THE DATASHEET OF

FODM3011R1_NF098

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FAIRCHILD SEMICONDUCTOR®

April 2009

FODM3011, FODM3012, FODM3022, FODM3023, FODM3052, FODM3053
4-Pin Full Pitch Mini-Flat Package Random-Phase Triac Driver Output Optocouplers

Features

- Compact 4-pin surface mount package (2.4 mm maximum standoff height)
- Peak blocking voltage
  250V (FODM301X)
  400V (FODM302X)
  600V (FODM305X)
- Available in tape and reel quantities of 2500.
- Add “NF098” for new construction version with 260°C max. reflow temperature rating
- UL, C-UL and VDE certifications pending

Applications

- Industrial controls
- Traffic lights
- Vending machines

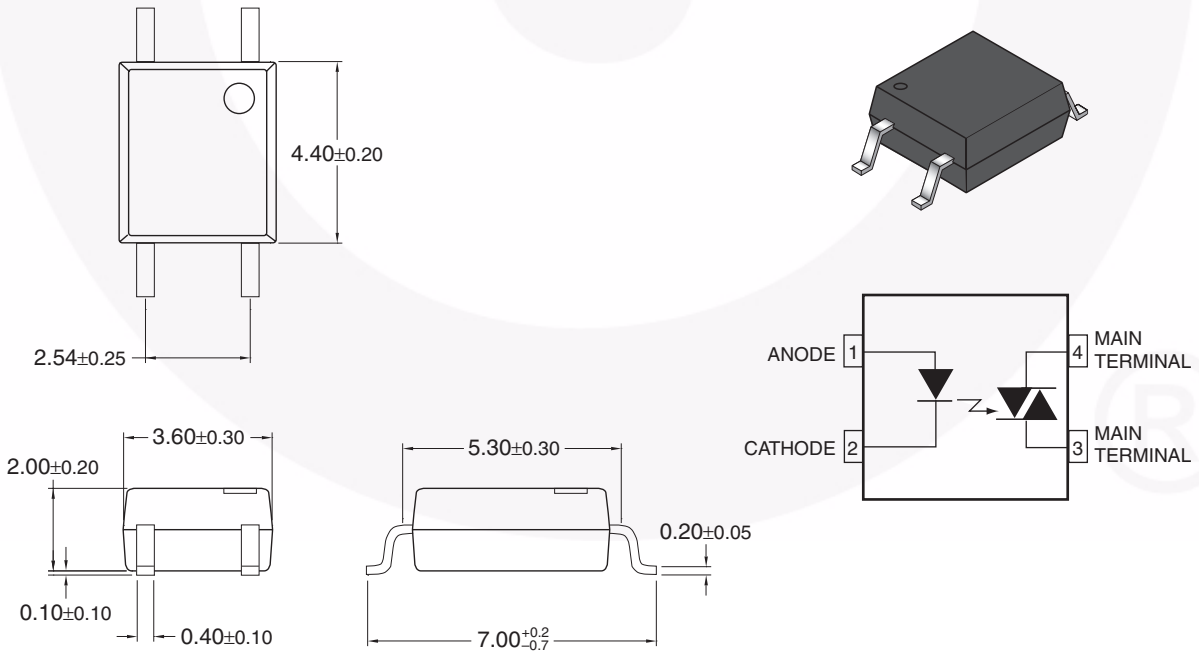
Applications (Continued)

- Solid state relay
- Lamp ballasts
- Solenoid/valve controls
- Static AC power switch
- Incandescent lamp dimmers
- Motor control

Description

The FODM301X, FODM302X, and FODM305X series consists of a GaAs infrared emitting diode driving a silicon bilateral switch housed in a compact 4-pin mini-flat package. The lead pitch is 2.54mm. They are designed for interfacing between electronic controls and power triacs to control resistive and inductive loads for 115V/240V operations.

Package Dimensions



Note:
All dimensions are in millimeters.

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Absolute Maximum Ratings (T_A = 25°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 PACKAGE				
T_{STG}	Storage Temperature		-55 to +150	°C
T_{OPR}	Operating Temperature		-40 to +100	°C
EMITTER				
$I_{F\ (avg)}$	Continuous Forward Current		60	mA
$I_{F\ (pk)}$	Peak Forward Current (1µs pulse, 300pps.)		1	A
V_R	Reverse Input Voltage		3	V
P_D	Power Dissipation (No derating required over operating temp. range)		100	mW
DETECTOR				
$I_{T(RMS)}$	On-State RMS Current		70	mA (RMS)
V_{DRM}	Off-State Output Terminal Voltage	FODM3011/FODM3012	250	V
		FODM3022/FODM3023	400	
		FODM3052/FODM3053	600	
P_D	Power Dissipation (No derating required over operating temp. range)		300	mW

Electrical Characteristics (T_A = 25°C)

Individual Component Characteristics

Symbol	Parameter	Test Conditions	Device	Min.	Typ.*	Max.	Unit
EMITTER							
V_F	Input Forward Voltage	I_F = 10mA	All		1.20	1.5	V
I_R	Reverse Leakage Current	V_R = 3V, T_A = 25°C	All		0.01	100	µA
DETECTOR							
I_{DRM}	Peak Blocking Current Either Direction	Rated V_{DRM}, I_F = 0(1)	All		2	100	nA
dV/dt	Critical Rate of Rise of Off-State Voltage	I_F = 0 (Figure 8)(2)	FODM3011, FODM3012, FODM3022, FODM3023		10		V/µs
			FODM3052, FODM3053	1,000			

Transfer Characteristics

Symbol	DC Characteristics	Test Conditions	Device	Min.	Typ.*	Max.	Unit
I_{FT}	LED Trigger Current	Main Terminal Voltage = 3V(3)	FODM3011, FODM3022, FODM3052			10	mA
			FODM3012, FODM3023, FODM3053			5	
I_H	Holding Current, Either Direction		All		300		µA
V_{TM}	Peak On-State Voltage Either Direction	I_{TM} = 100mA peak	All		1.7	3	V

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Device	Min.	Typ.*	Max.	Unit
V_{ISO}	Steady State Isolation Voltage	1 Minute, R.H. = 40% to 60%	All	3750			VRMS

*All typicals at T_A = 25°C

Notes:

1. Test voltage must be applied within dv/dt rating.
2. This is static dv/dt. See Figure 1 for test circuit Commutating dv/dt is function of the load-driving thyristor(s) only.
3. All devices are guaranteed to trigger at an I_F value less than or equal to max I_{FT}. Therefore, recommended operating I_F lies between max I_{FT} (10mA for FODM3011, FODM3022, and FODM3052, 5mA for FODM3012, FODM3023, and FODM3053) and absolute max I_F (60mA).

Typical Performance Curves

Fig. 1 LED Forward Voltage vs. Forward Current

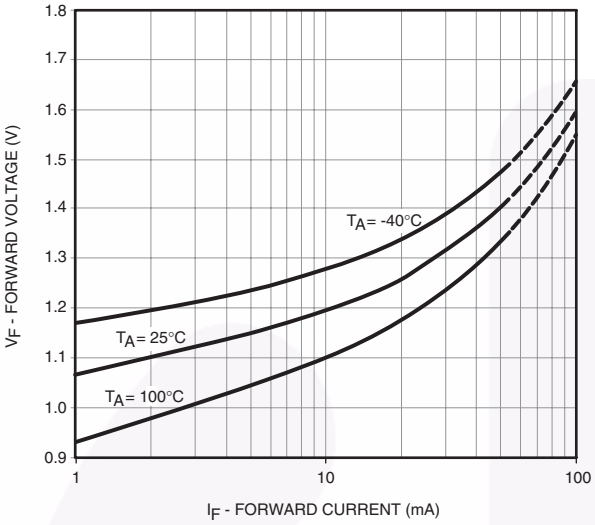


Fig. 2 Leakage Current vs. Ambient Temperature

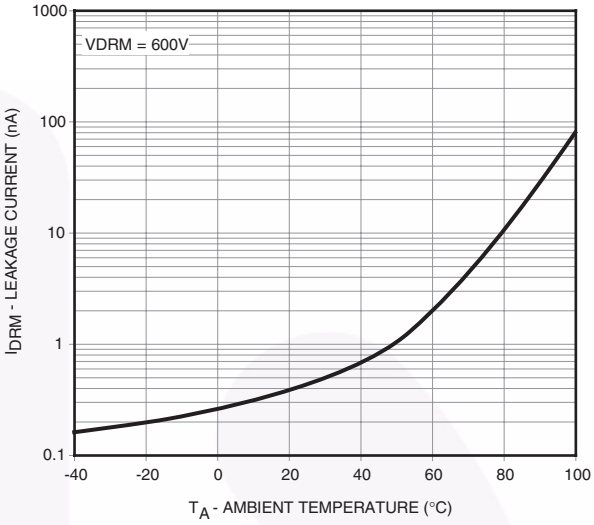


Fig. 3 Holding Current vs. Ambient Temperature

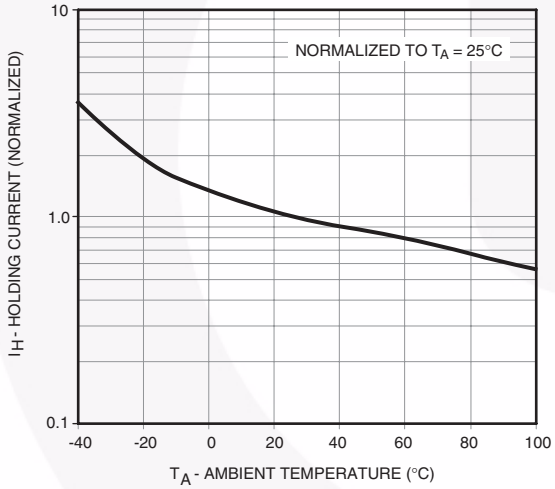
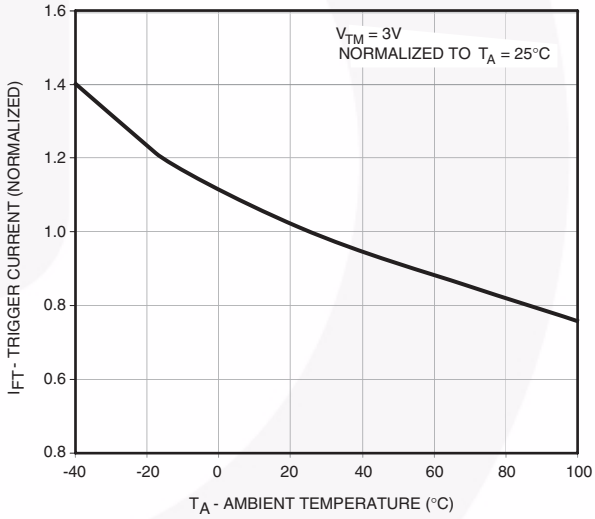


Fig. 4 Trigger Current vs. Ambient Temperature



Typical Performance Curves (Continued)

Fig. 5 LED Current Required to Trigger vs. LED Pulse Width

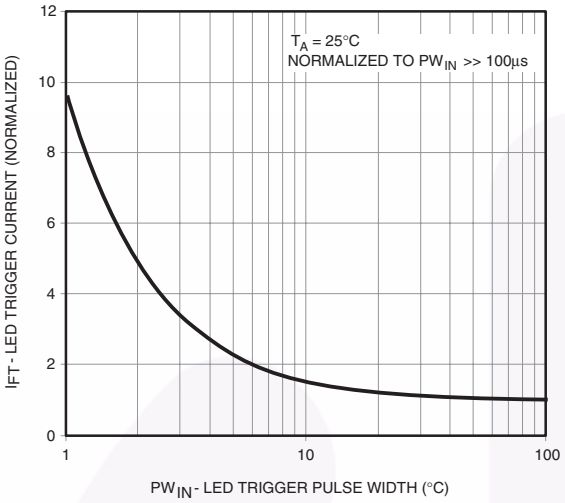


Fig. 6 Off-State Output Terminal Voltage vs. Ambient Temperature

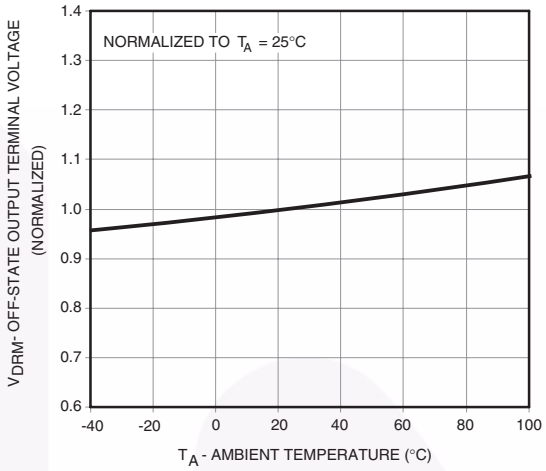
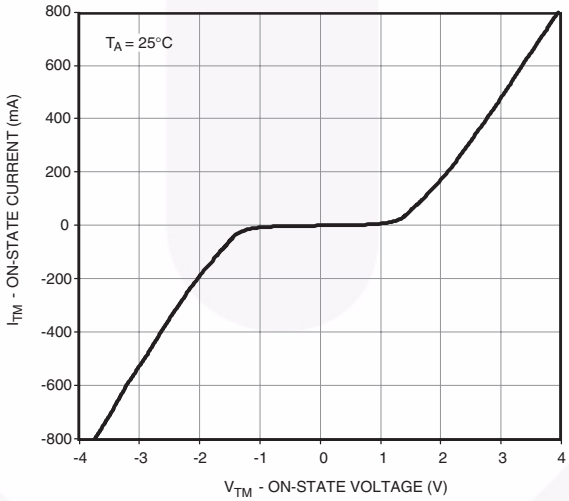
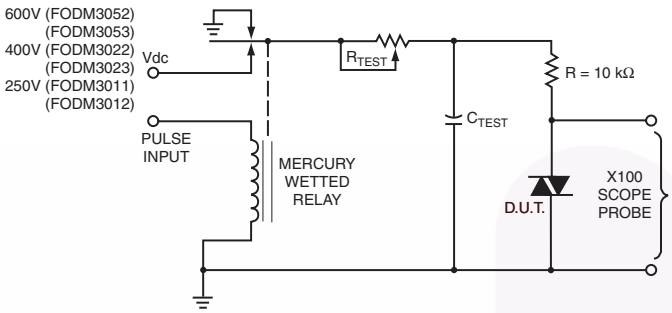


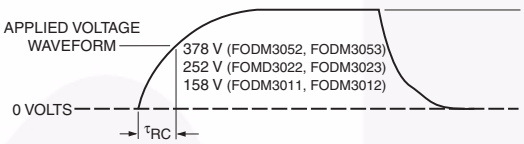
Fig. 7 On-State Characteristics



Typical Application Information



1. The mercury wetted relay provides a high speed repeated pulse to the D.U.T.
2. 100x scope probes are used, to allow high speeds and voltages.
3. The worst-case condition for static dv/dt is established by triggering the D.U.T. with a normal LED input current, then removing the current. The variable R_{TEST} allows the dv/dt to be gradually increased until the D.U.T. continues to trigger in response to the applied voltage pulse, even after the LED current has been removed. The dv/dt is then decreased until the D.U.T. stops triggering. τ_{RC} is measured at this point and recorded.



V_{max} = 600 V (FODM3052, FODM3053)
= 400 V (FODM3022, FODM3023)
= 250 V (FODM3011, FODM3012)

$$dv/dt = \frac{0.63\ V_{max}}{\tau_{RC}} = \frac{378}{\tau_{RC}} \begin{matrix}\text{(FODM3053)}\\ \text{(FODM3052)}\end{matrix}$$

$$= \frac{252}{\tau_{RC}} \begin{matrix}\text{(FODM3023)}\\ \text{(FODM3022)}\end{matrix}$$

$$= \frac{158}{\tau_{RC}} \begin{matrix}\text{(FODM3011)}\\ \text{(FODM3012)}\end{matrix}$$

NOTE: This optoisolator should not be used to drive a load directly. It is intended to be a trigger device only.

Figure 8. Static dv/dt Test Circuit

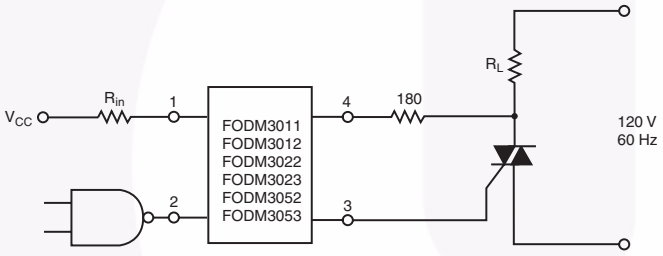


Figure 9. Resistive Load

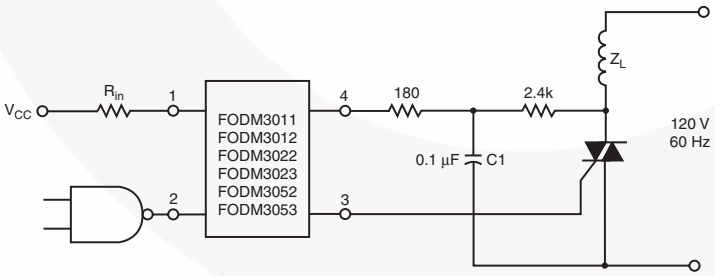
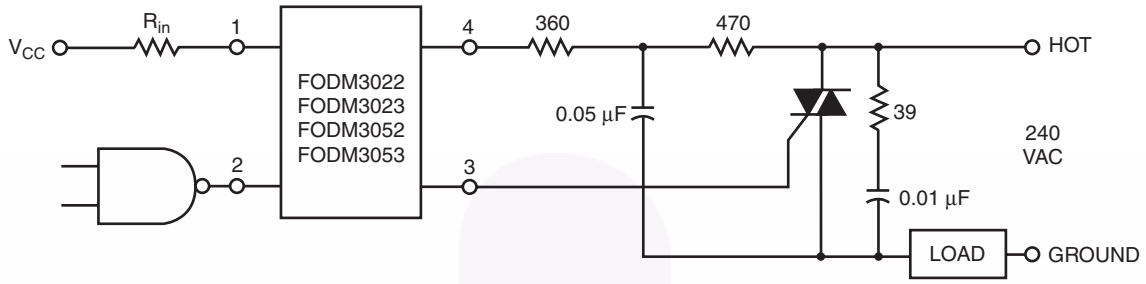


Figure 10. Inductive Load with Sensitive Gate Triac ($I_{GT} \leq 15$ mA)

Typical Application Information (Continued)



In this circuit the “hot” side of the line is switched and the load connected to the cold or ground side.

The 39Ω resistor and 0.01µF capacitor are for snubbing of the triac, and the 470Ω resistor and 0.05µF capacitor are for snubbing the coupler. These components may or may not be necessary depending upon the particular and load used.

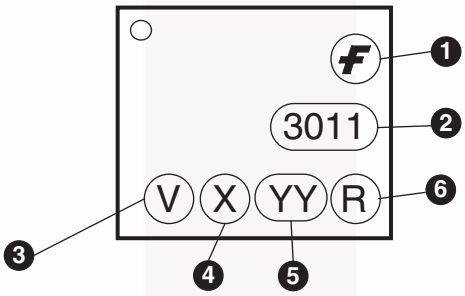
Figure 11. Typical Application Circuit

Ordering Information

Option	Description
V_NF098	VDE Approved
R2_NF098	Tape and Reel (2500 units)
R2V_NF098	Tape and Reel (2500 units) and VDE Approved

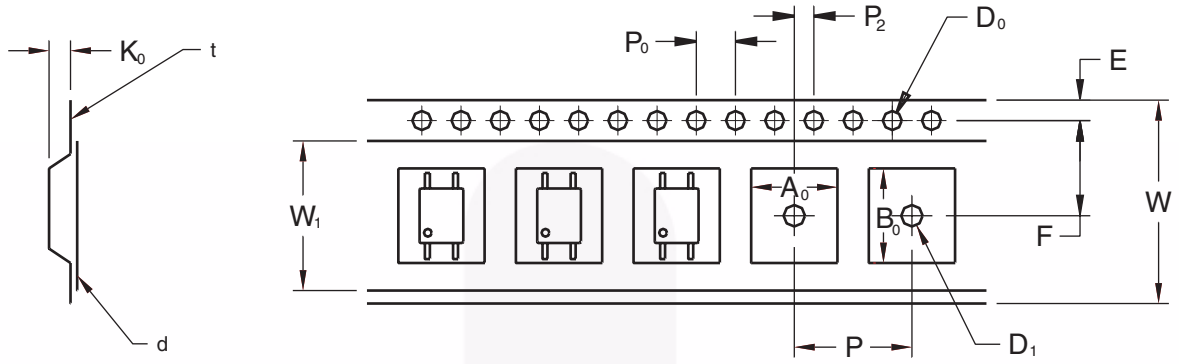
Note:
To specify the new construction version with 260°C max reflow peak temperature rating: Add "NF098" to the end of the part number. The non NF098 version is rated for 230°C peak reflow temperature.

Marking Information



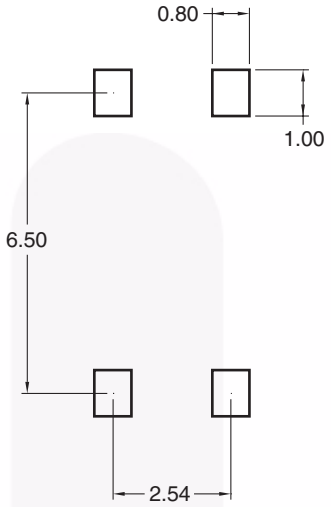
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code
5	Two digit work week ranging from ‘01’ to ‘53’
6	Assembly package code

Tape Specifications



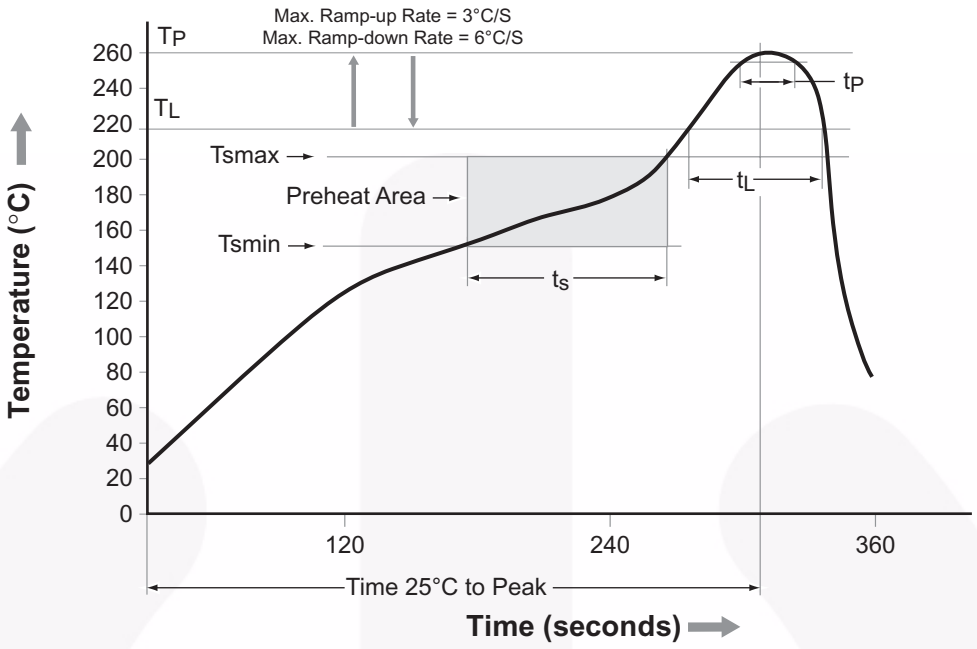
		2.54 Pitch
Description	**Symbol**	**Dimensions**
Tape Width	W	12.00±0.4
Tape Thickness	t	0.35±0.02
Sprocket Hole Pitch	P_0	4.00±0.20
Sprocket Hole Dia.	D_0	1.55±0.20
Sprocket Hole Location	E	1.75±0.20
Pocket Location	F	5.50±0.20
	P_2	2.00±0.20
Pocket Pitch	P	8.00±0.20
Pocket Dimension	A_0	4.75±0.20
	B_0	7.30±0.20
	K_0	2.30±0.20
Pocket Hole Dia.	D_1	1.55±0.20
Cover Tape Width	W_1	9.20
Cover Tape Thickness	d	0.065±0.02
Max. Component Rotation or Tilt		20° max
Devices Per Reel		2500
Reel Diameter		330 mm (13")

Footprint Drawing for PCB Layout



Note:
All dimensions are in mm.

Reflow Profile



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (t_S) from (Tsmin to Tsmax)	60–120 seconds
Ramp-up Rate (t_L to t_P)	3°C/second max.
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60–150 seconds
Peak Body Package Temperature	260°C +0°C / –5°C
Time (t_P) within 5°C of 260°C	30 seconds
Ramp-down Rate (T_P to T_L)	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

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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.
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Rev. I40

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