January 2009

# 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)

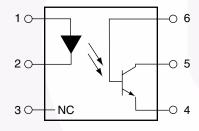
# **Applications**

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs

# Description

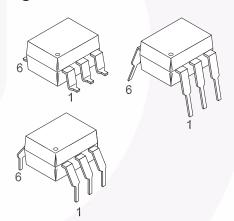
The general purpose optocouplers consist of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a 6-pin dual in-line package.

#### **Schematic**



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

# **Package Outlines**



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

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Value	Units
TOTAL DEV	ICE	1	1
T <sub>STG</sub>	Storage Temperature	-40 to +150	°C
T <sub>OPR</sub>	Operating Temperature	-40 to +100	°C
T <sub>SOL</sub>	Wave solder temperature (see page 8 for reflow solder profile)	260 for 10 sec	°C
P <sub>D</sub>	Total Device Power Dissipation @ T <sub>A</sub> = 25°C	250	mW
	Derate above 25°C	2.94	1
EMITTER			1
I <sub>F</sub>	DC/Average Forward Input Current	60	mA
V <sub>R</sub>	Reverse Input Voltage	6	V
I <sub>F</sub> (pk)	Forward Current – Peak (300µs, 2% Duty Cycle)	3	Α
P <sub>D</sub>	LED Power Dissipation @ T <sub>A</sub> = 25°C	120	mW
	Derate above 25°C	1.41	mW/°C
DETECTOR			
V <sub>CEO</sub>	Collector-Emitter Voltage	30	V
V <sub>CBO</sub>	Collector-Base Voltage	70	V
V <sub>ECO</sub>	Emitter-Collector Voltage	7	V
P <sub>D</sub>	Detector Power Dissipation @ T <sub>A</sub> = 25°C	150	mW
	Derate above 25°C	1.76	mW/°C

# Electrical Characteristics (T<sub>A</sub> = 25°C unless otherwise specified)

#### **Individual Component Characteristics**

	•					
Symbol	Parameter	Parameter Test Conditions		Тур.*	Max.	Unit
EMITTER						
V <sub>F</sub>	Input Forward Voltage	I <sub>F</sub> = 10mA		1.18	1.50	V
I <sub>R</sub>	Reverse Leakage Current	V <sub>R</sub> = 6.0V		0.001	10	μΑ
DETECTOR				•		
BV <sub>CEO</sub>	Collector-Emitter Breakdown Voltage	I <sub>C</sub> = 1.0mA, I <sub>F</sub> = 0	30	100		V
BV <sub>CBO</sub>	Collector-Base Breakdown Voltage	$I_C = 100 \mu A, I_F = 0$	70	120		V
BV <sub>ECO</sub>	Emitter-Collector Breakdown Voltage	$I_E = 100 \mu A, I_F = 0$	7	10		V
I <sub>CEO</sub>	Collector-Emitter Dark Current	$V_{CE} = 10V, I_F = 0$		1	50	nA
I <sub>CBO</sub>	Collector-Base Dark Current	V <sub>CB</sub> = 10V			20	nA
C <sub>CE</sub>	Capacitance	$V_{CE} = 0V, f = 1 MHz$		8		pF

#### **Isolation Characteristics**

Symbol	Characteristic	Test Conditions	Min.	Тур.*	Max.	Units
V <sub>ISO</sub>	Input-Output Isolation Voltage	f = 60Hz, t = 1 sec	7500			Vac(pk)
R <sub>ISO</sub>	Isolation Resistance	V <sub>I-O</sub> = 500 VDC	10 <sup>11</sup>			Ω
C <sub>ISO</sub>	Isolation Capacitance	$V_{I-O} = \&, f = 1MHz$		0.2	2	pF

<sup>\*</sup>Typical values at T<sub>A</sub> = 25°C

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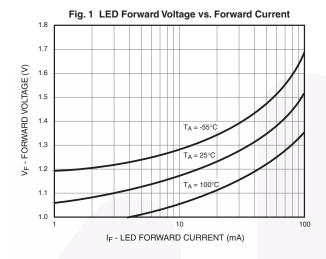
# $\textbf{Electrical Characteristics} \; (\texttt{Continued}) \; (\texttt{T}_{A} = 25 ^{\circ} \texttt{C} \; \text{unless otherwise specified})$

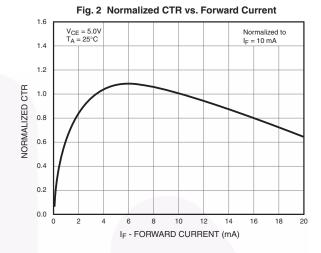
### **Transfer Characteristics**

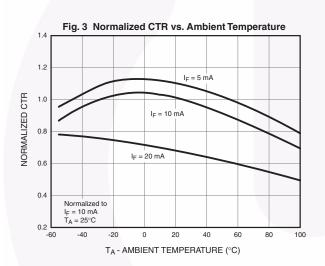
Symbol	Parameter	Test Conditions	Device	Min.	Typ.*	Max.	Unit
DC CHARA	ACTERISTICS				•		
CTR	Current Transfer Ratio, Collector to Emitter	I <sub>F</sub> = 10mA, V <sub>CE</sub> = 10V	4N35M, 4N36M, 4N37M	100			%
			H11A1M	50			
			H11A5M	30			
			4N25M, 4N26M H11A2M, H11A3M	20			
			4N27M, 4N28M H11A4M	10			
		$I_F = 10$ mA, $V_{CE} = 10$ V, $T_A = -55$ °C	4N35M, 4N36M, 4N37M	40			
		$I_F = 10$ mA, $V_{CE} = 10$ V, $T_A = +100$ °C	4N35M, 4N36M, 4N37M	40			
V <sub>CE</sub> (SAT)	Collector-Emitter Saturation Voltage	$I_C = 2mA$ , $I_F = 50mA$	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	
AC CHARA	CTERISTICS				•		
T <sub>ON</sub>	Non-Saturated Turn-on Time	$I_F = 10 \text{mA}, V_{CC} = 10 \text{V},$ $R_L = 100 \Omega \text{ (Fig. 11)}$	4N25M, 4N26M, 4N27M, 4N28M, H11A1M, H11A2M, H11A3M, H11A4, H11A5M		2		μѕ
		$I_C = 2mA, V_{CC} = 10V,$ $R_L = 100\Omega$ (Fig. 11)	4N35M, 4N36M, 4N37M		2	10	μs
T <sub>OFF</sub>	Turn-off Time	$I_F = 10 \text{mA}, V_{CC} = 10 \text{V},$ $R_L = 100 \Omega \text{ (Fig. 11)}$	4N25M, 4N26M, 4N27M, 4N28M, H11A1M, H11A2M, H11A3M, H11A4M, H11A5M		2		μs
		$I_C = 2mA, V_{CC} = 10V,$ $R_L = 100\Omega$ (Fig. 11)	4N35M, 4N36M, 4N37M		2	10	

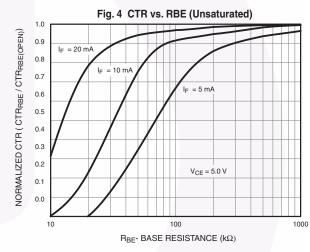
<sup>\*</sup> Typical values at T<sub>A</sub> = 25°C

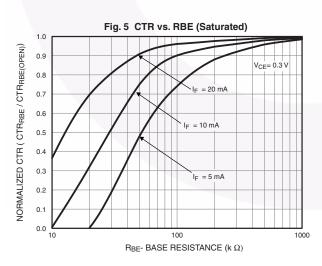
# **Typical Performance Curves**

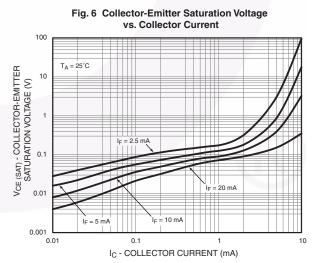


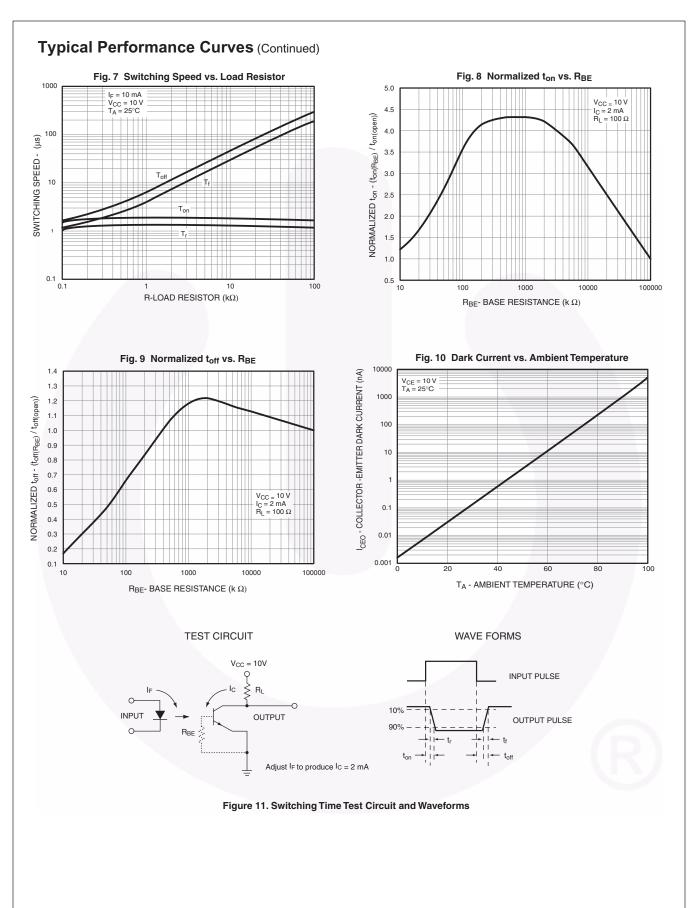






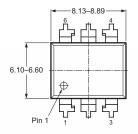


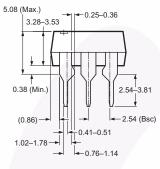


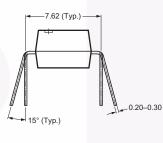


# **Package Dimensions**

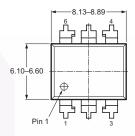
#### **Through Hole**

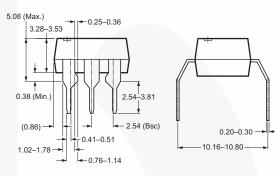




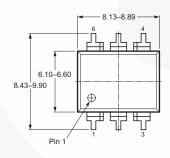


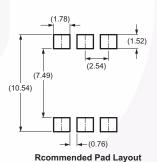
# 0.4" Lead Spacing

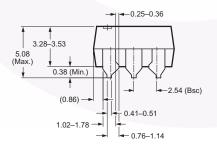


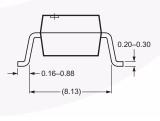


#### **Surface Mount**







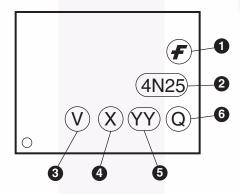


**Note:** All dimensions in mm.

# **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;		Surface Mount; Tape and Reel
T 4N25TM 0.4" Lead Spacing		0.4" Lead Spacing
V	4N25VM	VDE 0884
TV	4N25TVM	VDE 0884, 0.4" Lead Spacing
SV 4N25SVM VDE 0884, Surface Mount		VDE 0884, Surface Mount
SR2V 4N25SR2VM VDE 0884, Surface Moun		VDE 0884, Surface Mount, Tape and Reel

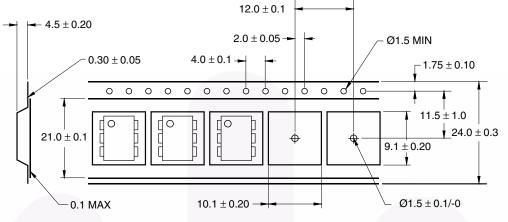
# **Marking Information**



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	6 Assembly package code			

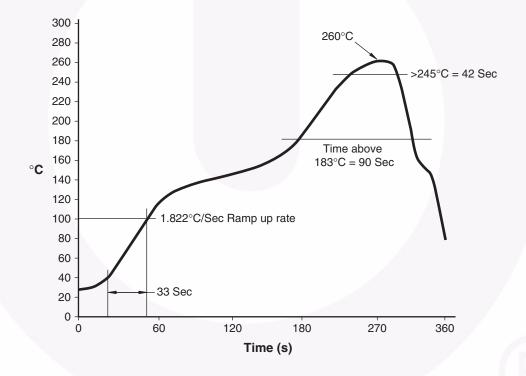
\*Note - Parts that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in portrait format.

# **Carrier Tape Specification**



User Direction of Feed ----

# **Reflow Profile**







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