



March 2014

Single-Channel: 6N135M, 6N136M, HCPL4503M Dual-Channel: HCPL2530M, HCPL2531M High Speed Transistor Optocouplers

Features

- High Speed –1 MBit/s
- Superior CMR – 10 kV/μs
- Dual-Channel: HCPL2530M, HCPL2531M
- CTR Guaranteed 0°C to 70°C
- U.L. Recognized (File # E90700, Vol. 2)
- DIN EN/IEC60747-5-5
 - Ordering Option 'V', e.g., 6N135VM
- 5,000 V_{RMS} (1 Minute) Isolation Rating
- Superior CMR of 15,000 V/μs Minimum (HCPL4503M)
- No Base Connection for Improved Noise Immunity (HCPL4503M)

Applications

- Line Receivers
- Pulse Transformer Replacement
- Output Interface to CMOS-LSTTL-TTL
- Wide-Bandwidth Analog Coupling

Description

The HCPL4503M, 6N135M, 6N136M, HCPL2530M, and HCPL2531M optocouplers consist of an AlGaAs LED optically coupled to a high speed photodetector transistor.

A separate connection for the bias of the photodiode improves the speed by several orders of magnitude over conventional phototransistor optocouplers by reducing the base-collector capacitance of the input transistor.

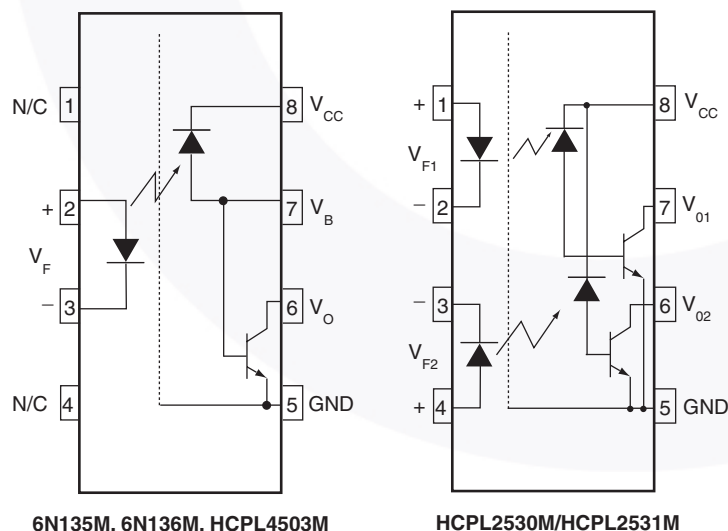
The HCPL4503M has no internal connection to the phototransistor base for improved noise immunity.

An internal noise shield provides superior common mode rejection of up to 50,000 V/μs.

Related Resources

- www.fairchildsemi.com/products/opto/
- www.fairchildsemi.com/pf/HC/HCPL0500.html
- www.fairchildsemi.com/pf/FO/FODM452.html
- www.fairchildsemi.com/pf/FO/FOD050L.html

Schematics



Pin 7 is not connected in the HCPL4503M

Figure 1. Schematics

Package Outlines

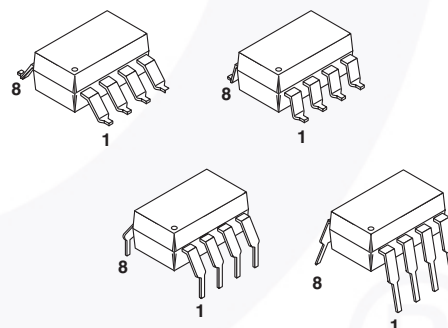


Figure 2. Package Outlines

Safety and Insulation Ratings for 8-Pin DIP White

As per DIN EN/IEC 60747-5-5. This optocoupler is suitable for “safe electrical insulation” only within the safety limit data. Compliance with the safety ratings shall be ensured by means of protective circuits.

Symbol	Parameter	Min.	Typ.	Max.	Unit
	Installation Classifications per DIN VDE 0110/1.89 Table 1				
	For Rated Mains Voltage < 150 V _{RMS}		I–IV		
	For Rated Mains Voltage < 300 V _{RMS}		I–IV		
	For Rated Mains Voltage < 450 V _{RMS}		I–III		
	For Rated Mains Voltage < 600 V _{RMS}		I–III		
	Climatic Classification		40/100/21		
	Pollution Degree (DIN VDE 0110/1.89)		2		
CTI	Comparative Tracking Index	175			
V _{PR}	Input to Output Test Voltage, Method b, V _{IORM} × 1.875 = V _{PR} , 100% Production Test with t _m = 1 s, Partial Discharge < 5 pC	1,669			
	Input to Output Test Voltage, Method a, V _{IORM} × 1.5 = V _{PR} , Type and Sample Test with t _m = 60 s, Partial Discharge < 5 pC	1,335			
V _{IORM}	Max Working Insulation Voltage	890			V _{PEAK}
V _{IOTM}	Highest Allowable Over Voltage	6,000			V _{PEAK}
	External Creepage	8.0			mm
	External Clearance	7.4			mm
	External Clearance (for Option T, 0.4" Lead Spacing)	10.16			mm
	Insulation Thickness	0.5			mm
T _S	Safety Limit Values, Maximum Values Allowed in the Event of a Failure				
	Case Temperature	150			°C
I _{S,INPUT}	Input Current	200			mA
P _{S,OUTPUT}	Output Power (Duty Factor ≤ 2.7%)	300			mW
R _{IO}	Insulation Resistance at T _S , V _{IO} = 500 V	10 ⁹			Ω

Absolute Maximum Ratings

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. $T_A = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	Condition	Value	Units
T _{STG}	Storage Temperature		-40 to +125	°C
T _{OPR}	Operating Temperature		-40 to +100	°C
T _{SOL}	Lead Solder Temperature		260 for 10 s	°C
EMITTER				
I _F (avg)	DC/Average Forward Input Current Each Channel ⁽¹⁾		25	mA
I _F (pk)	Peak Forward Input Current Each Channel ⁽²⁾	50% Duty Cycle, 1 ms P.W.	50	mA
I _F (trans)	Peak Transient Input Current Each Channel	≤ 1 μs P.W., 300 pps	1.0	A
V _R	Reverse Input Voltage Each Channel		5	V
P _D	Input Power Dissipation Each Channel ⁽³⁾	6N135M, 6N136M, and HCPL4503M	45	mW
		HCPL2530M and HCPL2531M		
DETECTOR				
I _O (avg)	Average Output Current Each Channel		8	mA
I _O (pk)	Peak Output Current Each Channel		16	mA
V _{EBR}	Emitter-Base Reverse Voltage	6N135M and 6N136M	5	V
V _{CC}	Supply Voltage		-0.5 to 30	V
V _O	Output Voltage		-0.5 to 20	V
I _B	Base Current	6N135M and 6N136M	5	mA
PD	Output Power Dissipation Each Channel ⁽⁴⁾	6N135M, 6N136M, and HCPL4503M	100	mW
		HCPL2530M and HCPL2531M	35	mW

Notes:

1. Derate linearly above 70°C free-air temperature at a rate of $0.8 \text{ mA}/^\circ\text{C}$.
2. Derate linearly above 70°C free-air temperature at a rate of $1.6 \text{ mA}/^\circ\text{C}$.
3. Derate linearly above 70°C free-air temperature at a rate of $0.9 \text{ mW}/^\circ\text{C}$.
4. Derate linearly above 70°C free-air temperature at a rate of $2.0 \text{ mW}/^\circ\text{C}$.

Electrical Characteristics

$T_A = 0^\circ\text{C}$ to 70°C unless otherwise specified. Typical value is measured at $T_A = 25^\circ\text{C}$ and $V_{CC} = 5.0\text{ V}$.

Individual Component Characteristics

Symbol	Parameter	Test Conditions	Device	Min.	Typ.	Max.	Unit
EMITTER							
V_F	Input Forward Voltage	$I_F = 16\text{ mA}$, $T_A = 25^\circ\text{C}$	All		1.45	1.7	V
		$I_F = 16\text{ mA}$	All			1.8	
B_{VR}	Input Reverse Breakdown Voltage	$I_R = 10\text{ }\mu\text{A}$	All	5.0	21		V
$\Delta V_F/\Delta T_A$	Temperature Coefficient of Forward Voltage	$I_F = 16\text{ mA}$	All		-1.7		mV/ $^\circ\text{C}$
DETECTOR							
I_{OH}	Logic High Output Current	$I_F = 0\text{ mA}$, $V_O = V_{CC} = 5.5\text{ V}$, $T_A = 25^\circ\text{C}$	All		0.0007	0.5	μA
		$I_F = 0\text{ mA}$, $V_O = V_{CC} = 15\text{ V}$, $T_A = 25^\circ\text{C}$	6N135M 6N136M HCPL4503M		0.0019	1	
		$I_F = 0\text{ mA}$, $V_O = V_{CC} = 15\text{ V}$	All			50	
I_{CCL}	Logic Low Supply Current	$I_F = 16\text{ mA}$, $V_O = \text{Open}$, $V_{CC} = 15\text{ V}$	6N135M 6N136M HCPL4503M		163	200	μA
		$I_{F1} = I_{F2} = 16\text{ mA}$, $V_O = \text{Open}$, $V_{CC} = 15\text{ V}$	HCPL2530M HCPL2531M			400	
I_{CCH}	Logic High Supply Current	$I_F = 0\text{ mA}$, $V_O = \text{Open}$, $V_{CC} = 15\text{ V}$, $T_A = 25^\circ\text{C}$	6N135M 6N136M HCPL4503M		0.0002	1	μA
		$I_F = 0\text{ mA}$, $V_O = \text{Open}$, $V_{CC} = 15\text{ V}$	6N135M 6N136M HCPL4503M		0.0004	2	
		$I_F = 0\text{ mA}$, $V_O = \text{Open}$, $V_{CC} = 15\text{ V}$	HCPL2530M HCPL2531M			4	

Electrical Characteristics (Continued)

$T_A = 0$ to 70°C unless otherwise specified. Typical value is measured at $T_A = 25^\circ\text{C}$ and $V_{CC} = 5.0\text{ V}$.

Transfer Characteristics

Symbol	Parameter	Test Conditions	Device	Min.	Typ.	Max.	Unit
COUPLED							
CTR	Current Transfer Ratio ⁽⁵⁾	$I_F = 16\text{ mA}$, $V_O = 0.4\text{ V}$, $V_{CC} = 4.5\text{ V}$, $T_A = 25^\circ\text{C}$	6N135M	7	38	50	%
			HCPL2530M				
			6N136M HCPL4503M	19	38	50	%
			HCPL2531M				
		$I_F = 16\text{ mA}$, $V_{CC} = 4.5\text{ V}$	$V_{OL} = 0.4\text{ V}$ 6N135M	5			%
			$V_{OL} = 0.5\text{ V}$ HCPL2530M				
			$V_{OL} = 0.4\text{ V}$ 6N136M HCPL4503M	15			%
			$V_{OL} = 0.5\text{ V}$ HCPL2531M				
V_{OL}	Logic LOW Output Voltage	$I_F = 16\text{ mA}$, $I_O = 1.1\text{ mA}$, $V_{CC} = 4.5\text{ V}$, $T_A = 25^\circ\text{C}$	6N135M		0.12	0.4	V
			HCPL2530M			0.5	
		$I_F = 16\text{ mA}$, $I_O = 3\text{ mA}$, $V_{CC} = 4.5\text{ V}$, $T_A = 25^\circ\text{C}$	6N136M HCPL4503M		0.20	0.4	
			HCPL2531M			0.5	
		$I_F = 16\text{ mA}$, $I_O = 0.8\text{ mA}$, $V_{CC} = 4.5\text{ V}$	6N135M		0.11	0.5	
			HCPL2530M				
		$I_F = 16\text{ mA}$, $I_O = 2.4\text{ mA}$, $V_{CC} = 4.5\text{ V}$	HCPL4503M		0.18	0.5	
			HCPL2531M				

Note:

5. Current Transfer Ratio is defined as a ratio of output collector current, I_O , to the forward LED input current, I_F , times 100%.

Electrical Characteristics (Continued)

$T_A = 0$ to 70°C unless otherwise specified. Typical values are measured at $T_A = 25^\circ\text{C}$ and $V_{CC} = 5\text{V}$.

Switching Characteristics ($V_{CC} = 5\text{V}$)

Symbol	Parameter	Test Conditions	Device	Min.	Typ.	Max.	Unit
t_{PHL}	Propagation Delay Time to Logic LOW	$T_A = 25^\circ\text{C}$, $R_L = 4.1\text{ k}\Omega$, $I_F = 16\text{ mA}^{(6)}$ (Figure 15)	6N135M		0.23	1.5	μs
			HCPL2530M				
		$R_L = 1.9\text{ k}\Omega$, $I_F = 16\text{ mA}$, $T_A = 25^\circ\text{C}^{(7)}$ (Figure 15)	6N136M HCPL4503M		0.25	0.8	μs
			HCPL2531M				
		$R_L = 4.1\text{ k}\Omega$, $I_F = 16\text{ mA}^{(6)}$ (Figure 15)	6N135M HCPL2530M			2.0	μs
t_{PLH}	Propagation Delay Time to Logic HIGH	$T_A = 25^\circ\text{C}$, ($R_L = 4.1\text{ k}\Omega$, $I_F = 16\text{ mA}^{(6)}$) (Figure 15)	6N135M		0.45	1.5	μs
			HCPL2530M				
		$R_L = 1.9\text{ k}\Omega$, $I_F = 16\text{ mA}^{(7)}$, $T_A = 25^\circ\text{C}$ (Figure 15)	6N136M HCPL4503M		0.26	0.8	μs
			HCPL2531M				
		$R_L = 4.1\text{ k}\Omega$, $I_F = 16\text{ mA}^{(6)}$ (Figure 15)	6N135M HCPL2530M			2.0	μs
ICM_{HI}	Common Mode Transient Immunity at Logic High	$I_F = 0\text{ mA}$, $V_{CM} = 10\text{ V}_{P-P}$, $R_L = 4.1\text{ k}\Omega$, $T_A = 25^\circ\text{C}^{(8)}$ (Figure 16)	6N135M HCPL2530M		10,000		$\text{V}/\mu\text{s}$
		$I_F = 0\text{ mA}$, $V_{CM} = 10\text{ V}_{P-P}$, $R_L = 1.9\text{ k}\Omega$, $T_A = 25^\circ\text{C}^{(8)}$ (Figure 16)	6N136M HCPL2531M		10,000		$\text{V}/\mu\text{s}$
		$I_F = 0\text{ mA}$, $V_{CM} = 1,500\text{ V}_{P-P}$, $R_L = 1.9\text{ k}\Omega$, $T_A = 25^\circ\text{C}^{(8)}$ (Figure 16)	HCPL4503M	15,000	50,000		
ICM_{LI}	Common Mode Transient Immunity at Logic Low	$I_F = 16\text{ mA}$, $V_{CM} = 10\text{ V}_{P-P}$, $R_L = 4.1\text{ k}\Omega$, $T_A = 25^\circ\text{C}^{(8)}$ (Figure 16)	6N135M HCPL2530M		10,000		$\text{V}/\mu\text{s}$
		$I_F = 16\text{ mA}$, $V_{CM} = 10\text{ V}_{P-P}$, $R_L = 1.9\text{ k}\Omega^{(8)}$ (Figure 16)	6N136M HCPL2531M		10,000		$\text{V}/\mu\text{s}$
		$I_F = 0\text{ mA}$, $V_{CM} = 1,500\text{ V}_{P-P}$, $R_L = 1.9\text{ k}\Omega$, $T_A = 25^\circ\text{C}^{(8)}$ (Figure 16)	HCPL4503M	15,000	50,000		

Notes:

- The $4.1\text{ k}\Omega$ load represents 1 LSTTL unit load of 0.36 mA and $6.1\text{ k}\Omega$ pull-up resistor.
- The $1.9\text{ k}\Omega$ load represents 1 TTL unit load of 1.6 mA and $5.6\text{ k}\Omega$ pull-up resistor.
- Common mode transient immunity in logic high level is the maximum tolerable (positive) dV_{cm}/dt on the leading edge of the common mode pulse signal V_{CM} , to assure that the output will remain in a logic high state (i.e., $V_O > 2.0\text{ V}$). Common mode transient immunity in logic low level is the maximum tolerable (negative) dV_{cm}/dt on the trailing edge of the common mode pulse signal, V_{CM} , to assure that the output will remain in a logic low state (i.e., $V_O < 0.8\text{ V}$).

Electrical Characteristics (Continued)

$T_A = 0$ to 70°C unless otherwise specified. Typical values are measured at $T_A = 25^\circ\text{C}$ and $V_{CC} = 5\text{ V}$.

Isolation Characteristics

Symbol	Characteristics	Test Conditions	Min.	Typ.	Max.	Unit
V_{ISO}	Withstand Insulation Test Voltage	$RH \leq 50\%$, $T_A = 25^\circ\text{C}$, $I_{I-O} \leq 10\text{ }\mu\text{A}$, $t = 1\text{ minute}$, $f = 50\text{ Hz}$ ⁽⁹⁾⁽¹¹⁾	5,000			V_{RMS}
R_{I-O}	Resistance (Input to Output)	$V_{I-O} = 500\text{ VDC}$ ⁽⁹⁾		10^{11}		Ω
C_{I-O}	Capacitance (Input to Output)	$f = 1\text{ MHz}$, $V_{I-O} = 0\text{ V}$ ⁽⁹⁾		1		pF
I_{I-I}	Input-Input Insulation Leakage Current	$RH \leq 45\%$, $V_{I-I} = 500\text{ VDC}$ ⁽¹⁰⁾ $t = 5\text{ s}$, (HCPL2530M/2531M only)		< 1		nA
R_{I-I}	Input-Input Resistance	$V_{I-I} = 500\text{ VDC}$ ⁽¹⁰⁾ (HCPL2530M/2531M only)		10^{12}		Ω
C_{I-I}	Input-Input Capacitance	$f = 1\text{ MHz}$ ⁽¹⁰⁾ (HCPL2530M/2531M only)		0.2		pF

Notes:

9. Device is considered a two terminal device: pins 1, 2, 3 and 4 are shorted together and pins 5, 6, 7 and 8 are shorted together.
10. Measured between pins 1 and 2 shorted together, and pins 3 and 4 shorted together.
11. 5,000 V_{RMS} for 1 minute duration is equivalent to 6,000 V_{RMS} for 1 second duration.

Typical Performance Curves

For single-channel devices; 6N135M, 6N136M, and HCPL4503M.

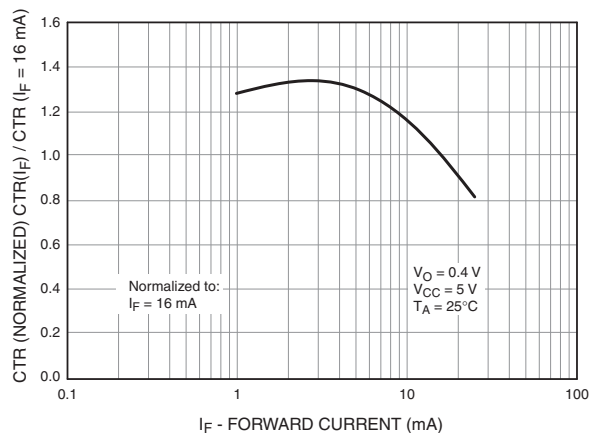


Figure 3. Normalized CTR vs. Forward Current

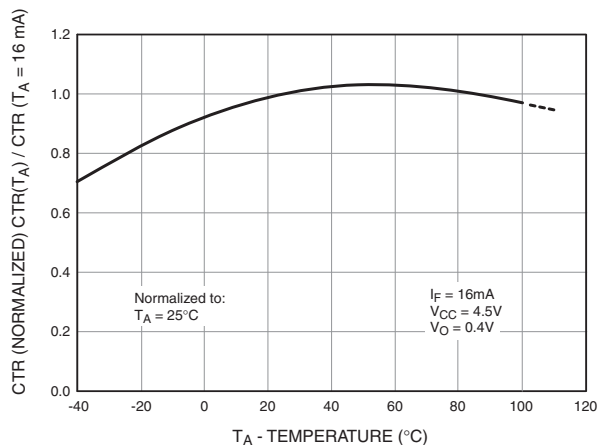


Figure 4. Normalized CTR vs. Temperature

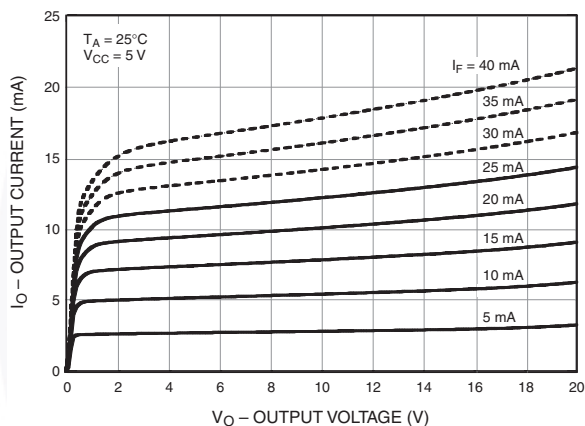


Figure 5. Output Current vs. Output Voltage

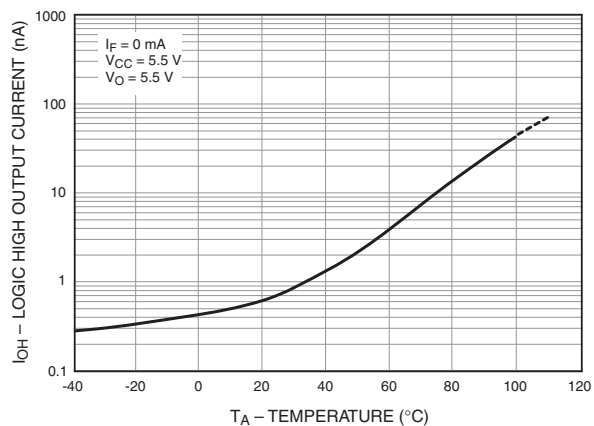


Figure 6. Logic High Output Current vs. Temperature

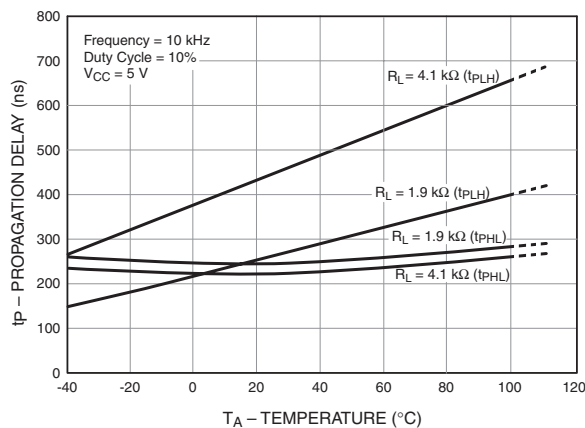


Figure 7. Propagation Delay vs. Temperature

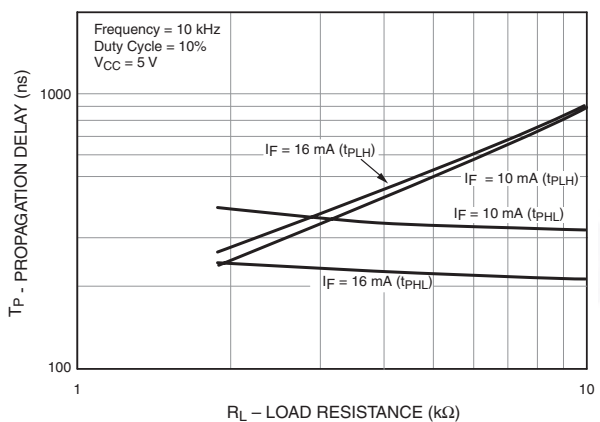


Figure 8. Propagation Delay vs. Load Resistance

Typical Performance Curves (Continued)

For dual-channel devices; HCPL2530M and HCPL2531M.

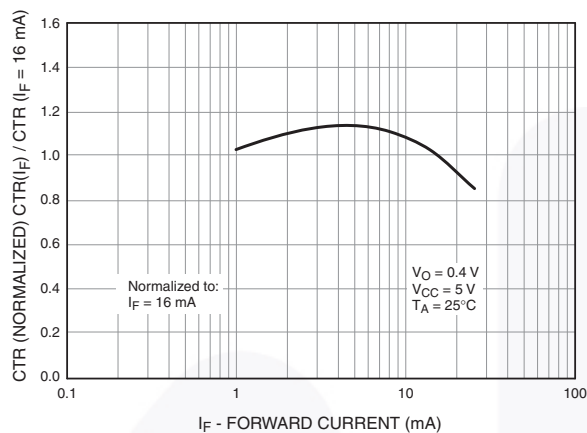


Figure 9. Normalized CTR vs. Forward Current

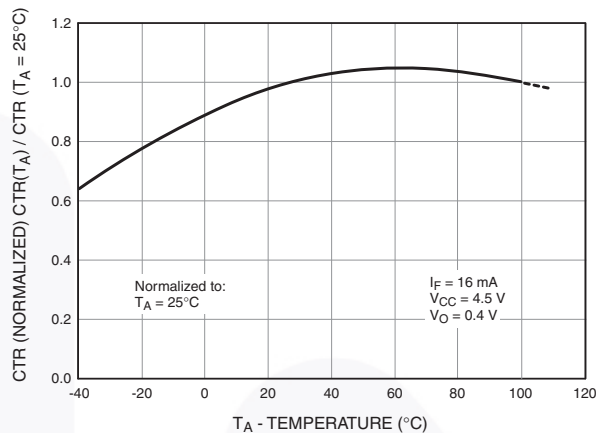


Figure 10. Normalized CTR vs. Temperature

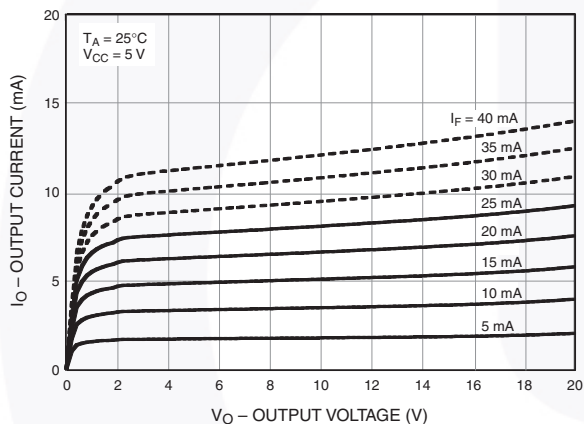


Figure 11. Output Current vs. Output Voltage

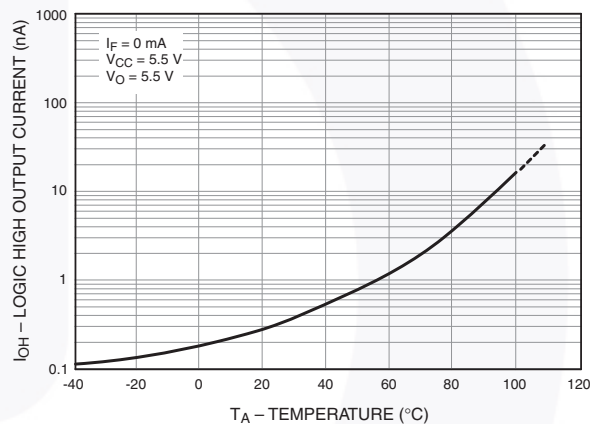


Figure 12. Logic High Output Current vs. Temperature

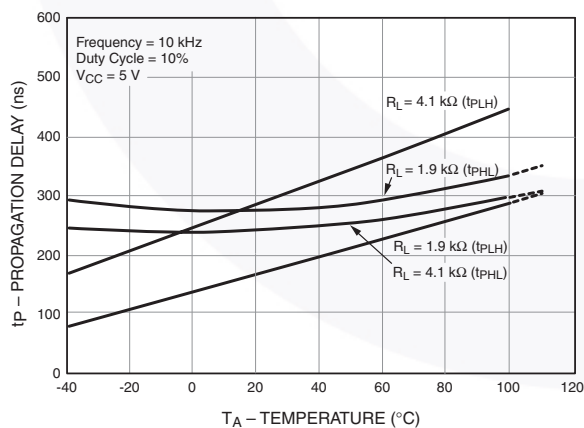


Figure 13. Propagation Delay vs. Temperature

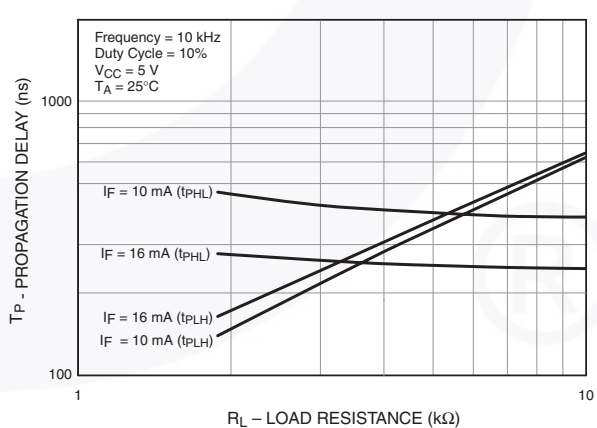
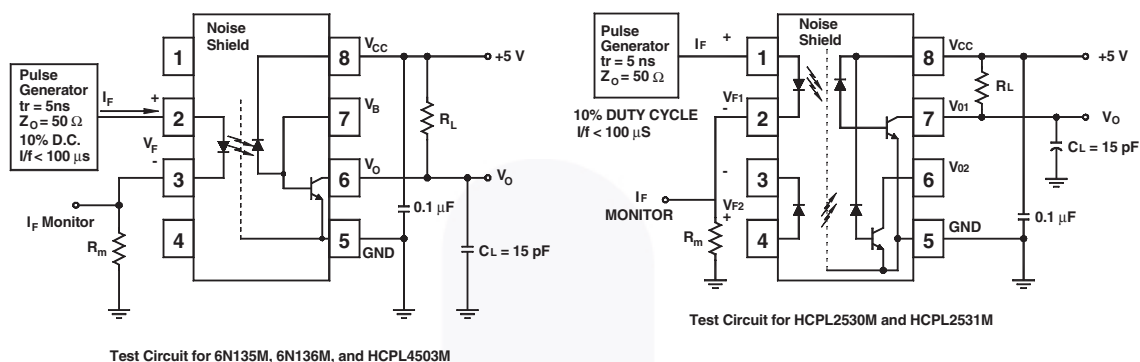


Figure 14. Propagation Delay vs. Load Resistance

Test Circuits



Test Circuit for 6N135M, 6N136M, and HCPL4503M

Test Circuit for HCPL2530M and HCPL2531M

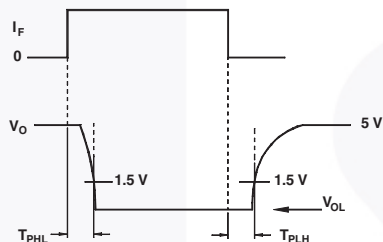
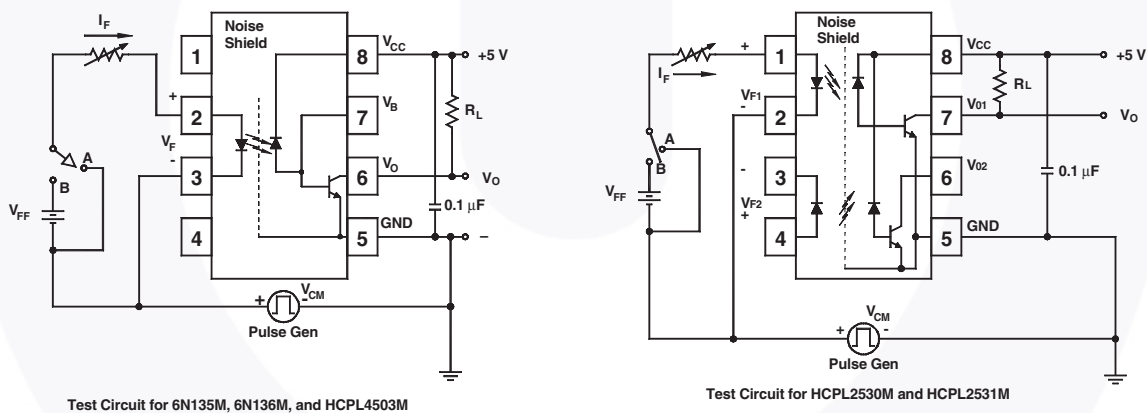


Figure 15. Switching Time Test Circuit



Test Circuit for 6N135M, 6N136M, and HCPL4503M

Test Circuit for HCPL2530M and HCPL2531M

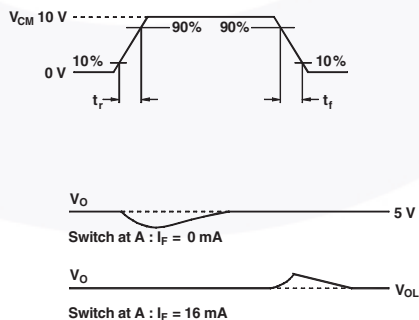
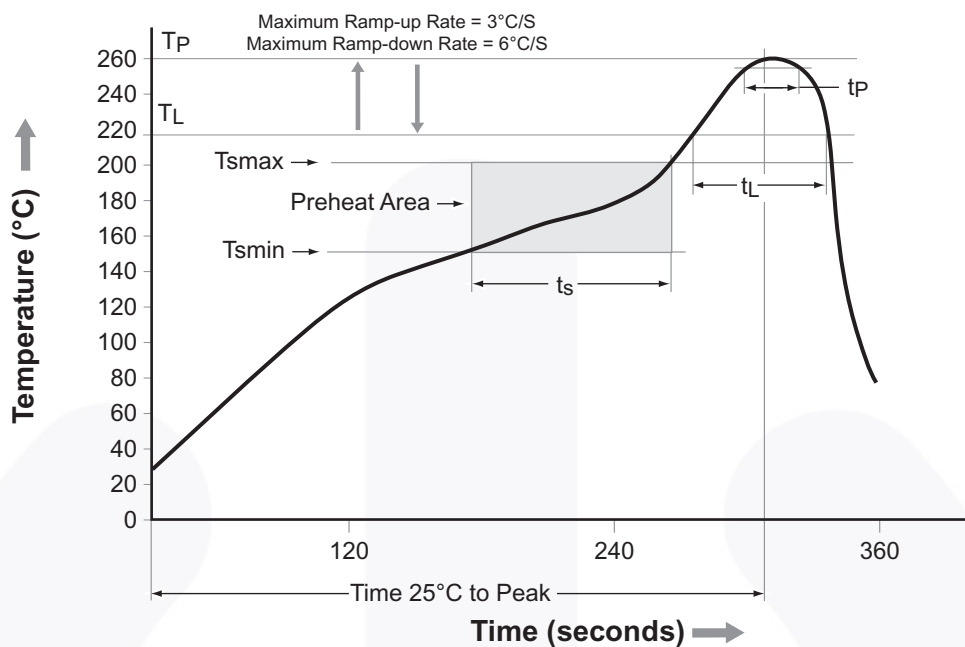


Figure 16. Common Mode Immunity Test Circuit

Reflow Profile



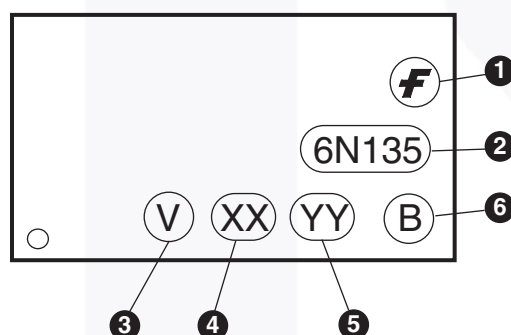
Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T _{smin})	150°C
Temperature Max. (T _{smax})	200°C
Time (t _s) from (T _{smin} to T _{smax})	60 to 120 s
Ramp-up Rate (t _L to t _P)	3°C/second maximum
Liquidous Temperature (T _L)	217°C
Time (t _L) Maintained Above (T _L)	60 to 150 s
Peak Body Package Temperature	260°C +0°C / -5°C
Time (t _P) within 5°C of 260°C	30 s
Ramp-down Rate (T _P to T _L)	6°C/s maximum
Time 25°C to Peak Temperature	8 minutes maximum

Figure 17. Relow Profile

Ordering Information

Part Number	Package	Packing Method
6N135M	DIP 8-Pin	Tube (50 units per tube)
6N135SM	SMT 8-Pin (Lead Bend)	Tube (50 units per tube)
6N135SDM	SMT 8-Pin (Lead Bend)	Tape and Reel (1,000 units per reel)
6N135VM	DIP 8-Pin, DIN EN/IEC 60747-5-5 option	Tube (50 units per tube)
6N135SVM	SMT 8-Pin (Lead Bend), DIN EN/IEC 60747-5-5 option	Tube (50 units per tube)
6N135SDVM	SMT 8-Pin (Lead Bend), DIN EN/IEC 60747-5-5 option	Tape and Reel (1,000 units per reel)
6N135TVM	DIP 8-Pin, 0.4" Lead Spacing, DIN EN/IEC 60747-5-5 option	Tube (50 units per tube)
6N135TSVM	SMT 8-Pin, 0.4" Lead Spacing, DIN EN/IEC 60747-5-5 option	Tube (50 units per tube)
6N135TSR2VM	SMT 8-Pin, 0.4" Lead Spacing, DIN EN/IEC 60747-5-5 option	Tape and Reel (700 units per reel)

Marking Information

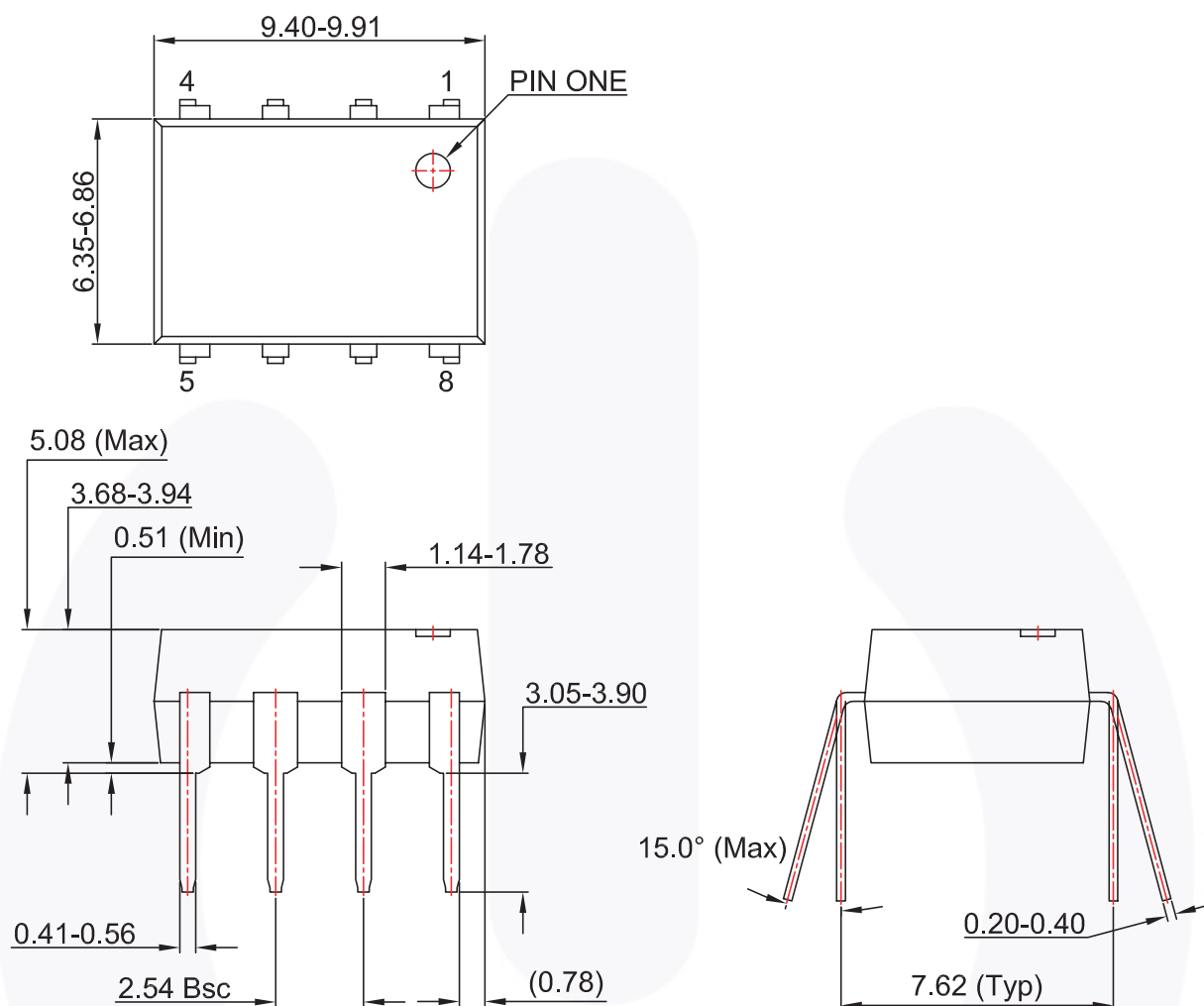


Definitions	
1	Fairchild logo
2 ⁽¹⁾	Device number
3	DIN EN/IEC60747-5-5 mark (Note: Only appears on parts ordered with this option – See order entry table)
4	Two-digit year code, e.g., '08'
5	Two-digit work week ranging from '01' to '53'
6	Assembly package code

Notes:

- 'HCPL' devices are marked with only the numeric characters (for example, HCPL4503M is marked as '4503').
- The 'M' suffix is an ordering identifier only. It is used to indicate the white package version. The 'M' does not appear in the top mark.

Package Dimensions



NOTES:

- A) NO STANDARD APPLIES TO THIS PACKAGE
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION
- D) DRAWING FILENAME AND REVISION: MKT-N08GREV6.

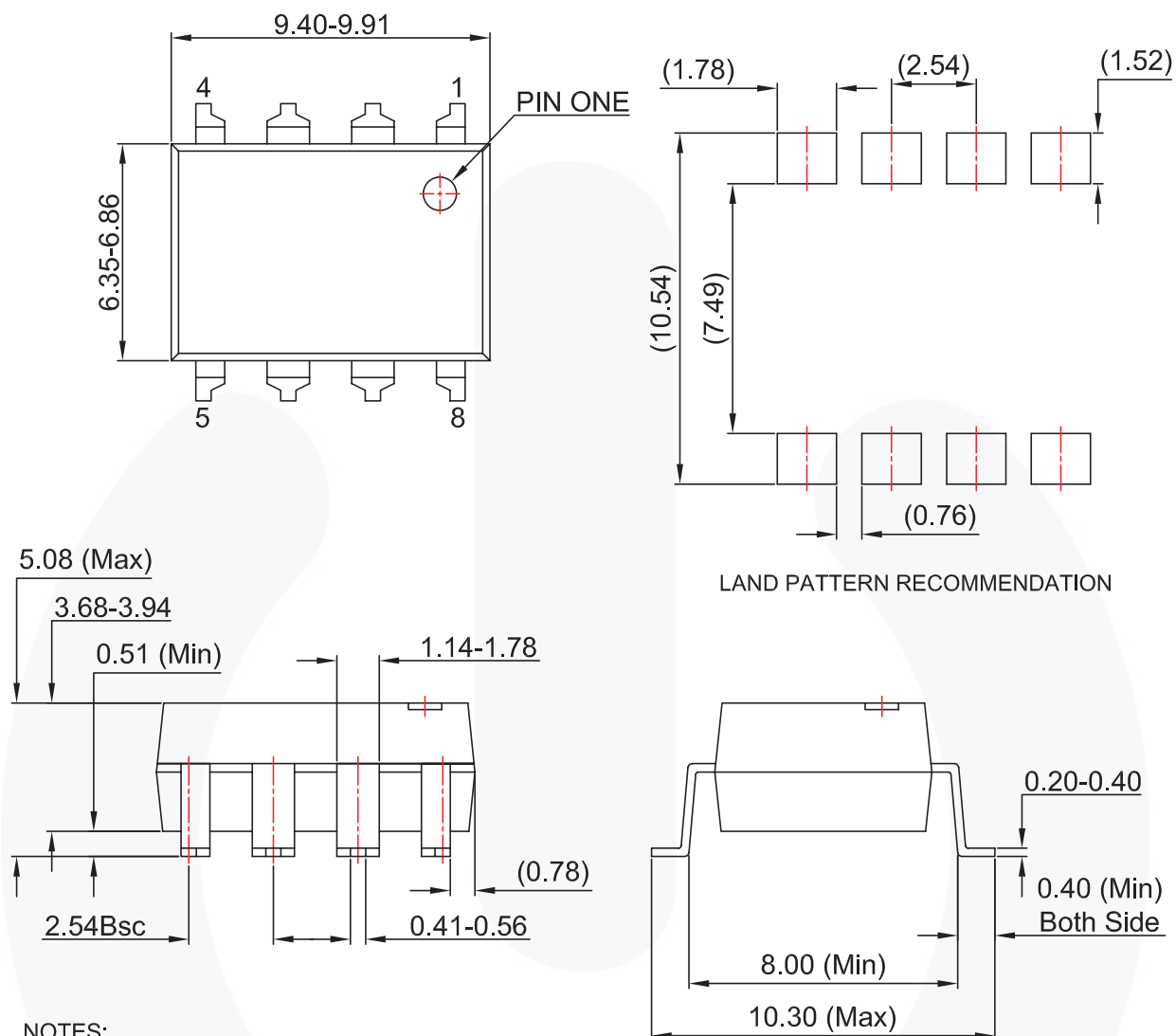
Figure 18. 8-Pin DIP Through Hole

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

<http://www.fairchildsemi.com/dwg/N0/N08G.pdf>.

Package Dimensions (Continued)



NOTES:

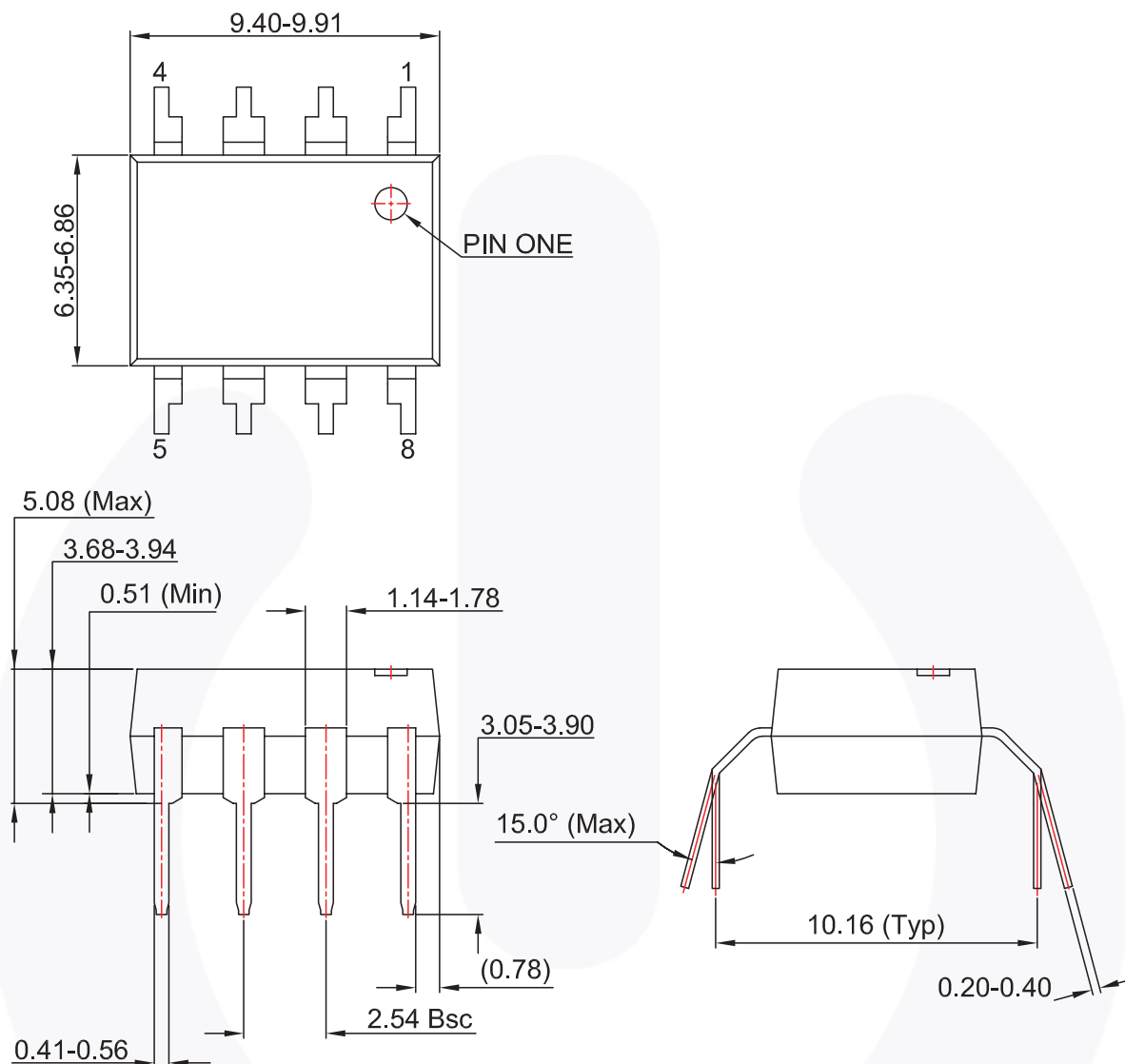
- A) NO STANDARD APPLIES TO THIS PACKAGE
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION
- D) DRAWING FILENAME AND REVISION: MKT-N08HREV6.

Figure 19. 8-Pin DIP Surface Mount (Option S)

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:
<http://www.fairchildsemi.com/dwg/N0/N08H.pdf>.

Package Dimensions (Continued)



NOTES:

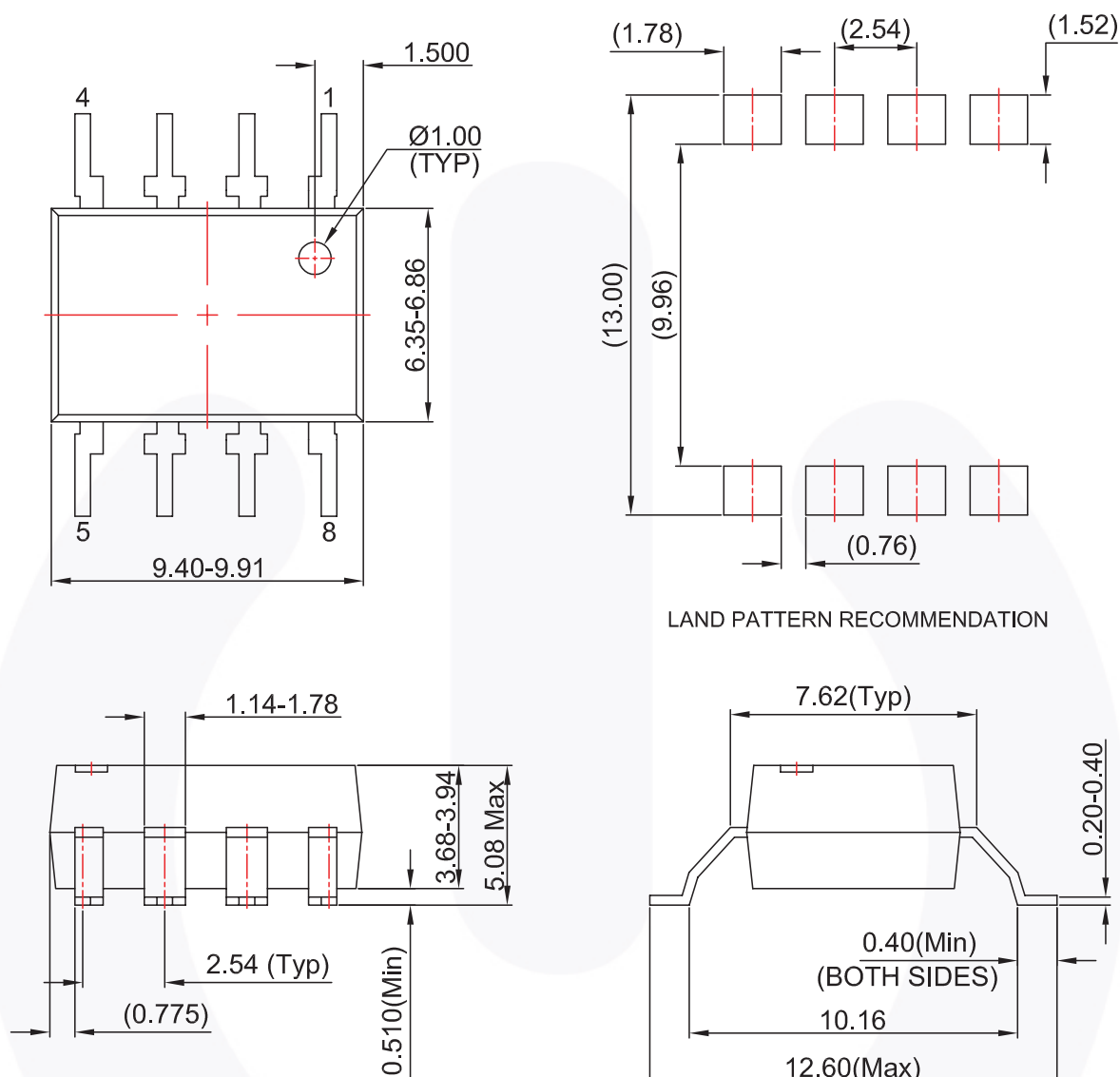
- A) NO STANDARD APPLIES TO THIS PACKAGE
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION
- D) DRAWING FILENAME AND REVISION: MKT-N08AREV6.

Figure 20. 8-Pin DIP Through Hole 0.4" Lead Spacing (Option T)

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:
<http://www.fairchildsemi.com/dwg/N0/N08A.pdf>.

Package Dimensions (Continued)



NOTES:

- A) NO STANDARD APPLIES TO THIS PACKAGE
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION
- D) DRAWING FILENAME AND REVISION: MKT-N08L.

Figure 21. 8-Pin DIP Surface Mount 0.4" Lead Spacing (Option TS)

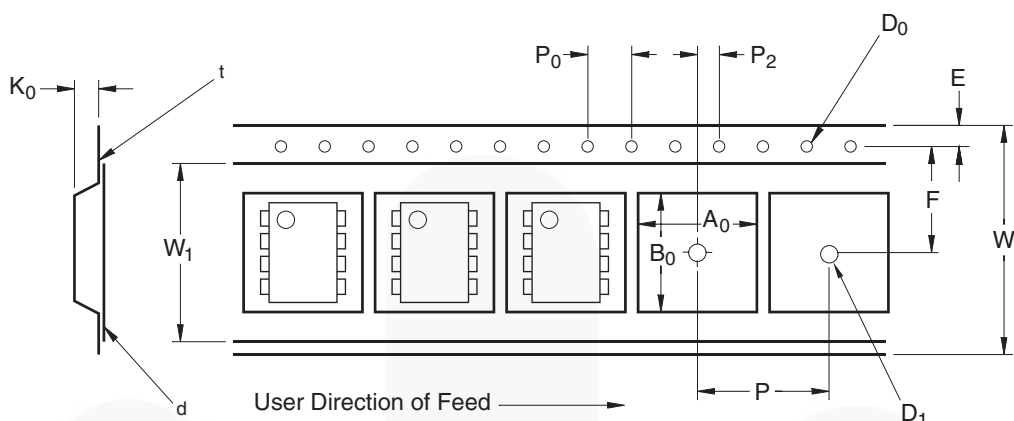
Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:
<http://www.fairchildsemi.com/dwg/N0/N08L.pdf>

The diagram illustrates a multi-lane automated sorting machine. A feeder on the left feeds material into the lanes. The material is sorted into different lanes based on size, with larger items going to the left and smaller items to the right. The diagram includes labels for various dimensions and parameters: K_0 (feeder width), t (material thickness), W_1 (lane width), P_0 , P_2 (lane widths), D_0 (material diameter), E (exit width), F (lane depth), W (total width), A_0 , B_0 (material dimensions), P (pitch), D_1 (material diameter), and "User Direction of Feed".

Symbol	Description	Dimension in mm
W	Tape Width	16.0 ± 0.3
t	Tape Thickness	0.30 ± 0.05
P ₀	Sprocket Hole Pitch	4.0 ± 0.1
D ₀	Sprocket Hole Diameter	1.55 ± 0.05
E	Sprocket Hole Location	1.75 ± 0.10
F	Pocket Location	7.5 ± 0.1
P ₂		2.0 ± 0.1
P	Pocket Pitch	12.0 ± 0.1
A ₀	Pocket Dimensions	10.30 ±0.20
B ₀		10.30 ±0.20
K ₀		4.90 ±0.20
W ₁	Cover Tape Width	13.2 ± 0.2
d	Cover Tape Thickness	0.1 Maximum
	Maximum Component Rotation or Tilt	10°
R	Minimum Bending Radius	30

Carrier Tape Specifications (Option TSR2)



Symbol	Description	Dimension in mm
W	Tape Width	24.0 ± 0.3
t	Tape Thickness	0.40 ± 0.1
P ₀	Sprocket Hole Pitch	4.0 ± 0.1
D ₀	Sprocket Hole Diameter	1.55 ± 0.05
E	Sprocket Hole Location	1.75 ± 0.10
F	Pocket Location	11.5 ± 0.1
P ₂		2.0 ± 0.1
P	Pocket Pitch	16.0 ± 0.1
A ₀	Pocket Dimensions	12.80 ± 0.1
B ₀		10.35 ± 0.1
K ₀		5.7 ± 0.1
W ₁	Cover Tape Width	21.0 ± 0.1
d	Cover Tape Thickness	0.1 Maximum
	Maximum Component Rotation or Tilt	10°
R	Minimum Bending Radius	30



TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™	F-PFS™	PowerTrench®	SYSTEM GENERAL®
AX-CAP®*	FRFET®	PowerXS™	TinyBoost®
BitSiC™	Global Power Resource™	Programmable Active Droop™	TinyBuck®
Build it Now™	GreenBridge™	QFET®	TinyCalc™
CorePLUS™	Green FPS™	QS™	TinyLogic®
CorePOWER™	Green FPS™ e-Series™	Quiet Series™	TINYOPTO™
CROSSVOLT™	Gmax™	RapidConfigure™	TinyPower™
CTL™	GTO™	Saving our world, 1mW/W/kW at a time™	TinyPwm™
Current Transfer Logic™	IntelliMAX™	SignalWise™	TinyWire™
DEUXPEED®	ISOPLANAR™	SmartMax™	TranSiC™
Dual Cool™	Making Small Speakers Sound Louder and Better™	SMART START™	TriFault Detect™
EcoSPARK®	MegaBuck™	Solutions for Your Success™	TRUECURRENT®*
EfficientMax™	MICROCOUPLER™	SPM®	µSerDes™
ESBC™	MicroFET™	STEALTH™	UHC®
F [®]	MicroPak™	SuperFET®	Ultra FRFET™
Fairchild®	MicroPak2™	SuperSOT™-3	UniFET™
Fairchild Semiconductor®	MillerDrive™	SuperSOT™-6	VCX™
FACT Quiet Series™	MotionMax™	SuperSOT™-8	VisualMax™
FACT®	mWSaver®	SupreMOS®	VoltagePlus™
FAST®	OptoHiT™	SyncFET™	XS™
FastvCore™	OPTOLOGIC®	Sync-Lock™	仙童™
FETBench™	OPTOPLANAR®		
FPS™			

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I68