

# 4N25M, 4N26M, 4N27M, 4N28M, 4N35M, 4N36M, 4N37M, H11A1M, H11A2M, H11A3M, H11A4M, H11A5M General Purpose 6-Pin Phototransistor Optocouplers

## Features

- UL recognized (File # E90700, Volume 2)
- VDE recognized (File # 102497)
  - Add option V (e.g., 4N25VM)

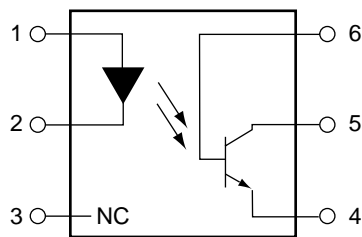
## Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs

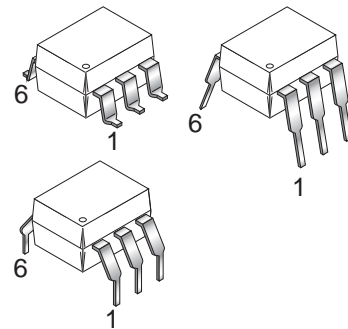
## Description

The general purpose optocouplers consist of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a 6-pin dual in-line package.

## Functional Block Diagram



- PIN 1. ANODE  
2. CATHODE  
3. NO CONNECTION  
4. EMITTER  
5. COLLECTOR  
6. BASE



**Absolute Maximum Ratings** ( $T_A = 25^\circ\text{C}$  unless otherwise specified)

Symbol	Parameter	Value	Units
<b>TOTAL DEVICE</b>			
$T_{STG}$	Storage Temperature	-55 to +150	$^\circ\text{C}$
$T_{OPR}$	Operating Temperature	-55 to +100	$^\circ\text{C}$
$T_{SOL}$	Wave solder temperature (see page 8 for reflow solder profile)	260 for 10 sec	$^\circ\text{C}$
$P_D$	Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	250	mW
		2.94	
<b>EMITTER</b>			
$I_F$	DC/Average Forward Input Current	60	mA
$V_R$	Reverse Input Voltage	6	V
$I_F(\text{pk})$	Forward Current – Peak (300 $\mu\text{s}$ , 2% Duty Cycle)	3	A
$P_D$	LED Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	120	mW
		1.41	mW/ $^\circ\text{C}$
<b>DETECTOR</b>			
$V_{CEO}$	Collector-Emitter Voltage	30	V
$V_{CBO}$	Collector-Base Voltage	70	V
$V_{ECO}$	Emitter-Collector Voltage	7	V
$P_D$	Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	150	mW
		1.76	mW/ $^\circ\text{C}$

**Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise specified)**Individual Component Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
<b>EMITTER</b>						
$V_F$	Input Forward Voltage	$I_F = 10\text{mA}$		1.18	1.50	V
$I_R$	Reverse Leakage Current	$V_R = 6.0\text{V}$		0.001	10	$\mu\text{A}$
<b>DETECTOR</b>						
$BV_{CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 1.0\text{mA}$ , $I_F = 0$	30	100		V
$BV_{CBO}$	Collector-Base Breakdown Voltage	$I_C = 100\mu\text{A}$ , $I_F = 0$	70	120		V
$BV_{ECO}$	Emitter-Collector Breakdown Voltage	$I_E = 100\mu\text{A}$ , $I_F = 0$	7	10		V
$I_{CEO}$	Collector-Emitter Dark Current	$V_{CE} = 10\text{V}$ , $I_F = 0$		1	50	nA
$I_{CBO}$	Collector-Base Dark Current	$V_{CB} = 10\text{V}$			20	nA
$C_{CE}$	Capacitance	$V_{CE} = 0\text{V}$ , $f = 1\text{MHz}$		8		pF

**Isolation Characteristics**

Symbol	Characteristic	Test Conditions	Min.	Typ.*	Max.	Units
$V_{ISO}$	Input-Output Isolation Voltage	$f = 60\text{Hz}$ , $t = 1\text{sec}$	7500			Vac(pk)
$R_{ISO}$	Isolation Resistance	$V_{I-O} = 500\text{VDC}$	$10^{11}$			$\Omega$
$C_{ISO}$	Isolation Capacitance	$V_{I-O} = \&$ , $f = 1\text{MHz}$		0.2	2	pF

\*Typical values at  $T_A = 25^\circ\text{C}$

**Electrical Characteristics** (Continued) ( $T_A = 25^\circ\text{C}$  unless otherwise specified)

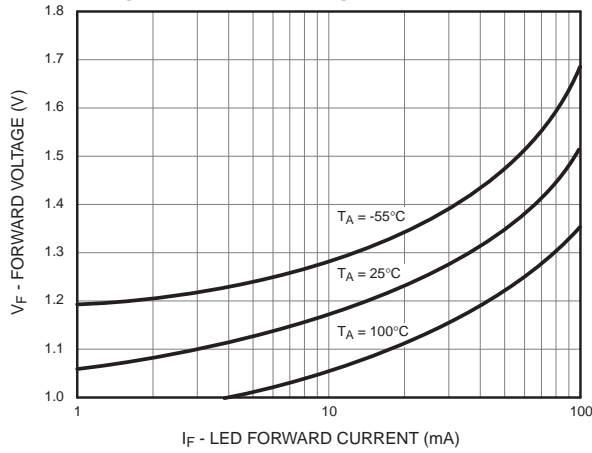
**Transfer Characteristics**

Symbol	Parameter	Test Conditions	Device	Min.	Typ.*	Max.	Unit
<b>DC CHARACTERISTICS</b>							
CTR	Current Transfer Ratio, Collector to Emitter	$I_F = 10\text{mA}$ , $V_{CE} = 10\text{V}$	4N35M, 4N36M, 4N37M	100			%
			H11A1M	50			
			H11A5M	30			
			4N25M, 4N26M H11A2M, H11A3M	20			
			4N27M, 4N28M H11A4M	10			
		$I_F = 10\text{mA}$ , $V_{CE} = 10\text{V}$ , $T_A = -55^\circ\text{C}$	4N35M, 4N36M, 4N37M	40			
		$I_F = 10\text{mA}$ , $V_{CE} = 10\text{V}$ , $T_A = +100^\circ\text{C}$	4N35M, 4N36M, 4N37M	40			
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$I_C = 2\text{mA}$ , $I_F = 50\text{mA}$	4N25M, 4N26M, 4N27M, 4N28M,			0.5	V
		$I_C = 0.5\text{mA}$ , $I_F = 10\text{mA}$	4N35M, 4N36M, 4N37M			0.3	
			H11A1M, H11A2M, H11A3M, H11A4M, H11A5M			0.4	
<b>AC CHARACTERISTICS</b>							
$T_{ON}$	Non-Saturated Turn-on Time	$I_F = 10\text{mA}$ , $V_{CC} = 10\text{V}$ , $R_L = 100\Omega$ (Fig. 11)	4N25M, 4N26M, 4N27M, 4N28M, H11A1M, H11A2M, H11A3M, H11A4, H11A5M		2		$\mu\text{s}$
		$I_C = 2\text{mA}$ , $V_{CC} = 10\text{V}$ , $R_L = 100\Omega$ (Fig. 11)	4N35M, 4N36M, 4N37M		2	10	$\mu\text{s}$
$T_{OFF}$	Turn-off Time	$I_F = 10\text{mA}$ , $V_{CC} = 10\text{V}$ , $R_L = 100\Omega$ (Fig. 11)	4N25M, 4N26M, 4N27M, 4N28M, H11A1M, H11A2M, H11A3M, H11A4M, H11A5M		2		$\mu\text{s}$
		$I_C = 2\text{mA}$ , $V_{CC} = 10\text{V}$ , $R_L = 100\Omega$ (Fig. 11)	4N35M, 4N36M, 4N37M		2	10	

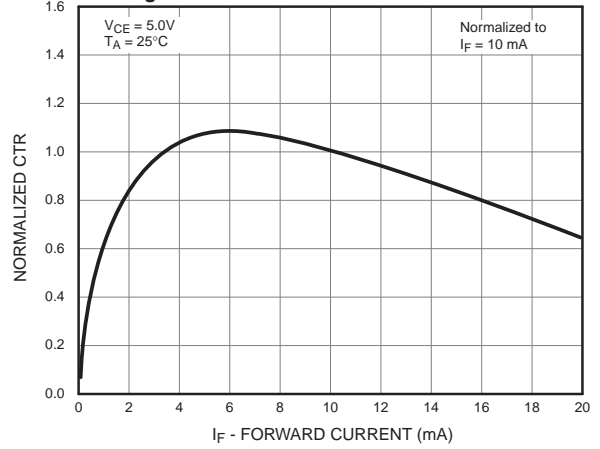
\* Typical values at  $T_A = 25^\circ\text{C}$

## Typical Performance Curves

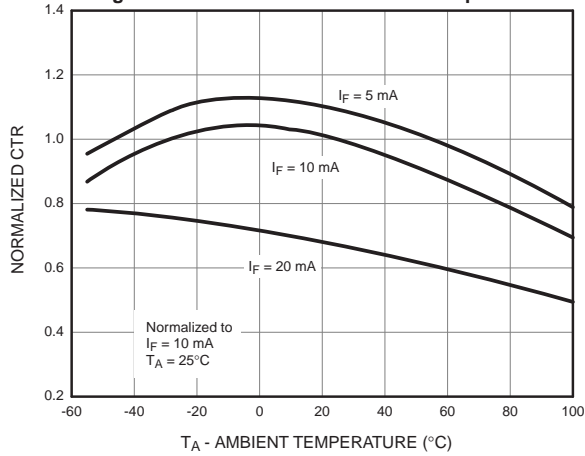
**Fig. 1 LED Forward Voltage vs. Forward Current**



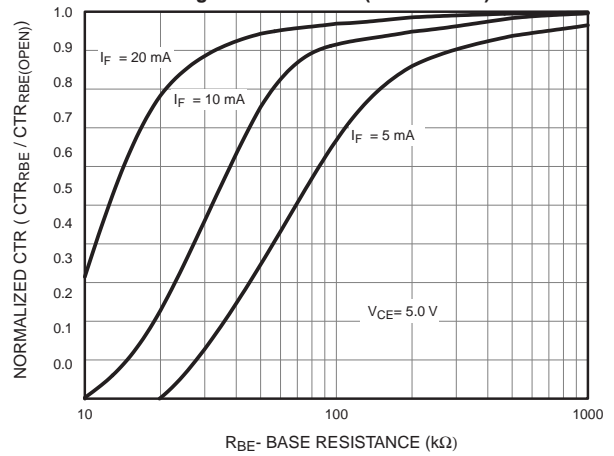
**Fig.2 Normalized CTR vs. Forward Current**



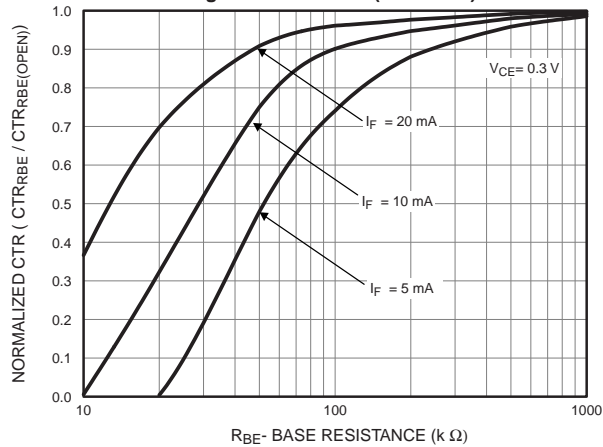
**Fig. 3 Normalized CTR vs. Ambient Temperature**



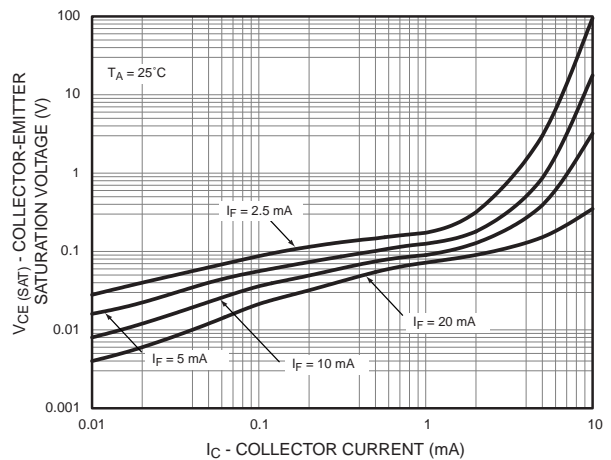
**Fig. 4 CTR vs. RBE (Unsaturated)**

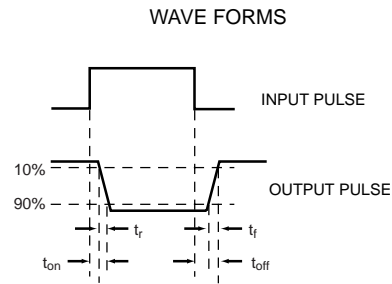
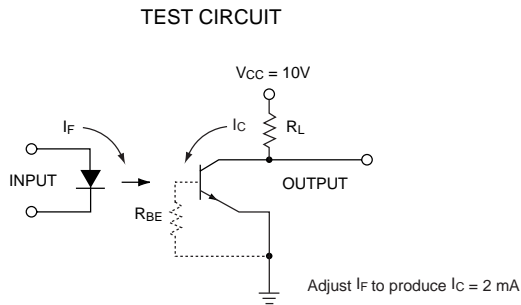
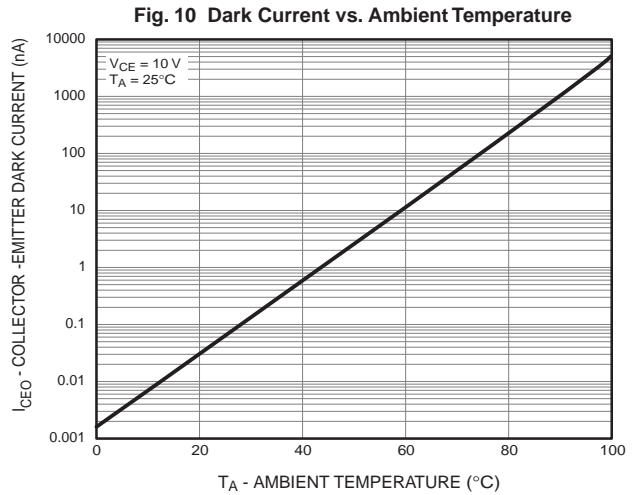
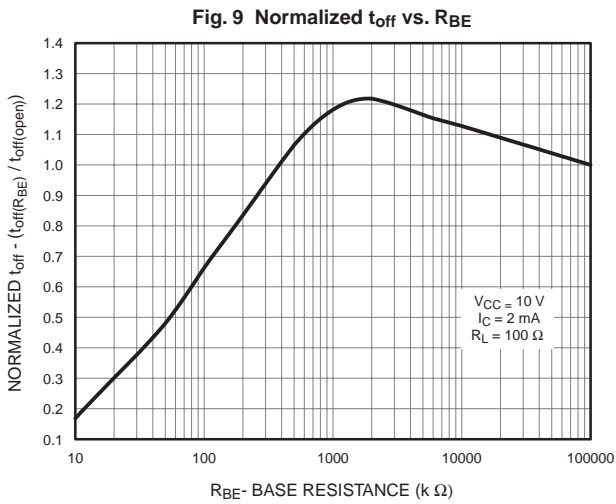
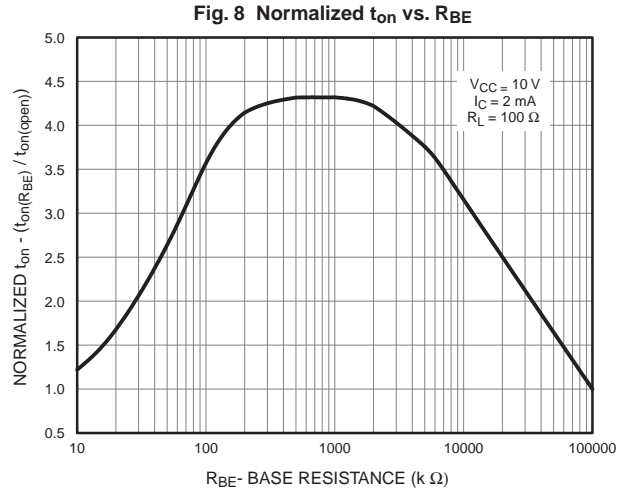
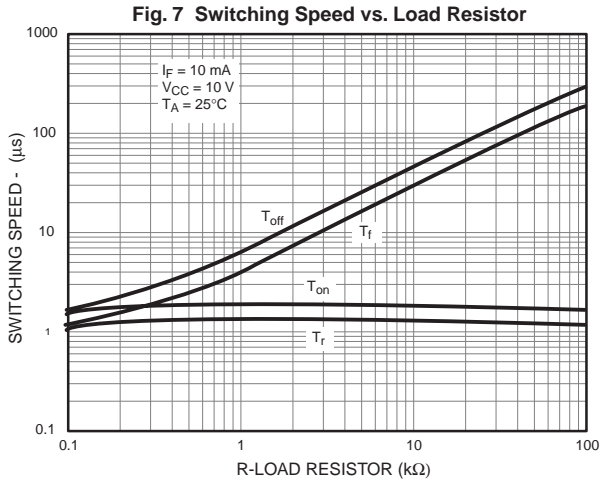


**Fig. 5 CTR vs. RBE (Saturated)**



**Fig. 6 Collector-Emitter Saturation Voltage vs. Collector Current**





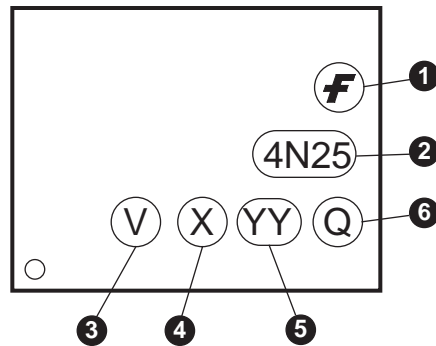
**Figure 11. Switching Time Test Circuit and Waveforms**



## Ordering Information

Option	Order Entry Identifier (Example)	Description
No option	4N25M	Standard Through Hole Device
S	4N25SM	Surface Mount Lead Bend
SR2	4N25SR2M	Surface Mount; Tape and Reel
T	4N25TM	0.4" Lead Spacing
V	4N25VM	VDE 0884
TV	4N25TVM	VDE 0884, 0.4" Lead Spacing
SV	4N25SVM	VDE 0884, Surface Mount
SR2V	4N25SR2VM	VDE 0884, Surface Mount, Tape and Reel

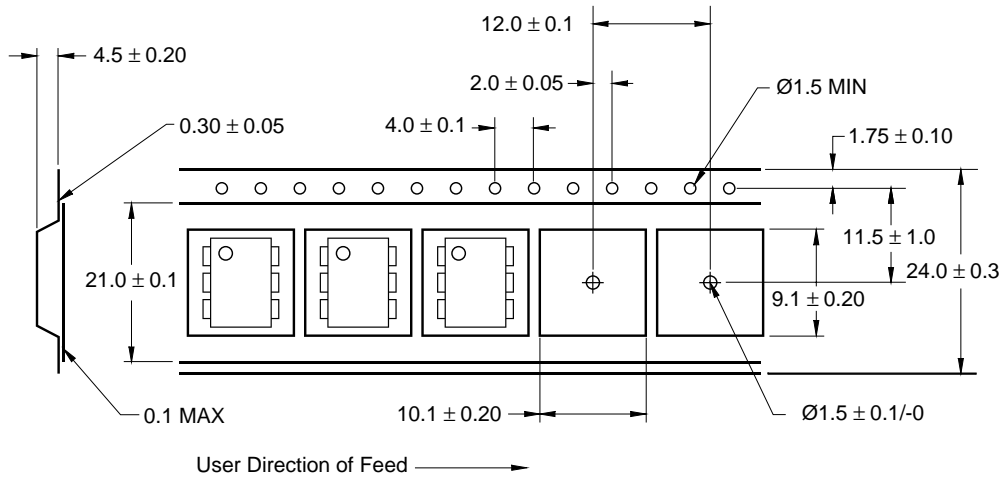
## Marking Information



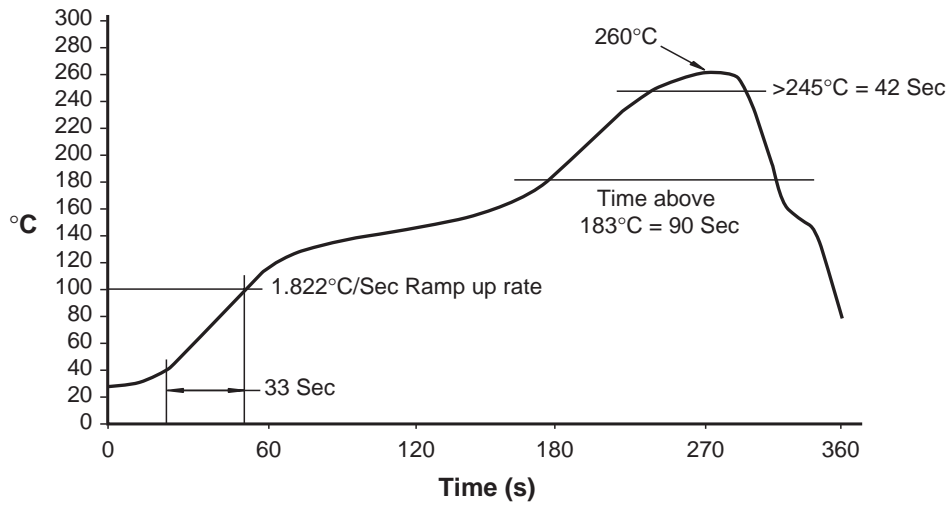
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., '7'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

\*Note – Parts that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in portrait format.

### Carrier Tape Specification



### Reflow Profile







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E <sup>2</sup> CMOS <sup>™</sup>	OCX <sup>™</sup>	STEALTH <sup>™</sup>	
EcoSPARK <sup>®</sup>	OCXPro <sup>™</sup>	SuperFET <sup>™</sup>	
EnSigna <sup>™</sup>	OPTOLOGIC <sup>®</sup>	SuperSOT <sup>™</sup> -3	
FACT Quiet Series <sup>™</sup>	OPTOPLANAR <sup>®</sup>	SuperSOT <sup>™</sup> -6	
FACT <sup>®</sup>	PACMAN <sup>™</sup>	SuperSOT <sup>™</sup> -8	
FAST <sup>®</sup>	POP <sup>™</sup>	SyncFET <sup>™</sup>	
FASTr <sup>™</sup>	Power220 <sup>®</sup>	TCM <sup>™</sup>	
FPS <sup>™</sup>	Power247 <sup>®</sup>	The Power Franchise <sup>®</sup>	
FRFET <sup>®</sup>	PowerEdge <sup>™</sup>	 ™	
GlobalOptoisolator <sup>™</sup>	PowerSaver <sup>™</sup>	TinyBoost <sup>™</sup>	
GTO <sup>™</sup>	PowerTrench <sup>®</sup>	TinyBuck <sup>™</sup>	

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Rev. I24