FAIRCHILD SEMICONDUCTOR®

June 2007

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

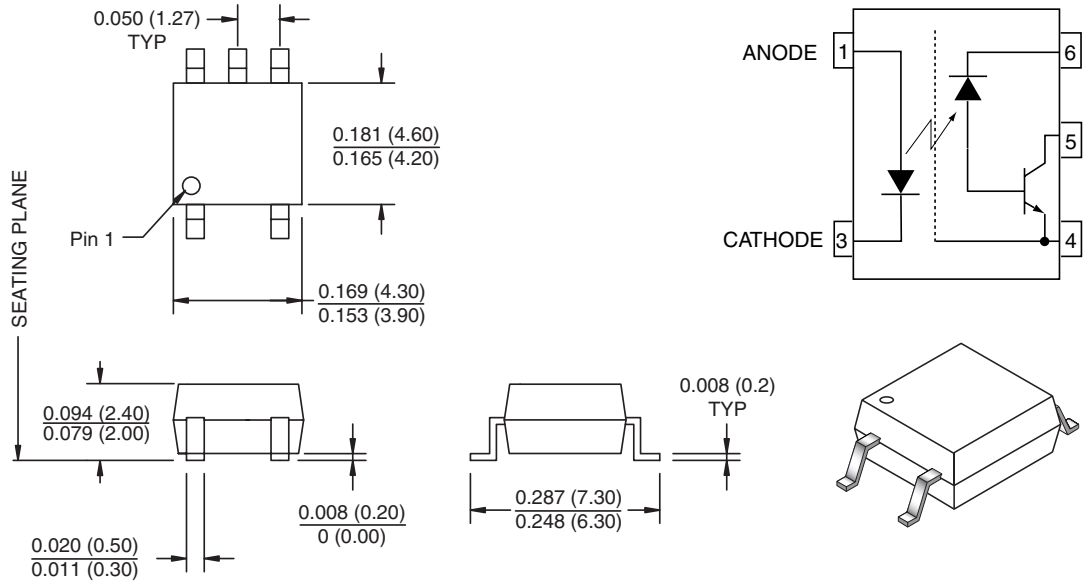
Description

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.

Applications

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

Package



Lead Coplanarity : 0.004 (0.10) MAX

Schematic

Note:
All dimensions are in inches (millimeters).

Absolute Maximum Ratings (T_A = 25°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	°C
T_{OPR}	Operating Temperature	-40 to +85	°C
EMITTER			
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 (≤1µs 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
DETECTOR			
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_A = 0 to 70°C unless otherwise specified)

Individual Component Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
EMITTER						
V_F	Input Forward Voltage	I_F = 16mA, T_A = 25°C		1.60	1.7	V
		I_F = 16mA			1.8	
B_{VR}	Input Reverse Breakdown Voltage	I_R = 10µA	5.0			V
$\Delta V_F/\Delta T_A$	Temperature Coefficient of Forward Voltage	I_F = 16mA		-1.8		mV/°C
DETECTOR						
I_{OH}	Logic High Output Current	I_F = 0mA, V_O = V_{CC} = 5.5V, T_A =25°C		.001	0.5	µA
		I_F = 0 mA, V_O = V_{CC} = 15V, T_A =25°C		.001	1	
		I_F = 0mA, V_O = V_{CC} = 15V			50	
I_{CCL}	Logic Low Supply Current	I_F = 16mA, V_O = Open, V_{CC} = 15V		100	200	µA
I_{CCH}	Logic high supply current	I_F = 0 mA, V_O = Open, V_{CC} = 15V, T_A = 25°C		0.05	1	µA
		I_F = 0mA, V_O = Open, V_{CC} = 15V			2	

Transfer Characteristics

Symbol	Parameter	Test Conditions		Min.	Typ.*	Max	Unit
COUPLED							
CTR	Current Transfer Ratio[1]	I_F = 16mA, V_{CC} = 4.5V	T_A = 25°C V_{OL}=0.4V	20		50	%
			V_{OL}=0.5V	15			
V_{OL}	Logic LOW Output Voltage	I_F = 16mA, I_O = 3mA, V_{CC} = 4.5V, T_A =2 5°C				0.4	V
		I_F = 16mA, I_O = 2.4mA, V_{CC} = 4.5 V				0.5	

Switching Characteristics (V_{CC} = 5V)

Symbol	Parameter	Test Conditions	Device	Min.	Typ.*	Max.	Unit
T_{PHL}	Propagation Delay Time to Logic LOW	R_L = 1.9kΩ, I_F = 16mA, T_A = 25°C[2] (Fig. 9)			0.40	0.8	µs
		R_L = 1.9kΩ, I_F = 16mA[2] (Fig. 9)				1.0	µs
T_{PLH}	Propagation Delay Time to Logic HIGH	R_L = 1.9kΩ, I_F = 16mA, T_A = 25°C[2] (Fig. 9)			0.35	0.8	µs
		R_L = 1.9kΩ, I_F = 16mA[2] (Fig. 9)				1.0	µs
$\|CM_H\|$	Common Mode Transient Immunity at Logic HIGH	I_F = 0mA, V_{CM} = 10V_{P-P}, R_L = 1.9kΩ, T_A = 25°C[3] (Fig. 10)	FODM452	5	15		KV/µs
		I_F = 0mA, V_{CM} = 1500V_{P-P}, R_L = 1.9kΩ T_A = 25°C[3] (Fig. 10)	FODM453	15	40		KV/µs
$\|CM_L\|$	Common Mode Transient Immunity at Logic LOW	I_F = 16mA, V_{CM} = 10V_{P-P}, R_L = 1.9kΩ, T_A = 25°C[3] (Fig. 10)	FODM452	5	15		KV/µs
		I_F = 16mA, V_{CM} = 1500V_{P-P}, R_L = 1.9kΩ, T_A = 25°C[3] (Fig. 10)	FODM453	15	40		KV/µs
BW	Bandwidth	R_L = 100Ω			3		MHz

Isolation Characteristics

Symbol	Characteristics	Test Conditions	Min.	Typ.*	Max.	Unit
V_{ISO}	Withstand Insulation Test Voltage	RH ≤ 50%, T_A = 25°C, t = 1 min.[4]	3750			V_{RMS}
C_{I-O}	Capacitance (Input to Output)	f = 1MHz[4]		0.2		pF

*All Typicals at T_A = 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 1.9kΩ load represents 1 TTL unit load of 1.6mA and 5.6kΩ 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

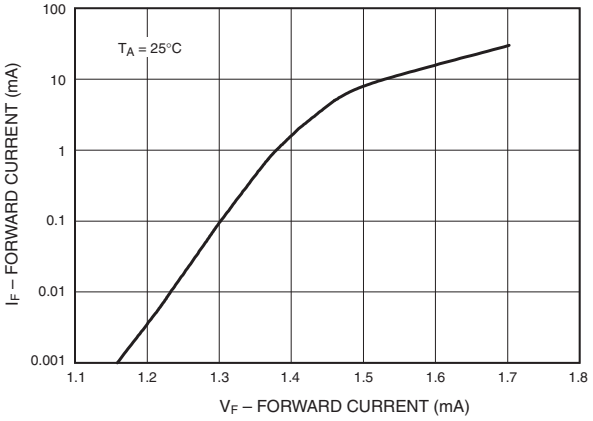


Fig. 2 Normalized Current Transfer Ratio vs. Input Current

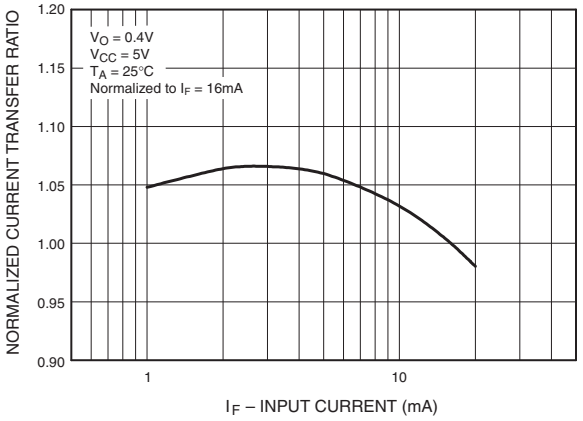


Fig. 3 Normalized Current Transfer Ratio vs. Ambient Temperature

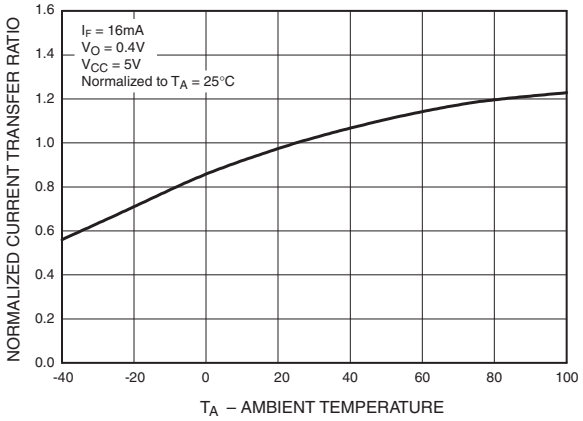


Fig. 4 Logic High Output Current vs. Ambient Temperature

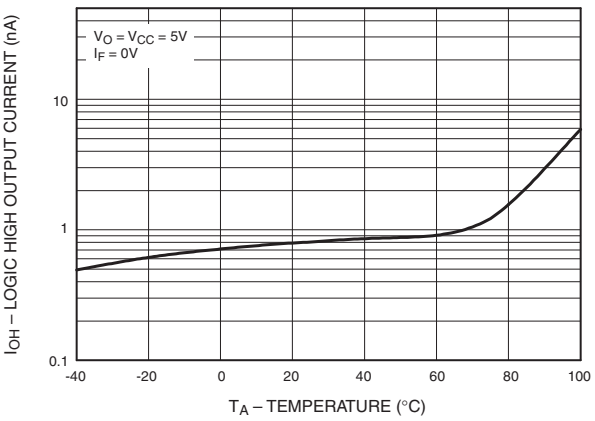


Fig. 5 DC and Pulsed Transfer Characteristics

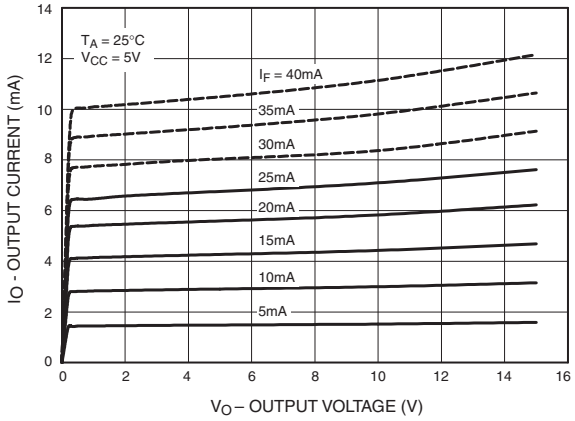
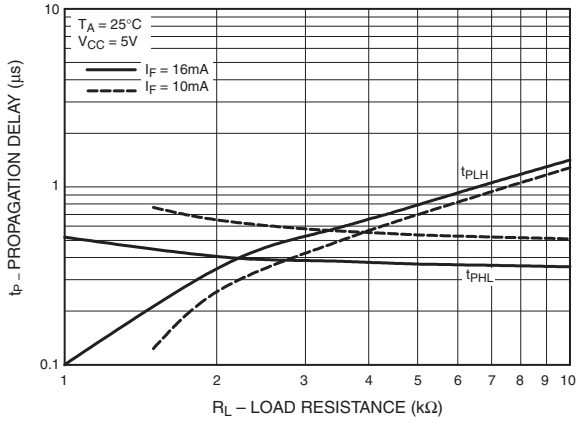


Fig. 6 Propagation Delay vs. Load Resistance



Typical Performance Curves (Continued)

Fig. 7 Propagation Delay vs. Ambient Temperature

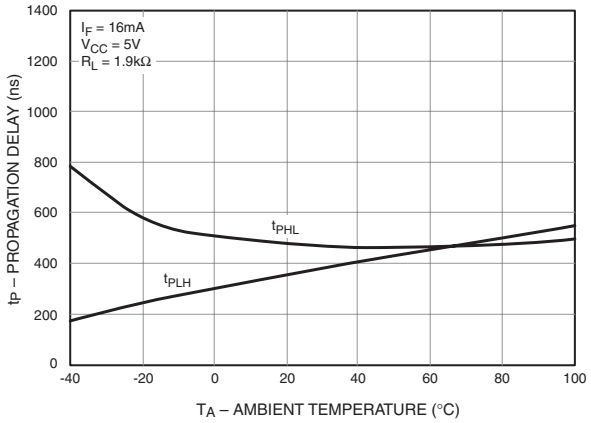
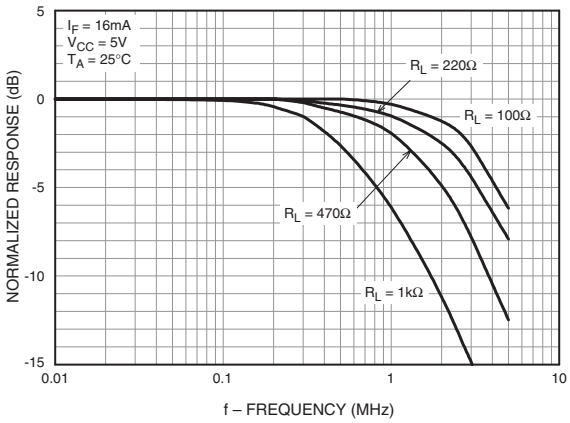


Fig. 8 Frequency Response



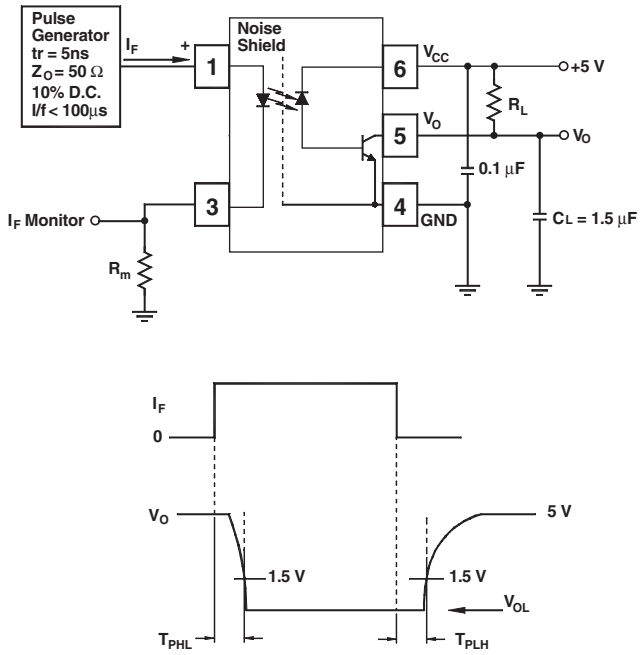


Fig. 9 Switching Time Test Circuit

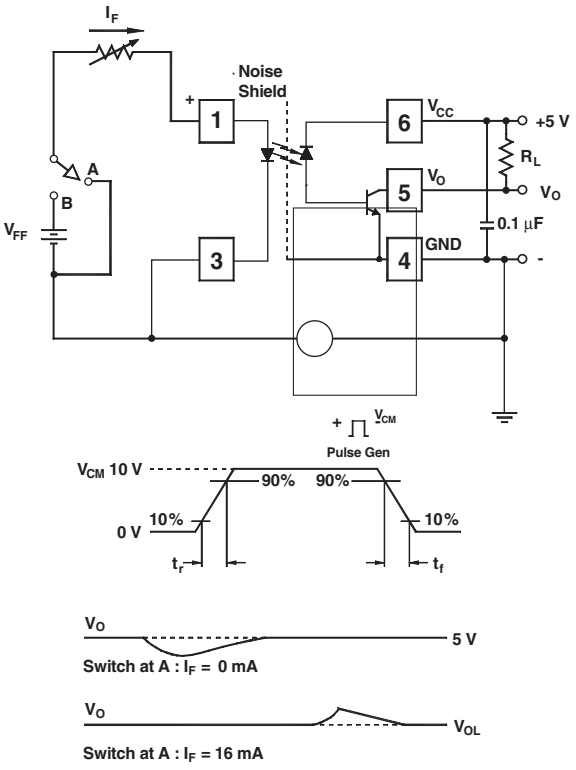
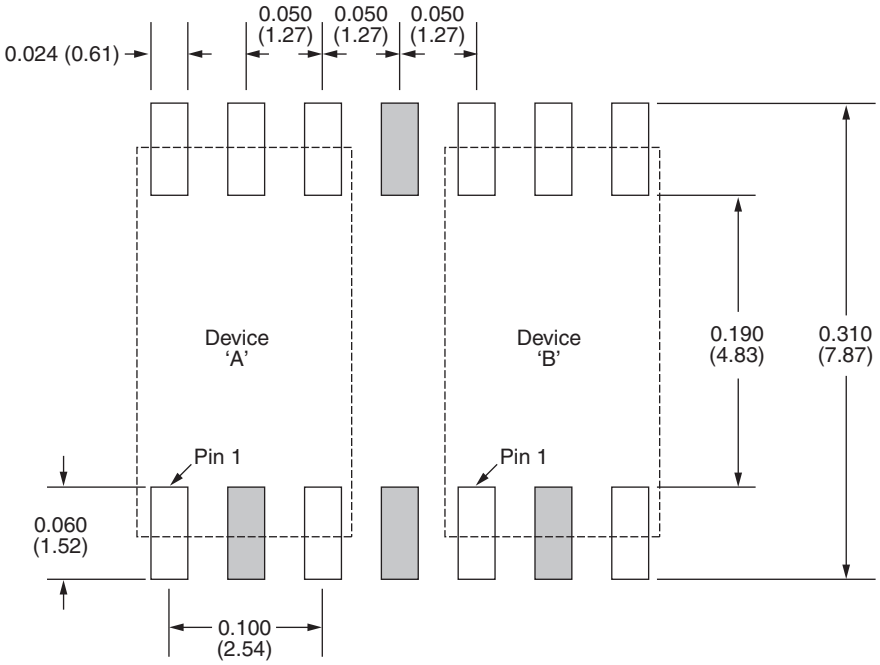


Fig. 10 Common Mode Immunity Test Circuit

Footprint Drawing for PCB Layout



End Stacking Configuration

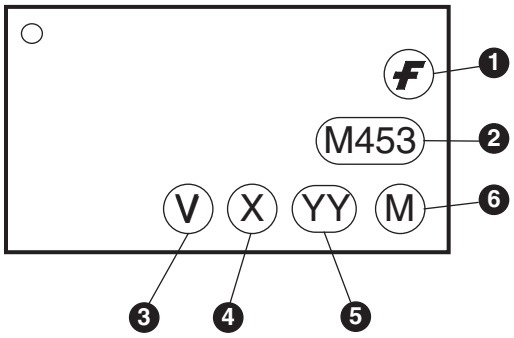
Dimensions in inches (mm)

Unutilized Solder Pad

Ordering Information

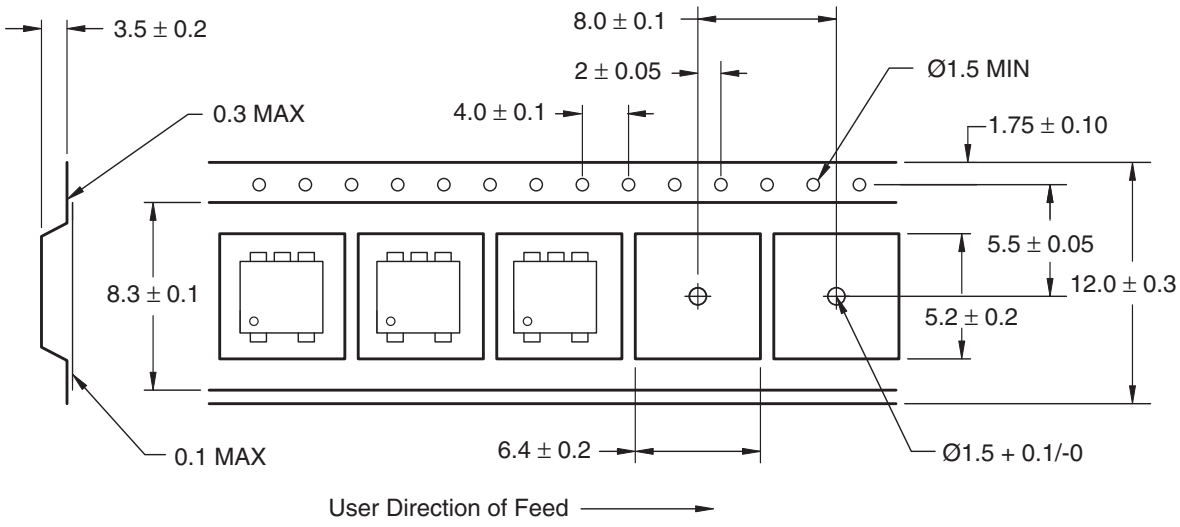
Option	Order Entry Identifier (example)	Description
R1	FODM452R1	Tape and Reel (500 per reel)
R2	FODM452R2	Tape and Reel (2500 per reel)
V	FODM452V	VDE0884
R1V	FODM452R1V	VDE0884, Tape and Reel (500 per reel)
R2V	FODM452R2V	VDE0884, Tape and Reel (2500 per reel)

Marking Information



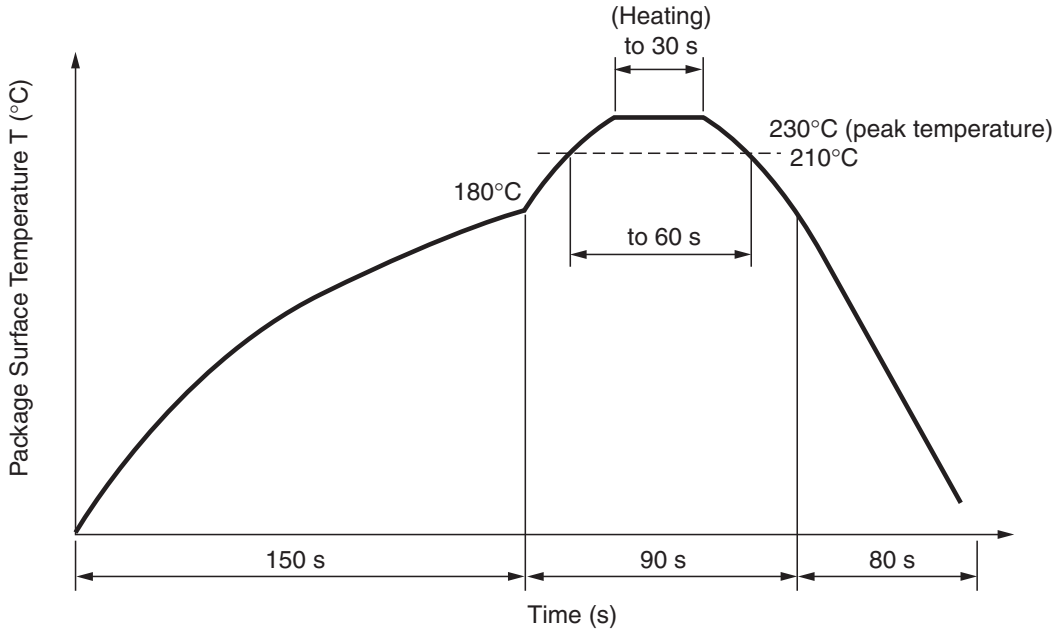
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., ‘7’
5	Two digit work week ranging from ‘01’ to ‘53’
6	Assembly package code

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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