



Is Now Part of



**ON Semiconductor®**

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

# FODM611

## High Noise Immunity, 5V, 10Mbit/sec Logic Gate Output (Open Collector) Optocoupler

### Features

- High Noise Immunity characterized by common mode transient immunity (CMTi)
  - 20kV/μs Minimum CMTi
- High Speed
  - 10Mbit/sec Date Rate (NRZ)
  - 100ns max. Propagation Delay
  - 35ns max. Pulse Width Distortion
  - 40ns max. Propagation Delay Skew
- -40 to +85°C temperature range
- Safety and regulatory approvals
  - UL1577, 3750 VAC<sub>RMS</sub> for 1 min.
  - IEC60747-5-2 (pending approval)

### Applications

- Microprocessor system interface
  - SPI, I<sup>2</sup>C
- Industrial fieldbus communications
  - DeviceNet, CAN, RS485
- Programmable logic control
- Isolated data acquisition system
- Voltage level translator
- Isolating MOSFET/IGBT gate drivers

### Description

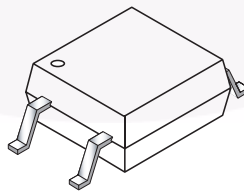
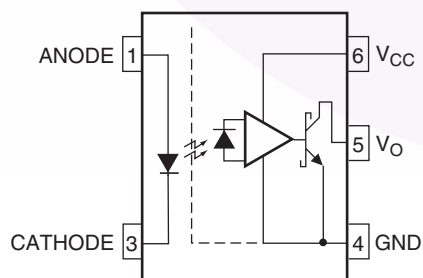
The FODM611 is a 5V high-speed logic gate output (open collector) optocoupler, which supports isolated communications allowing digital signals to communicate between systems without conducting ground loops or hazardous voltages. It utilizes Fairchild's proprietary coplanar packaging technology, Optoplanar®, and optimized IC design to achieve high noise immunity, characterized by high common mode transient immunity specifications.

This optocoupler consists of an AlGaAS LED at the input, optically coupled to a high speed integrated photo-detector logic gate. The output of the detector IC is an open collector schottky-clamped transistor. The coupled parameters are guaranteed over the wide temperature range of -40°C to +85°C. A maximum input signal of 5mA will provide a minimum output sink current of 13mA (fan out of 8).

### Related Resources

- [www.fairchildsemi.com/products/opto/](http://www.fairchildsemi.com/products/opto/)
- [www.fairchildsemi.com/pf/FO/FODM8061.html](http://www.fairchildsemi.com/pf/FO/FODM8061.html)
- [www.fairchildsemi.com/pf/FO/FODM8071.html](http://www.fairchildsemi.com/pf/FO/FODM8071.html)

### Functional Schematic



### Truth Table

LED	Output
Off	High
On	Low

## Pin Definitions

Number	Name	Function Description
1	ANODE	Anode
3	CATHODE	Cathode
4	GND	Output Ground
5	$V_O$	Output Voltage
6	$V_{CC}$	Output Supply Voltage

## Safety and Insulation Ratings for Mini-Flat Package (SO5 Pin)

As per IEC60747-5-2 (Pending Certification). 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 main voltage < 150Vrms		I-IV		
	For rated main voltage < 300Vrms		I-III		
	Climatic Classification		40/85/21		
	Pollution Degree (DIN VDE 0110/1.89)		2		
CTI	Comparative Tracking Index	175			
$V_{PR}$	Input to Output Test Voltage, Method b, $V_{IORM} \times 1.875 = V_{PR}$ , 100% Production Test with $t_m = 1$ sec, Partial Discharge < 5 pC	1060			
$V_{PR}$	Input to Output Test Voltage, Method a, $V_{IORM} \times 1.5 = V_{PR}$ , Type and Sample Test with $t_m = 60$ sec, Partial Discharge < 5 pC	848			
$V_{IORM}$	Max Working Insulation Voltage	565			$V_{peak}$
$V_{IOTM}$	Highest Allowable Over Voltage	4000			$V_{peak}$
	External Creepage	5.0			mm
	External Clearance	5.0			mm
	Insulation thickness	0.5			mm
$T_{Case}$	Safety Limit Values, Maximum Values allowed in the event of a failure, Case Temperature	150			°C
$R_{IO}$	Insulation Resistance at $T_S$ , $V_{IO} = 500V$	$10^9$			$\Omega$

**Absolute Maximum Ratings** ( $T_A=25^\circ\text{C}$  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
$T_{STG}$	Storage Temperature	-40 to +125	$^\circ\text{C}$
$T_{OPR}$	Operating Temperature	-40 to +85	$^\circ\text{C}$
$T_J$	Junction Temperature	-40 to +125	$^\circ\text{C}$
$T_{SOL}$	Lead Solder Temperature (Refer to Reflow Temperature Profile)	260 for 10sec	$^\circ\text{C}$
$I_F$	Forward Current	50	mA
$V_R$	Reverse Voltage	5.0	V
$V_{CC}$	Supply Voltage	0 to 7.0	V
$V_O$	Output Voltage	-0.5 to $V_{CC}+0.5$	V
$I_O$	Average Output Current	50	mA
$PD_I$	Input Power Dissipation <sup>(1)(2)</sup>	100	mW
$PD_O$	Output Power Dissipation <sup>(1)(2)</sup>	85	mW

**Recommended Operating Conditions**

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min.	Max.	Unit
$T_A$	Ambient Operating Temperature	-40	+85	$^\circ\text{C}$
$V_{CC}$	Supply Voltages <sup>(3)</sup>	4.5	5.5	V
$V_{FL}$	Logic Low Input Voltage	0	0.8	V
$I_{FH}$	Logic High Input Current	6.3	15	mA
$I_{FL}$	Logic Low Input Current		250	$\mu\text{A}$
N	Fan Out (at $R_L = 1\text{k}\Omega$ )		5	TTL Loads
$R_L$	Output Pull-up Resistor	330	4k	$\Omega$

**Isolation Characteristics** ( $T_A=25^\circ\text{C}$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{ISO}$	Input-Output Isolation Voltage	freq= 60Hz, t = 1.0min, $I_{I-O} \leq 10\mu\text{A}^{(4)(5)}$	3750			$V_{AC_{RMS}}$
$R_{ISO}$	Isolation Resistance	$V_{I-O} = 500\text{V}^{(4)}$		$10^{12}$		$\Omega$
$C_{ISO}$	Isolation Capacitance	$V_{I-O} = 0\text{V}$ , freq=1.0MHz <sup>(4)</sup>		0.6		pF

**Notes:**

1. No derate required to  $85^\circ\text{C}$ .
2. Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.
3. 0.1 $\mu\text{F}$  bypass capacitor must be connected between pins 4 and 6.
4. Device is considered a two terminal device: Pins 1 and 3 are shorted, and Pins 4, 5, and 6 are shorted together.
5. 3,750  $V_{AC_{RMS}}$  for 1 minute duration is equivalent to 4,500  $V_{AC_{RMS}}$  for 1 second duration.

**Electrical Characteristics** (Apply over all recommended conditions)(T<sub>A</sub> = -40°C to +85°C, 4.5V ≤ V<sub>CC</sub> ≤ 5.5V), unless otherwise specified.Typical value is measured at T<sub>A</sub> = 25°C and V<sub>CC</sub> = 5.0V.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
<b>INPUT CHARACTERISTICS</b>						
V <sub>F</sub>	Forward Voltage	I <sub>F</sub> = 10mA, Fig. 1	1.05	1.45	1.8	V
BV <sub>R</sub>	Input Reverse Breakdown Voltage	I <sub>R</sub> = 10μA	5.0			V
I <sub>FHL</sub>	Threshold Input Current	V <sub>O</sub> = 0.6V, I <sub>OL</sub> (sinking) = 13mA, T <sub>A</sub> < 85°C, Fig. 2		3.4	5.0	mA
<b>OUTPUT CHARACTERISTICS</b>						
V <sub>OL</sub>	Logic LOW Output Voltage	I <sub>F</sub> = rated I <sub>FHL</sub> , I <sub>OL</sub> (sinking) = 13mA, Fig. 3		0.4	0.6	V
I <sub>OH</sub>	Logic HIGH Output Current	I <sub>F</sub> = 250μA, V <sub>O</sub> = 5.0V, Fig. 4		2.1	30.0	μA
I <sub>CCL</sub>	Logic LOW Output Supply Current	I <sub>F</sub> = 10mA, V <sub>CC</sub> = 5.0V, Fig. 5, 7		7.5	10.0	mA
I <sub>CCH</sub>	Logic HIGH Output Supply Current	I <sub>F</sub> = 0mA, V <sub>CC</sub> = 5.0V, Fig. 6, 7		6.0	9.0	mA

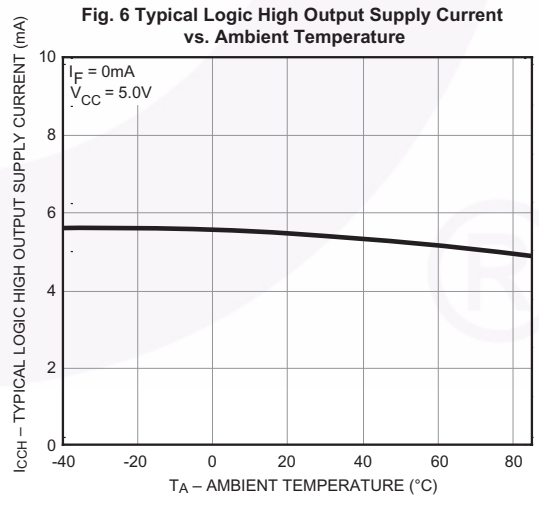
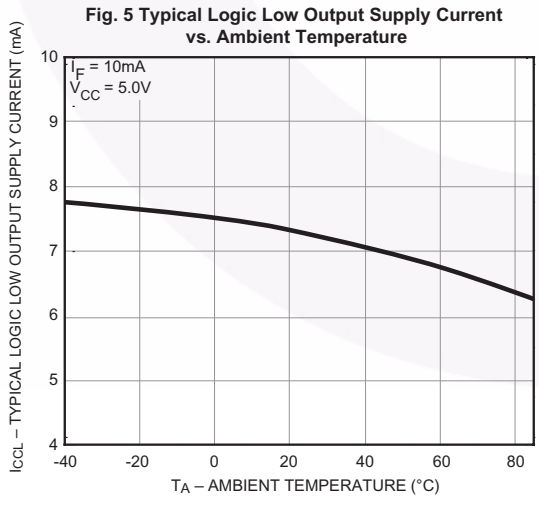
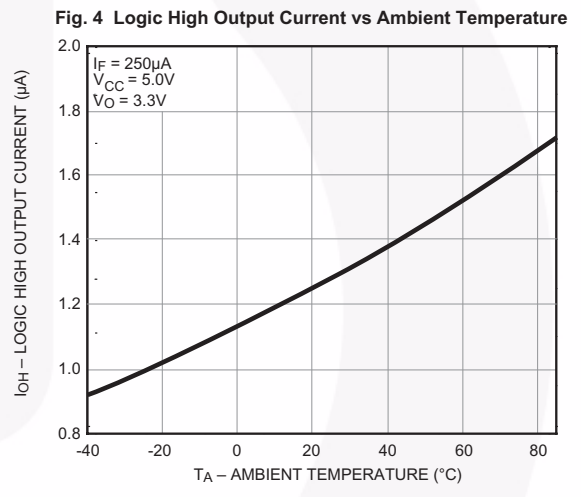
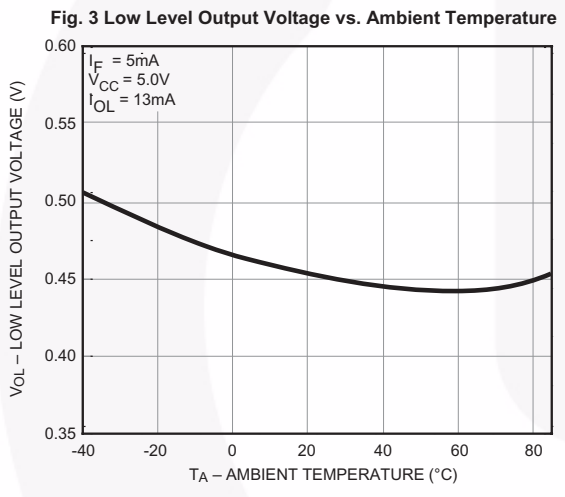
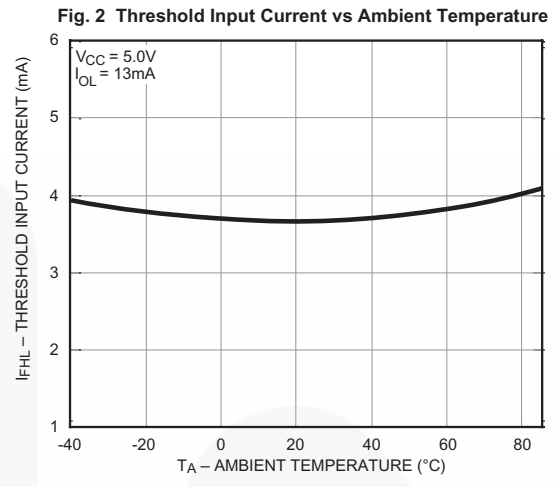
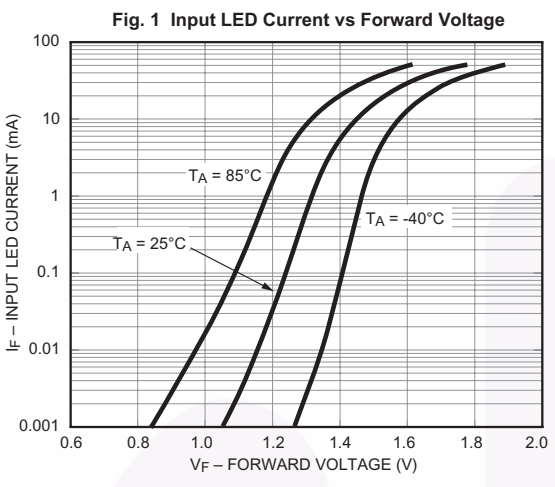
**Switching Characteristics** (Apply over all recommended conditions)(T<sub>A</sub> = -40°C to +85°C, 4.5V ≤ V<sub>CC</sub> ≤ 5.5V, I<sub>F</sub> = 7.5mA), unless otherwise specified.Typical value is measured at T<sub>A</sub> = 25°C and V<sub>CC</sub> = 5.0V

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Date Rate		R <sub>L</sub> = 350Ω			10	Mbps
t <sub>PHL</sub>	Propagation Delay Time to Logic Low Output	R <sub>L</sub> = 350Ω, C <sub>L</sub> = 15pF, Fig. 8 and 11		43	100	ns
t <sub>PLH</sub>	Propagation Delay Time to Logic High Output	R <sub>L</sub> = 350Ω, C <sub>L</sub> = 15pF, Fig. 8 and 11		50	100	ns
PWD	Pulse Width Distortion,   t <sub>PHL</sub> - t <sub>PLH</sub>	R <sub>L</sub> = 350Ω, C <sub>L</sub> = 15pF, Fig. 9		7	35	ns
t <sub>PSK</sub>	Propagation Delay Skew	R <sub>L</sub> = 350Ω, C <sub>L</sub> = 15pF <sup>(6)</sup>			40	ns
t <sub>R</sub>	Output Rise Time, (10% to 90%)	R <sub>L</sub> = 350Ω, C <sub>L</sub> = 15pF, Fig. 10 and 11		20		ns
t <sub>F</sub>	Output Fall Time, (90% to 10%)	R <sub>L</sub> = 350Ω, C <sub>L</sub> = 15pF, Fig. 10 and 11		10		ns
CM <sub>H</sub>	Common Mode Transient Immunity at Output High	V <sub>I</sub> = 5.0V, V <sub>O</sub> > 0.8 × V <sub>CC</sub> , V <sub>CM</sub> = 1000V <sup>(7)</sup> , Fig. 12	20	40		kV/μs
CM <sub>L</sub>	Common Mode Transient Immunity at Output Low	V <sub>I</sub> = 0V, V <sub>O</sub> < 0.8V, V <sub>CM</sub> = 1000V <sup>(7)</sup> , Fig. 12	20	40		kV/μs

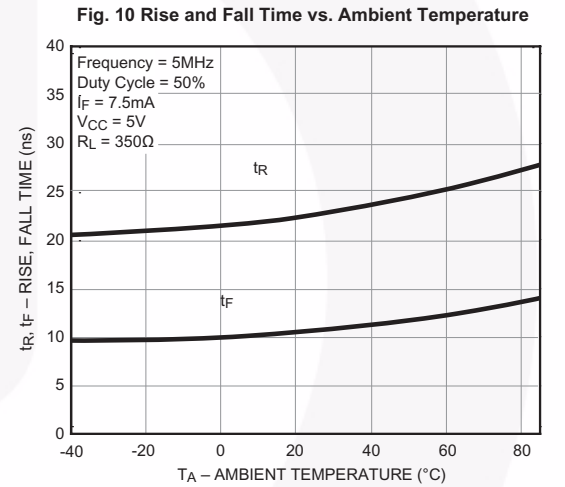
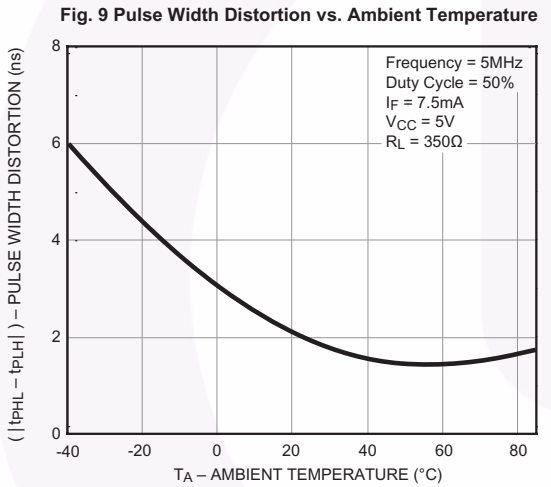
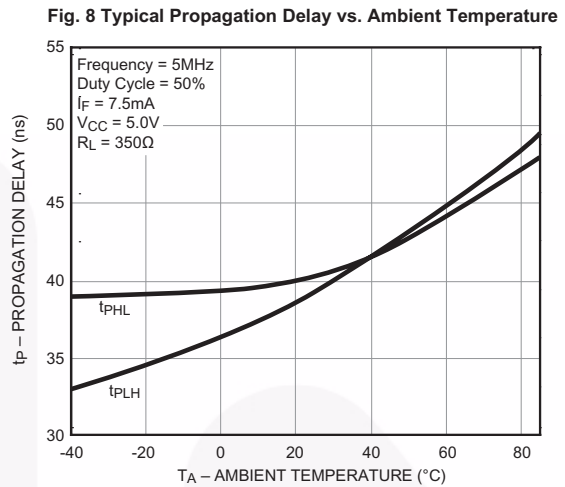
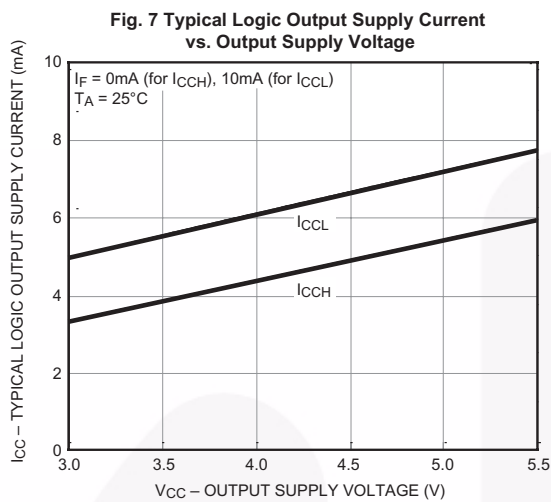
**Notes**

- t<sub>PSK</sub> is equal to the magnitude of the worst case difference in t<sub>PHL</sub> and/or t<sub>PLH</sub> that will be seen between any two units from the same manufacturing date code that are operated at same case temperature (±5°C), at same operating conditions, with equal loads (R<sub>L</sub> = 350Ω and C<sub>L</sub> = 15pF), and with an input rise time less than 5ns.
- Common mode transient immunity at output high is the maximum tolerable positive dV<sub>cm</sub>/dt on the leading edge of the common mode impulse signal, V<sub>cm</sub>, to assure that the output will remain high. Common mode transient immunity at output low is the maximum tolerable negative dV<sub>cm</sub>/dt on the trailing edge of the common pulse signal, V<sub>cm</sub>, to assure that the output will remain low.

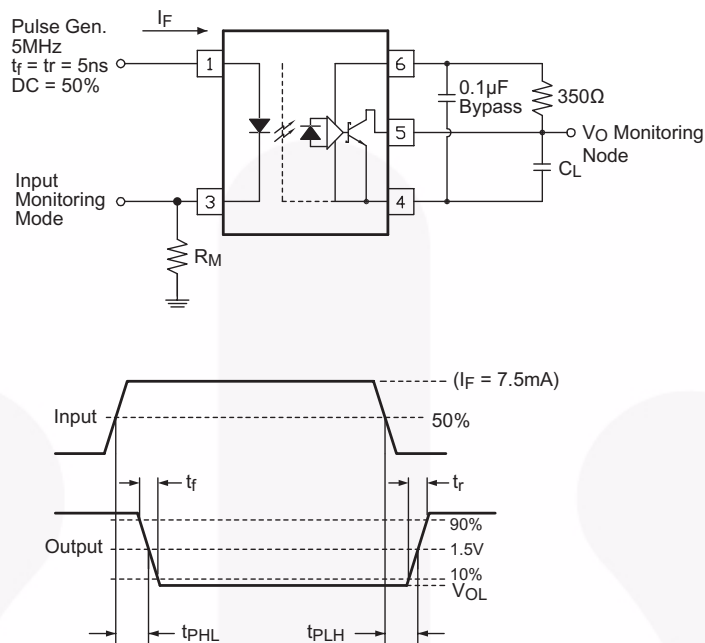
## Typical Performance Curves



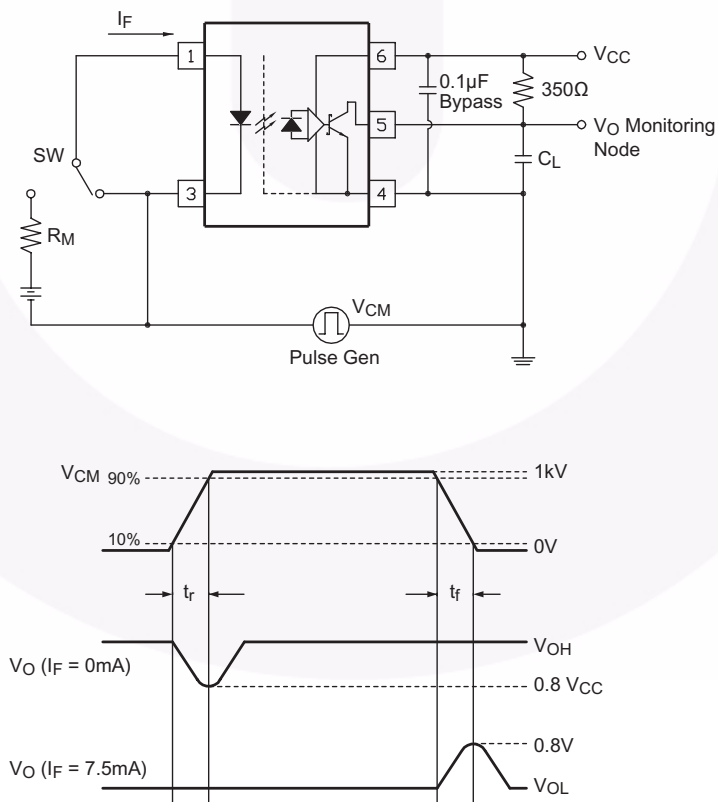
### Typical Performance Curves (Continued)



## Schematics



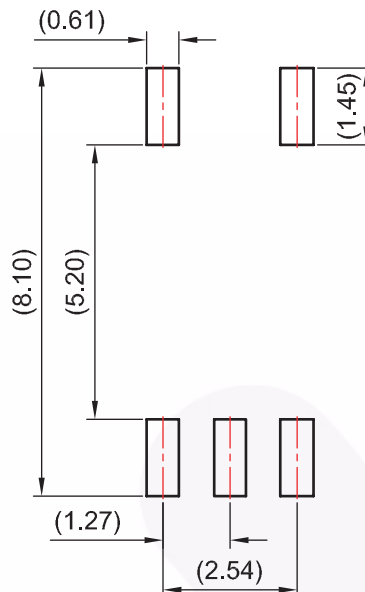
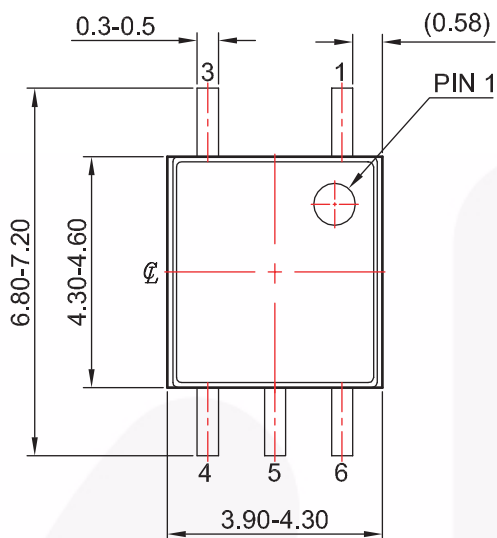
**Figure 11. Test Circuit for Propagation Delay Time, Rise Time and Fall Time**



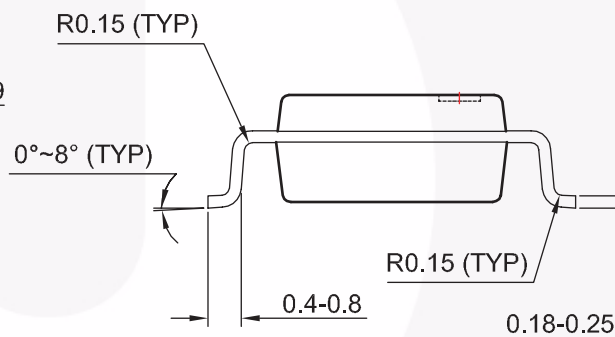
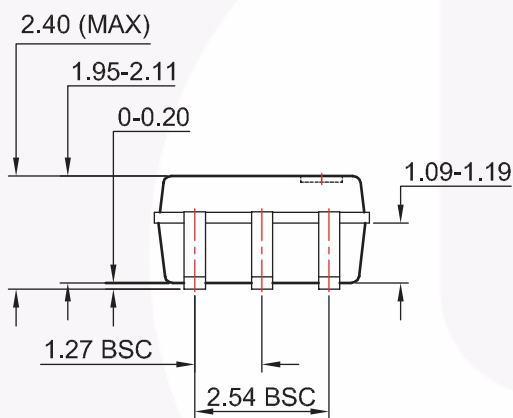
**Figure 12. Test Circuit for Instantaneous Common Mode Rejection Voltage**



## Package Dimensions



## LAND PATTERN RECOMMENDATION



### Notes:

1. No standard applies to this package.
2. All dimensions are in millimeters.
3. Dimensions are exclusive of burrs, mold flash, and tie bar extrusion.
4. Drawings filename and revision: MKT-MFP05A.


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:

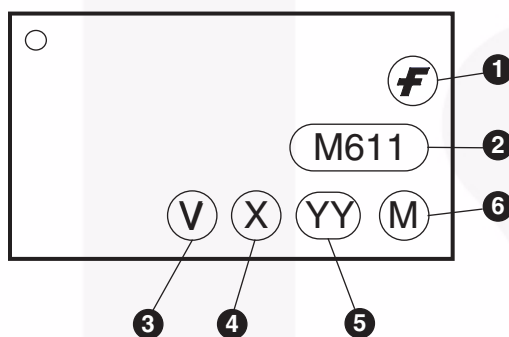
<http://www.fairchildsemi.com/packaging/>

## Ordering Information

Option	Order Entry Identifier (Example)	Description
No Suffix	FODM611	Mini-Flat 5-pin, shipped in tubes (100 units per tube)
R2	FODM611R2	Mini-Flat 5-pin, tape and reel (2,500 units per reel)

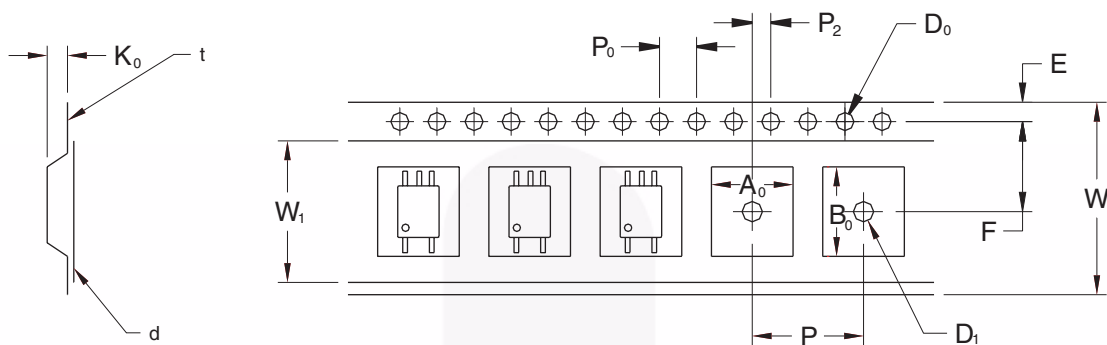
 All packages are lead free per JEDEC: J-STD-020B standard.

## Marking Information



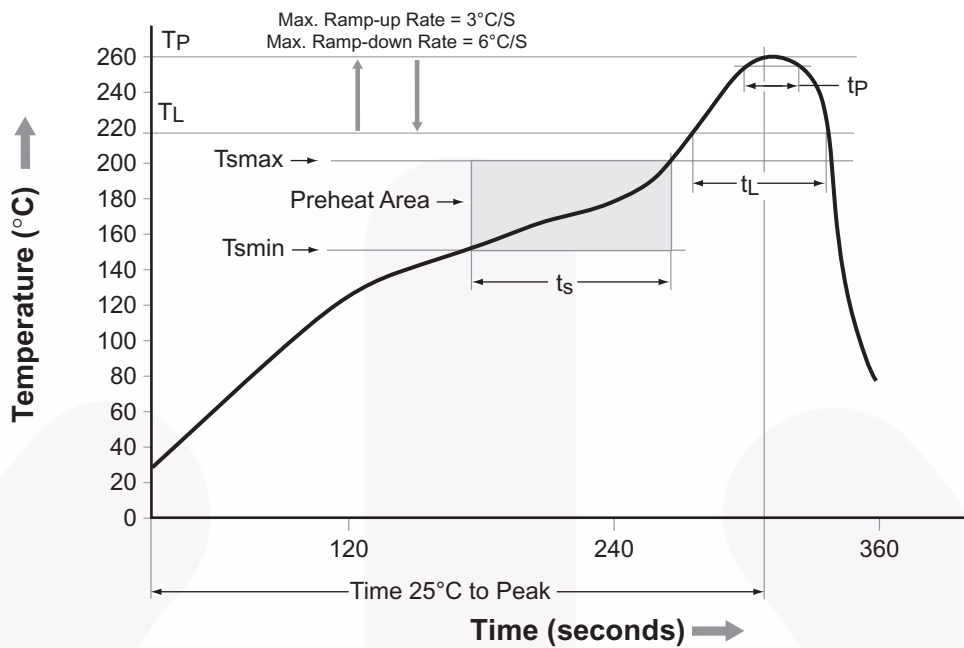
Definitions	
1	Fairchild logo
2	Device number
3	IEC60747-5-2 (VDE marking)
4	One digit year code, e.g., '9'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

## Tape and Reel Dimensions



		2.54 Pitch
Description	Symbol	Dimensions (mm)
Tape Width	W	12.00 +0.30/-0.10
Tape Thickness	t	0.30 ±0.05
Sprocket Hole Pitch	P <sub>0</sub>	4.00 ±0.10
Sprocket Hole Diameter	D <sub>0</sub>	1.50 +0.10/-0.0
Sprocket Hole Location	E	1.75 ±0.10
Pocket Location	F	5.50 ±0.10
	P <sub>2</sub>	2.00 ±0.10
Pocket Pitch	P	8.00 ±0.10
Pocket Dimension	A <sub>0</sub>	4.40 ±0.10
	B <sub>0</sub>	7.30 ±0.10
	K <sub>0</sub>	2.30 ±0.10
Pocket Hole Diameter	D <sub>1</sub>	1.50 Min.
Cover Tape Width	W <sub>1</sub>	9.20
Cover Tape Thickness	d	0.065 ±0.010
Max. Component Rotation or Tilt		10° Max.
Devices Per Reel		2500
Reel Diameter		330mm (13")

## Reflow Profile



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmín)	150°C
Temperature Max. (Tsmáx)	200°C
Time (ts) from (Tsmín to Tsmáx)	60–120 seconds
Ramp-up Rate (tL to tp)	3°C/second max.
Liquidous Temperature (TL)	217°C
Time (tL) Maintained Above (TL)	60–150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (tp) within 5°C of 260°C	30 seconds
Ramp-down Rate (TP to TL)	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.



**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™  
AttitudeEngine™  
Awinda®  
AX-CAP®\*  
BitSiC™  
Build it Now™  
CorePLUS™  
CorePOWER™  
CROSSVOL™  
CTL™  
Current Transfer Logic™  
DEUXPEED®  
Dual Cool™  
EcoSPARK®  
EfficientMax™  
ESBC™  
F®  
Fairchild®  
Fairchild Semiconductor®  
FACT Quiet Series™  
FACT®  
FastvCore™  
FETBench™  
FPS™

F-PFS™  
FRFET®  
Global Power Resource™  
GreenBridge™  
Green FPS™  
Green FPS™ e-Series™  
Gmax™  
GTO™  
IntelliMAX™  
ISOPLANAR™  
Making Small Speakers Sound Louder and Better™  
MegaBuck™  
MICROCOUPLER™  
MicroFET™  
MicroPak™  
MicroPak2™  
MillerDrive™  
MotionMax™  
MotionGrid®  
MTi®  
MTx®  
MVN®  
mWSaver®  
OptoHiT™  
OPTOLOGIC®

OPTOPLANAR®  
Power Supply WebDesigner™  
PowerTrench®  
PowerXS™  
Programmable Active Droop™  
QFET®  
QS™  
Quiet Series™  
RapidConfigure™  
Saving our world, 1mW/W/kW at a time™  
SignalWise™  
SmartMax™  
SMART START™  
Solutions for Your Success™  
SPM®  
STEALTH™  
SuperFET®  
SuperSOT™-3  
SuperSOT™-6  
SuperSOT™-8  
SupreMOS®  
SyncFET™  
Sync-Lock™

SYSTEM GENERAL®  
TinyBoost®  
TinyBuck®  
TinyCalc™  
TinyLogic®  
TINYOPTO™  
TinyPower™  
TinyPWM™  
TinyWire™  
TranSiC™  
TriFault Detect™  
TRUECURRENT®\*  
µSerDes™  
SerDes®  
UHC®  
Ultra FRFET™  
UniFET™  
VCX™  
VisualMax™  
VoltagePlus™  
XS™  
Xsens™  
仙童™

\* 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. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT [HTTP://WWW.FAIRCHILDSEMI.COM](http://www.fairchildsemi.com). 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.

**AUTHORIZED USE**

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

**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](http://www.fairchildsemi.com), under Terms of Use

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. I76

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