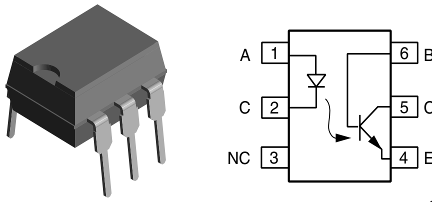
Optocoupler, Phototransistor Output, Low Input Current, With Base Connection

Features

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



i179004

Agency Approvals

- UL1577, File No. E52744 System Code H or J, Double Protection
- BSI IEC60950 IEC60965
- DIN EN 60747-5-2 (VDE0884)
  DIN EN 60747-5-5 pending
  Available with Option 1
- CSA 93751

Description

The MCT521/5211 are optocouplers with a high efficiency AIGaAs 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 one and three 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.

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)

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
Peak reverse voltage		V_R	6.0	V
Forward continuous current		I_F	40	mA
Power dissipation		P_{diss}	75	mW
Derate linearly from 25 °C			1.0	mW/°C

Output

Parameter	Test condition	Symbol	Value	Unit
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

Coupler

Parameter	Test condition	Symbol	Value	Unit
Isolation test voltage		V_{ISO}	5300	V_{RMS}
Total package dissipation (LED + Detector)		P_{tot}	260	mW
Derate linearly from 25 °C			3.5	mW/°C
Leakage path			≥ 7	mm
Clearance path			≥ 7	mm
Comparative tracking index per DIN IEC 112/VDE 0303, part1			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_{amb}	- 55 to + 100	°C
Storage temperature		T_{stg}	- 55 to + 150	°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 = 5.0 mA	V_F		1.2	1.5	V
Reverse voltage	I_R = 10 µA	V_R	6.0			V

Output

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
DC forward current gain	V_{CE} = 5.0 V, I_C = 100 µA	HFE	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 current	V_{CE} = 10 V	I_{CEO}		5.0	100	nA

Coupler

0 - 70 °C

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
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

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-ow to high	R_L = 330 Ω , I_F = 3.0 mA, V_{CC} = 5.0 V	MCT5210	t_{PLH}		10		μs
Propagation delay-low to high	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

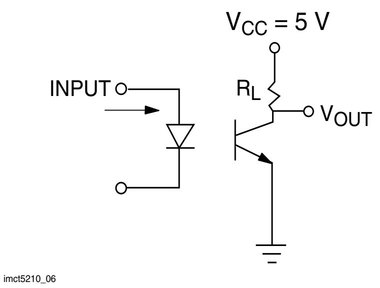


Figure 1. Switching Schematic

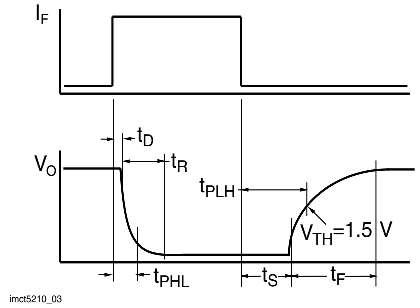


Figure 2. Switching Waveform

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

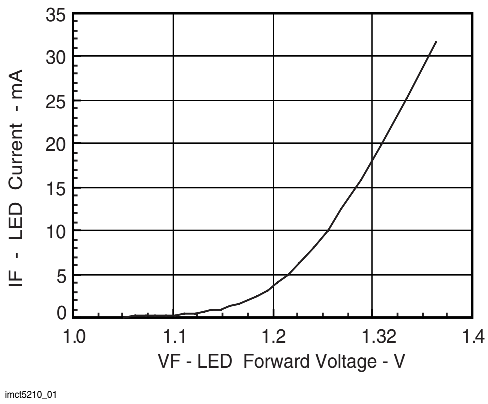


Figure 3. Forward Current vs. Forward Voltage

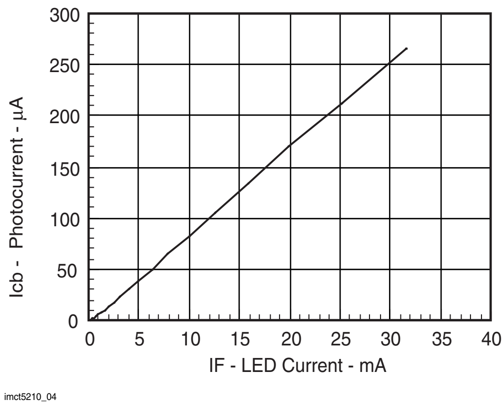


Figure 5. Collector Base Photocurrent vs. LED Current

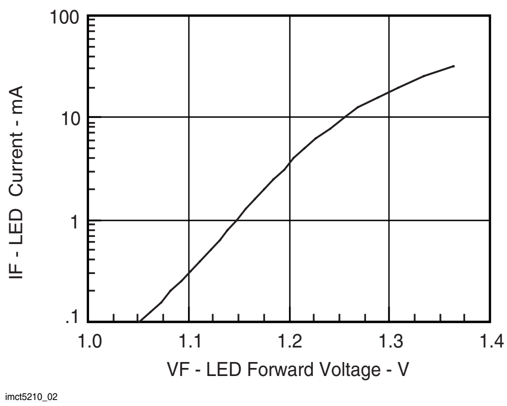


Figure 4. LED Forward Current vs.Forward Voltage

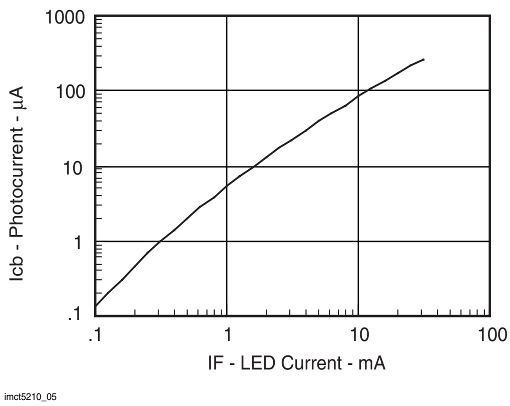


Figure 6. Photocurrent vs. LED Current

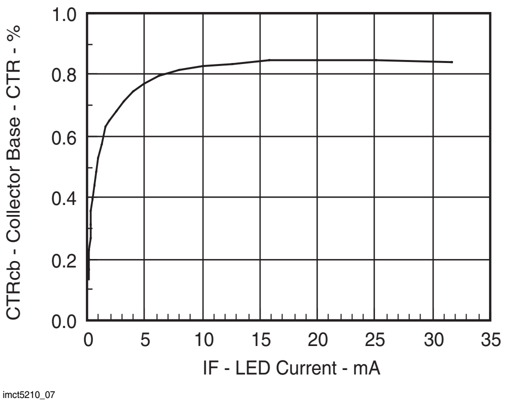


Figure 7. Collector Base CTR vs. LED Current

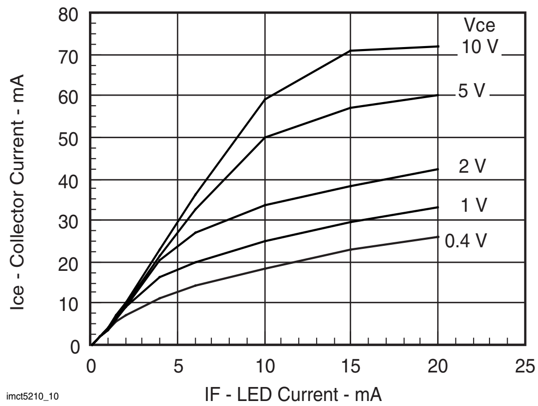


Figure 10. Collector Current vs. LED Current

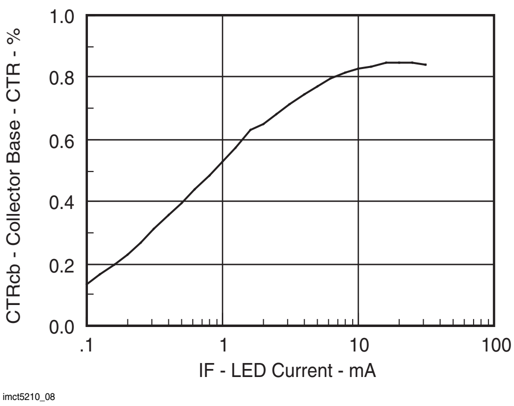


Figure 8. Collector Base CTR vs. LED Current

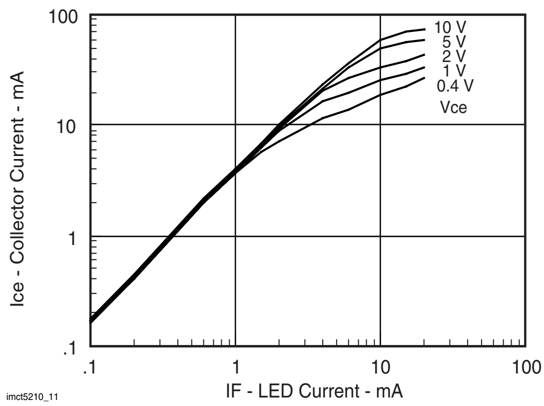


Figure 11. Collector Current vs. LED Current

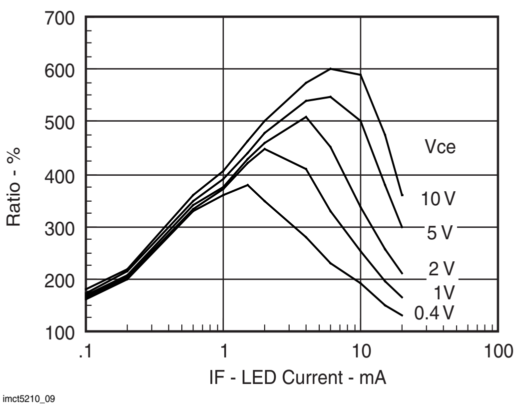


Figure 9. CTR vs. LED Current

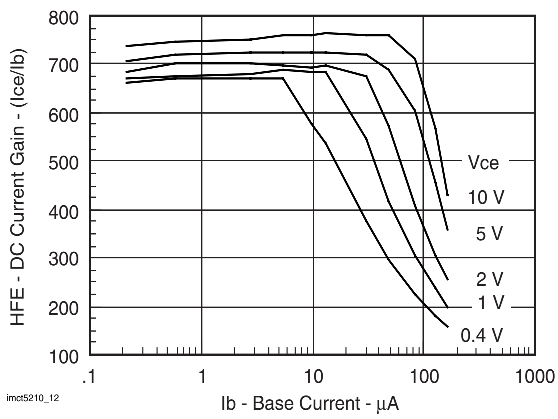


Figure 12. Transistor Current Gain vs. Base Current

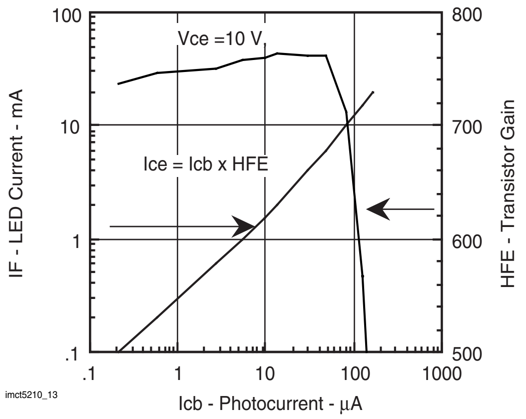


Figure 13. Transfer Curve

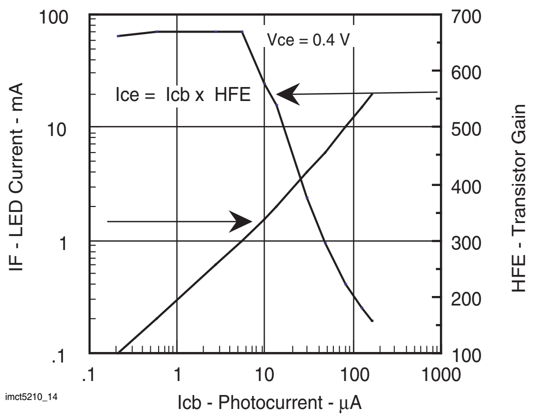


Figure 14. Transfer Curve

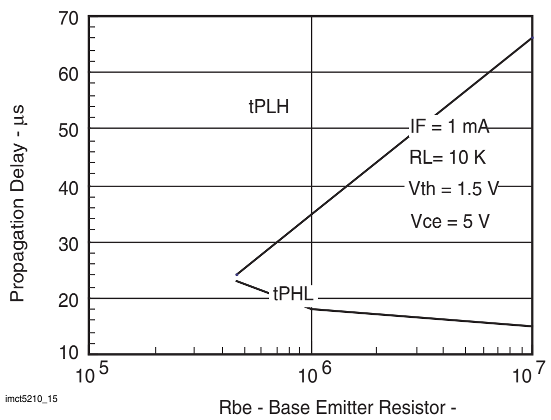


Figure 15. Propagation Delay vs. Base Emitter Resistor

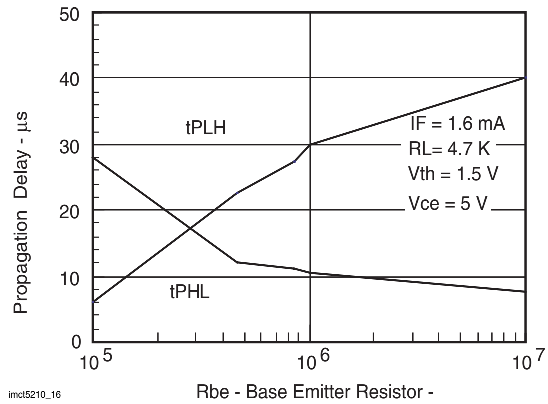


Figure 16. Propagation Delay vs. Base Emitter Resistor

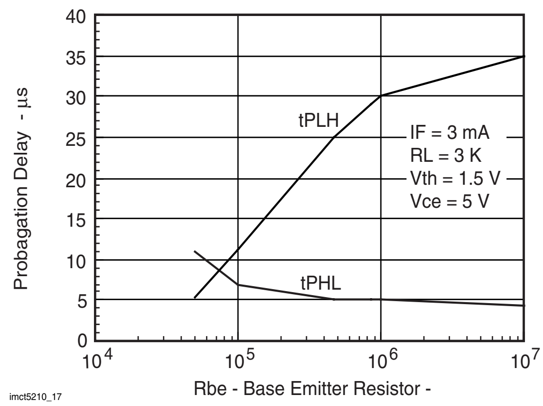
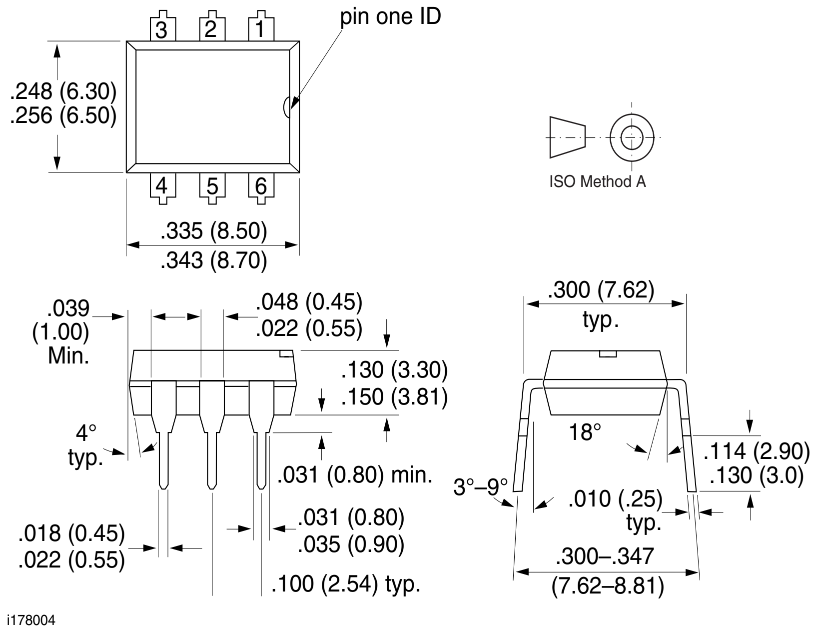
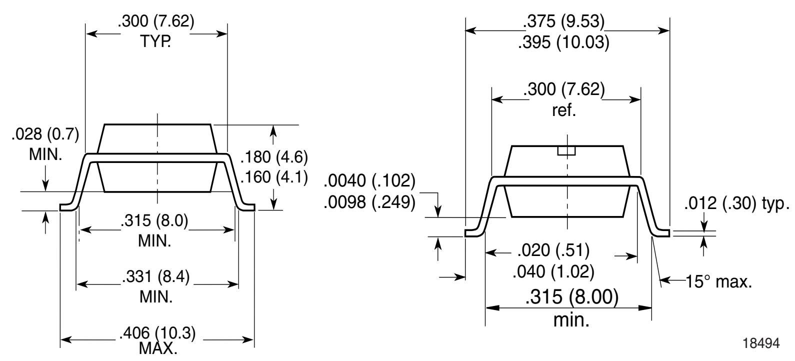


Figure 17. Propagation Delay vs. Base Emitter Resistor

Package Dimensions in Inches (mm)



Option 7 **Option 9**



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.

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