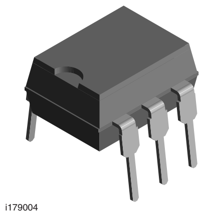
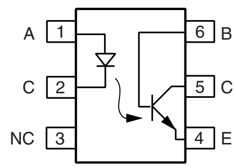
Optocoupler, Phototransistor Output, Low Input Current, With Base Connection





FEATURES

- Saturation CTR - MCT5211, > 100 % at I_F = 1.6 mA
- High isolation voltage, 5300 V_{RMS}
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

DESCRIPTION

The MCT521/5211 are optocouplers with a high efficiency AlGaAs LED optically coupled to a NPN phototransistor. The high performance LED makes operation at low input currents practical. The coupler is housed in a six pin DIP package. Isolation test voltage is 5300 V_{RMS}.
Because these parts have guaranteed CTRs at 1 mA and 3 mA, they are ideally suitable for interfacing from CMOS to TTL or LSTTL to TTL. They are also ideal for telecommunications applications such as ring or off-hook detection.

AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- BSI IEC 60950; IEC 60065
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 pending available with option 1
- CSA 93751

ORDER INFORMATION

PART	REMARKS
MCT5210	CTR > 70 %, DIP-6
MCT5211	CTR > 110 %, DIP-6
MCT5211-X007	CTR > 110 %, SMD-6 (option 7)
MCT5211-X009	CTR > 110 %, SMD-6 (option 9)

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

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Peak reverse voltage		V_R	6.0	V
Forward continuos current		I_F	40	mA
Power dissipation		P_{diss}	75	mW
Derate linearly from 25 °C			1.0	mW/°C
OUTPUT				
Collector emitter breakdown voltage		BV_{CEO}	30	V
Emitter collector breakdown voltage		BV_{ECO}	7.0	V
Collector base breakdown voltage		BV_{CBO}	70	V
Power dissipation		P_{diss}	200	mW
Derate linearly from 25 °C			2.6	mW/°C

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
COUPLER				
Isolation test voltage		V_{ISO}	5300	V_{RMS}
Total package dissipation (LED and detector)		P_{tot}	260	mW
Derate linearly from 25 °C			3.5	mW/°C
Creepage distance			≥ 7	mm
Clearance distance			≥ 7	mm
Comparative tracking index per DIN IEC 112/VDE 0303, part 1		CTI	175	
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	≥ 10^{12}	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	≥ 10^{11}	Ω
Operating temperature		T_{amp}	- 55 to + 100	°C
Storage temperature		T_{stg}	- 55 to + 150	°C

Note

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

ELECTRICAL CHARACTERISTICS							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT							
Forward voltage	I_F = 5.0 mA		V_F		1.2	1.5	V
Reverse voltage	I_R = 10 µA		V_R	6.0			V
OUTPUT							
DC forward current gain	V_{CE} = 5.0 V, I_C = 100 µA		h_{FE}	100	200		
Collector emitter breakdown voltage	I_C = 100 µA		BV_{CEO}	30			V
Emitter collector breakdown voltage	I_E = 100 µA		BV_{ECO}	7.0			V
Collector base breakdown voltage	I_E = 10 µA		BV_{CBO}	70			V
Collector emitter leakage voltage	V_{CE} = 10 V		I_{CEO}		5.0	100	nA
COUPLER							
Saturation voltage	I_F = 3.0 mA, I_C = 1.8 mA	MCT5210	V_{CEsat}		0.25	0.4	V
	I_F = 1.6 mA, I_C = 1.6 mA	MCT5211	V_{CEsat}		0.25	0.4	V

Note

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.

CURRENT TRANSFER RATIO							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Current transfer ratio (collector emitter saturated)	V_{CE} = 0.4 V, I_F = 3.0 mA	MCT5210	CTR_{CEsat}	60	120		%
	V_{CE} = 0.4 V, I_F = 1.6 mA	MCT5211	CTR_{CEsat}	100	200		%
	V_{CE} = 0.4 V, I_F = 1.0 mA	MCT5211	CTR_{CEsat}	75	150		%
Current transfer ratio	V_{CE} = 5.0 mA, I_F = 3.0 mA	MCT5210	CTR	70	150		%
	V_{CE} = 5.0 mA, I_F = 1.6 mA	MCT5211	CTR	150	300		%
	V_{CE} = 5.0 mA, I_F = 1.0 mA	MCT5211	CTR	110	225		%
Current transfer ratio (collector base)	V_{CE} = 4.3 V, I_F = 3.0 mA	MCT5210	CTR_{CB}	0.2	0.4		%
	V_{CE} = 4.3 V, I_F = 1.6 mA	MCT5211	CTR_{CB}	0.3	0.6		%
	V_{CE} = 4.3 V, I_F = 1.0 mA	MCT5211	CTR_{CB}	0.25	0.5		%

SWITCHING CHARACTERISTICS							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Propagation delay high to low	R_L = 330 Ω , I_F = 3.0 mA, V_{CC} = 5.0 V	MCT5210	t_{PHL}		10		µs
	R_L = 750 Ω , I_F = 1.6 mA, V_{CC} = 5.0 V	MCT5211	t_{PHL}		20		µs
	R_L = 1.5 kΩ , I_F = 1.0 mA, V_{CC} = 5.0 V	MCT5211	t_{PHL}		40		µs
Propagation delay low to high	R_L = 330 Ω , I_F = 3.0 mA, V_{CC} = 5.0 V	MCT5210	t_{PLH}		10		µs
	R_L = 750 Ω , I_F = 1.6 mA, V_{CC} = 5.0 V	MCT5211	t_{PLH}		20		µs
	R_L = 1.5 kΩ , I_F = 1.0 mA, V_{CC} = 5.0 V	MCT5211	t_{PLH}		40		µs

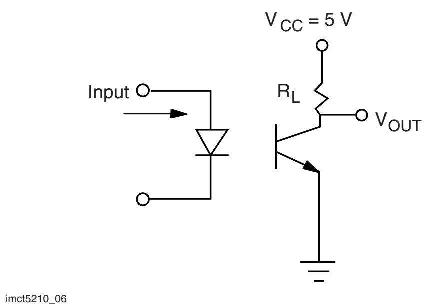


Fig. 1 - Switching Schematic

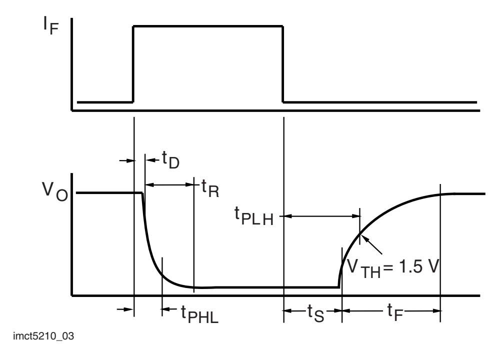


Fig. 2 - Switching Waveform

TYPICAL CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

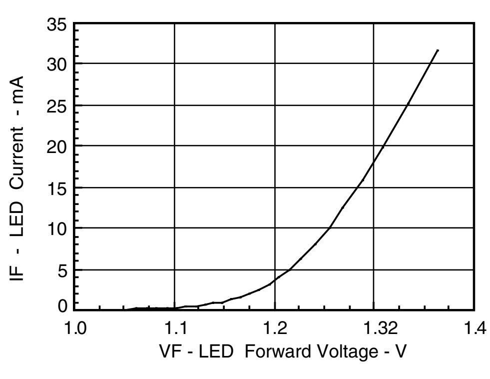


Fig. 3 - Forward Current vs. Forward Voltage

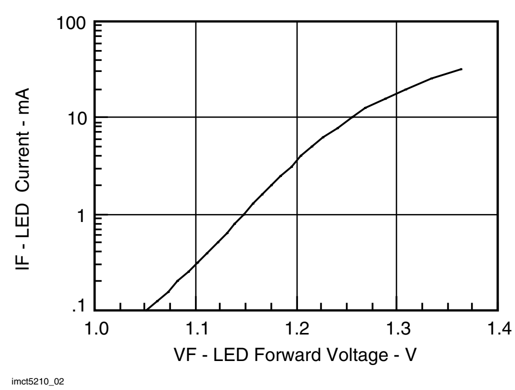


Fig. 4 - LED Forward Current vs. Forward Voltage

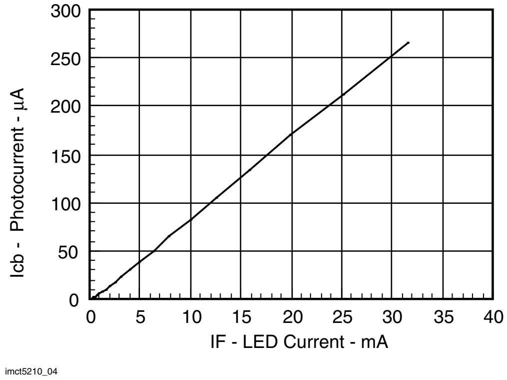


Fig. 5 - Collector Base Photocurrent vs. LED Current

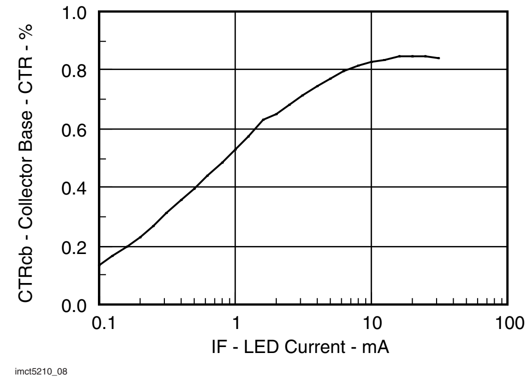


Fig. 8 - Collector Base CTR vs. LED Current

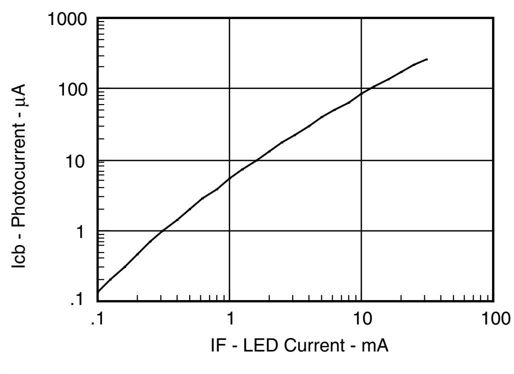


Fig. 6 - Photocurrent vs. LED Current

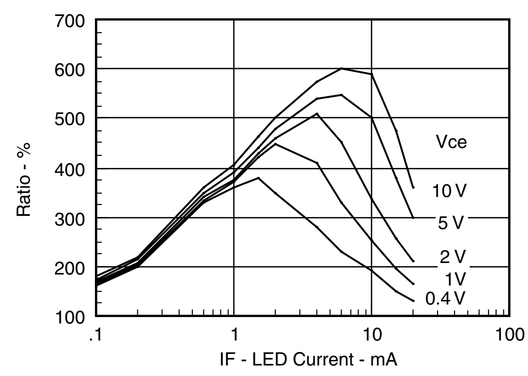


Fig. 9 - CTR vs. LED Current

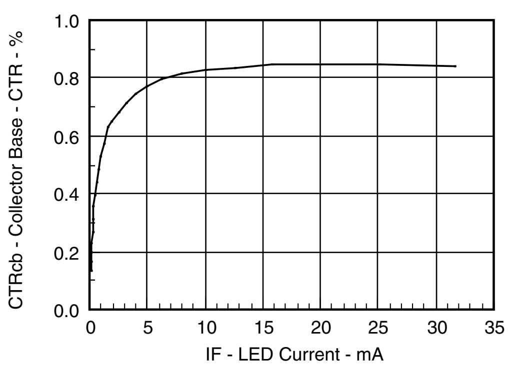


Fig. 7 - Collector Base CTR vs. LED Current

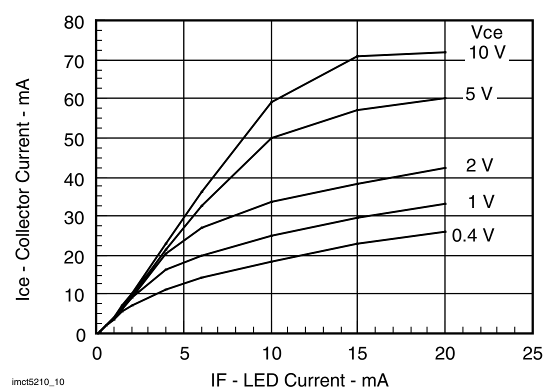


Fig. 10 - Collector Current vs. LED Current

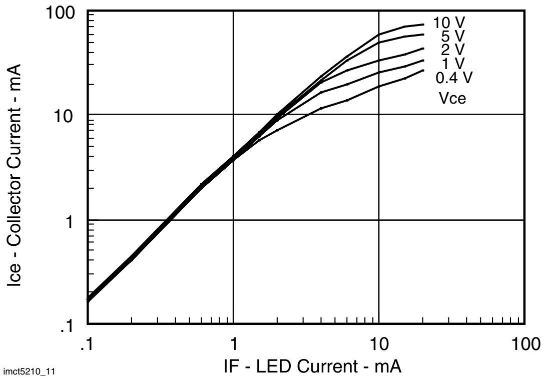


Fig. 11 - Collector Current vs. LED Current

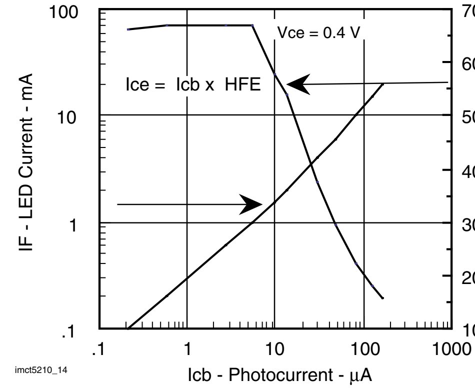


Fig. 14 - Transfer Curve

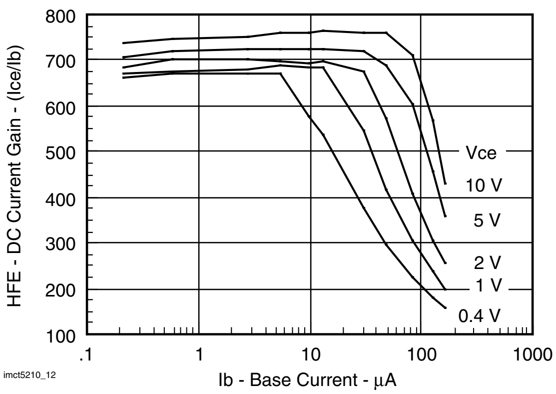


Fig. 12 - Transistor Current Gain vs. Base Current

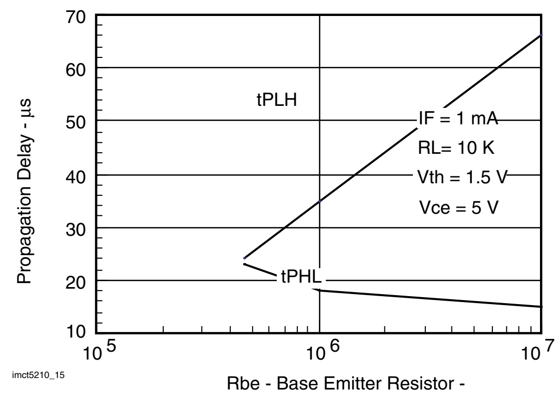


Fig. 15 - Propagation Delay vs. Base Emitter Resistor

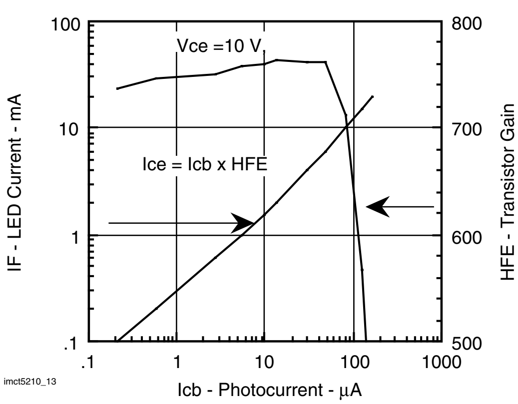


Fig. 13 - Transfer Curve

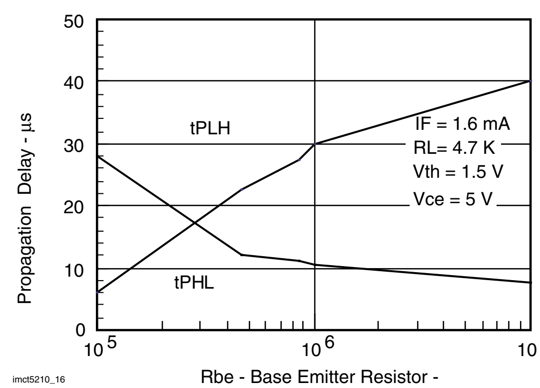


Fig. 16 - Propagation Delay vs. Base Emitter Resistor

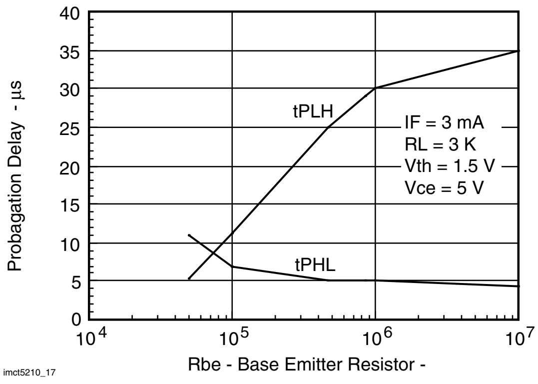
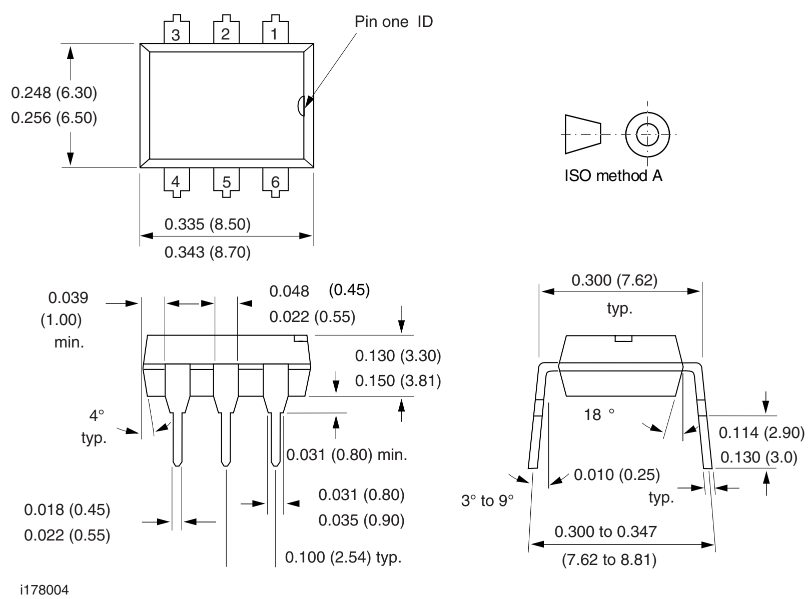
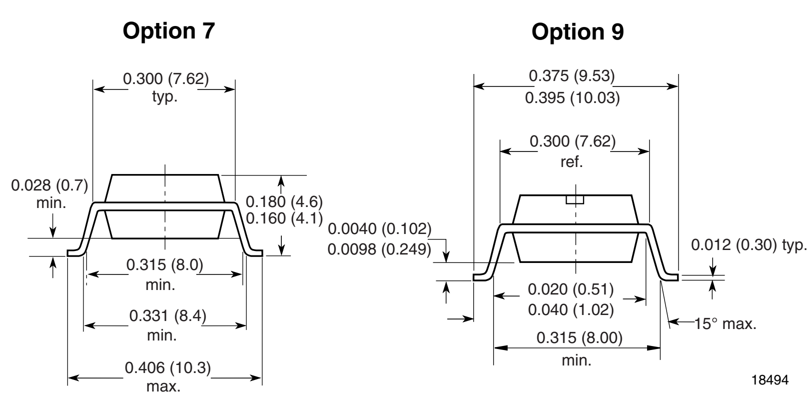


Fig. 17 - Propagation Delay vs. Base Emitter Resistor

PACKAGE DIMENSIONS in Inches (millimeters)





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.

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

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