Is Now Part of

ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
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. Please email any questions regarding the system integration to 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. 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.

October 2011

FOD3150
High Noise Immunity, 1.0A Output Current, Gate Drive Optocoupler

Features

- High noise immunity characterized by 20kV/μs minimum common mode rejection
- Use of P-channel MOSFETs at output stage enables output voltage swing close to the supply rail
- Wide supply voltage range from 15V to 30V
- Fast switching speed
  - 500ns max. propagation delay
  - 300ns max. pulse width distortion
- Under Voltage LockOut (UVLO) with hysteresis
- Extended industrial temperate range, -40°C to 100°C temperature range
- Safety and regulatory approvals
  - UL1577, 5000 V_{RMS} for 1 min.
  - IEC60747-5-2
- >8.0mm clearance and creepage distance (option 'T')

Applications

- Industrial inverter
- Uninterruptible power supply
- Induction heating
- Isolated IGBT/Power MOSFET gate drive

Description

The FOD3150 is a 1.0A Output Current Gate Drive Optocoupler, capable of driving most 800V/20A IGBT/MOSFET. It is ideally suited for fast switching driving of power IGBT and MOSFETs used in motor control inverter applications, and high performance power system.

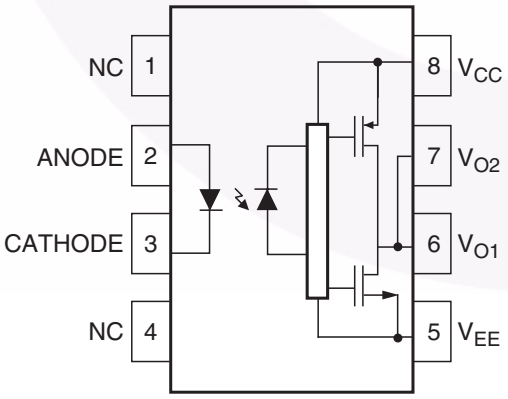
It utilizes Fairchild's patented coplanar packaging technology, Optoplanar®, and optimized IC design to achieve high noise immunity, characterized by high common mode rejection.

It consists of a gallium aluminum arsenide (AlGaAs) light emitting diode optically coupled to an integrated circuit with a high-speed driver for push-pull MOSFET output stage.

Related Resources

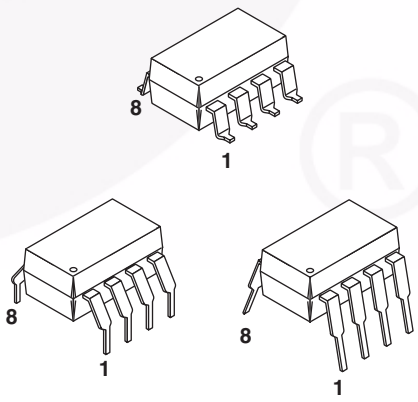
- FOD3120, 2.5A Output Current, Gate Drive Optocoupler Datasheet
- www.fairchildsemi.com/products/opto/

Functional Block Diagram



Note:
A 0.1μF bypass capacitor must be connected between pins 5 and 8.

Package Outlines



©2008 Fairchild Semiconductor Corporation

Truth Table

LED	$V_{CC} - V_{EE}$ "Positive Going" (Turn-on)	$V_{CC} - V_{EE}$ "Negative Going" (Turn-off)	V_O
Off	0V to 30V	0V to 30V	Low
On	0V to 11V	0V to 9.5V	Low
On	11V to 13.5V	9.5V to 12V	Transition
On	13.5V to 30V	12V to 30V	High

Pin Definitions

Pin #	Name	Description
1	NC	Not Connected
2	Anode	LED Anode
3	Cathode	LED Cathode
4	NC	Not Connected
5	V_{EE}	Negative Supply Voltage
6	V_{O2}	Output Voltage 2 (internally connected to V_{O1})
7	V_{O1}	Output Voltage 1
8	V_{CC}	Positive Supply Voltage

©2008 Fairchild Semiconductor Corporation

Safety and Insulation Ratings

As per IEC 60747-5-2. 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–IV		
	For Rated Main Voltage < 450Vrms		I–III		
	For Rated Main Voltage < 600Vrms		I–III		
	Climatic Classification		55/100/21		
	Pollution Degree (DIN VDE 0110/1.89)		2		
CTI	Comparative Tracking Index	175			
V_{PR}	Input to Output Test Voltage, Method b, V_{IORM} x 1.875 = V_{PR}, 100% Production Test with tm = 1 sec., Partial Discharge < 5pC	1669			
	Input to Output Test Voltage, Method a, V_{IORM} x 1.5 = V_{PR}, Type and Sample Test with tm = 60 sec.,Partial Discharge < 5 pC	1335			
V_{IORM}	Max Working Insulation Voltage	890			V_{peak}
V_{IOTM}	Highest Allowable Over Voltage	6000			V_{peak}
	External Creepage	8			mm
	External Clearance	7.4			mm
	External Clearance (for Option T-0.4” Lead Spacing)	10.16			mm
	Insulation Thickness	0.5			mm
	Safety Limit Values – Maximum Values Allowed in the Event of a Failure				
T_{Case}	Case Temperature	150			°C
$I_{S,INPUT}$	Input Current	25			mA
$P_{S,OUTPUT}$	Output Power (Duty Factor ≤ 2.7%)	250			mW
R_{IO}	Insulation Resistance at T_S, V_{IO} = 500V	10^9			Ω

©2008 Fairchild Semiconductor Corporation

Absolute Maximum Ratings (T_A = 25ºC 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	-55 to +125	ºC
T_{OPR}	Operating Temperature	-40 to +100	ºC
T_J	Junction Temperature	-40 to +125	ºC
T_{SOL}	Lead Wave Solder Temperature (refer to page 19 for reflow solder profile)	260 for 10sec	ºC
$I_{F(AVG)}$	Average Input Current	25	mA
V_R	Reverse Input Voltage	5	V
$I_{O(PEAK)}$	Peak Output Current(1)	1.5	A
$V_{CC} - V_{EE}$	Supply Voltage	0 to 35	V
$V_{O(PEAK)}$	Peak Output Voltage	0 to V_{CC}	V
$t_{R(IN)}$, $t_{F(IN)}$	Input Signal Rise and Fall Time	500	ns
PD_I	Input Power Dissipation(2)(4)	45	mW
PD_O	Output Power Dissipation(3)(4)	250	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	Value	Units
T_A	Ambient Operating Temperature	-40 to +100	°C
$V_{CC} - V_{EE}$	Power Supply	15 to 30	V
$I_{F(ON)}$	Input Current (ON)	7 to 16	mA
$V_{F(OFF)}$	Input Voltage (OFF)	0 to 0.8	V

Isolation Characteristics

Apply over all recommended conditions, typical value is measured at T_A = 25ºC

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{ISO}	Input-Output Isolation Voltage	T_A = 25ºC, R.H.< 50%, t = 1.0min, $I_{I-O} \le$ 10μA, 50Hz(5)(6)	5000			V_{RMS}
R_{ISO}	Isolation Resistance	V_{I-O} = 500V(5)		10^{11}		Ω
C_{ISO}	Isolation Capacitance	V_{I-O} = 0V, Freq = 1.0MHz(5)		1		pF

©2008 Fairchild Semiconductor Corporation

Electrical Characteristics

Apply over all recommended conditions, typical value is measured at V_{CC} = 30V, V_{EE} = Ground, T_A = 25°C unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_F	Input Forward Voltage	I_F = 10mA	1.2	1.5	1.8	V
$\Delta(V_F / T_A)$	Temperature Coefficient of Forward Voltage			-1.8		mV/ºC
BV_R	Input Reverse Breakdown Voltage	I_R = 10µA	5			V
C_{IN}	Input Capacitance	f = 1MHz, VF = 0V		60		pF
I_{OH}	High Level Output Current(1)	$V_O = V_{CC} – 0.75V$	0.2			A
		$V_O = V_{CC} – 4V$	1.0			
I_{OL}	Low Level Output Current(1)	$V_O = V_{CC} + 0.75V$	0.2			A
		$V_O = V_{CC} + 4V$	1.0			
V_{OH}	High Level Output Voltage	I_F = 10mA, I_O = -1A	$V_{CC} – 4V$	$V_{CC} – 6V$		V
		I_F = 10mA, I_O = -100mA	$V_{CC} – 0.5V$	$V_{CC} – 0.1V$		
V_{OL}	Low Level Output Voltage	I_F = 0mA, I_O = 1A		$V_{EE} + 6V$	$V_{EE} + 4V$	V
		I_F = 0mA, I_O = 100mA		$V_{EE} + 0.1V$	$V_{EE} + 0.5V$	
I_{CCH}	High Level Supply Current	V_O = Open, I_F = 7 to 16mA		2.8	5	mA
I_{CCL}	Low Level Supply Current	V_O = Open, V_F = 0 to 0.8V		2.8	5	mA
I_{FLH}	Threshold Input Current Low to High	I_O = 0mA, V_O > 5V		2.3	5.0	mA
V_{FHL}	Threshold Input Voltage High to Low	I_O = 0mA, V_O < 5V	0.8			V
V_{UVLO+}	Under Voltage Lockout Threshold	I_F = 10mA, V_O > 5V	11	12.7	13.5	V
$V_{UVLO–}$		I_F = 10mA, V_O < 5V	9.5	11.2	12.0	V
$UVLO_{HYS}$	Under Voltage Lockout Threshold Hysteresis			1.5		V

©2008 Fairchild Semiconductor Corporation

Switching Characteristics

Apply over all recommended conditions, typical value is measured at V_{CC} = 30V, V_{EE} = Ground, T_A = 25°C unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
t_{PHL}	Propagation Delay Time to Logic Low Output	I_F = 7mA to 16mA, Rg = 20Ω, Cg =10nF, f = 10kHz, Duty Cycle = 50%	100	275	500	ns
t_{PLH}	Propagation Delay Time to Logic High Output		100	255	500	ns
PWD	Pulse Width Distortion, $\lvert t_{PHL} - t_{PLH} \rvert$			20	300	ns
PDD (Skew)	Propagation Delay Difference Between Any Two Parts or Channels, $(t_{PHL} - t_{PLH})$[7]		-350		350	ns
t_r	Output Rise Time (10% – 90%)			60		ns
t_f	Output Fall Time (90% – 10%)			60		ns
$t_{UVLO\ ON}$	UVLO Turn On Delay	I_F = 10mA , V_O > 5V		1.6		µs
$t_{UVLO\ OFF}$	UVLO Turn Off Delay	I_F = 10mA , V_O < 5V		0.4		µs
$\lvert CM_H \rvert$	Common Mode Transient Immunity at Output High	T_A = 25°C, V_{CC} = 30V, I_F = 7 to 16mA, V_{CM} = 2000V[8]	20	50		kV/µs
$\lvert CM_L \rvert$	Common Mode Transient Immunity at Output Low	T_A = 25°C, V_{CC} = 30V, V_F = 0V, V_{CM} = 2000V[9]	20	50		kV/µs

Notes:

1. Maximum pulse width = 10µs, maximum duty cycle = 0.2%
2. Derate linearly above 87°C, free air temperature at a rate of 0.77mW/°C
3. No derating required across temperature range.
4. Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.
5. Device is considered a two terminal device: Pins 2 and 3 are shorted together and Pins 5, 6, 7 and 8 are shorted together.
6. 5,000 V_{RMS} for 1 minute duration is equivalent to 6,000 VAC_{RMS} for 1 second duration.
7. The difference between t_{PHL} and t_{PLH} between any two FOD3150 parts under same test conditions.
8. Common mode transient immunity at output high is the maximum tolerable negative dVcm/dt on the trailing edge of the common mode impulse signal, Vcm, to assure that the output will remain high (i.e. V_O > 15.0V).
9. Common mode transient immunity at output low is the maximum tolerable positive dVcm/dt on the leading edge of the common pulse signal, Vcm, to assure that the output will remain low (i.e. V_O < 1.0V).

©2008 Fairchild Semiconductor Corporation

Typical Performance Curves

Fig. 1 Output High Voltage Drop vs. Output High Current

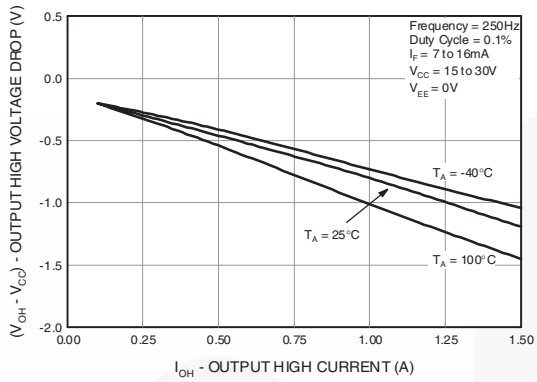


Fig. 2 Output High Voltage Drop vs. Ambient Temperature

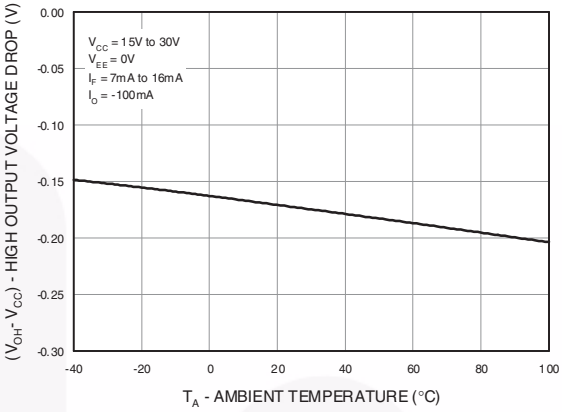


Fig. 3 Output Low Voltage vs. Output Low Current

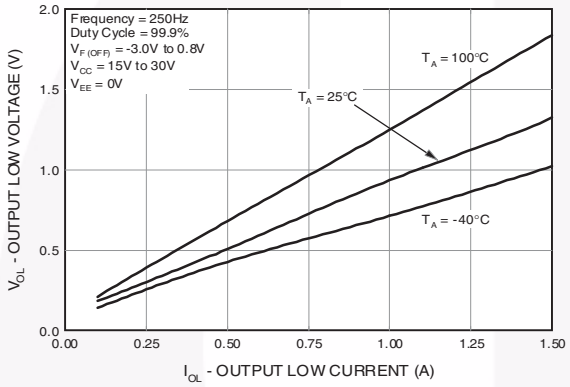


Fig. 4 Output Low Voltage vs. Ambient Temperature

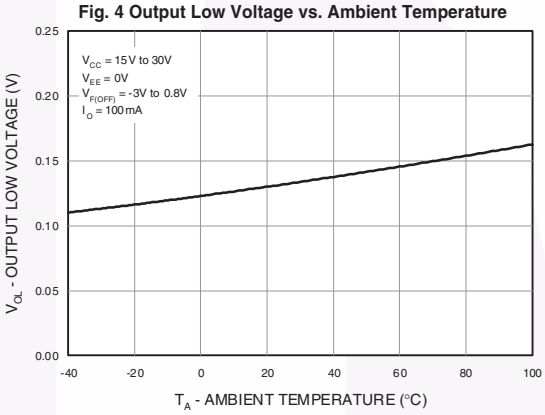


Fig. 5 Supply Current vs. Ambient Temperature

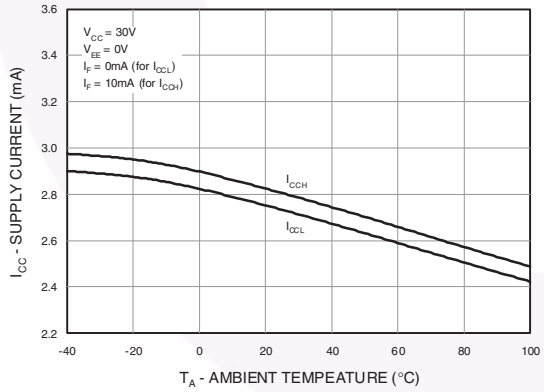
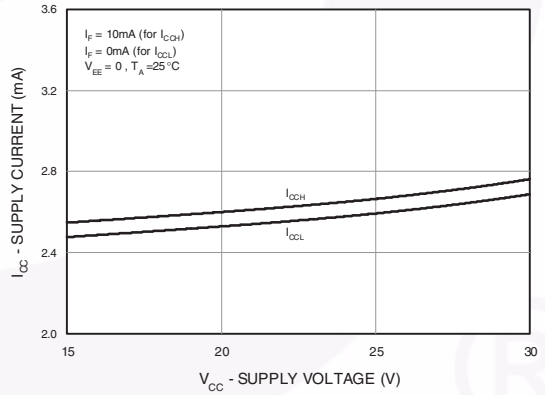


Fig. 6 Supply Current vs. Supply Voltage



Typical Performance Curves (Continued)

Fig. 7 Low to High Input Current Threshold vs. Ambient Temperature

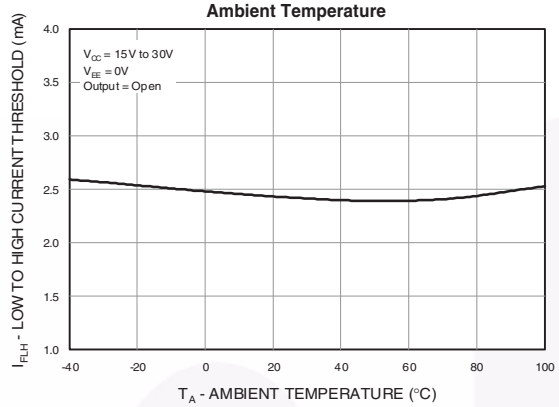


Fig. 8 Propagation Delay vs. Supply Voltage

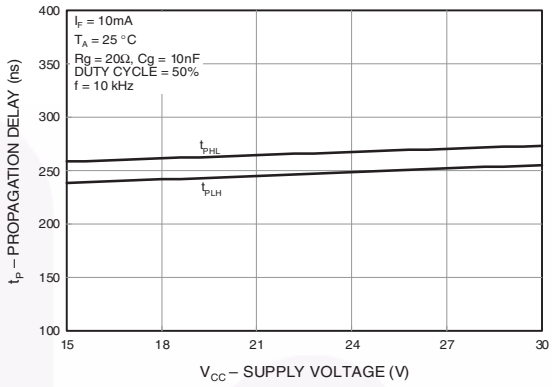


Fig. 9 Propagation Delay vs. LED Forward Current

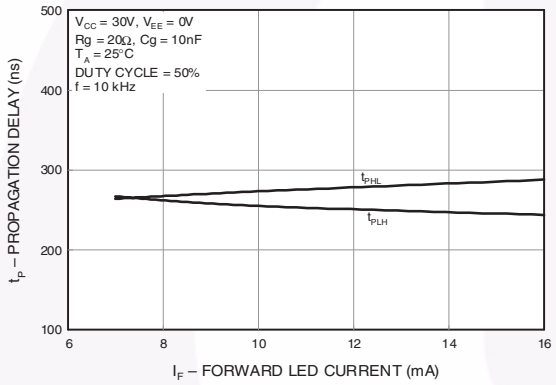


Fig. 10 Propagation Delay vs. Ambient Temperature

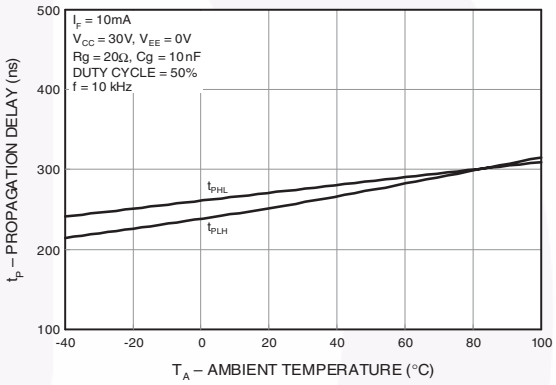


Fig. 11 Propagation Delay vs. Series Load Resistance

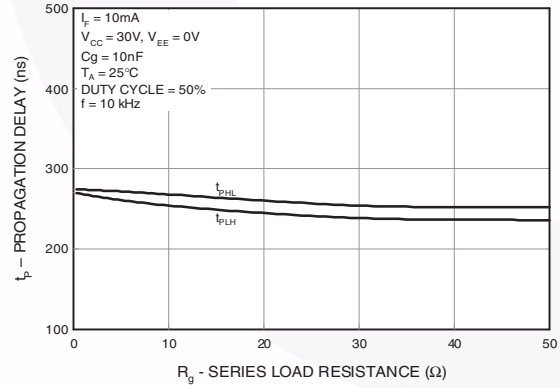
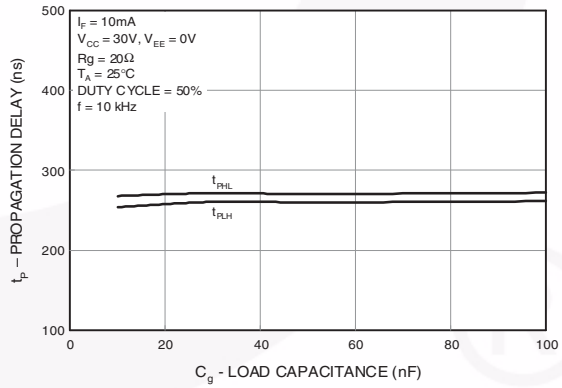


Fig. 12 Propagation Delay vs. Load Capacitance



Typical Performance Curves (Continued)

Fig. 13 Transfer Characteristics

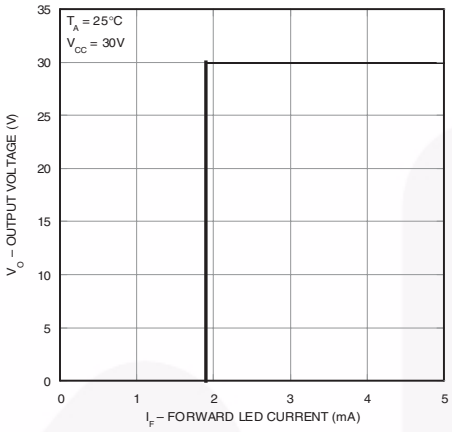


Fig. 14 Input Forward Current vs. Forward Voltage

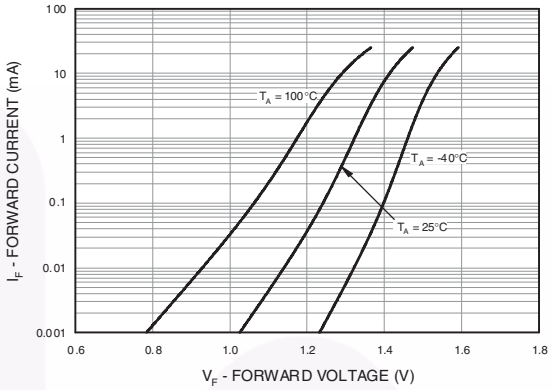
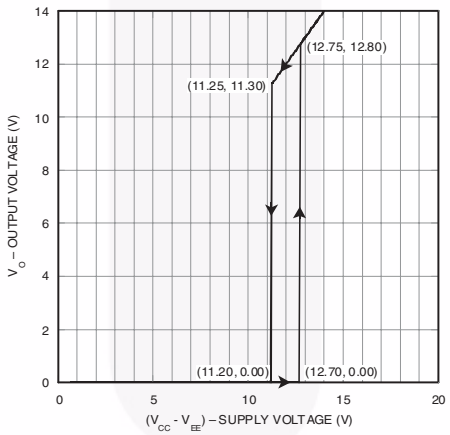
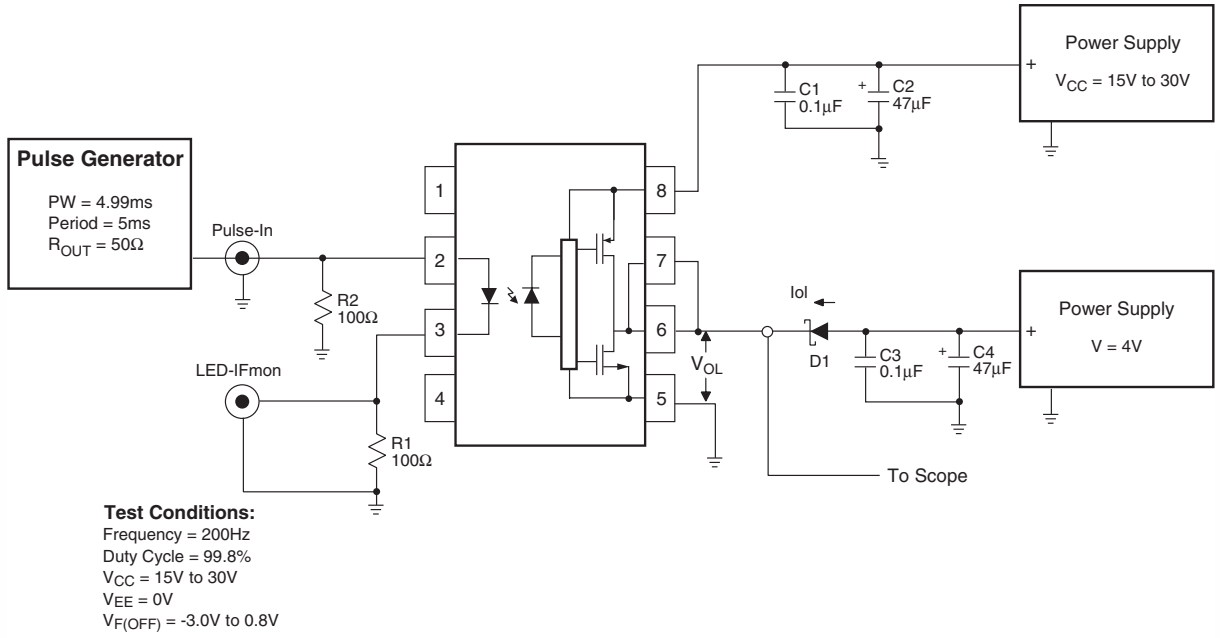


Fig. 15 Under Voltage Lockout

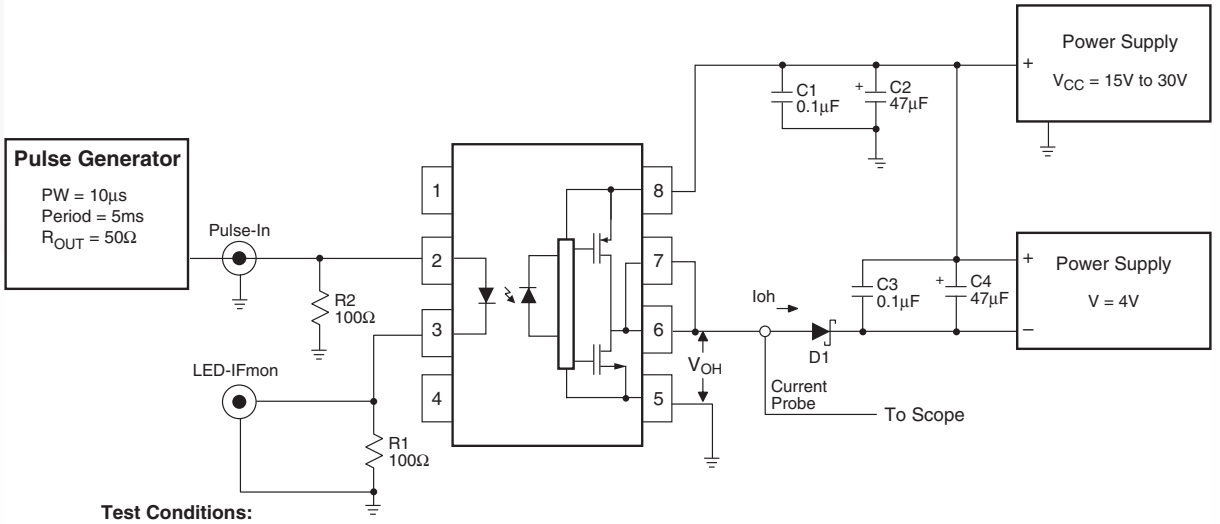


Test Circuit



Test Conditions:
Frequency = 200Hz
Duty Cycle = 99.8%
V_{CC} = 15V to 30V
V_{EE} = 0V
$V_{F(OFF)}$ = -3.0V to 0.8V

Figure 20. I_{OL} Test Circuit



Test Conditions:
Frequency = 200Hz
Duty Cycle = 0.2%
V_{CC} = 15V to 30V
V_{EE} = 0V
I_F = 7mA to 16mA

Figure 21. I_{OH} Test Circuit

Test Circuit (Continued)

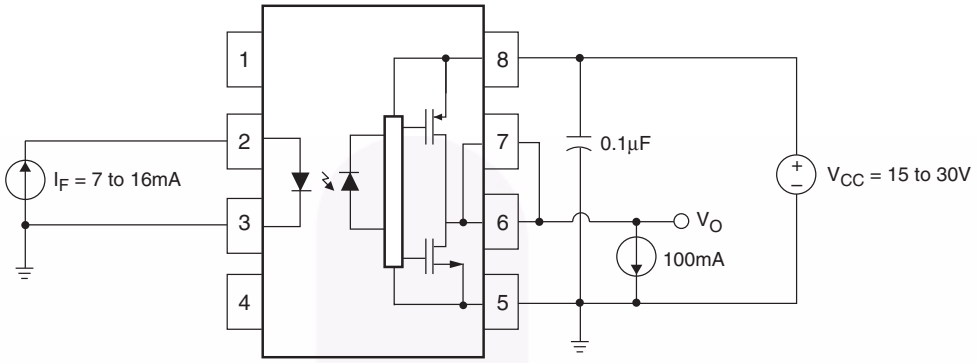


Figure 22. V_{OH} Test Circuit

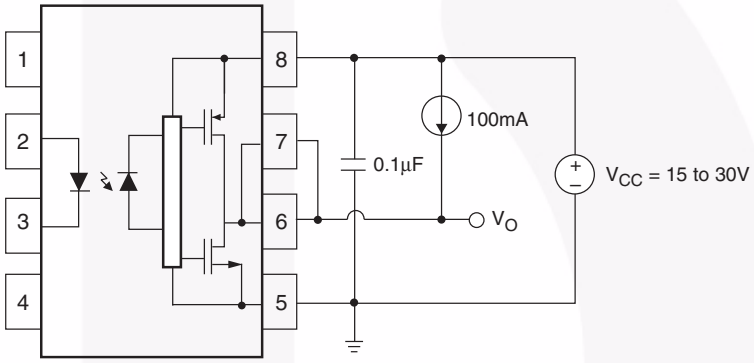


Figure 23. V_{OL} Test Circuit

Test Circuit (Continued)

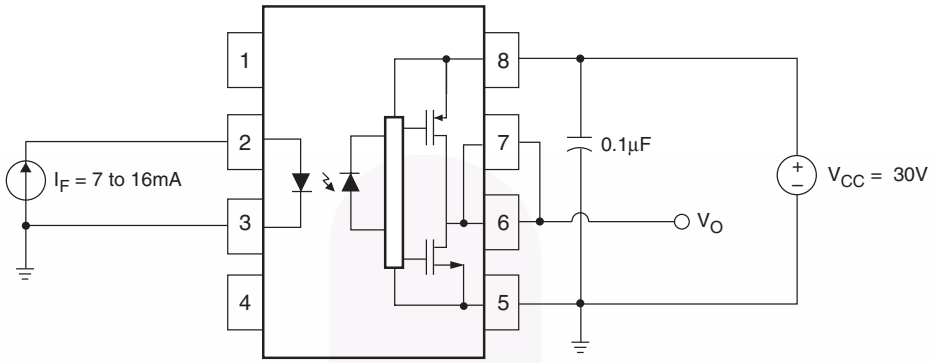


Figure 24. I_{CCH} Test Circuit

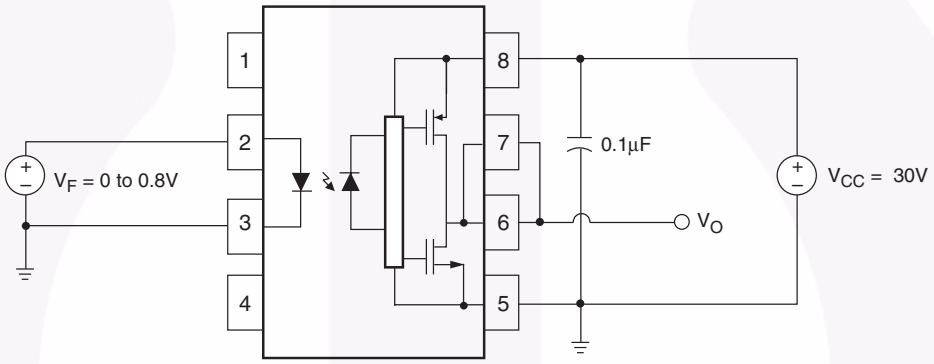


Figure 25. I_{CCL} Test Circuit

Test Circuit (Continued)

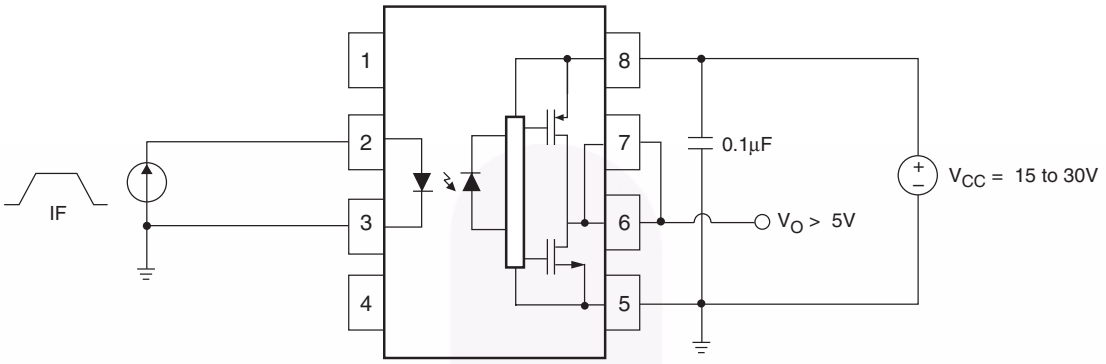


Figure 26. I_{FLH} Test Circuit

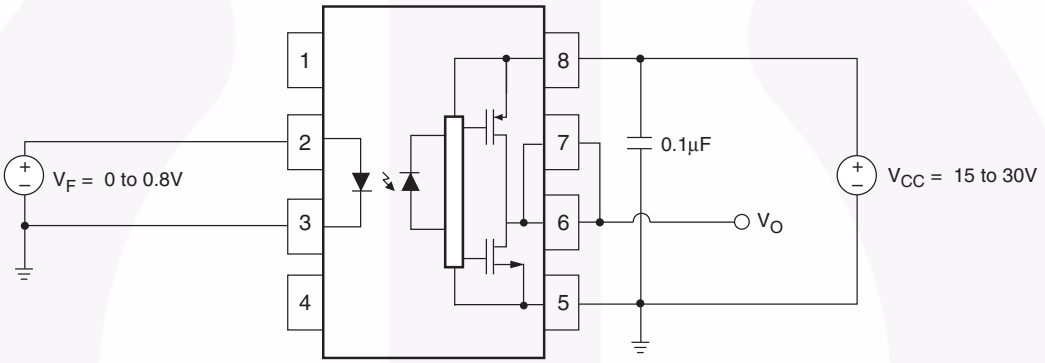


Figure 27. V_{FHL} Test Circuit

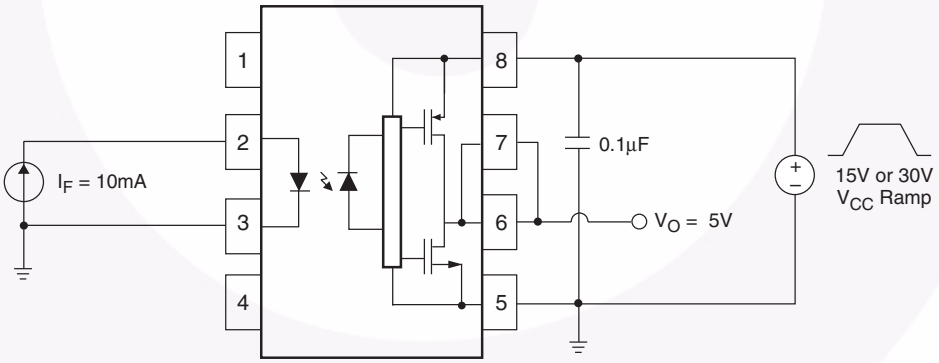


Figure 28. UVLO Test Circuit

Test Circuit (Continued)

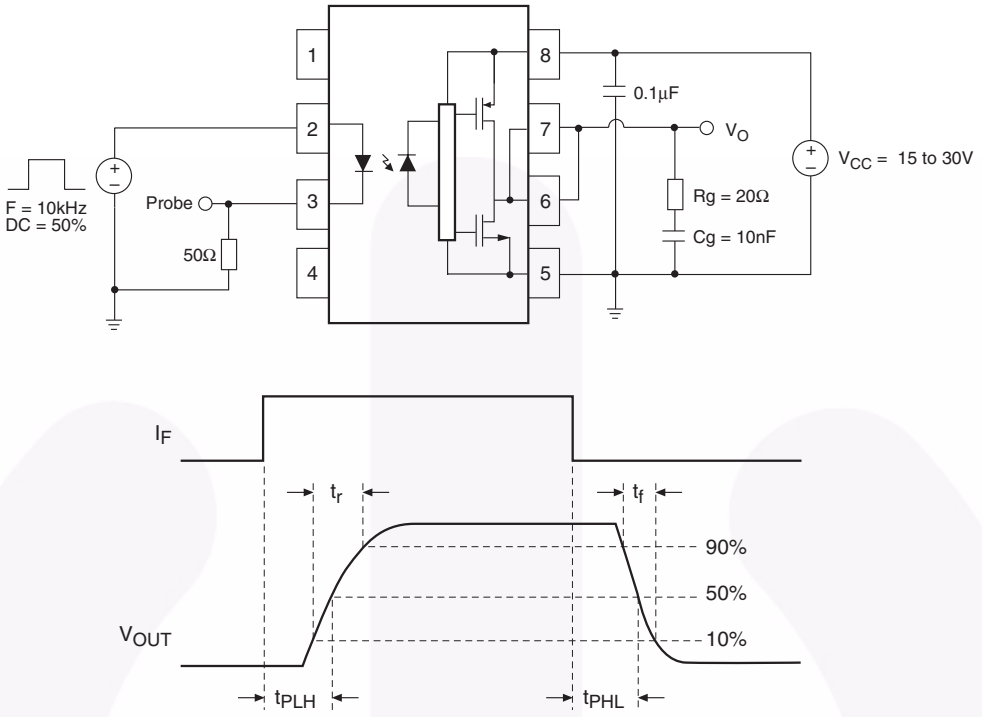


Figure 29. t_{PHL}, t_{PLH}, t_R and t_F Test Circuit and Waveforms

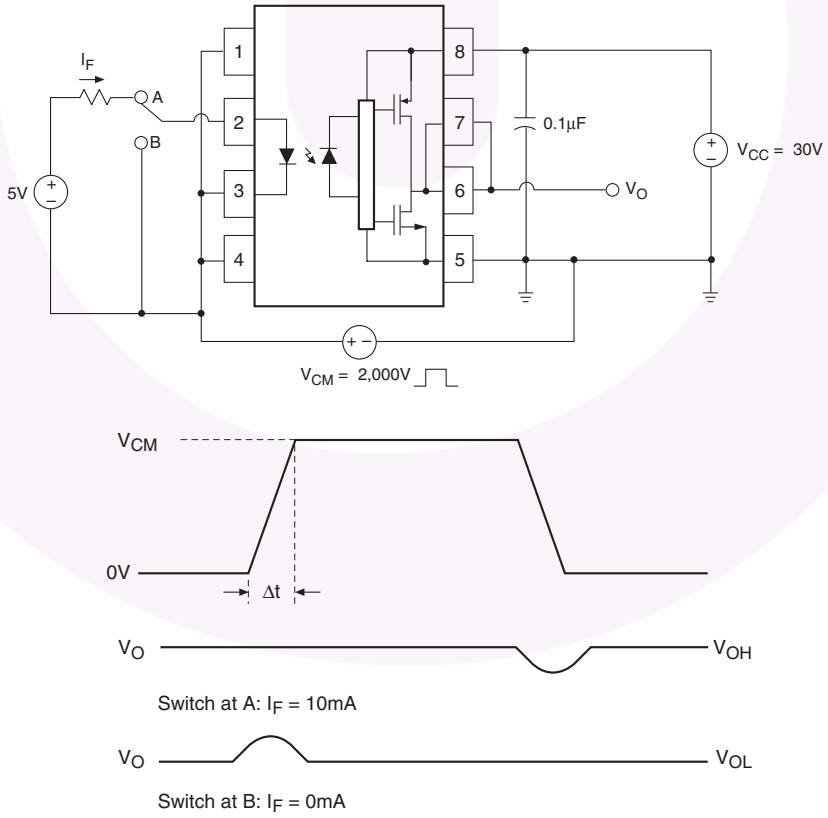
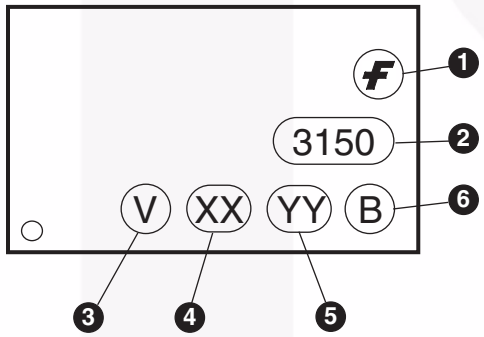


Figure 30. CMR Test Circuit and Waveforms

Ordering Information

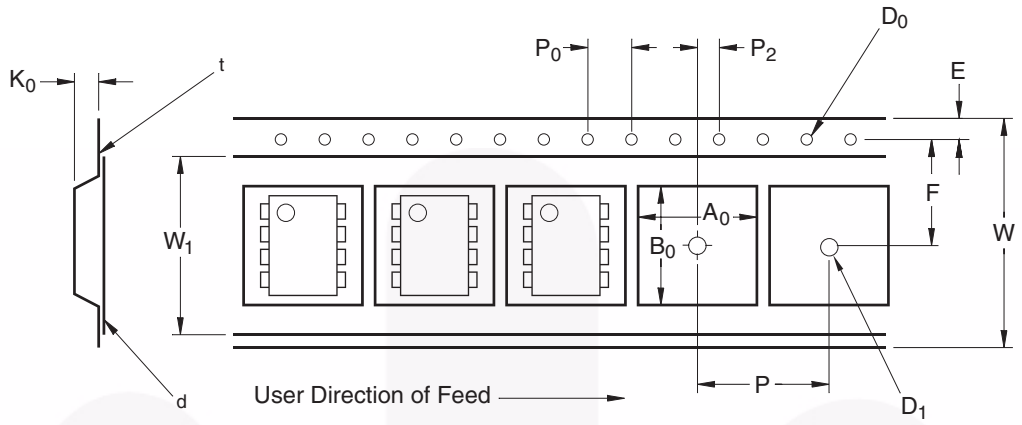
Part Number	Package	Packing Method
FOD3150	DIP 8-Pin	Tube (50 units per tube)
FOD3150S	SMT 8-Pin (Lead Bend)	Tube (50 units per tube)
FOD3150SD	SMT 8-Pin (Lead Bend)	Tape and Reel (1,000 units per reel)
FOD3150V	DIP 8-Pin, IEC60747-5-2 option	Tube (50 units per tube)
FOD3150SV	SMT 8-Pin (Lead Bend), IEC60747-5-2 option	Tube (50 units per tube)
FOD3150SDV	SMT 8-Pin (Lead Bend), IEC60747-5-2 option	Tape and Reel (1,000 units per reel)
FOD3150T	DIP 8-Pin, 0.4” Lead Spacing	Tube (50 units per tube)
FOD3150TV	DIP 8-Pin, 0.4” Lead Spacing , IEC60747-5-2 option	Tube (50 units per tube)

Marking Information



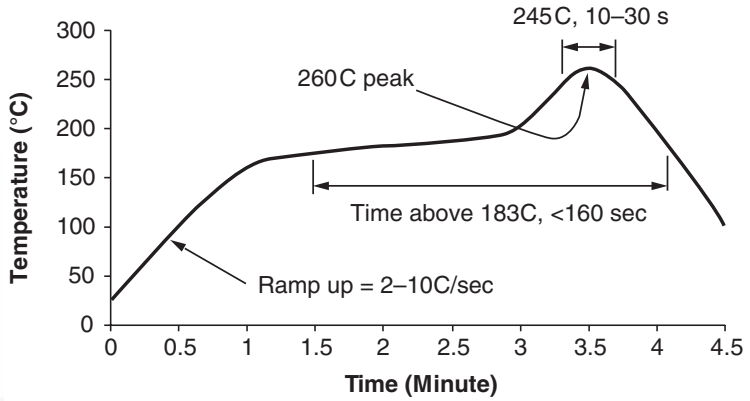
Definitions	
1	Fairchild logo
2	Device number
3	IEC60747-5-2 Option (only appears on component ordered with this option)
4	Two digit year code, e.g., ‘08’
5	Two digit work week ranging from ‘01’ to ‘53’
6	Assembly package code

Carrier Tape Specifications

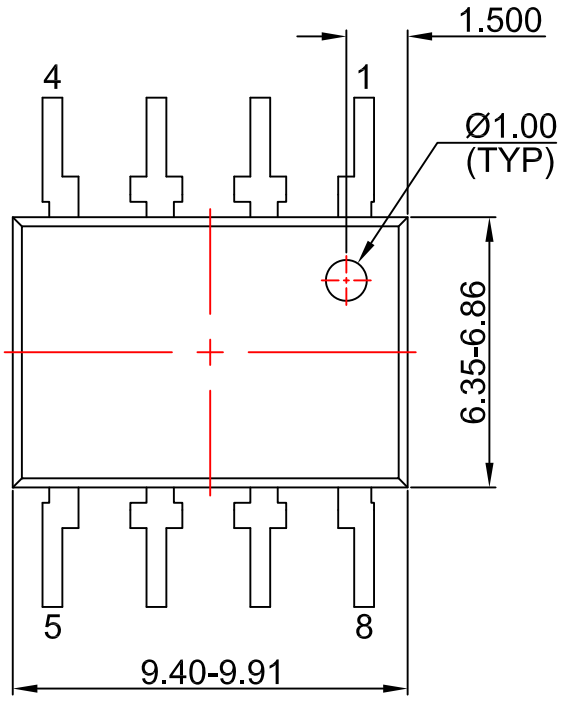


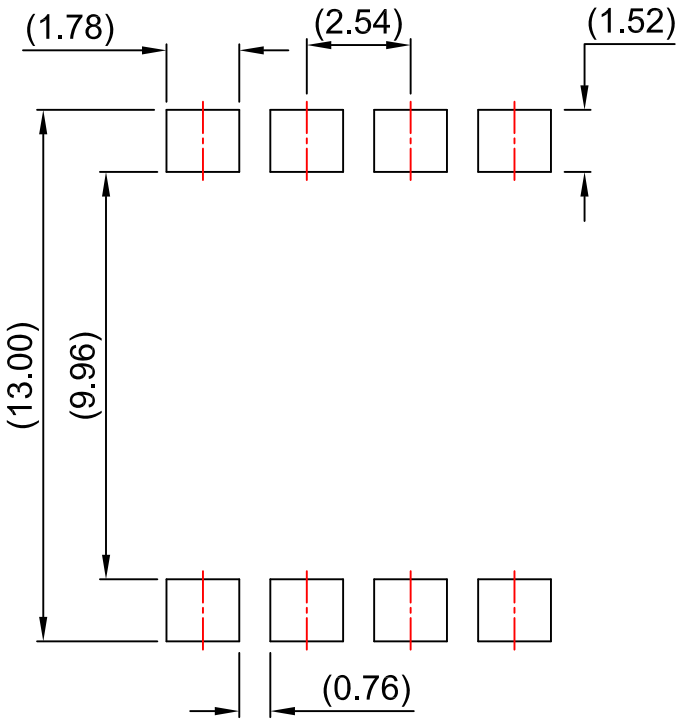
Symbol	Description	Dimension in mm
W	Tape Width	16.0 ± 0.3
t	Tape Thickness	0.30 ± 0.05
P_0	Sprocket Hole Pitch	4.0 ± 0.1
D_0	Sprocket Hole Diameter	1.55 ± 0.05
E	Sprocket Hole Location	1.75 ± 0.10
F	Pocket Location	7.5 ± 0.1
P_2		2.0 ± 0.1
P	Pocket Pitch	12.0 ± 0.1
A_0	Pocket Dimensions	10.30 ±0.20
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 max
	Max. Component Rotation or Tilt	10°
R	Min. Bending Radius	30

Reflow Profile

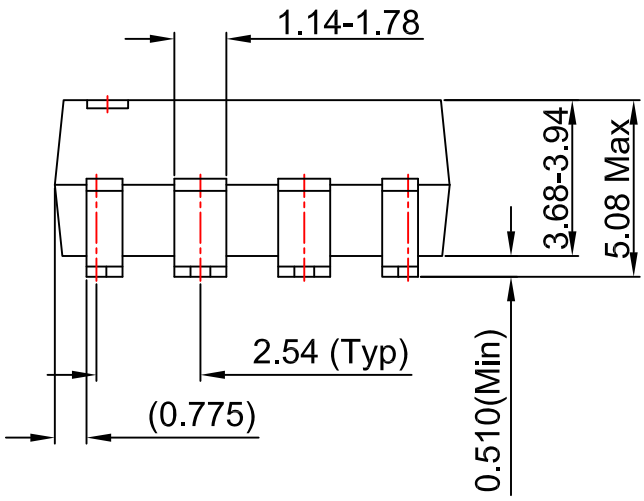


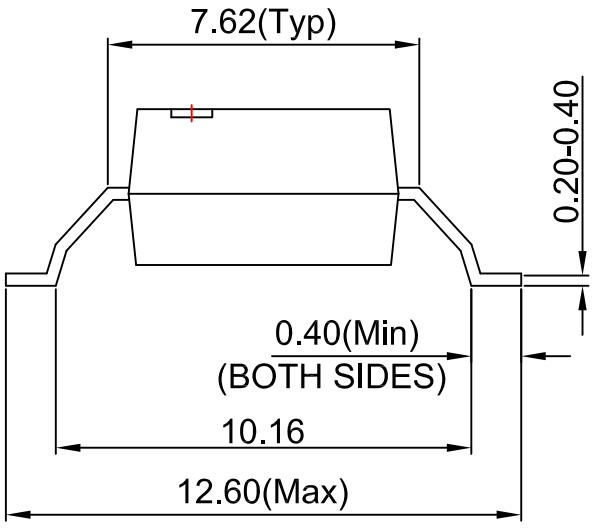
- Peak reflow temperature: 260C (package surface temperature)
- Time of temperature higher than 183C for 160 seconds or less
- One time soldering reflow is recommended





LAND PATTERN RECOMMENDATION





NOTES:

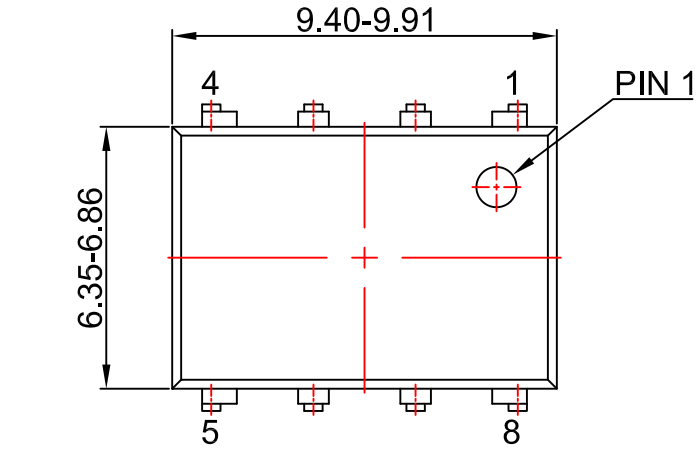
A) NO STANDARD APPLIES TO THIS PACKAGE

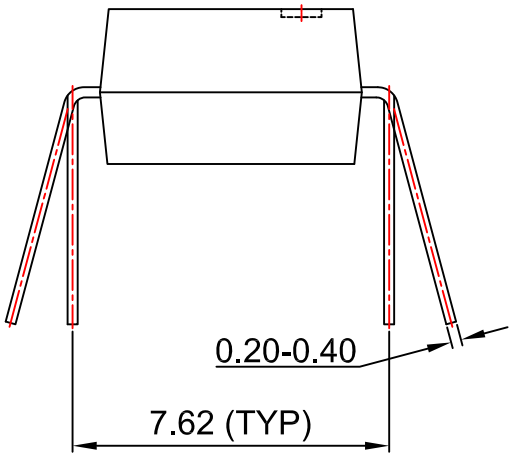
B) ALL DIMENSIONS ARE IN MILLIMETERS.

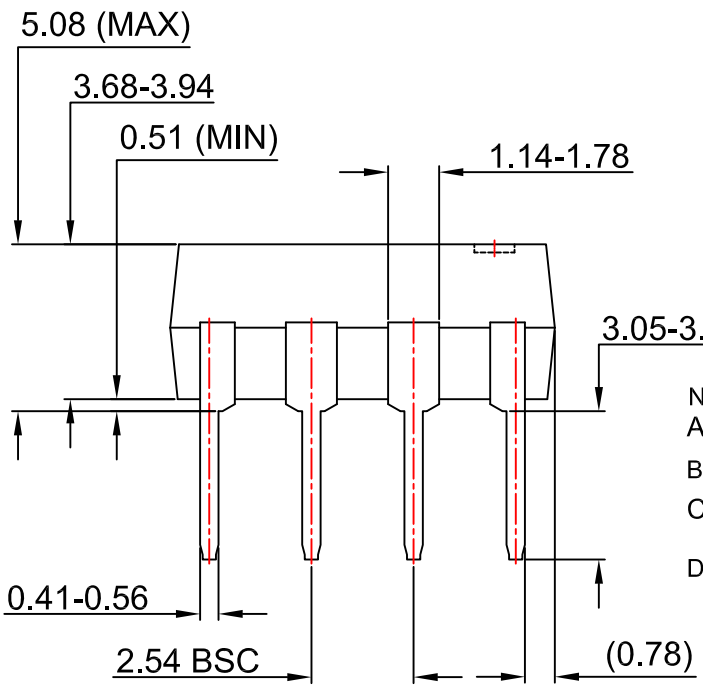
C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION

D) DWG FILENAME AND REVISION: MKT-N08Lrev2.

FAIRCHILD™







NOTES:

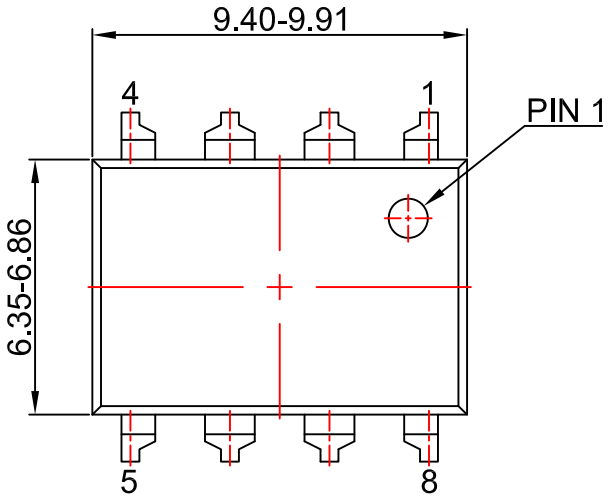
A) NO STANDARD APPLIES TO THIS PACKAGE

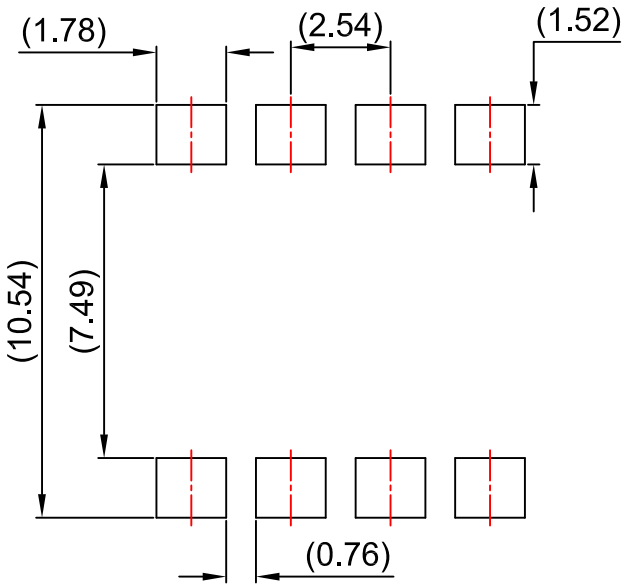
B) ALL DIMENSIONS ARE IN MILLIMETERS.

C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION

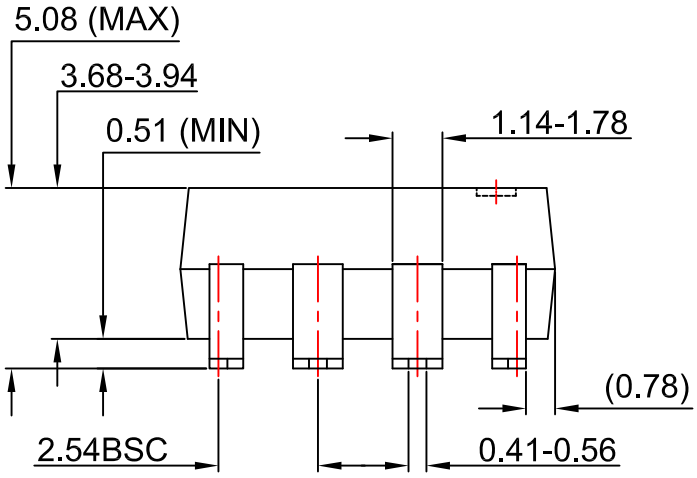
D) DRAWING FILENAME AND REVSION: MKT-N08GREV7

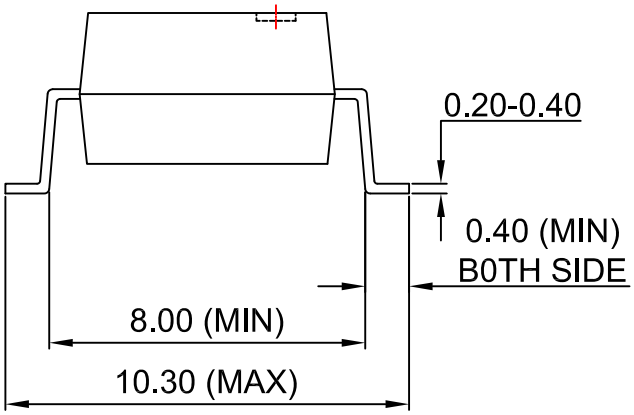
FAIRCHILD™





LAND PATTERN RECOMMENDATION





NOTES:

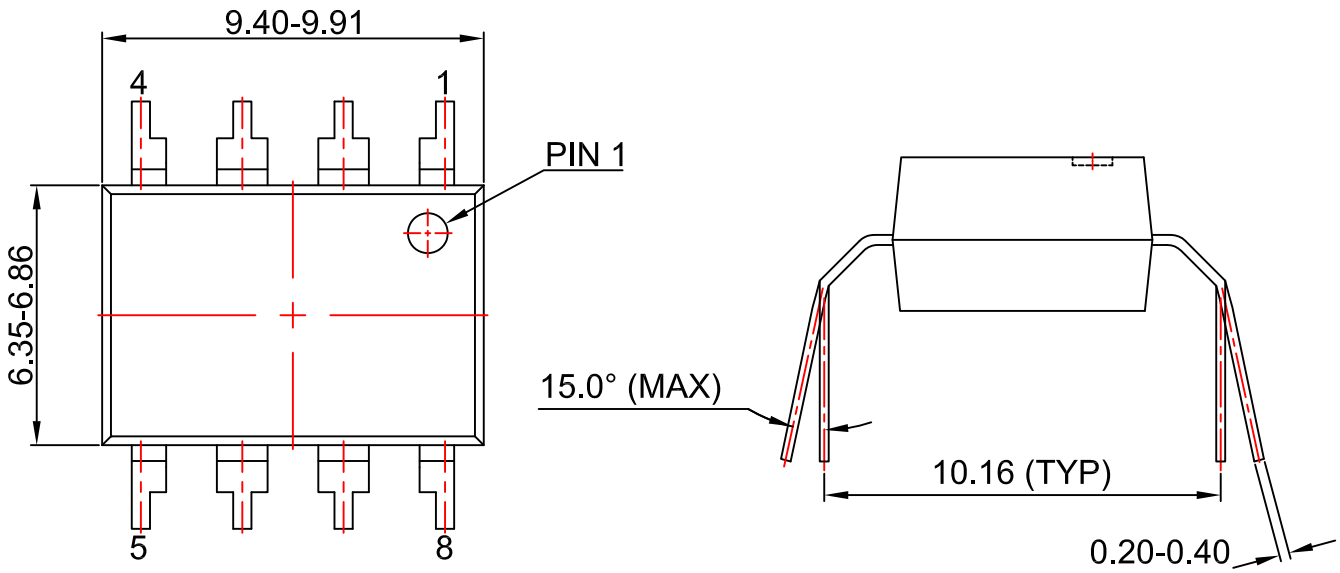
A) NO STANDARD APPLIES TO THIS PACKAGE

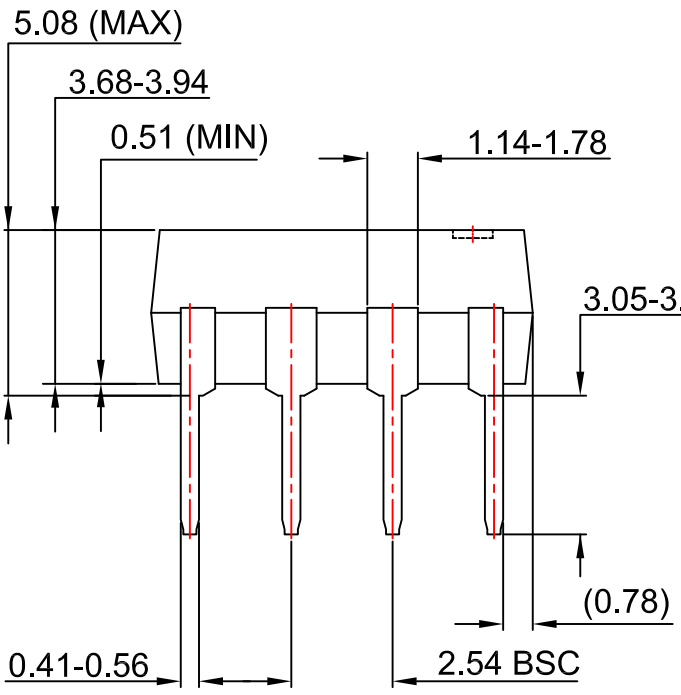
B) ALL DIMENSIONS ARE IN MILLIMETERS.

C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION

D) DRAWING FILENAME AND REVSION: MKT-N08Hrev7.

FAIRCHILD





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 REVSION: MKT-N08REV7

FAIRCHILD™

ON Semiconductor and ON 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. 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

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**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative