



Is Now Part of



**ON Semiconductor®**

To learn more about ON Semiconductor, please visit our website at  
[www.onsemi.com](http://www.onsemi.com)

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (\_), the underscore (\_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (\_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at [www.onsemi.com](http://www.onsemi.com). Please email any questions regarding the system integration to [Fairchild\\_questions@onsemi.com](mailto:Fairchild_questions@onsemi.com).

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.



May 2017

# 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)
- Safety and Regulatory Approvals:
  - UL1577, 3,750 VAC<sub>RMS</sub> for 1 Minute
  - DIN-EN/IEC60747-5-5, 565 V Peak Working Insulation Voltage

### Applications

- Industrial Controls
- Traffic Lights
- Vending Machines
- 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 2.54 mm. They are designed for interfacing between electronic controls and power triacs to control resistive and inductive loads for 115 V/240 V operations.

### Functional Schematic

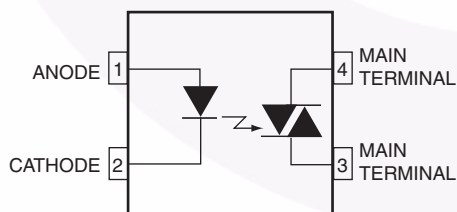


Figure 1. Functional Schematic

### Package Outlines



Figure 2. Package Outlines

## Safety and Insulation Ratings

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.

| Parameter   |                        | Characteristics |
|---|------------------------|-----------------|
| Installation Classifications per DIN VDE 0110/1.89 Table 1, For Rated Mains Voltage | < 150 V <sub>RMS</sub> | I–IV            |
|   | < 300 V <sub>RMS</sub> | I–III           |
| Climatic Classification   |                        | 40/100/21       |
| Pollution Degree (DIN VDE 0110/1.89)  |                        | 2               |
| Comparative Tracking Index  |                        | 175             |

| Symbol                | Parameter  | Value             | Unit              |
|-----------------------|--|-------------------|-------------------|
| V <sub>PR</sub>       | Input-to-Output Test Voltage, Method A, V <sub>IORM</sub> × 1.6 = V <sub>PR</sub> , Type and Sample Test with t <sub>m</sub> = 10 s, Partial Discharge < 5 pC  | 904               | V <sub>peak</sub> |
|                       | Input-to-Output Test Voltage, Method B, V <sub>IORM</sub> × 1.875 = V <sub>PR</sub> , 100% Production Test with t <sub>m</sub> = 1 s, Partial Discharge < 5 pC | 1060              | V <sub>peak</sub> |
| V <sub>IORM</sub>     | Maximum Working Insulation Voltage   | 565               | V <sub>peak</sub> |
| V <sub>IOTM</sub>     | Highest Allowable Over-Voltage   | 6000              | V <sub>peak</sub> |
|                       | External Creepage  | ≥ 5               | mm                |
|                       | External Clearance   | ≥ 5               | mm                |
| DTI                   | Distance Through Insulation (Insulation Thickness)   | ≥ 0.4             | mm                |
| T <sub>S</sub>        | Case Temperature <sup>(1)</sup>  | 150               | °C                |
| I <sub>S,INPUT</sub>  | Input Current <sup>(1)</sup>   | 200               | mA                |
| P <sub>S,OUTPUT</sub> | Output Power <sup>(1)</sup>  | 300               | mW                |
| R <sub>IO</sub>       | Insulation Resistance at T <sub>S</sub> , V <sub>IO</sub> = 500 V <sup>(1)</sup>   | > 10 <sup>9</sup> | Ω                 |

### Note:

1. Safety limit values – maximum values allowed in the event of a failure.

## 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   | Value              | Unit             |
|-----------------|---|--------------------|------------------|
| $T_{STG}$       | Storage Temperature   | -55 to +150        | $^\circ\text{C}$ |
| $T_{OPR}$       | Operating Temperature   | -40 to +100        | $^\circ\text{C}$ |
| $T_J$           | Junction Temperature  | -40 to +125        | $^\circ\text{C}$ |
| $T_{SOL}$       | Lead Solder Temperature   | 260 for 10 sec     | $^\circ\text{C}$ |
| <b>EMITTER</b>  |   |                    |                  |
| $I_F$ (avg)     | Continuous Forward Current  | 60                 | mA               |
| $I_F$ (pk)      | Peak Forward Current (1 $\mu\text{s}$ pulse, 300 pps.)              | 1                  | A                |
| $V_R$           | Reverse Input Voltage   | 3                  | V                |
| $P_D$           | Power Dissipation (No derating required over operating temp. range) | 100                | mW               |
| <b>DETECTOR</b> |   |                    |                  |
| $I_{T(RMS)}$    | On-State RMS Current  | 70                 | mA (RMS)         |
| $V_{DRM}$       | Off-State Output Terminal Voltage                                   | FODM3011, FODM3012 | 250              |
|                 |   | FODM3022, FODM3023 | 400              |
|                 |   | FODM3052, FODM3053 | 600              |
| $P_D$           | Power Dissipation (No derating required over operating temp. range) | 300                | mW               |

## Electrical Characteristics

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

### Individual Component Characteristics

| Symbol           | Parameter                                  | Test Conditions                            | Device  | Min.  | Typ. | Max. | Unit             |
|------------------|--|--|---|-------|------|------|------------------|
| <b>EMITTER</b>   |  |  |   |       |      |      |                  |
| $V_F$            | Input Forward Voltage                      | $I_F = 10\text{ mA}$                       | All   |       | 1.20 | 1.50 | V                |
| $I_R$            | Reverse Leakage Current                    | $V_R = 3\text{ V}, T_A = 25^\circ\text{C}$ | All   |       | 0.01 | 100  | $\mu\text{A}$    |
| <b>DETECTOR</b>  |  |  |   |       |      |      |                  |
| $I_{\text{DRM}}$ | Peak Blocking Current Either Direction     | Rated $V_{\text{DRM}}, I_F = 0^{(2)}$      | All   |       | 2    | 100  | nA               |
| $dv/dt$          | Critical Rate of Rise of Off-State Voltage | $I_F = 0$ (Figure 8) <sup>(3)</sup>        | FODM3011,<br>FODM3012,<br>FODM3022,<br>FODM3023 |       | 10   |      | V/ $\mu\text{s}$ |
|                  |  |  | FODM3052,<br>FODM3053                           | 1,000 |      |      |                  |

#### Notes:

- Test voltage must be applied within  $dv/dt$  rating.
- This is static  $dv/dt$ . See Figure 1 for test circuit. Commutating  $dv/dt$  is function of the load-driving thyristor(s) only.

### Transfer Characteristics

| Symbol          | Parameter                              | Test Conditions                            | Device                             | Min. | Typ. | Max. | Unit          |
|-----------------|--|--|------------------------------------|------|------|------|---------------|
| $I_T$           | LED Trigger Current                    | Main Terminal Voltage = $3\text{ V}^{(4)}$ | FODM3011,<br>FODM3022,<br>FODM3052 |      |      | 10   | mA            |
|                 |  |  | FODM3012,<br>FODM3023,<br>FODM3053 |      |      | 5    |               |
| $I_H$           | Holding Current, Either Direction      |  | All                                |      | 450  |      | $\mu\text{A}$ |
| $V_{\text{TM}}$ | Peak On-State Voltage Either Direction | $I_{\text{TM}} = 100\text{ mA peak}$       | All                                |      | 2.2  | 3    | V             |

#### Notes:

- All devices are guaranteed to trigger at an  $I_F$  value of less than or equal to the max  $I_{\text{FT}}$  specification. For optimum operation over temperature and lifetime of the device, the LED should be biased with an  $I_F$  that is at least 50% higher than the maximum  $I_{\text{FT}}$  specification. The  $I_{\text{FT}}$  should not exceed the absolute maximum rating of 60 mA.  
Example: For FODM0353M, the minimum  $I_F$  bias should be  $5\text{ mA} \times 150\% = 7.5\text{ mA}$

### Isolation Characteristics

| Symbol           | Parameter                      | Test Conditions                | Device | Min.  | Typ. | Max. | Unit                      |
|------------------|--------------------------------|--------------------------------|--------|-------|------|------|---------------------------|
| $V_{\text{ISO}}$ | Steady State Isolation Voltage | 1 Minute,<br>R.H. = 40% to 60% | All    | 3,750 |      |      | $\text{VAC}_{\text{RMS}}$ |

## Typical Performance Characteristics

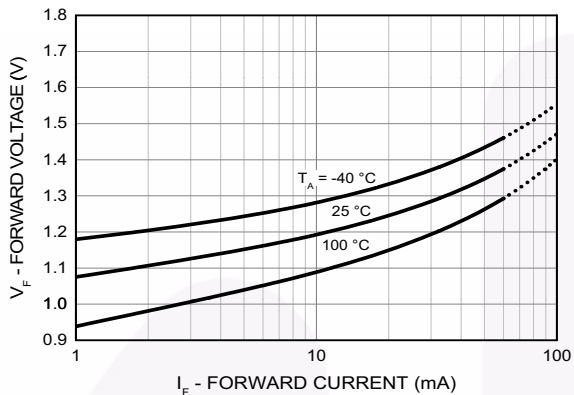


Fig 3. LED Forward Voltage vs. Forward Current

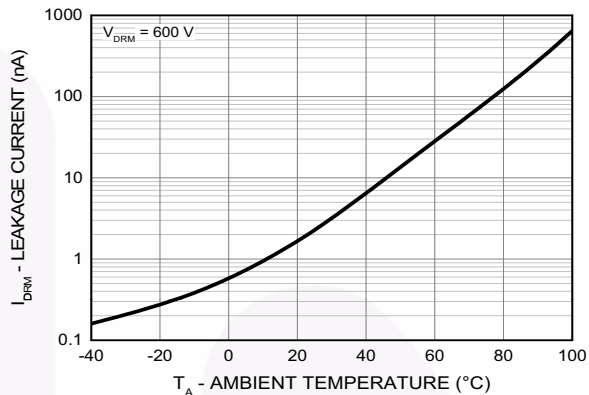


Fig 4. Leakage Current vs. Ambient Temperature

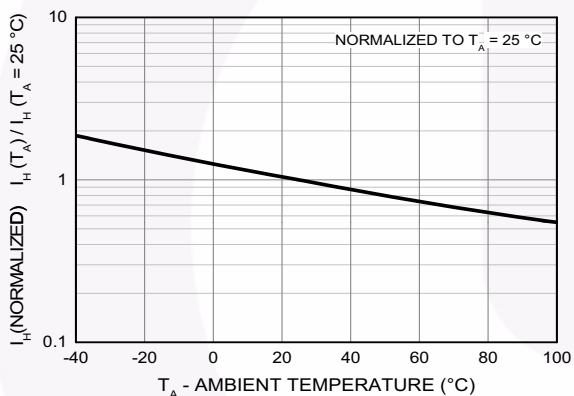


Fig 5. Normalized Holding Current vs. Ambient Temperature

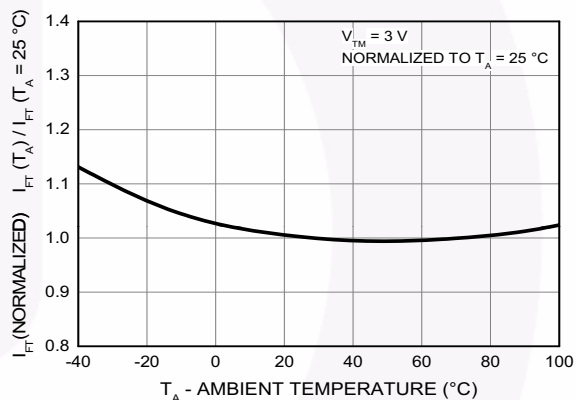


Fig 6. Normalized Trigger Current vs. Ambient Temperature

**Typical Performance Characteristics** (Continued)

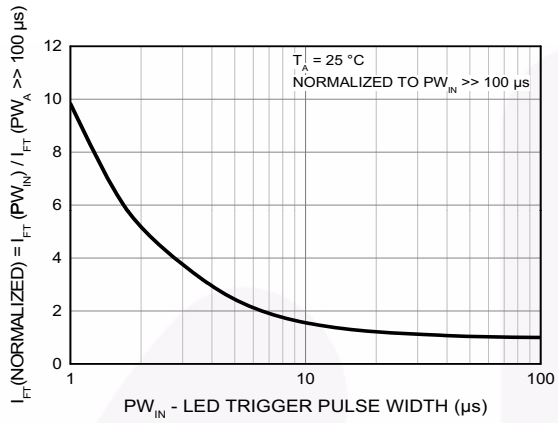


Fig 7. LED Current Required to Trigger vs. LED Pulse Width

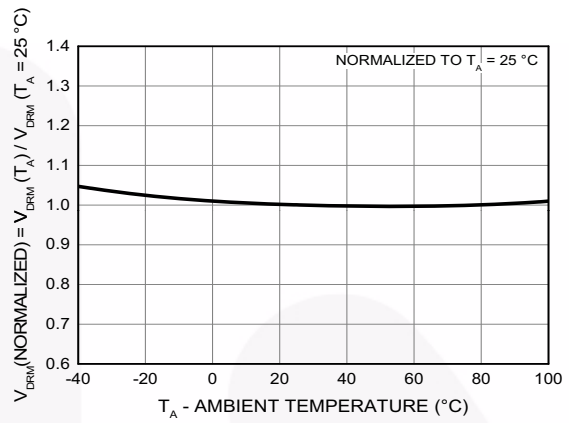


Fig 8. Normalized Off-State Output Terminal Voltage vs. Ambient Temperature

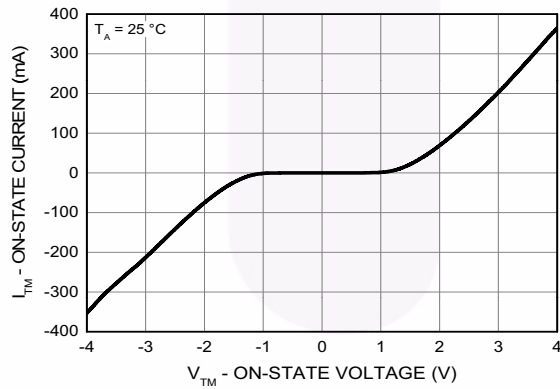
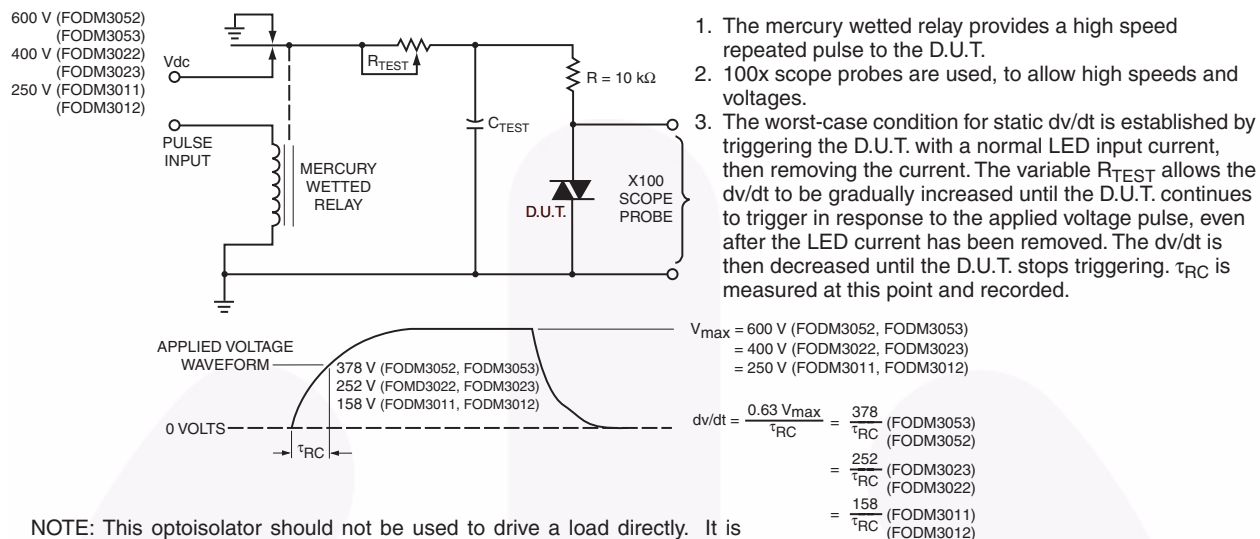


Fig 9. On-State Characteristics

## Typical Application Information



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

Figure 10. Static dv/dt Test Circuit

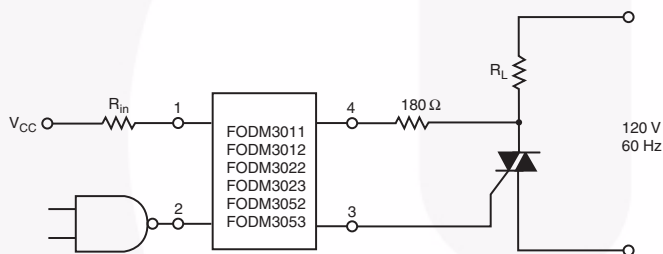


Figure 11. Resistive Load

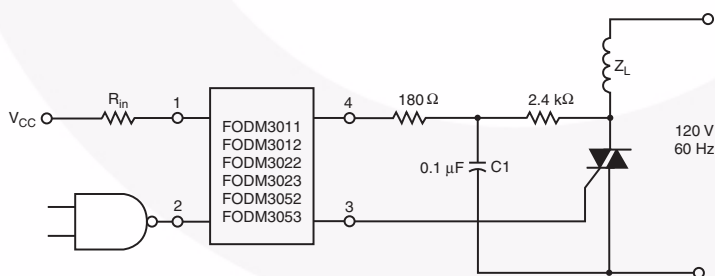
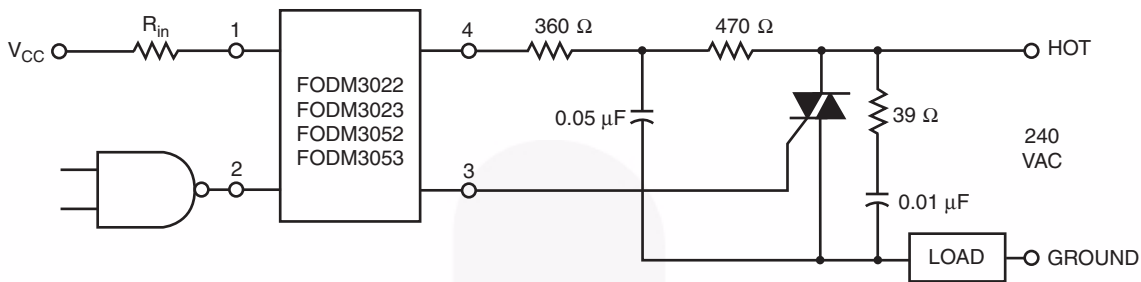


Figure 12. Inductive Load with Sensitive Gate Triac (I<sub>GT</sub> ≤ 15 mA)



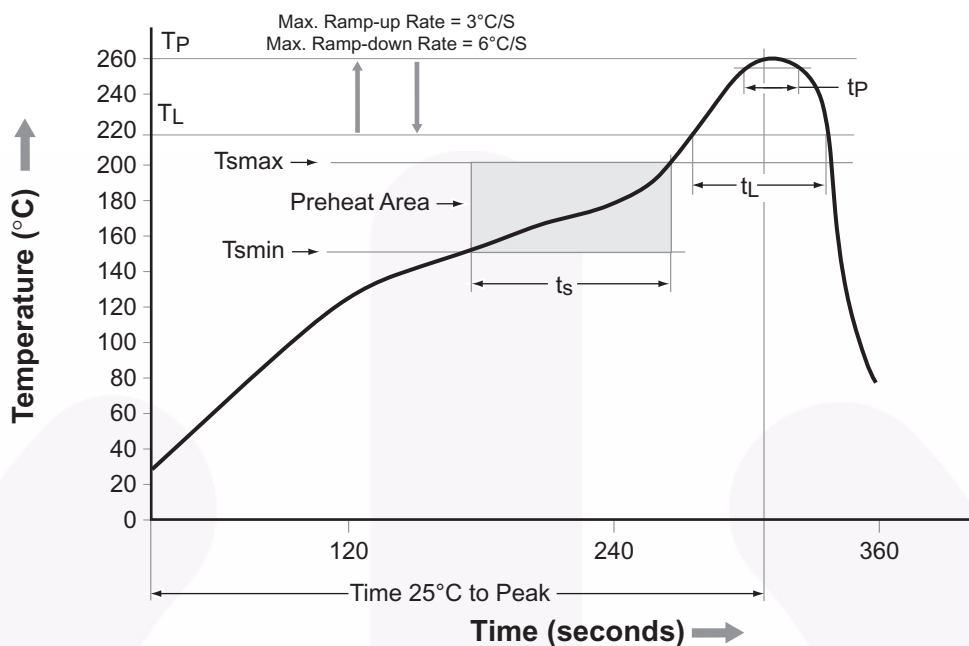
**Typical Application Information** (Continued)



In this circuit the “hot” side of the line is switched and the load connected to the cold or ground side.  
 The 39 Ω resistor and 0.01μF capacitor are for snubbing of the triac, and the 470 Ω resistor and 0.05 μF capacitor are for snubbing the coupler. These components may or may not be necessary depending upon the particular and load used.

**Figure 13. Typical Application 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 $T_{smax}$ ) | 60–120 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.           |

## Ordering Information

| Part Number | Package  | Packing Method             |
|-------------|--|----------------------------|
| FODM3011    | Full Pitch Mini-Flat 4-Pin                             | Tube (100 units)           |
| FODM3011R2  | Full Pitch Mini-Flat 4-Pin                             | Tape and Reel (2500 Units) |
| FODM3011V   | Full Pitch Mini-Flat 4-Pin, DIN EN/IEC60747-5-5 Option | Tube (100 Units)           |
| FODM3011R2V | Full Pitch Mini-Flat 4-Pin, DIN EN/IEC60747-5-5 Option | Tape and Reel (2500 Units) |

### Note:

The product orderable part number system listed in this table also applies to the FODM3012, FODM3022, FODM3023, FODM3052, and FODM3053 products.

## Marking Information

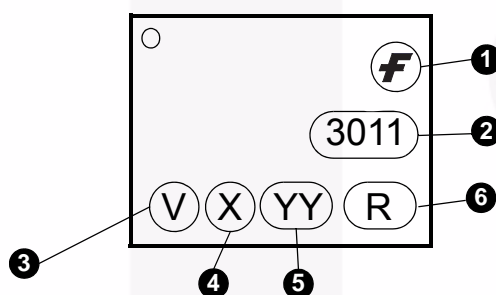


Figure 14. Top Mark

Table 1. Top Mark Definitions

|   |   |
|---|---|
| 1 | Fairchild Logo  |
| 2 | Device Number   |
| 3 | DIN EN/IEC60747-5-5 Option (only appears on component ordered with this option) |
| 4 | One-Digit Year Code, e.g., "6"  |
| 5 | 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 <sub>0</sub> | 4.00±0.20    |
| Sprocket Hole Dia.              | D <sub>0</sub> | 1.55±0.20    |
| Sprocket Hole Location          | E              | 1.75±0.20    |
| Pocket Location                 | F              | 5.50±0.20    |
|                                 | P <sub>2</sub> | 2.00±0.20    |
| Pocket Pitch                    | P              | 8.00±0.20    |
| Pocket Dimension                | A <sub>0</sub> | 4.75±0.20    |
|                                 | B <sub>0</sub> | 7.30±0.20    |
|                                 | K <sub>0</sub> | 2.30±0.20    |
| Pocket Hole Dia.                | D <sub>1</sub> | 1.55±0.20    |
| Cover Tape Width                | W <sub>1</sub> | 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") |



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-MFP04Crev3.



ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5817-1050

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>  
For additional information, please contact your local  
Sales Representative

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[ON Semiconductor:](#)

[FODM3053V\\_NF098](#)



## Стандарт Электрон Связь

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

### Наши контакты:

**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331