

# FODM452, FODM453 5-Pin Mini Flat Package High Speed Transistor Optocoupler

## Features

- Compact 5-pin mini flat package
- High speed-1 MBit/s
- Superior CMR-15kV/μs at  $V_{CM} = 1500V$  (FODM453)
- Performance guaranteed over temperature (0–70°C)
- U.L. recognized (File # E90700)
- VDE0884 recognized (File # 136480)
  - Ordering option V, e.g., FODM452V

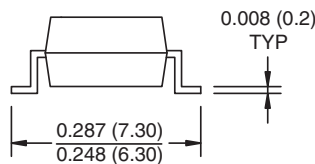
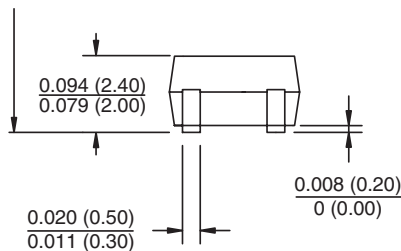
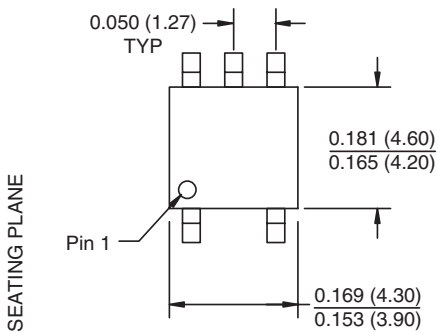
## Applications

- Line receivers
- Pulse transformer replacement
- Output interface to CMOS-LSTTL-TTL
- Wide bandwidth analog coupling

## Description

The FODM452 and FODM453 optocouplers consist of an AlGaAs LED optically coupled to a high speed photo-detector transistor. The devices are housed in a compact 5-pin mini flat package for optimum mounting density. The FODM453 features a high CMR rating for optimum common mode transient immunity.

## Package

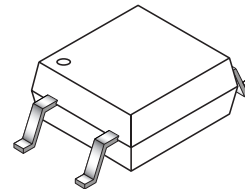
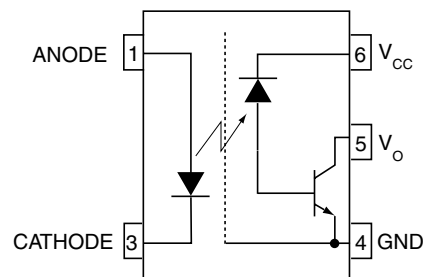


Lead Coplanarity : 0.004 (0.10) MAX

### Note:

All dimensions are in inches (millimeters).

## Schematic



**Absolute Maximum Ratings** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

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	$^\circ\text{C}$
<b>EMITTER</b>			
$I_F$ (avg)	DC/Average Forward Input Current	25	mA
$I_F$ (pk)	Peak Forward Input Current (50% duty cycle, 1ms P.W.)	50	mA
$I_F$ (trans)	Peak Transient Input Current ( $\leq 1\mu\text{s}$ P.W., 300pps)	1.0	A
$V_R$	Reverse Input Voltage	5	V
$P_D$	Input Power Dissipation (No derating required over specified operating temp range)	45	mW
<b>DETECTOR</b>			
$I_O$ (avg)	Average Output Current	8	mA
$I_O$ (pk)	Peak Output Current	16	mA
$V_{CC}$	Supply Voltage	-0.5 to 30	V
$V_O$	Output Voltage	-0.5 to 20	V
$P_D$	Output Power Dissipation (No derating required over specified operating temp range)	100	mW

## Electrical Characteristics (T<sub>A</sub> = 0 to 70°C unless otherwise specified)

### Individual Component Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
<b>EMITTER</b>						
V <sub>F</sub>	Input Forward Voltage	I <sub>F</sub> = 16mA, T <sub>A</sub> = 25°C		1.60	1.7	V
		I <sub>F</sub> = 16mA			1.8	
B <sub>VR</sub>	Input Reverse Breakdown Voltage	I <sub>R</sub> = 10μA	5.0			V
ΔV <sub>F</sub> /ΔT <sub>A</sub>	Temperature Coefficient of Forward Voltage	I <sub>F</sub> = 16mA		-1.8		mV/°C
<b>DETECTOR</b>						
I <sub>OH</sub>	Logic High Output Current	I <sub>F</sub> = 0mA, V <sub>O</sub> = V <sub>CC</sub> = 5.5V, T <sub>A</sub> = 25°C		.001	0.5	μA
		I <sub>F</sub> = 0 mA, V <sub>O</sub> = V <sub>CC</sub> = 15V, T <sub>A</sub> = 25°C		.001	1	
		I <sub>F</sub> = 0mA, V <sub>O</sub> = V <sub>CC</sub> = 15V			50	
I <sub>CCL</sub>	Logic Low Supply Current	I <sub>F</sub> = 16mA, V <sub>O</sub> = Open, V <sub>CC</sub> = 15V		100	200	μA
I <sub>CCH</sub>	Logic high supply current	I <sub>F</sub> = 0 mA, V <sub>O</sub> = Open, V <sub>CC</sub> = 15V, T <sub>A</sub> = 25°C		0.05	1	μA
		I <sub>F</sub> = 0mA, V <sub>O</sub> = Open, V <sub>CC</sub> = 15V			2	

### Transfer Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max	Unit	
<b>COUPLED</b>							
CTR	Current Transfer Ratio <sup>(1)</sup>	I <sub>F</sub> = 16mA, V <sub>CC</sub> = 4.5V	T <sub>A</sub> = 25°C V <sub>OL</sub> =0.4V	20		50	%
			V <sub>OL</sub> =0.5V	15			
V <sub>OL</sub>	Logic LOW Output Voltage	I <sub>F</sub> = 16mA, I <sub>O</sub> = 3mA, V <sub>CC</sub> = 4.5V, T <sub>A</sub> = 25°C			0.4	V	
		I <sub>F</sub> = 16mA, I <sub>O</sub> = 2.4mA, V <sub>CC</sub> = 4.5 V			0.5		

### Switching Characteristics (V<sub>CC</sub> = 5V)

Symbol	Parameter	Test Conditions	Device	Min.	Typ.*	Max.	Unit
T <sub>PHL</sub>	Propagation Delay Time to Logic LOW	R <sub>L</sub> = 1.9kΩ, I <sub>F</sub> = 16mA, T <sub>A</sub> = 25°C <sup>(2)</sup> (Fig. 9)			0.40	0.8	μs
		R <sub>L</sub> = 1.9kΩ, I <sub>F</sub> = 16mA <sup>(2)</sup> (Fig. 9)				1.0	
T <sub>PLH</sub>	Propagation Delay Time to Logic HIGH	R <sub>L</sub> = 1.9kΩ, I <sub>F</sub> = 16mA, T <sub>A</sub> = 25°C <sup>(2)</sup> (Fig. 9)			0.35	0.8	μs
		R <sub>L</sub> = 1.9kΩ, I <sub>F</sub> = 16mA <sup>(2)</sup> (Fig. 9)				1.0	
CM <sub>H</sub>	Common Mode Transient Immunity at Logic HIGH	I <sub>F</sub> = 0mA, V <sub>CM</sub> = 10V <sub>P-P</sub> , R <sub>L</sub> = 1.9kΩ, T <sub>A</sub> = 25°C <sup>(3)</sup> (Fig. 10)	FODM452	5	15		KV/μs
		I <sub>F</sub> = 0mA, V <sub>CM</sub> = 1500V <sub>P-P</sub> , R <sub>L</sub> = 1.9kΩ, T <sub>A</sub> = 25°C <sup>(3)</sup> (Fig. 10)	FODM453	15	40		KV/μs
CM <sub>L</sub>	Common Mode Transient Immunity at Logic LOW	I <sub>F</sub> = 16mA, V <sub>CM</sub> = 10V <sub>P-P</sub> , R <sub>L</sub> = 1.9kΩ, T <sub>A</sub> = 25°C <sup>(3)</sup> (Fig. 10)	FODM452	5	15		KV/μs
		I <sub>F</sub> = 16mA, V <sub>CM</sub> = 1500V <sub>P-P</sub> , R <sub>L</sub> = 1.9kΩ, T <sub>A</sub> = 25°C <sup>(3)</sup> (Fig. 10)	FODM453	15	40		KV/μs
BW	Bandwidth	R <sub>L</sub> = 100Ω			3		MHz

### Isolation Characteristics

Symbol	Characteristics	Test Conditions	Min.	Typ.*	Max.	Unit
V <sub>ISO</sub>	Withstand Insulation Test Voltage	RH ≤ 50%, T <sub>A</sub> = 25°C, t = 1 min. <sup>(4)</sup>	3750			V <sub>RMS</sub>
C <sub>I-O</sub>	Capacitance (Input to Output)	f = 1MHz <sup>(4)</sup>		0.2		pF

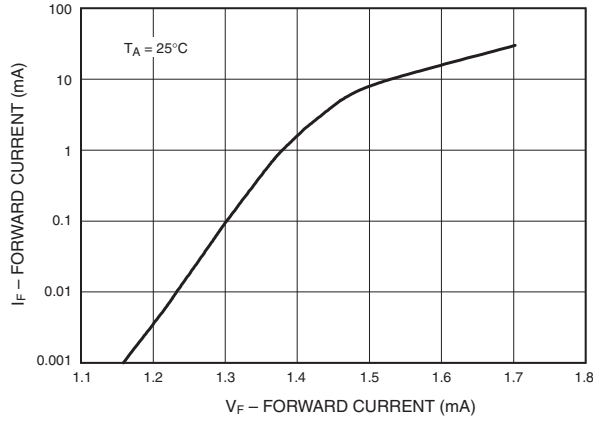
\*All Typicals at T<sub>A</sub> = 25°C

**Notes:**

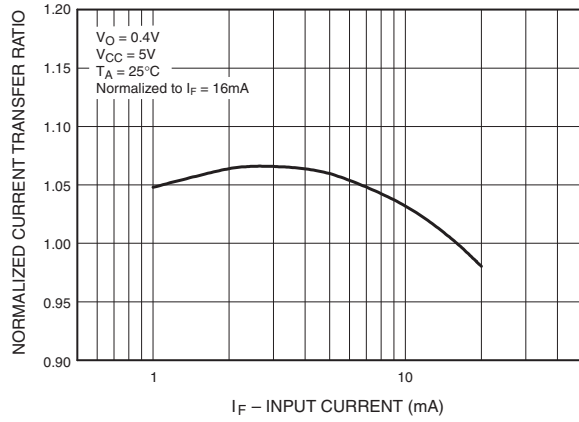
1. Current Transfer Ratio is defined as a ratio of output collector current,  $I_O$ , to the forward LED input current,  $I_F$ , times 100%.
2. The 1.9k $\Omega$  load represents 1 TTL unit load of 1.6mA and 5.6k $\Omega$  pull-up resistor.
3. Common mode transient immunity in logic high level is the maximum tolerable (positive)  $dV_{cm}/dt$  on the leading edge of the common mode pulse signal  $V_{CM}$ , to assure that the output will remain in a logic high state (i.e.,  $V_O > 2.0V$ ). Common mode transient immunity in logic low level is the maximum tolerable (negative)  $dV_{cm}/dt$  on the trailing edge of the common mode pulse signal,  $V_{CM}$ , to assure that the output will remain in a logic low state (i.e.,  $V_O < 0.8V$ ).
4. Device is considered a two terminal device: Pins 1, and 3 are shorted together and Pins 4, 5, and 6 are shorted together.

## Typical Performance Curves

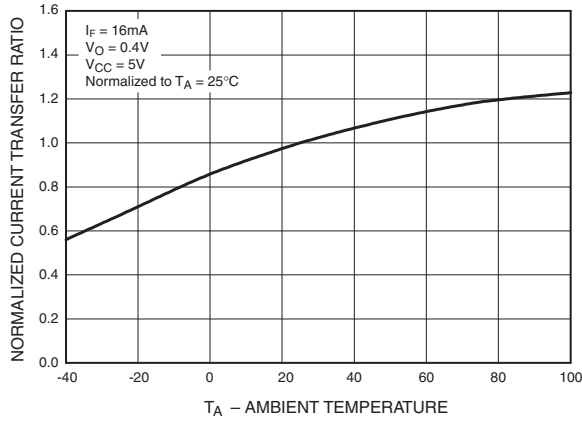
**Fig. 1 Input Forward Current vs Forward Voltage**



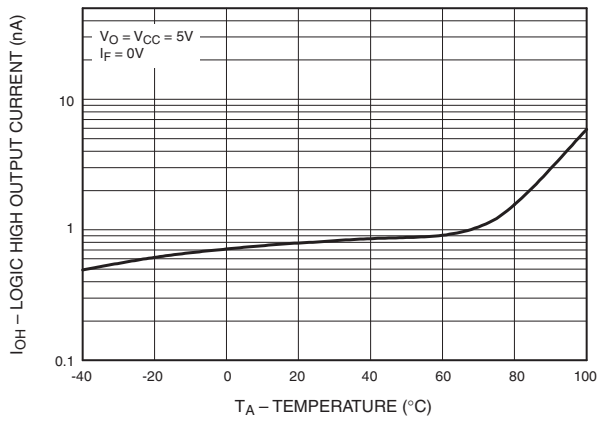
**Fig. 2 Normalized Current Transfer Ratio vs. Input Current**



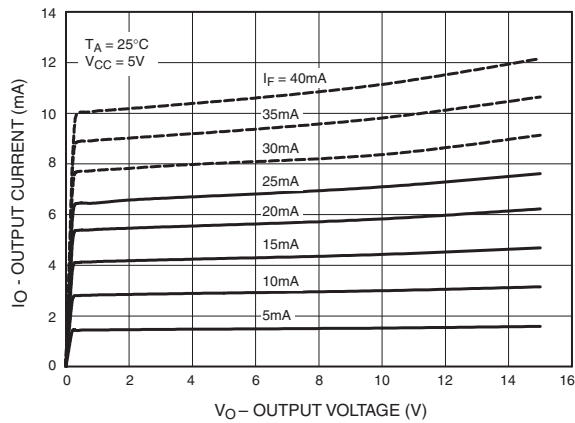
**Fig. 3 Normalized Current Transfer Ratio vs. Ambient Temperature**



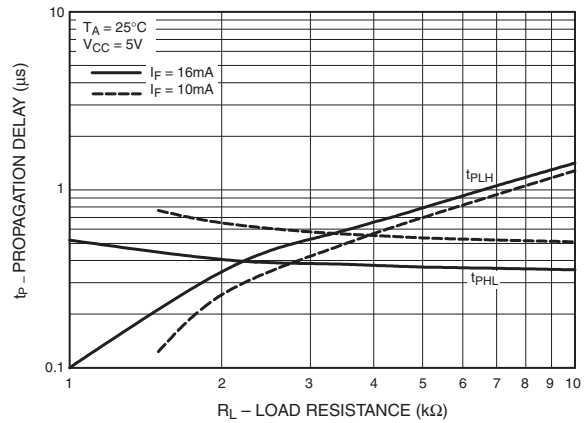
**Fig. 4 Logic High Output Current vs. Ambient Temperature**



**Fig. 5 DC and Pulsed Transfer Characteristics**

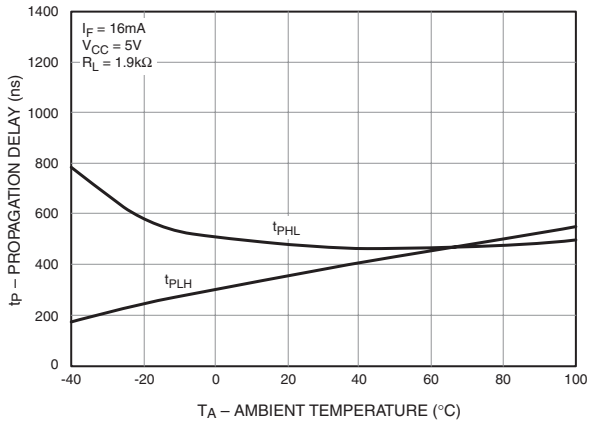


**Fig. 6 Propagation Delay vs. Load Resistance**

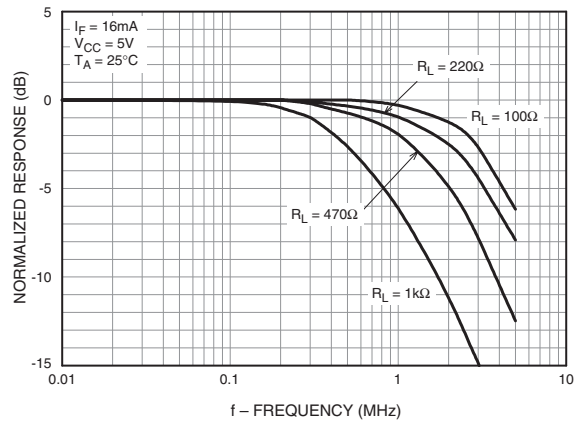


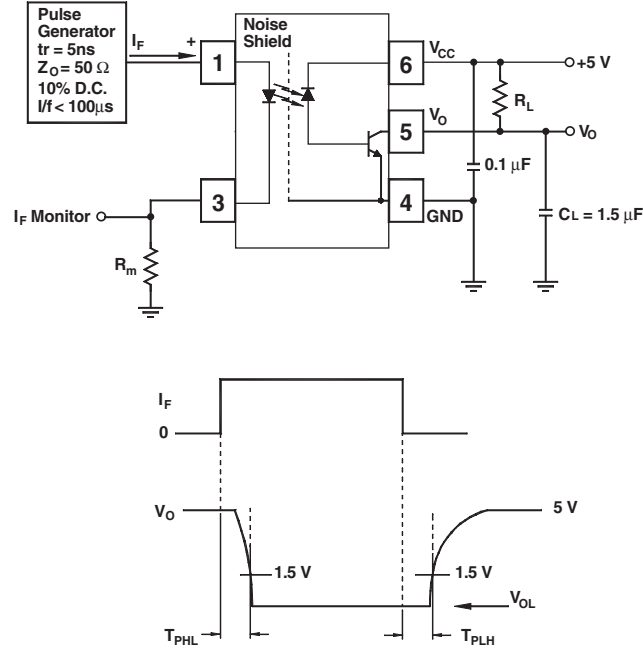
**Typical Performance Curves (Continued)**

**Fig. 7 Propagation Delay vs. Ambient Temperature**

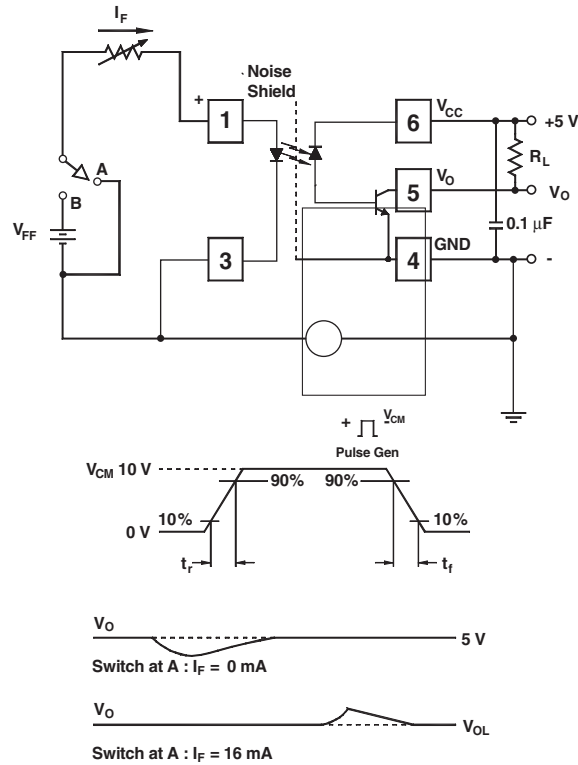


**Fig. 8 Frequency Response**



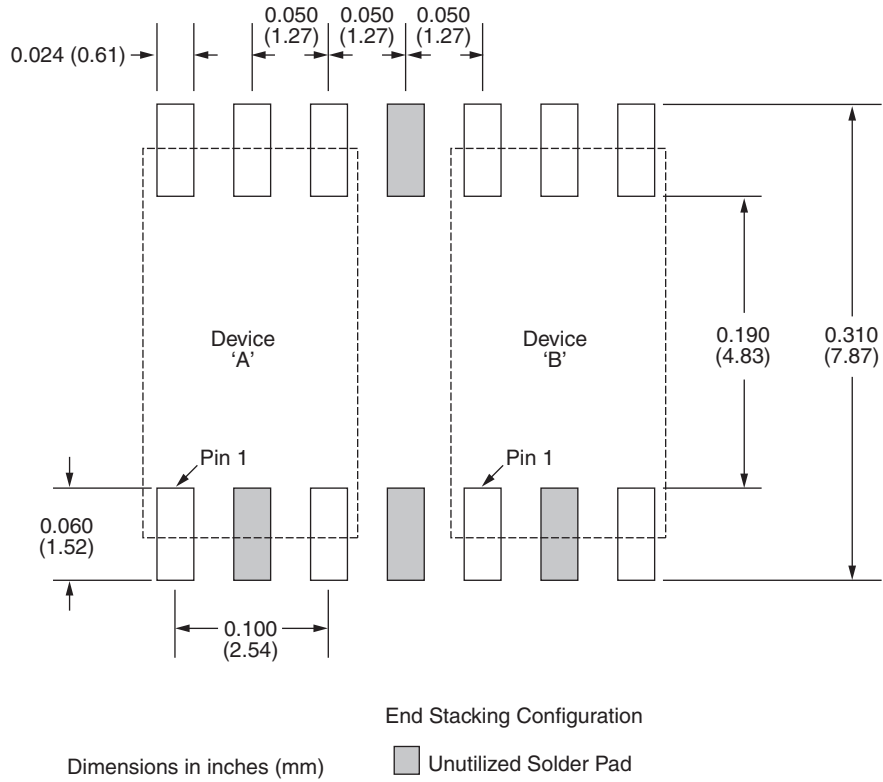


**Fig. 9 Switching Time Test Circuit**



**Fig. 10 Common Mode Immunity Test Circuit**

### Footprint Drawing for PCB Layout

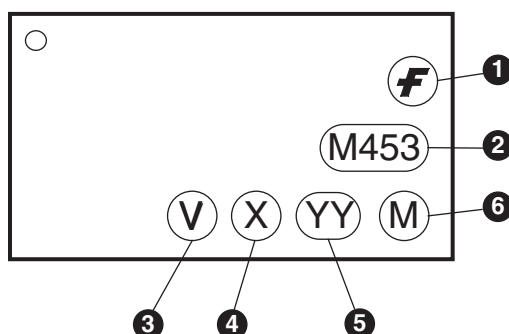




### Ordering Information

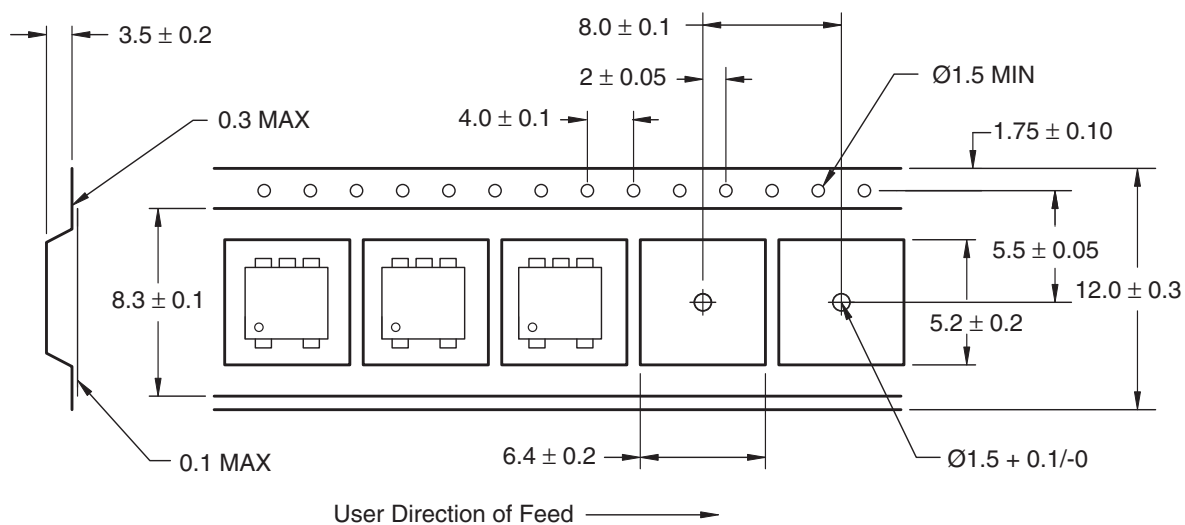
Option	Order Entry Identifier (example)	Description
R1	FODM452R1	Tape and Reel (500 per reel)
R2	FODM452R2	Tape and Reel (2500 per reel)
V	FODM452V	VDE0884
R1V	FODM452R1V	VDE0884, Tape and Reel (500 per reel)
R2V	FODM452R2V	VDE0884, Tape and Reel (2500 per reel)

### Marking Information



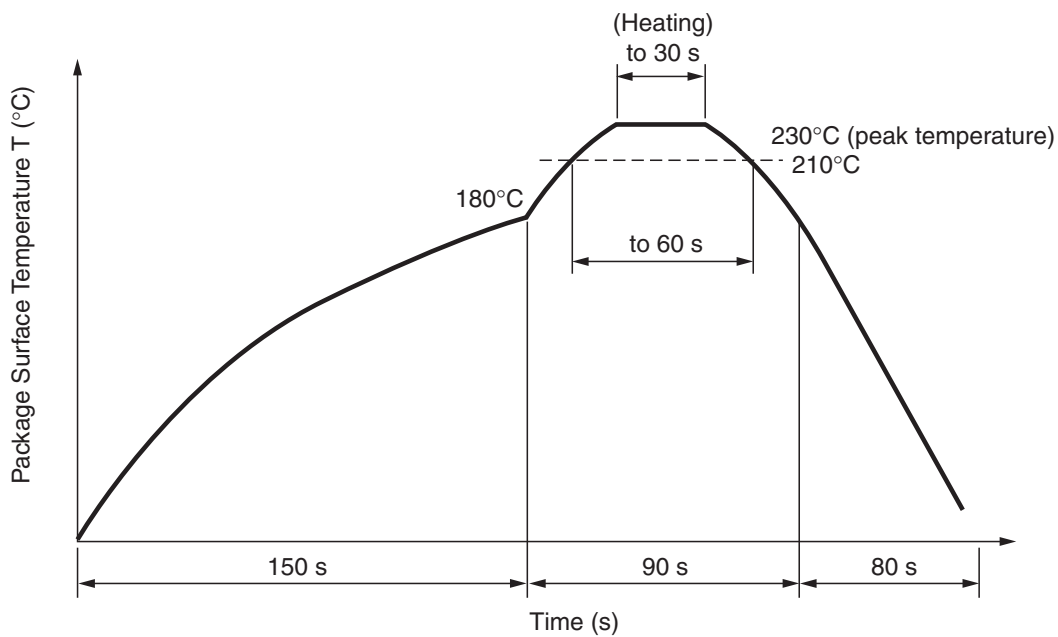
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., '7'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

### Carrier Tape Specifications



**Note:**  
All dimensions are in millimeters.

### Reflow Profile




- Peak reflow temperature: 230°C (package surface temperature) for 30 seconds
- Time of temperature higher than 210°C: 60 seconds or less
- One time soldering reflow is recommended



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