

3.3 V/5 V High Speed-10 MBit/s Logic Gate Optocouplers

FOD060L, FOD260L

Description

These optocouplers consist of an AlGaAs LED, optically coupled to a very high speed integrated photo-detector logic gate. Devices include a strobable output. This output features an open collector, thereby permitting wired OR outputs. The coupled parameters are guaranteed over the temperature range of -40°C to $+85^{\circ}\text{C}$. A maximum input signal of 5 mA will provide a minimum output sink current of 13 mA (fan out of 8). An internal noise shield provides superior common mode rejection of typically 50 kV/ μs at 1,000 V common mode.

Features

- FOD060L in SO8 and FOD260L in 8-pin DIP
- Very High Speed – 10 MBit/s
- Superior CMR – 50 kV/ μs at 1,000 V Peak
- Fan-out of 8 over -40°C to $+85^{\circ}\text{C}$
- Logic Gate Output
- Storable Output
- Wired OR-open Collector
- Safety and Regulatory Approvals
 - ♦ UL1577
 - ♦ DIN EN/IEC 60747-5-2

Applications

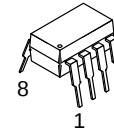
- Ground Loop Elimination
- LSTTL to TTL, LSTTL or 5-volt CMOS
- Line Receiver, Data Transmission
- Data Multiplexing
- Switching Power Supplies
- Pulse Transformer Replacement
- Computer-peripheral Interface

TRUTH TABLE (POSITIVE LOGIC)

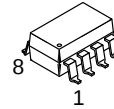
Input	Enable	Output
On	H	L
Off	H	H
On	L	H
Off	L	H
On*	NC*	L*
Off*	NC*	H*

* Devices with pin 7 not connected.

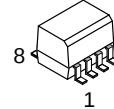
A 0.1 μF bypass capacitor must be connected between pins 5 and 8. (See Note 2)



PDIP8 9.655x6.6, 2.54P
(DIP)
CASE 646CQ

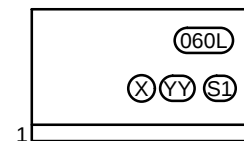


PDIP8 GW
(SMT)
CASE 709AC



SOIC8
(Small Outline)
CASE 751DZ

MARKING DIAGRAM



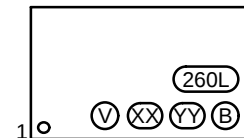
SOIC8

060L = Device number

X = One digit year code, e.g., '8'

YY = Two digit work week ranging from '01' to '53'

S1 = Assembly package code



PDIP8/PDIP8 GW

260L = Device number

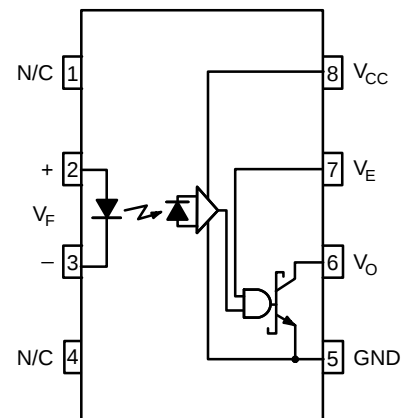
V = VDE mark (Note: Only appears on parts ordered with DIN EN/IEC 60747-5-2 option – See order entry table)

XX = Two digit year code, e.g., '11'

YY = Two digit work week ranging from '01' to '53'

B = Assembly package code

BLOCK DIAGRAM



ORDERING INFORMATION

See detailed ordering and shipping information on page 11 of this data sheet.

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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 _{RMS}	I–IV
	<300 V _{RMS}	I–III
Climatic Classification		55/100/21
Pollution Degree (DIN VDE 0110/1.89)		2
Comparative Tracking Index		175

Symbol	Parameter	Value	Unit
V _{PR}	Input-to-Output Test Voltage, Method A, V _{IORM} × 1.6 = V _{PR} , Type and Sample Test with t _m = 10 s, Partial Discharge < 5 pC	904	V _{peak}
	Input-to-Output Test Voltage, Method B, V _{IORM} × 1.875 = V _{PR} , 100% Production Test with t _m = 1 s, Partial Discharge < 5 pC	1060	V _{peak}
V _{IORM}	Maximum Working Insulation Voltage	565	V _{peak}
V _{IOTM}	Highest Allowable Over-Voltage	4000	V _{peak}
	External Creepage	≥4	mm
	External Clearance	≥4	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥0.4	mm
T _S	Case Temperature (Note 1)	150	°C
I _{S,INPUT}	Input Current (Note 1)	200	mA
P _{S,OUTPUT}	Output Power (Note 1)	300	mW
R _{IO}	Insulation Resistance at T _S , V _{IO} = 500 V (Note 1)	>10 ⁹	Ω

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

ABSOLUTE MAXIMUM RATINGS (No derating required up to 85 °C)

Symbol	Parameter	Value	Unit
T _{STG}	Storage Temperature	–40 to +125	°C
T _{OPR}	Operating Temperature	–40 to +85	°C

EMITTER

I _F	DC/Average Forward Input Current	50	mA
V _E	Enable Input Voltage, not to Exceed V _{CC} by More than 500 mV	V _{CC} + 0.5 V	V
V _R	Reverse Input Voltage	5.0	V
P _I	Power Dissipation	45	mW

DETECTOR

V _{CC} (1 minute max)	Supply Voltage	7.0	V
I _O	Output Current	50	mA
V _O	Output Voltage	7.0	V
P _O	Collector Output Power Dissipation	85	mW

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected. Operating the device outside its recommended conditions, but still within its maximum rated limits may not cause immediate damage. However, doing so can lead to reduced performance, unpredictable behavior, and potentially shorten the device's lifespan or reliability.



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RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
I_{FL}	Input Current, Low Level	0	250	μA
I_{FH}	Input Current, High Level	*6.3	15	mA
V_{CC}	Supply Voltage, Output	3.0	5.5	V
V_{EL}	Enable Voltage, Low Level	0	0.8	V
V_{EH}	Enable Voltage, High Level	2.0	V_{CC}	V
T_A	Operating Temperature	-40	+85	$^{\circ}C$
N	Fan Out (TTL Load)		8	
R_L	Output Pull-up Resistor	330	4K	Ω

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

* 6.3 mA is a guard banded value which allows for at least 20% CTR degradation. Initial input current threshold value is 5.0 mA or less.

ELECTRICAL CHARACTERISTICS ($T_A = -40^{\circ}C$ to $+85^{\circ}C$ unless otherwise specified. Typical value is measured at $T_A = 25^{\circ}C$ and $V_{CC} = 3.3 V$)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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INDIVIDUAL COMPONENT CHARACTERISTICS

EMITTER

V_F	Input Forward Voltage	$I_F = 10 \text{ mA}$ $T_A = 25^{\circ}C$		1.4	1.8 1.75	V
B_{VR}	Input Reverse Breakdown Voltage	$I_R = 10 \mu A$	5.0			V
C_{IN}	Input Capacitance	$V_F = 0, f = 1 \text{ MHz}$		6.0		pF
$\Delta V_F / \Delta T_A$	Input Diode Temperature Coefficient	$I_F = 10 \text{ mA}$		-1.9		mV/ $^{\circ}C$

DETECTOR

I_{CCH}	High Level Supply Current	$V_E = 0.5 V, I_F = 0 \text{ mA}, V_{CC} = 3.3 V$		3.5	7	mA
I_{CCL}	Low Level Supply Current	$V_E = 0.5 V, I_F = 0 \text{ mA}, V_{CC} = 3.3 V$		3.2	10	mA
I_{EL}	Low Level Enable Current	$V_{CC} = 3.3 V, V_E = 0.5 V$			-1.6	mA
I_{EH}	High Level Enable Current	$V_{CC} = 3.3 V, V_E = 2.0 V$			-1.6	mA
V_{EH}	High Level Enable Voltage	$V_{CC} = 3.3 V, I_F = 10 \text{ mA}$	2.0	1.27		V
V_{EL}	Low Level Enable Voltage	$V_{CC} = 3.3 V, I_F = 10 \text{ mA}$ (Note 3)		1.18	0.8	V

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

SWITCHING CHARACTERISTICS ($T_A = -40^{\circ}C$ to $+85^{\circ}C, V_{CC} = 3.3 V, I_F = 7.5 \text{ mA}$ unless otherwise specified. Typical value is measured at $T_A = 25^{\circ}C$ and $V_{CC} = 3.3 V$)

Symbol	AC Characteristics	Test Condition	Min	Typ	Max	Unit
T_{PLH}	Propagation Delay Time to Output High Level	$R_L = 350 \Omega, C_L = 15 \text{ pF}$ (Figure 9) (Note 4)		65	90	ns
T_{PHL}	Propagation Delay Time to Output Low Level	$R_L = 350 \Omega, C_L = 15 \text{ pF}$ (Figure. 9) (Note 5)		43	75	ns
$ T_{PHL} - T_{PLH} $	Pulse Width Distortion	$R_L = 350 \Omega, C_L = 15 \text{ pF}$ (Figure 9)		23	25	ns
t_{PSK}	Propagation Delay Skew	$R_L = 350 \Omega, C_L = 15 \text{ pF}$ (Note 6)		31	40	ns
t_r	Output Rise Time (10–90%)	$R_L = 350 \Omega, C_L = 15 \text{ pF}$ (Figure 9) (Note 7)		22		ns
t_f	Output Fall Time (90–10%)	$R_L = 350 \Omega, C_L = 15 \text{ pF}$ (Figure 9) (Note 8)		3		ns
t_{ELH}	Enable Propagation Delay Time to Output High Level	$V_{EH} = 3 V, R_L = 350 \Omega, C_L = 15 \text{ pF}$ (Figure 10) (Note 9)		47		ns



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SWITCHING CHARACTERISTICS ($T_A = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$, $V_{CC} = 3.3\text{ V}$, $I_F = 7.5\text{ mA}$ unless otherwise specified. Typical value is measured at $T_A = 25\text{ }^{\circ}\text{C}$ and $V_{CC} = 3.3\text{ V}$) (continued)

Symbol	AC Characteristics	Test Condition	Min	Typ	Max	Unit
t_{EHL}	Enable Propagation Delay Time to Output Low Level	$V_{EH} = 3\text{ V}$, $R_L = 350\text{ }\Omega$, $C_L = 15\text{ pF}$ (Figure 10) (Note 10)		27		ns
CM_H	Common Mode Transient Immunity (at Output High Level)	$R_L = 350\text{ }\Omega$, $T_A = 25\text{ }^{\circ}\text{C}$, $I_F = 0\text{ mA}$, $V_{OH}(\text{Min.}) = 2.0\text{ V}$, $ V_{CM} = 1,000\text{ V}$ (Figure 11) (Note 11)	25,000	50,000		V/ μs
CM_L	Common Mode Transient Immunity (at Output Low Level)	$R_L = 350\text{ }\Omega$, $T_A = 25\text{ }^{\circ}\text{C}$, $I_F = 7.5\text{ mA}$, $V_{OL}(\text{Max.}) = 0.8\text{ V}$, $ V_{CM} = 1,000\text{ V}$ (Figure 11) (Note 12)	25,000	50,000		V/ μs

TRANSFER CHARACTERISTICS ($T_A = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ unless otherwise specified. Typical value is measured at $T_A = 25\text{ }^{\circ}\text{C}$ and $V_{CC} = 3.3\text{ V}$)

Symbol	DC Characteristics	Test Condition	Min	Typ	Max	Unit
I_{OH}	High Level Output Current	$I_F = 250\text{ }\mu\text{A}$, $V_{CC} = 3.3\text{ V}$, $V_O = 3.3\text{ V}$, $V_E = 2.0\text{ V}$ (Note 3)		0.01	50	μA
V_{OL}	Low Level Output Voltage	$V_{CC} = 3.3\text{ V}$, $I_F = 5\text{ mA}$, $I_{OL} = 13\text{ mA}$, $V_E = 2.0\text{ V}$ (Note 3)		0.3	0.6	V
I_{FT}	Input Threshold Current	$V_{CC} = 3.3\text{ V}$, $V_O = 0.6\text{ V}$, $I_{OL} = 13\text{ mA}$, $V_E = 2.0\text{ V}$ (Note 3)		1	5	mA

ISOLATION CHARACTERISTICS ($T_A = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ unless otherwise specified. Typical value is measured at $T_A = 25\text{ }^{\circ}\text{C}$ and $V_{CC} = 3.3\text{ V}$)

Symbol	Characteristics	Test Condition	Min	Typ	Max	Unit
I_{I-O}	Input-Output Insulation Leakage Current	Relative humidity = 45%, $T_A = 25\text{ }^{\circ}\text{C}$, $t = 5\text{ s}$, $V_{I-O} = 3000\text{ VDC}$ (Note 13)			1.0	μA
V_{ISO}	Withstand Insulation Test Voltage FOD060L FOD260L	$I_{IO} \leq 2\text{ }\mu\text{A}$, $R_H < 50\%$, $T_A = 25\text{ }^{\circ}\text{C}$, $t = 1\text{ min.}$ (Note 13)	3750			VRMS
			5000			
R_{I-O}	Resistance (Input to Output)	$V_{I-O} = 500\text{ V}$ (Note 13)		10^{12}		Ω
C_{I-O}	Capacitance (Input to Output)	$f = 1\text{ MHz}$ (Note 13)		0.6		pF

NOTES:

- The V_{CC} supply to each optoisolator must be bypassed by a $0.1\text{ }\mu\text{F}$ capacitor or larger. This can be either a ceramic or solid tantalum capacitor with good high frequency characteristic and should be connected as close as possible to the package V_{CC} and GND pins of each device.
- Enable Input – No pull up resistor required as the device has an internal pull up resistor.
- t_{PLH} – Propagation delay is measured from the 3.75 mA level on the HIGH to LOW transition of the input current pulse to the 1.5 V level on the LOW to HIGH transition of the output voltage pulse.
- t_{PHL} – Propagation delay is measured from the 3.75 mA level on the LOW to HIGH transition of the input current pulse to the 1.5 V level on the HIGH to LOW transition of the output voltage pulse.
- t_{PSK} is the worst case difference between t_{PHL} and t_{PLH} for any devices at the stated test conditions.
- t_r – Rise time is measured from the 90% to the 10% levels on the LOW to HIGH transition of the output pulse.
- t_f – Fall time is measured from the 10% to the 90% levels on the HIGH to LOW transition of the output pulse.
- t_{ELH} – Enable input propagation delay is measured from the 1.5 V level on the HIGH to LOW transition of the input voltage pulse to the 1.5 V level on the LOW to HIGH transition of the output voltage pulse.
- t_{EHL} – Enable input propagation delay is measured from the 1.5 V level on the LOW to HIGH transition of the input voltage pulse to the 1.5 V level on the HIGH to LOW transition of the output voltage pulse.
- CM_H – The maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the high state (i.e., $V_{OUT} > 2.0\text{ V}$). Measured in volts per microsecond (V/ μs).
- CM_L – The maximum tolerable rate of fall of the common mode voltage to ensure the output will remain in the low output state (i.e., $V_{OUT} < 0.8\text{ V}$). Measured in volts per microsecond (V/ μs).
- Device considered a two-terminal device: Pins 1, 2, 3 and 4 shorted together, and Pins 5, 6, 7 and 8 shorted together.

FOD060L, FOD260L

TYPICAL PERFORMANCE CURVES

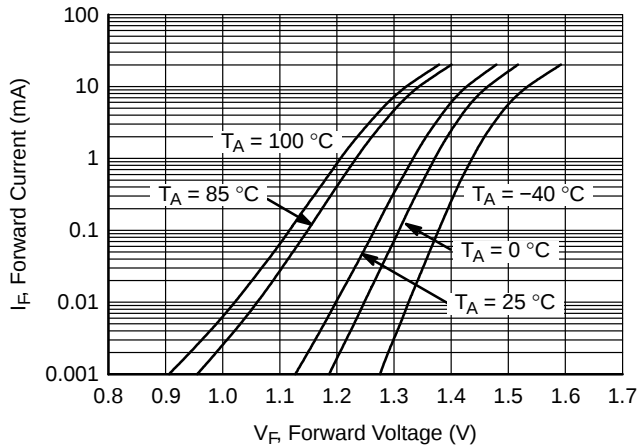


Figure 1. Input Forward Current vs. Forward Voltage

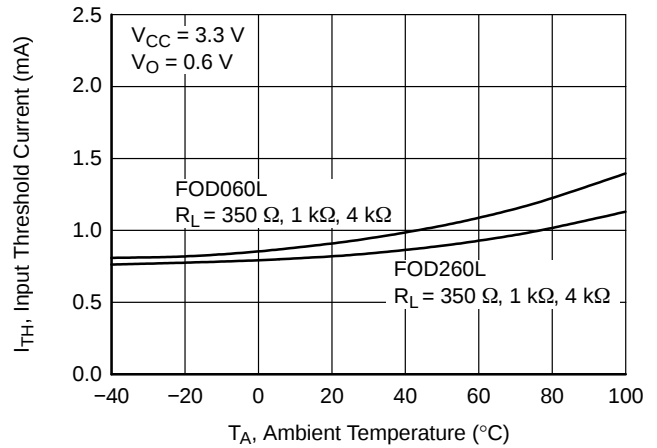


Figure 2. Input Threshold Current vs. Ambient Temperature

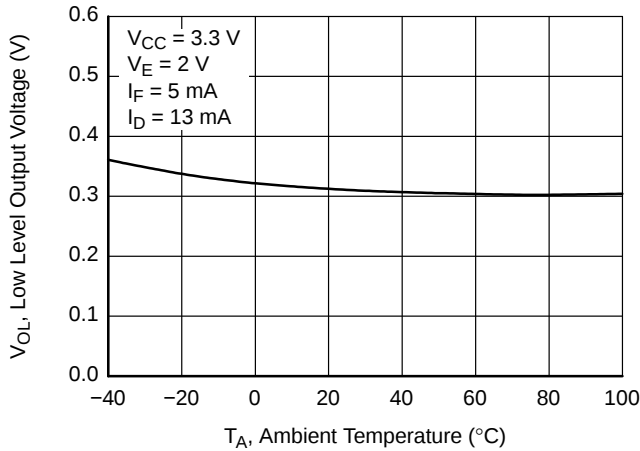


Figure 3. Low Level Output Voltage vs. Ambient Temperature

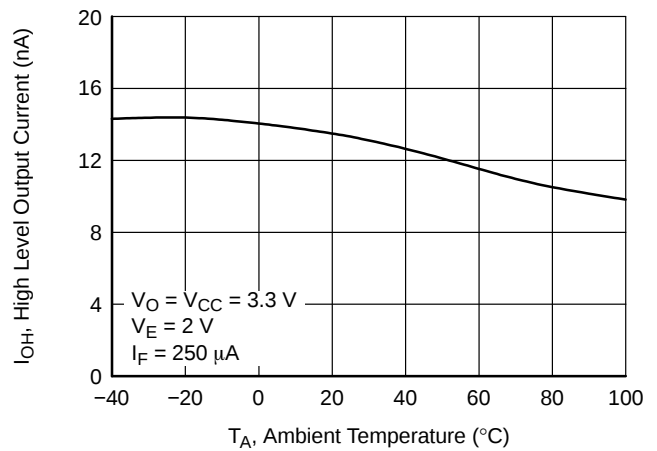


Figure 4. High Level Output Current vs. Ambient Temperature

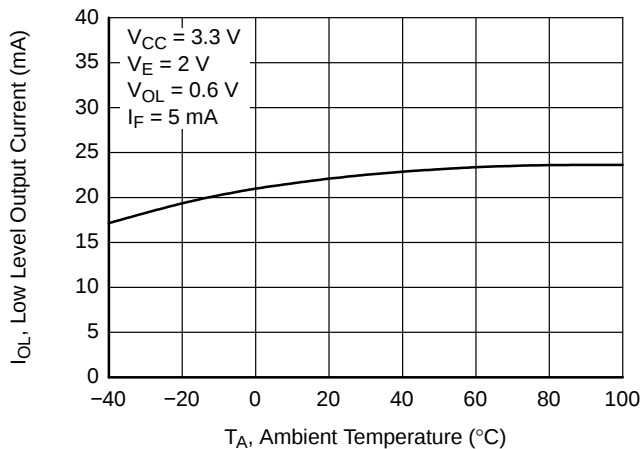


Figure 5. Low Level Output Current vs. Ambient Temperature

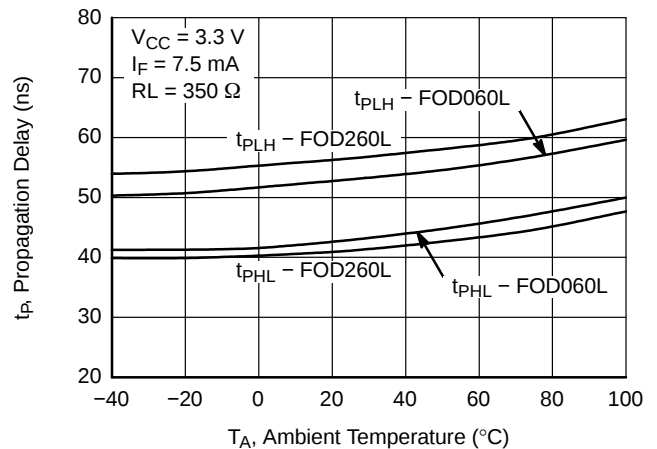


Figure 6. Propagation Delay vs. Ambient Temperature

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TYPICAL PERFORMANCE CURVES (CONTINUED)

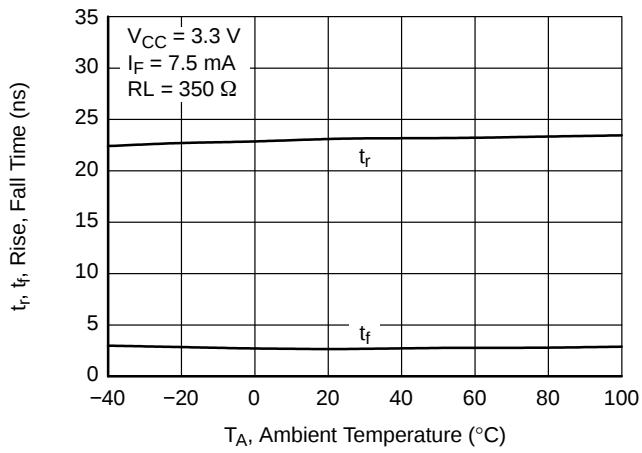


Figure 7. Rise and Fall Times vs. Ambient Temperature

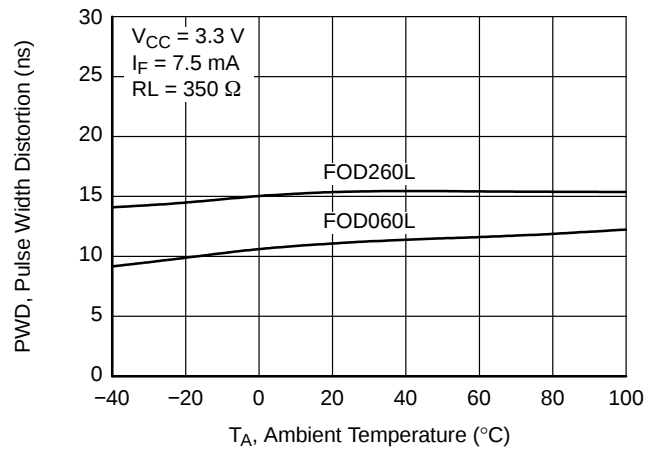


Figure 8. Pulse Width Distortion vs. Ambient Temperature

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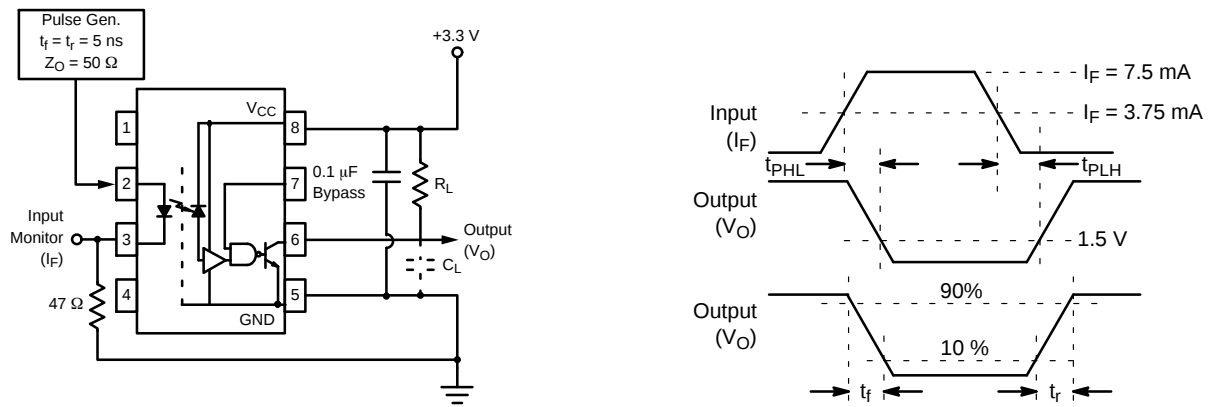


Figure 9. Test Circuit and Waveforms for t_{PLH}, t_{PHL}, t_r and t_f

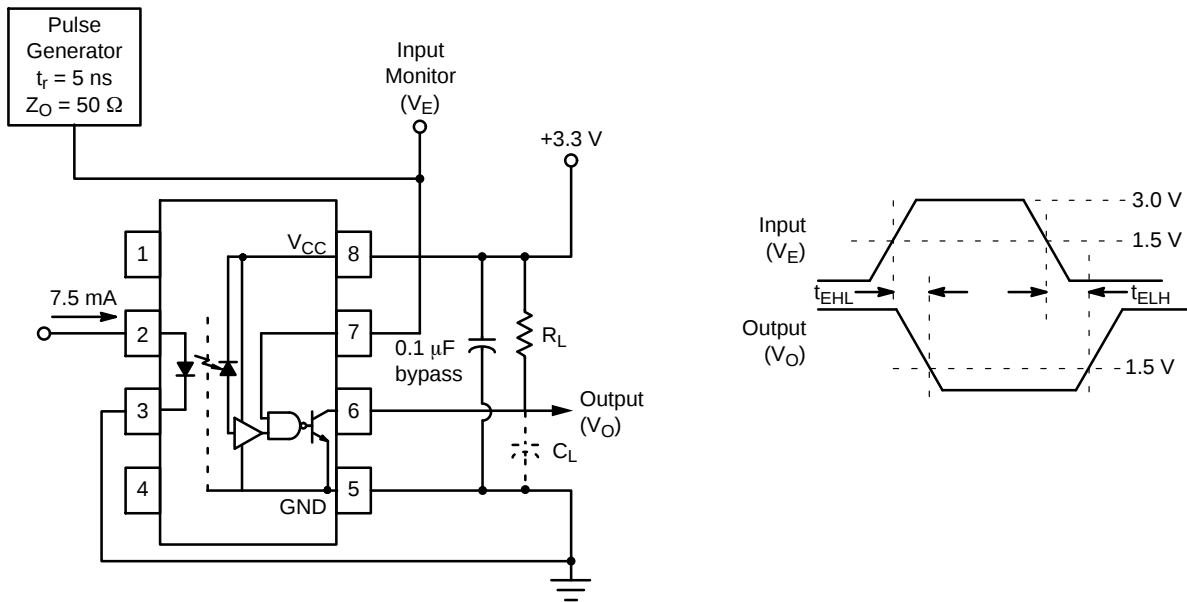


Figure 10. Test Circuit t_{EHL} and t_{ELH}

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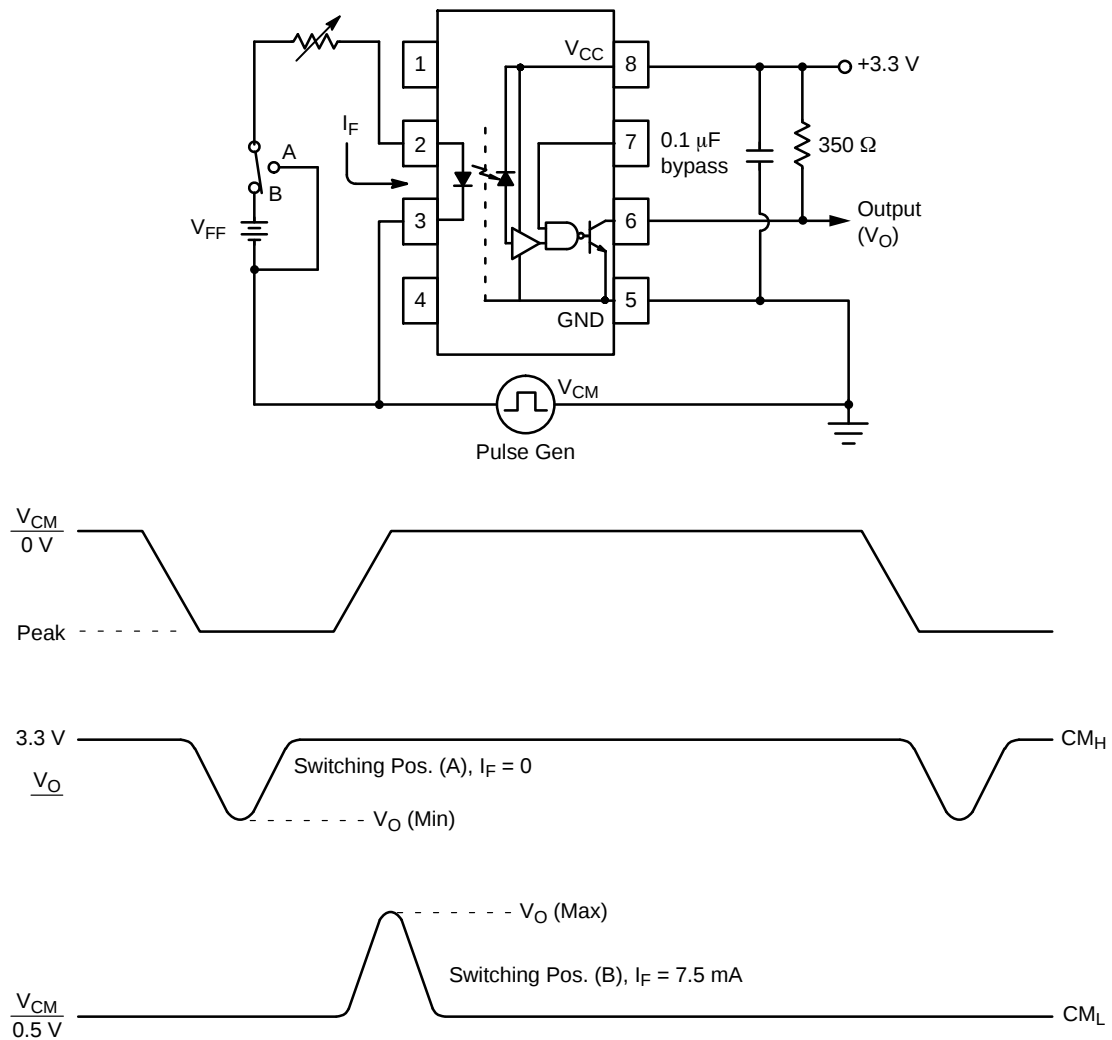


Figure 11. Test Circuit Common Mode Transient Immunity

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REFLOW PROFILE

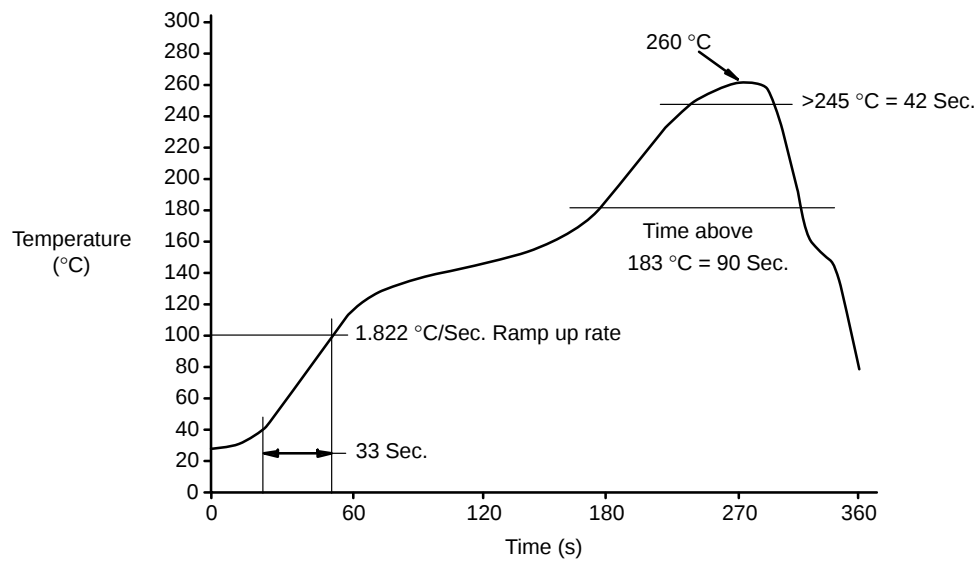


Figure 12. Small Outline

FOD060L, FOD260L

REFLOW PROFILE (CONTINUED)

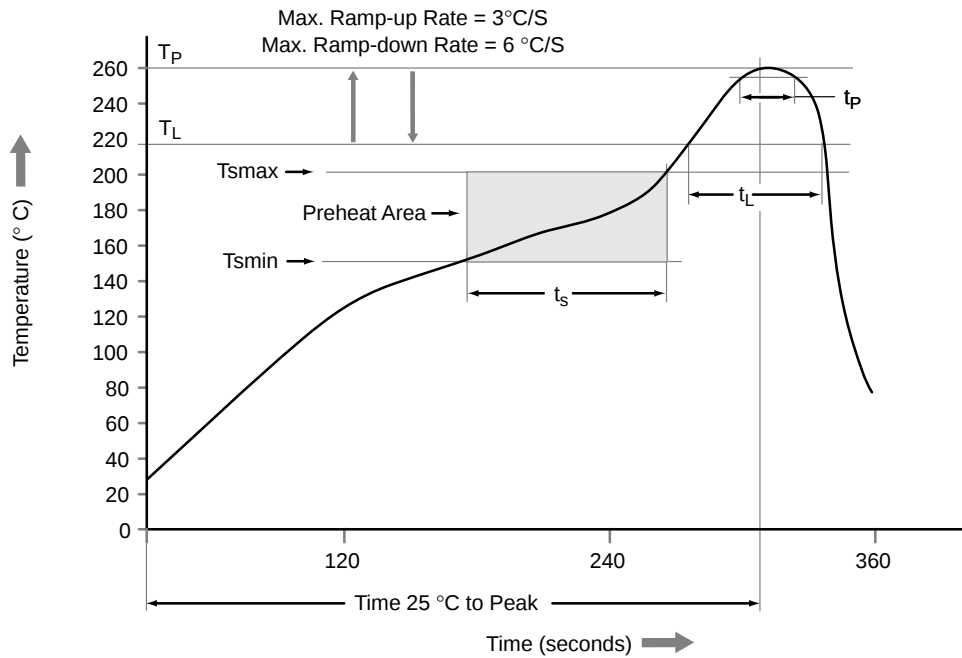


Figure 13. DIP and SMT

REFLOW PROFILE

Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmmin)	150 °C
Temperature Max. (Tsmmax)	200 °C
Time (ts) from (Tsmmin to Tsmmax)	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.

FOD060L, FOD260L

ORDERING INFORMATION

Device Order Number	Specific Device Marking	Shipping [†]
FOD060L	Small outline 8-pin	50 Units / Tube
FOD060LR2	Small outline 8-pin	2,500 Units / Tape & Reel
FOD260L	DIP 8-Pin	50 Units / Tube
FOD260LS	SMT 8-Pin (Lead Bend)	50 Units / Tube
FOD260LSD	SMT 8-Pin (Lead Bend)	1,000 Units / Tape & Reel
FOD260LSV	SMT 8-Pin (Lead Bend), DIN EN/IEC 60747-5-2 option	50 Units / Tube
FOD260LSDV	SMT 8-Pin (Lead Bend), DIN EN/IEC 60747-5-2 option	1,000 Units / Tape & Reel

[†] For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).



FOD060L, FOD260L

REVISION HISTORY

Revision	Description of Changes	Date
3	Converted the document to onsemi format.	5/13/2026

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.



PDIP8 9.655x6.6, 2.54P
CASE 646CQ
ISSUE O

DATE 18 SEP 2017



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PDIP8 GW
CASE 709AC
ISSUE O

DATE 31 JUL 2016



NOTES:

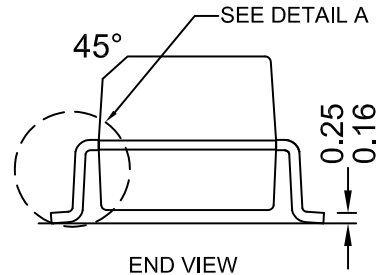
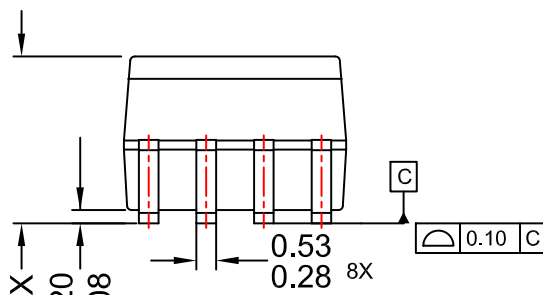
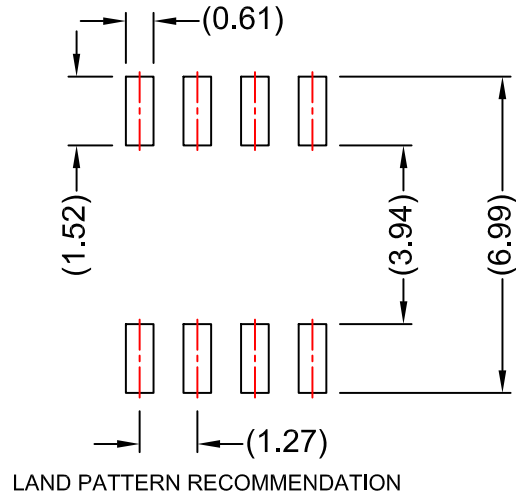
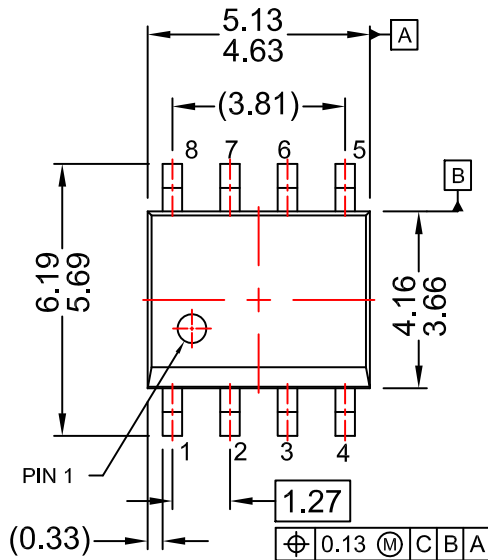
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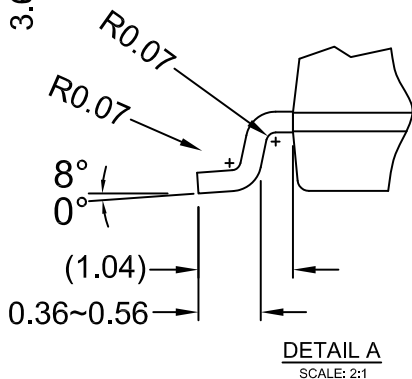
SOIC8
CASE 751DZ
ISSUE O

DATE 30 SEP 2016



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- C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
- D) LANDPATTERN STANDARD: SOIC127P600X175-8M.



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