mm
Clearance distance	Standard DIP-16		$\geq 7$	mm
Creepage distance	400 mil DIP-16		$\geq 8$	mm
Clearance distance	400 mil DIP-16		$\geq 8$	mm
Insulation thickness		DTI	$\geq 0.4$	mm
Partial discharge test voltage - routine test	100 %, $t_{test} = 1 \text{ s}$	$V_{pd}$	1.669	$\text{kV}_{peak}$
Partial discharge test voltage - lot test (sample test)	$t_{Tr} = 60 \text{ s}, t_{test} = 10 \text{ s}$ , (see Fig. 2)	$V_{pd}$	1.424	$\text{kV}_{peak}$

**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** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

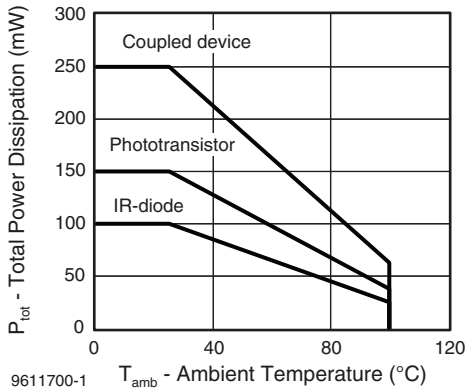


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

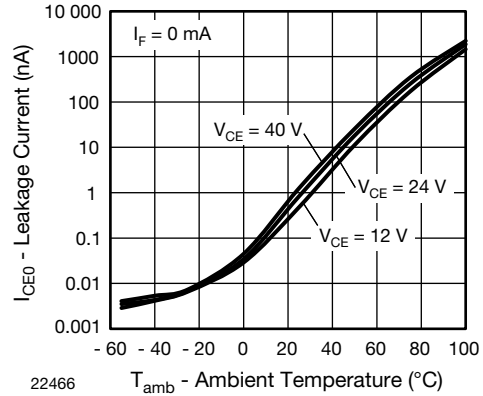


Fig. 9 - Leakage Current vs. Ambient Temperature

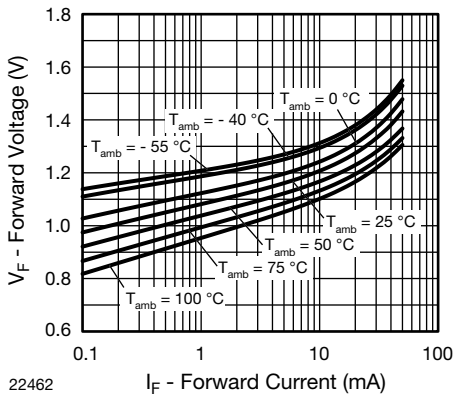


Fig. 7 - Forward Current vs. Forward Voltage

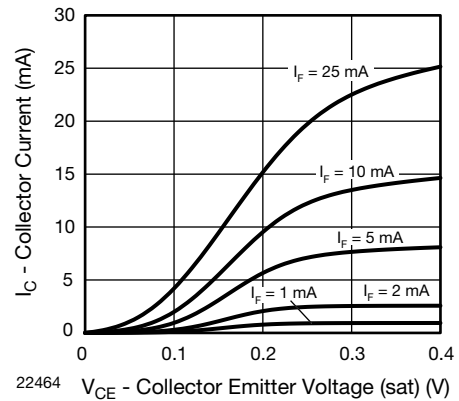


Fig. 10 - Collector Current vs. Collector Emitter Voltage (saturated)

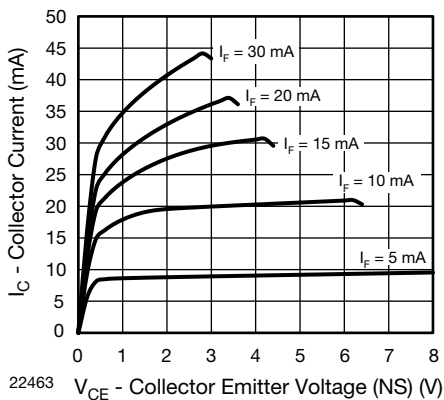


Fig. 8 - Collector Current vs. Collector Emitter Voltage (non-saturated)

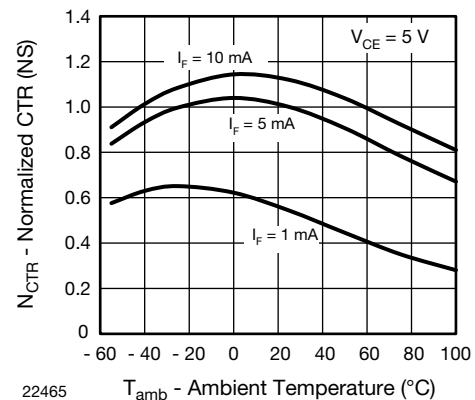


Fig. 11 - Normalized CTR (non-saturated) vs. Ambient Temperature

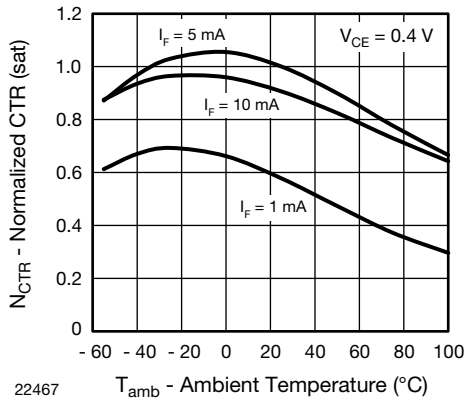


Fig. 12 - Normalized CTR (saturated) vs. Ambient Temperature

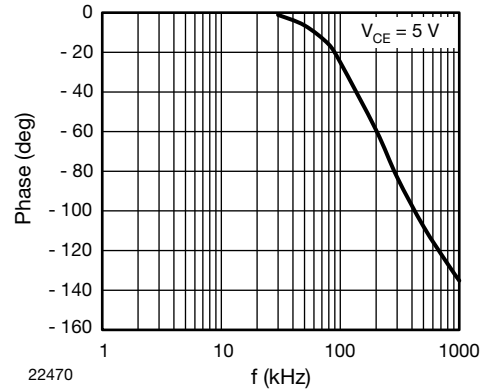


Fig. 15 -  $F_{CTR}$  vs. Phase Angle

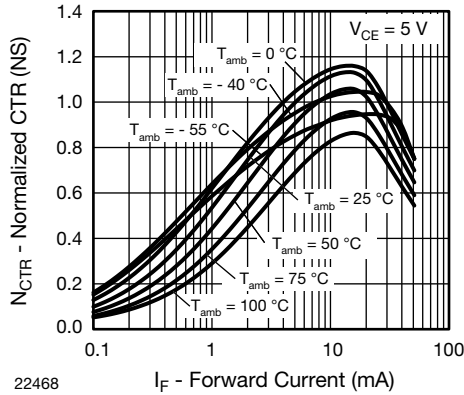


Fig. 13 - Normalized CTR (non-saturated) vs. Forward Current

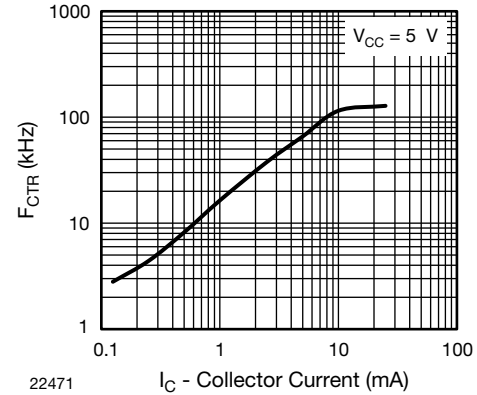


Fig. 16 -  $F_{CTR}$  vs.  $I_C$

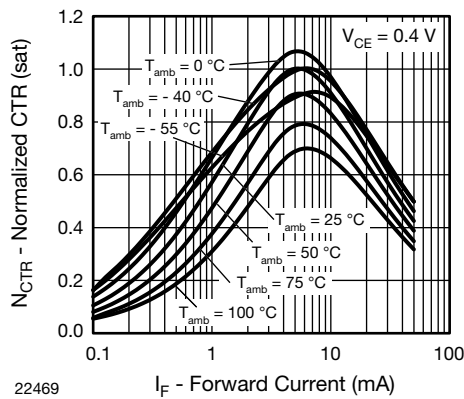


Fig. 14 - Normalized CTR (saturated) vs. Forward Current

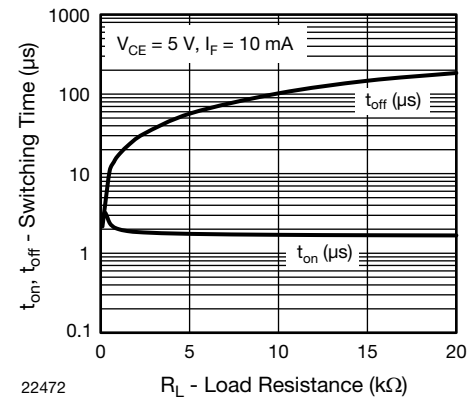


Fig. 17 - Switching Time vs. Load Resistance





## 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.