FAIRCHILD

SEMICONDUCTOR®

December 2006

H11L1M, H11L2M, H11L3M
6-Pin DIP Optocoupler

Features

■ High data rate, 1MHz typical (NRZ)

■ Free from latch up and oscilliation throughout voltage and temperature ranges.

■ Microprocessor compatible drive

■ Logic compatible output sinks 16mA at 0.4V maximum

■ Guaranteed on/off threshold hysteresis

■ Wide supply voltage capability, compatible with all popular logic systems

■ Underwriters Laboratory (UL) recognized—
file #E90700, Volume 2

■ VDE recognized – File#102497 – Add option V
(e.g., H11LIVM)

Applications

■ Logic to logic isolator

■ Programmable current level sensor

■ Line receiver—eliminate noise and transient problems

■ A.C. to TTL conversion—square wave shaping

■ Digital programming of power supplies

■ Interfaces computers with peripherals

Description

The H11LXM series has a high speed integrated circuit detector optically coupled to a gallium-arsenide infrared emitting diode. The output incorporates a Schmitt trigger, which provides hysteresis for noise immunity and pulse shaping. The detector circuit is optimized for simplicity of operation and utilizes an open collector output for maximum application flexibility.

Packages
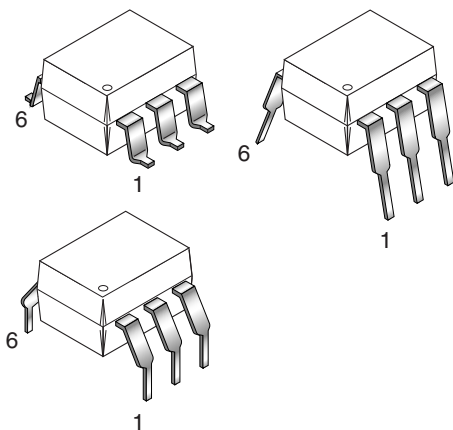
Schematic
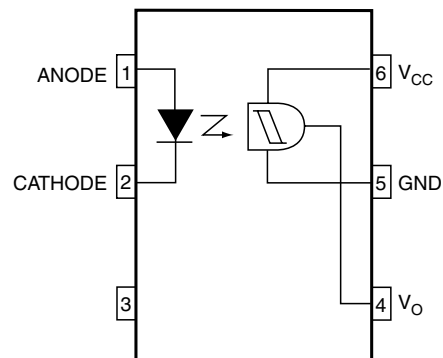
Truth Table

Input	Output
H	L
L	H

Absolute Maximum Ratings $(T_A = 25°C$ Unless otherwise specified.)

Symbol	Parameters	Value	Units
TOTAL DEVICE			
T_{STG}	Storage Temperature	-55 to +150	°C
T_{OPR}	Operating Temperature	-40 to +85	°C
T_{SOL}	Lead Solder Temperature	260 for 10 sec	°C
P_D	Total Device Power Dissipation @ 25°C	250	mW
	Derate Above 25°C	2.94	mW/°C
EMITTER			
I_F	Continuous Forward Current	60	mA
V_R	Reverse Voltage	6	V
$I_F(pk)$	Forward Current – Peak (1µs pulse, 300pps)	3.0	A
P_D	LED Power Dissipation 25°C Ambient	120	mW
	Derate Linearly From 25°C	1.41	mW/°C
DETECTOR			
P_D	Detector Power Dissipation @ 25°C	150	mW
	Derate Linearly from 25°C	2.0	mW/°C
V_O	V_{45} Allowed Range	0 to 16	V
V_{CC}	V_{65} Allowed Range	3 to 16	V
I_O	I_4 Output Current	50	mA

Electrical Characteristics (T_A = 25°C Unless otherwise specified.)
Individual Component Characteristics

Symbol	Parameters	Test Conditions	Device	Min.	Typ.	Max.	Units
EMITTER							
V_F	Input Forward Voltage	$I_F = 10mA$	All		1.2	1.5	V
		$I_F = 0.3mA$		0.75	1.0		
I_R	Reverse Current	$V_R = 3V$	All			10	µA
C_J	Capacitance	V = 0, f = 1.0MHz	All			100	pF
DETECTOR							
V_{CC}	Operating Voltage Range		All	3		15	V
$I_{CC(off)}$	Supply Current	$I_F = 0$, $V_{CC} = 5V$	All		1.6	5.0	mA
I_{OH}	Output Current, High	$I_F = 0$, $V_{CC} = V_O = 15V$	All			100	µA

Transfer Characteristics

Symbol	Parameter	Test Conditions	Device	Min.	Typ.	Max.	Units
DC CHARACTERISTICS							
$I_{CC(on)}$	Supply Current	$I_F = 10mA$, $V_{CC} = 5V$	All		1.6	5.0	mA
V_{OL}	Output Voltage, low	$R_L = 270\Omega$, $V_{CC} = 5V$, $I_F = I_{F(on)}$ max.	All		0.2	0.4	V
$I_{F(on)}$	Turn-On Threshold Current[1]	$R_L = 270\Omega$, $V_{CC} = 5V$	H11L1M			1.6	mA
			H11L2M			10.0	
			H11L3M			5.0	
$I_{F(off)}$	Turn-Off Threshold Current	$R_L = 270\Omega$, $V_{CC} = 5V$	All	0.3	1.0		mA
$I_{F(off)}/I_{F(on)}$	Hysteresis Ratio	$R_L = 270\Omega$, $V_{CC} = 5V$	All	0.50	0.75	0.90	
AC CHARACTERISTICS, Switching Speed							
t_{on}	Turn-On time	$R_L = 270\Omega$, $V_{CC} = 5V$, $I_F = I_{F(on)}$, $T_A = 25°C$	All		1.0	4	µs
t_f	Fall Time	$R_L = 270\Omega$, $V_{CC} = 5V$, $I_F = I_{F(on)}$, $T_A = 25°C$	All		0.1		µs
t_{off}	Turn-Off Time	$R_L = 270\Omega$, $V_{CC} = 5V$, $I_F = I_{F(on)}$, $T_A = 25°C$	All		1.2	4	µs
t_r	Rise time	$R_L = 270\Omega$, $V_{CC} = 5V$, $I_F = I_{F(on)}$, $T_A = 25°C$	All		0.1		µs
	Data Rate		All		1.0		MHz

Isolation Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{ISO}	Input-Output Isolation Voltage	t =1 sec.	7500			V_{PEAK}
C_{ISO}	Isolation Capacitance	$V_{I-O} = 0V$, f = 1MHz		0.4	0.6	pF
R_{ISO}	Isolation Resistance	$V_{I-O} = \pm500$ VDC	10^{11}			Ω

Note:
1. Maximum $I_{F(ON)}$ is the maximum current required to trigger the output. For example, a 1.6mA maximum trigger current would require the LED to be driven at a current greater than 1.6mA to guarantee the device will turn on. A 10% guard band is recommended to account for degradation of the LED over its lifetime. The maximum allowable LED drive current is 60mA.

Typical Performance Curves

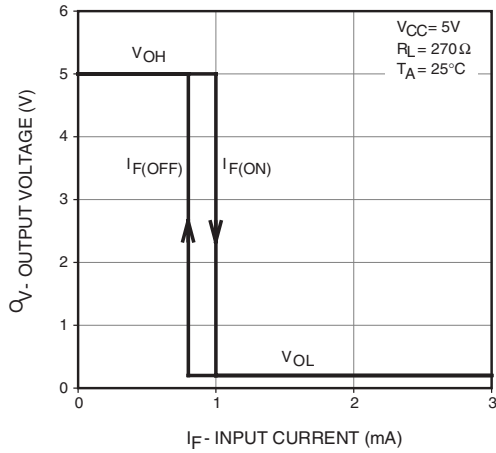**Figure 1. Transfer Characteristics**

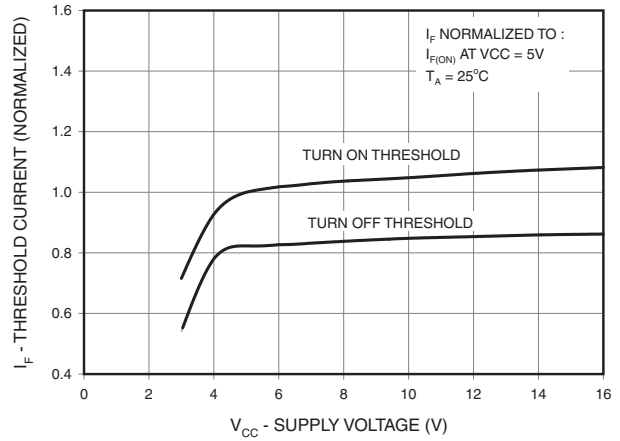**Figure 2. Threshold Current vs. Supply Voltage**

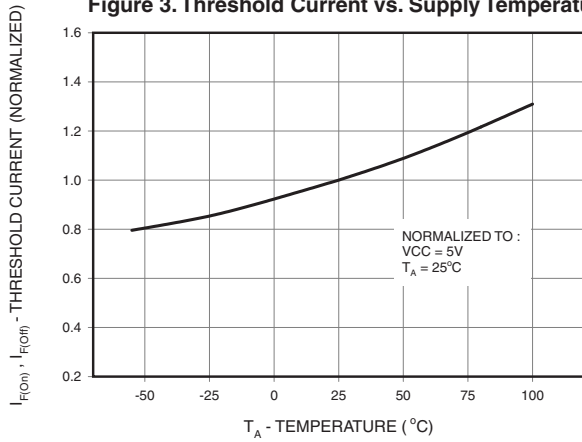**Figure 3. Threshold Current vs. Supply Temperature**

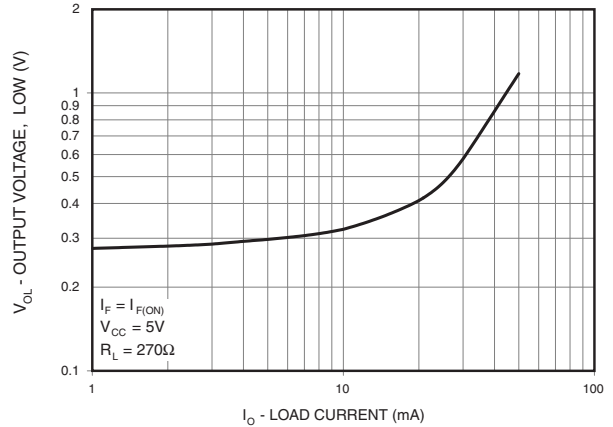**Figure 4. Output Voltage, Low vs. Load Current**
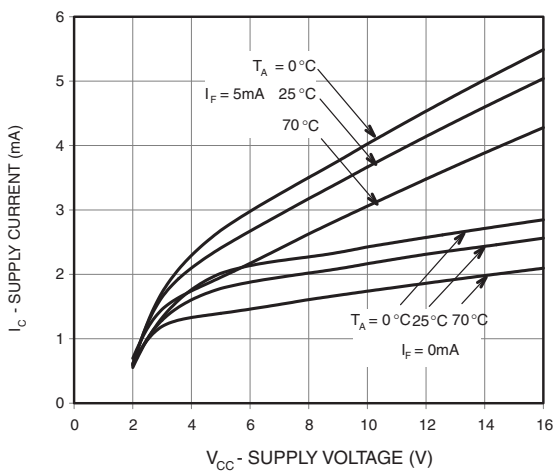

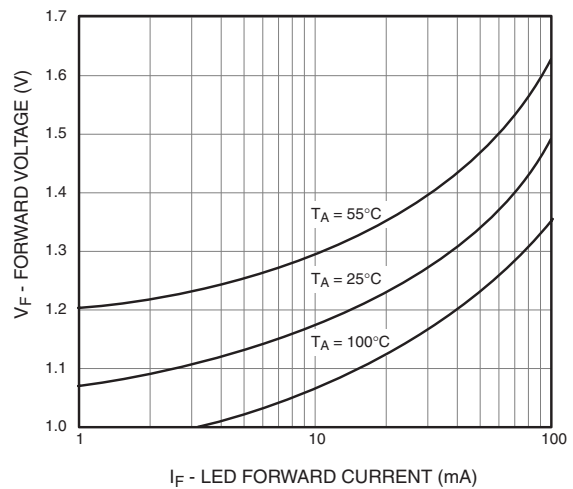
Figure 5. Supply Current vs. Supply Voltage

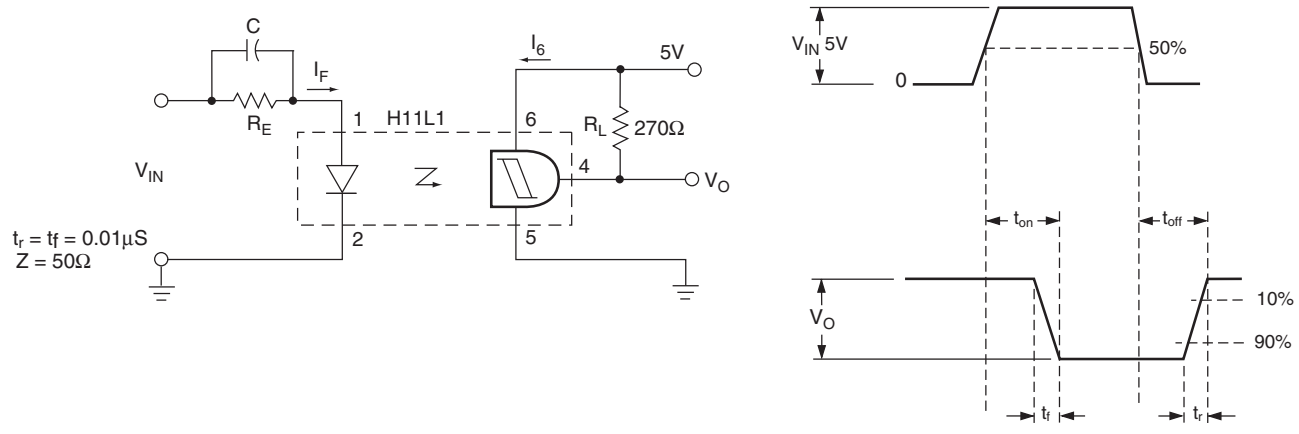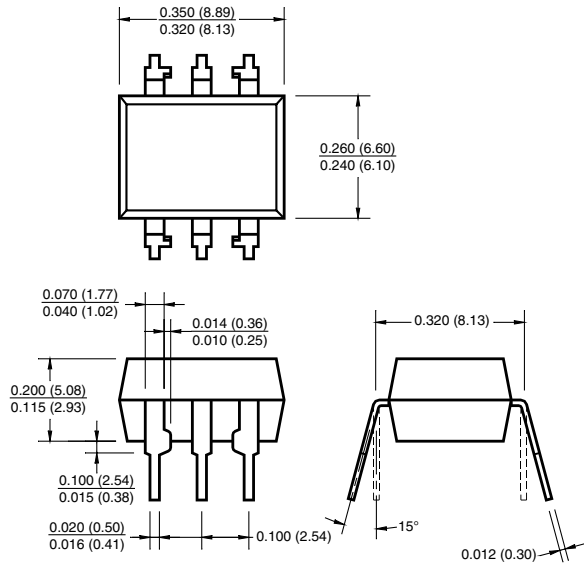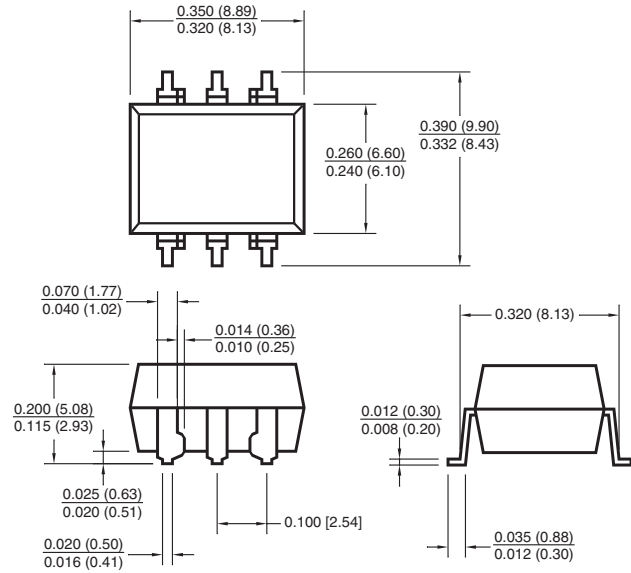**Figure 6. LED Forward Voltage vs. Forward Current**

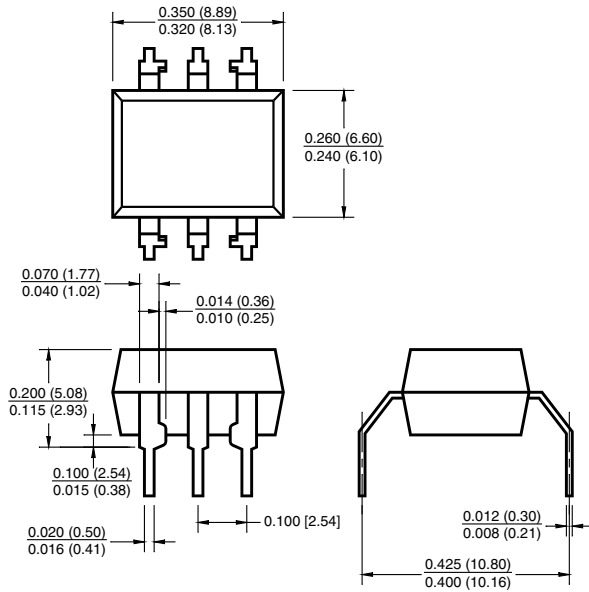**Figure 7. Switching Test Circuit and Waveforms**

Package Dimensions

Through Hole

0.350 (8.89)
0.320 (8.13)

0.260 (6.60)
0.240 (6.10)

0.070 (1.77)
0.040 (1.02)

0.014 (0.36)
0.010 (0.25)

0.320 (8.13)

0.200 (5.08)
0.115 (2.93)

0.100 (2.54)
0.015 (0.38)

0.020 (0.50)
0.016 (0.41)

0.100 (2.54)

15°

0.012 (0.30)

Surface Mount

0.350 (8.89)
0.320 (8.13)

0.390 (9.90)
0.332 (8.43)

0.260 (6.60)
0.240 (6.10)

0.070 (1.77)
0.040 (1.02)

0.014 (0.36)
0.010 (0.25)

0.320 (8.13)

0.200 (5.08)
0.115 (2.93)

0.012 (0.30)
0.008 (0.20)

0.025 (0.63)
0.020 (0.51)

0.100 (2.54)

0.020 (0.50)
0.016 (0.41)

0.035 (0.88)
0.012 (0.30)

0.4" Lead Spacing

0.350 (8.89)
0.320 (8.13)

0.260 (6.60)
0.240 (6.10)

0.070 (1.77)
0.040 (1.02)

0.014 (0.36)
0.010 (0.25)

0.200 (5.08)
0.115 (2.93)

0.100 (2.54)
0.015 (0.38)

0.020 (0.50)
0.016 (0.41)

0.100 [2.54]

0.012 (0.30)
0.008 (0.21)

0.425 (10.80)
0.400 (10.16)

Recommend Pad Layout for Surface Mount Leadform

0.070 (1.78)

0.060 (1.52)

0.425 (10.79)

0.100 (2.54)

0.305 (7.75)

0.030 (0.76)
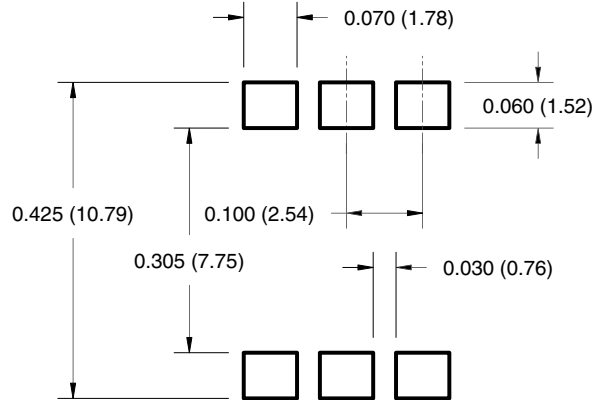
Note:

All dimensions are in inches (millimeters).

Ordering Information

Option/Order Entry Identifier	Description
S	Surface Mount Lead Bend
SR2	Surface Mount; Tape and reel
T	0.4" Lead Spacing
V	VDE 0884
TV	VDE 0884, 0.4" Lead Spacing
SV	VDE 0884, Surface Mount
SR2V	VDE 0884, Surface Mount, Tape & Reel

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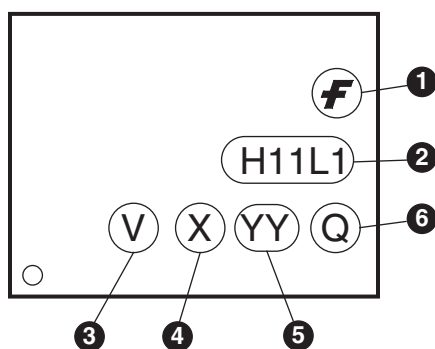
| Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., '3'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

*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.
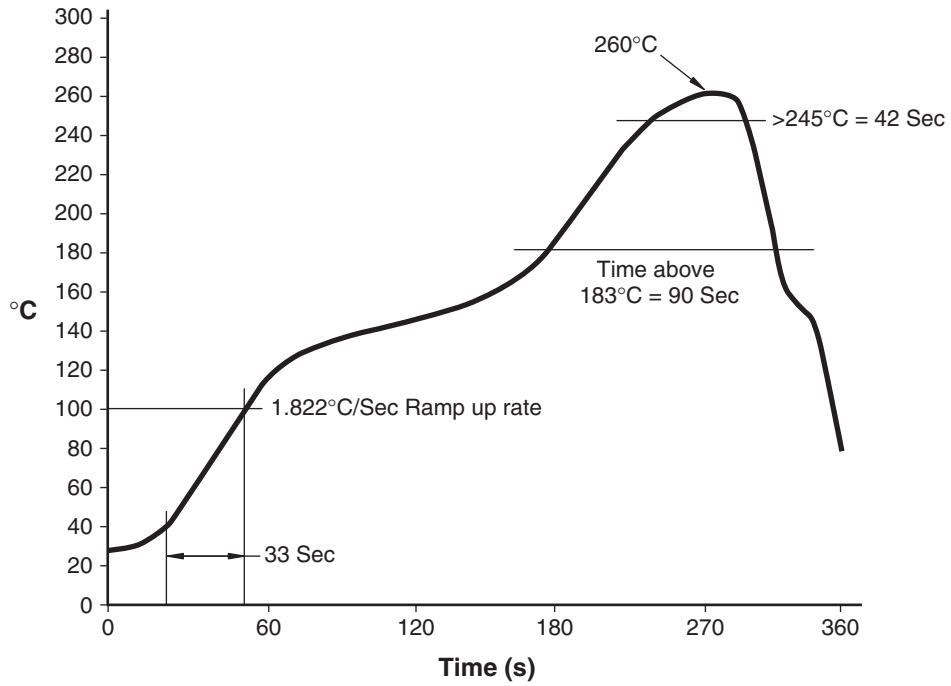
Tape Dimensions
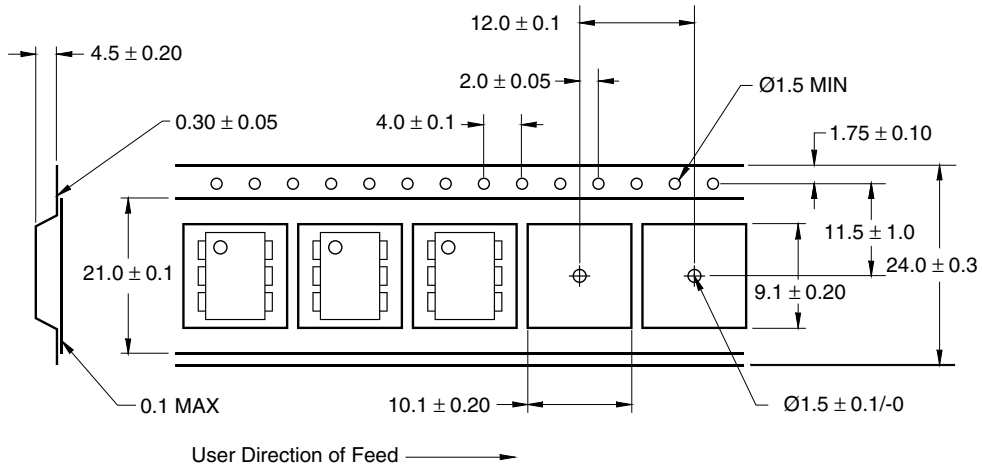
Note:
All dimensions are in millimeters.

Reflow Profile

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Bottomless™	GTO™	OPTOLOGIC®	SPM™	Wire™
Build it Now™	HiSeC™	OPTOPLANAR™	Stealth™	
CoolFET™	I^{2}C™	PACMAN™	SuperFET™	
CROSSVOLT™	*i-Lo*™	POP™	SuperSOT™-3	
DOME™	ImpliedDisconnect™	Power247™	SuperSOT™-6	
EcoSPARK™	IntelliMAX™	PowerEdge™	SuperSOT™-8	
E^{2}CMOS™	ISOPLANAR™	PowerSaver™	SyncFET™	
EnSigna™	LittleFET™	PowerTrench®	TCM™	
FACT®	MICROCOUPLER™	QFET®	TinyBoost™	
FAST®	MicroFET™	QS™	TinyBuck™	
FASTr™	MicroPak™	QT Optoelectronics™	TinyPWM™	
FPS™	MICROWIRE™	Quiet Series™	TinyPower™	
FRFET™	MSX™	RapidConfigure™	TinyLogic®	
	MSXPro™	RapidConnect™	TINYOPTO™	
Across the board. Around the world.™		μSerDes™	TruTranslation™	
The Power Franchise®		ScalarPump™	UHC®	
Programmable Active Droop™				

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and 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	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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