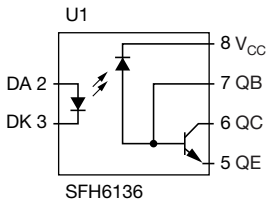
High Speed Optocoupler, 1 MBd, Photodiode With Transistor Output

DESCRIPTION

The 1 MBd high speed optocoupler consists of a GaAlAs infrared emitting diode, optically coupled with an integrated photo detector and a high speed transistor. The open collector output function allows circuit designers to adjust the load conditions when interfacing with different logic systems such as TTL, CMOS, etc.

The PSpice models are written from device characterization data for simulation. All symbols are in the symbol library file SFH6136.olb. All model data are in the PSpice model library file SFH6136.lib.

This document is intended as a PSpice modeling guideline and does not constitute a commercial product, neither a substitute to datasheet.

PART	MODEL DESCRIPTION	SYMBOL FILE	MODEL FILE
SFH6136	High speed optocoupler, 1 MBd, photodiode with transistor output	 SFSH6136.olb	SFH6136.lib

RECOMMENDED USE OF THE MODEL

- This model is designed only for use at 25 °C and should be used as is.
- This model has been created and tested with OrCAD version 16.6.
- The olb file (symbol) is not down-compatible. Users of the earlier versions need to create the symbols on their platform and associate with relative PSpice model data.

NETLIST OF MODEL

Following list shows the netlist of the model:

```
* Library of Vishay 1 Mbd high speed optocouplers
* Copyright VISHAY, Inc. 2016 All Rights Reserved.
*
* Symbol Pin -> Model Node
*   A         1
*   K         2
*   E         3
*   C         4
*   B         5
*   VCC       6
.SUBCKT SFH6136 DA DK QE QC QB  VCC
DIN DA 9 DT8811VB
VT 9 DK 0
CIO DA QC 0.6e-12
QOUT QC QB QE QF290D
```

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RFX QB QE 1e6
Hd T1 0 VT 800 ;I-V
Rdly1 T1 T2 0.1
Cdly1 T2 0 1P
Gdly1 VCC QB VALUE {-2E-7 + 5e-6*V(T2) -1.7e-8*V(T2)*V(T2)}

.MODEL DT8811VB D
+ IS=4.5E-18 N=1.40 RS=3.8
+ BV=3.000e+000 IBV=0.5e-006  XTI=4
+ EG=1.52436 CJO=18E-12 VJ=0.75 M=0.5 FC=0.5
.MODEL QF290D NPN
+ IS=2.691e-016 NF=1.000e+000 ISE=6.586e-018
+ NE = 1.082e+000 BF = 176 BR = 1.000e+000
+ IKF = 7.300e-003 VAF = 1.000e+002 VAR = 2.800e+002
+ EG = 1.110e+000 XTI = 1.068e+000 XTB = 0.000e+000
+ RC = -1e+000 RB = 2.500e+001 RE = 40
+ CJE = 2.500e-012 MJE = 1.740e-001 VJE = 1.250e-001
+ CJC = 7.24e-012 MJC = 2.573e-001 VJC = 1.100e-001
.ENDS SFH6136

**=====================================================================*
* Note:                                                               *
* Altough models can be a useful tool in evaluating device            *
* performance, they cannot model exact device performance             *
* under all conditions, nor are they intended to replace              *
* breadboarding for final verification!                               *
*                                                                     *
* Models provided by VISHAY Semiconductors GmbH are not               *
* as fully representing all of the specifications and operating       *
* characteristics of the semiconductor product to which the           *
* model relates.                                                      *
* The models describe the characteristics of typical devices.         *
* In all cases, the current data sheet information for a given        *
* device is the final design guideline and the only actual            *
* performance specification.                                          *
* VISHAY Semiconductors does not assume any liability arising         *
* from the model use. VISHAY Semiconductors reserves the right to     *
* change models without prior notice.                                 *
**=====================================================================*
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SIMULATED PARAMETERS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**SIMULATION DATA**	**UNIT**
INPUT				
Input forward voltage	I_F = 16 mA	V_F	1.36	V
COUPLER				
Current transfer ratio	I_F = 16 mA, V_O = 0.4 V	CTR	28	%
SWITCHING (1)				
Propagation delay time to high output level	V_{CC} = 5 V, I_F = 16 mA, R_L= 1.9 kΩ	t_{pLH}	0.4	µs
Propagation delay time to low output level		t_{pHL}	0.6	

Note

(1) See Switching Time and Timing Simulation Setup for switching parameters.

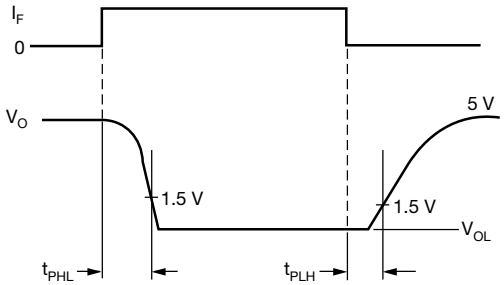

Fig. 1 - Switching Times

EXAMPLE SIMULATION PLOTS USING OrCAD

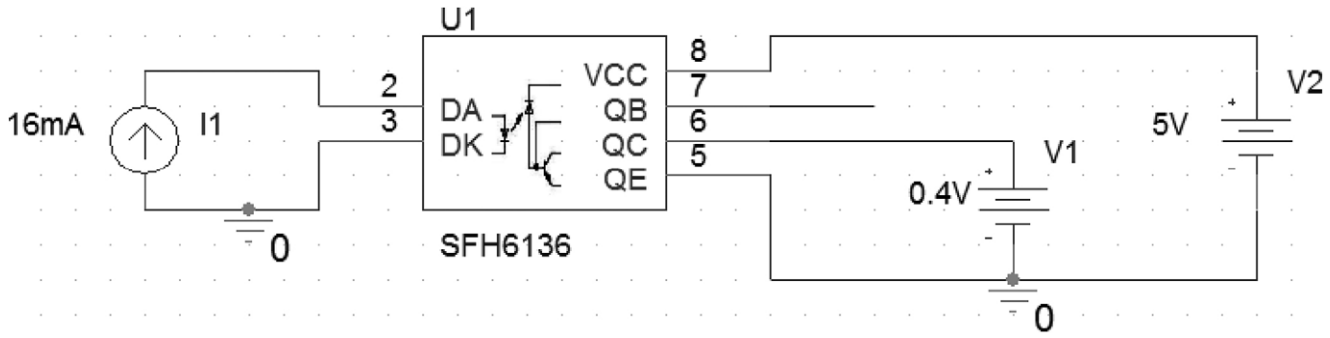

Fig. 2 - Simulation Setup for DC Characteristics

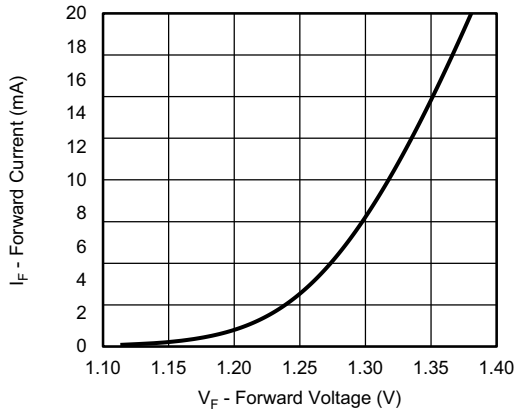

Fig. 3 - Simulation of Input Forward Current vs. Forward Voltage

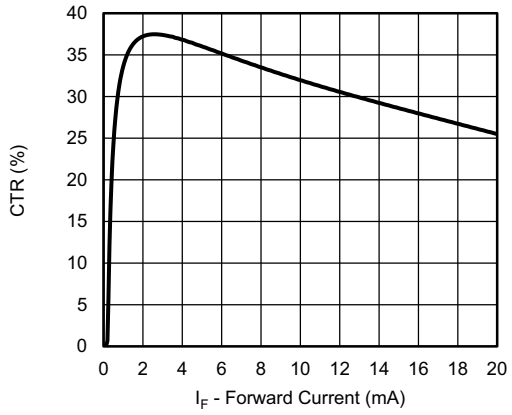

Fig. 4 - Simulation of CTR vs. Forward Current (V_O = 0.4 V)

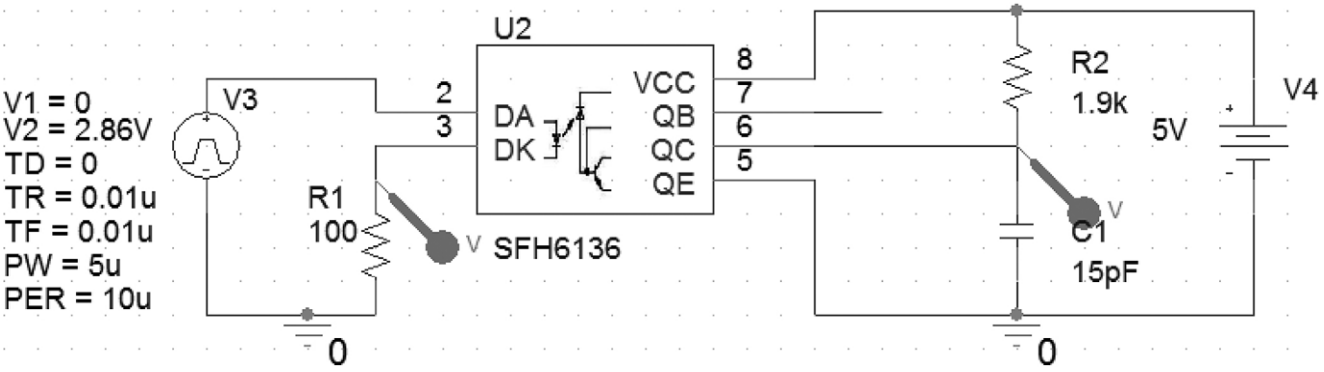

Fig. 5 - Timing Simulation Setup (V_{CC} = 5 V, I_F = 16 mA, R_L = 1.9 kΩ, C_L = 15 pF)

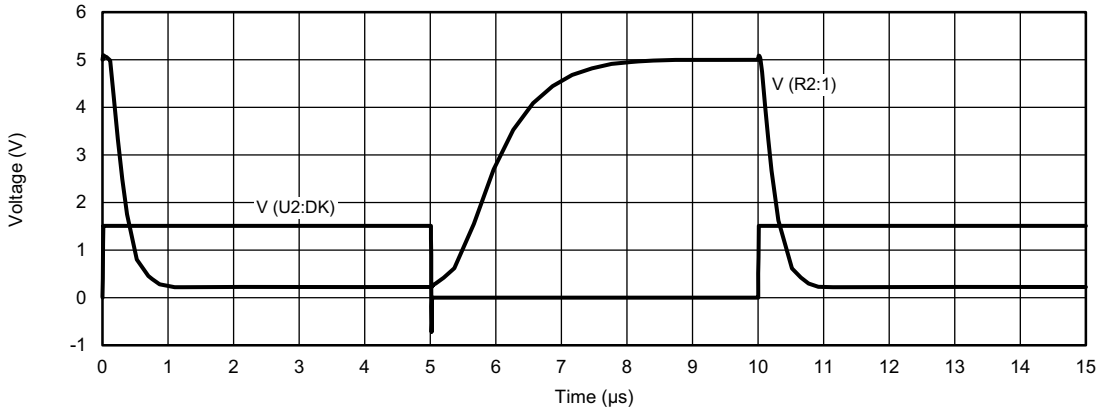

Fig. 6 - Timing Simulation Output