FAIRCHILD SEMICONDUCTOR®

April 2009

FOD073L
LVTTL/LVCMOS Compatible Low Input Current High Gain Split Darlington Optocoupler

Features

- Low power consumption
- Low input current: 0.5mA
- Dual channel 8-pin SOIC package
- High CTR: 400% minimum
- High CMR: 10kV/µs
- Guaranteed performance over temperature 0°C to 70°C
- U.L. recognized (File # E90700)
- LVTTL/LVCMOS Compatible output

Applications

- Digital logic ground isolation – LVTTL/LVCMOS
- Telephone ring detector
- EIA-RS-232C line receiver
- High common mode noise line receiver
- µP bus isolation
- Current loop receiver

Description

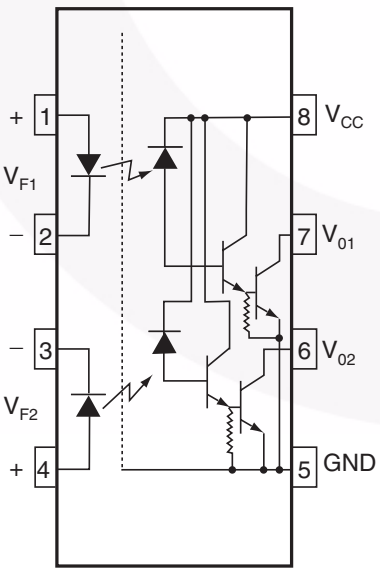
The FOD073L optocoupler consists of an AlGaAs LED optically coupled to a high gain split darlington photo-detector. This device is specified to operate at a 3.3V supply voltage.

An integrated emitter – base resistor provides superior stability over temperature.

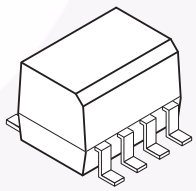
The combination of a very low input current of 0.5mA and a high current transfer ratio of 2000% (typical) makes this device particularly useful for input interface to MOS, CMOS, LSTTL and EIA RS232C, while output compatibility is ensured to LVCMOS as well as high fan-out LVTTL requirements.

An internal noise shield provides exceptional common mode rejection of 10kV/µs.

Schematic



Package Outline



Truth Table

LED	V_O
ON	LOW
OFF	HIGH

Absolute Maximum Ratings (No derating required up to 85°C)

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
T_{SOL}	Lead Solder Temperature (Wave solder only. See reflow profile for surface mount devices)		260 for 10 sec	°C
EMITTER				
I_F (avg)	DC/Average Forward Input Current	Each Channel	20	mA
I_F (pk)	Peak Forward Input Current (50% duty cycle, 1ms P.W.)	Each Channel	40	mA
I_F (trans)	Peak Transient Input Current (≤1µs P. W., 300 pps)	Each Channel	1.0	A
V_R	Reverse Input Voltage	Each Channel	5	V
P_D	Input Power Dissipation	Each Channel	35	mW
DETECTOR				
I_O (avg)	Average Output Current	Each Channel	60	mA
V_{EB}	Emitter-Base Reverse Voltage (FOD070L, FOD270L)	Each Channel	0.5	V
V_{CC}, V_O	Supply Voltage, Output Voltage	Each Channel	-0.5 to 7	V
P_D	Output power dissipation	Each Channel	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	T_A =25°C		1.35	1.7	V
		I_F = 1.6mA (Each Channel)			1.75	
BV_R	Input Reverse Breakdown Voltage	T_A =25°C, I_R = 10µA (Each Channel)	5.0			V
DETECTOR						
I_{OH}	Logic High Output Current	I_F = 0 mA, V_O = V_{CC} = 3.3V (Each Channel)		0.05	25	µA
I_{CCL}	Logic Low Supply Current	I_{F1} = I_{F2} = 1.6mA, V_{O1} = V_{O2} = Open, V_{CC} = 3.3V		0.8	3	mA
I_{CCH}	Logic High Supply Current	I_{F1} = I_{F2} = 0mA, V_{O1} = V_{O2} = Open, V_{CC} = 3.3V		0.01	2	µA

Transfer Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
CTR	COUPLED Current Transfer Ratio (Note 1)	I_F = 0.5mA, V_O = 0.4V, V_{CC} = 3.3V	400		7000	%
V_{OL}	Logic Low Output Voltage	I_F = 1.6mA, I_O = 8mA, V_{CC} = 3.3V		0.07	0.3	V
		I_F = 5mA, I_O = 15mA, V_{CC} = 3.3V		0.07	0.4	

Switching Characteristics (V_{CC} = 3.3 V)

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
T_{PHL}	Propagation Delay Time to Logic LOW	R_L = 4.7kΩ, I_F = 0.5mA (Fig. 9)		5	30	µs
T_{PLH}	Propagation Delay Time to Logic HIGH	R_L = 4.7kΩ, I_F = 0.5mA (Fig. 9)		25	90	µs
$\|CM_H\|$	Common Mode Transient Immunity at Logic HIGH	I_F = 0 mA, $\|V_{CM}\|$ = 10 V_{P-P}, T_A = 25°C, R_L = 2.2kΩ (Note 2) (Fig. 10)	1,000	10,000		V/µs
$\|CM_L\|$	Common Mode Transient Immunity at Logic LOW	I_F = 1.6mA, $\|V_{CM}\|$ = 10 V_{P-P}, R_L = 2.2kΩ, T_A = 25°C (Note 2) (Fig. 10)	1,000	10,000		V/µs

*All typicals at T_A = 25°C

Electrical Characteristics (Continued) (T_A = 0 to 70°C unless otherwise specified)

Isolation Characteristics

Symbol	Characteristics	Test Conditions	Min.	Typ.*	Max.	Unit
I_{I-O}	Input-Output Insulation Leakage Current	Relative humidity = 45%, T_A = 25°C, t = 5 s, V_{I-O} = 3000 VDC (Note 3)			1.0	µA
V_{ISO}	Withstand Insulation Test Voltage	$R_H \leq 50\%$, T_A = 25°C, $I_{I-O} \leq 2\mu A$, t = 1 min. (Note 3)	2500			V_{RMS}
R_{I-O}	Resistance (Input to Output)	V_{I-O} = 500 VDC (Note 3)		10^{12}		Ω
C_{I-O}	Capacitance (Input to Output)	f = 1 MHz (Notes 3, 4)		0.7		pF
I_{I-I}	Input-Input Insulation Leakage Current	RH ≤ 45%, V_{I-I} = 500 VDC (Note 5)	0.005			µA
R_{I-I}	Input-Input Resistance	V_{I-I} = 500 VDC (Note 5)		10^{11}		Ω
C_{I-I}	Input-Input Capacitance	f = 1 MHz (Note 5)		0.03		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. 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<0.8 V).
3. Device is considered a two terminal device: Pins 1, 2, 3 and 4 are shorted together and Pins 5, 6, 7 and 8 are shorted together.
4. CI-O is measured by shorting pins 1 and 2 or pins 3 and 4 together and pins 5 through 8 shorted together.
5. Measured between pins 1 and 2 shorted together, and pins 3 and 4 shorted together.

Typical Performance Curves

Fig. 1 Input Forward Current vs Forward Voltage

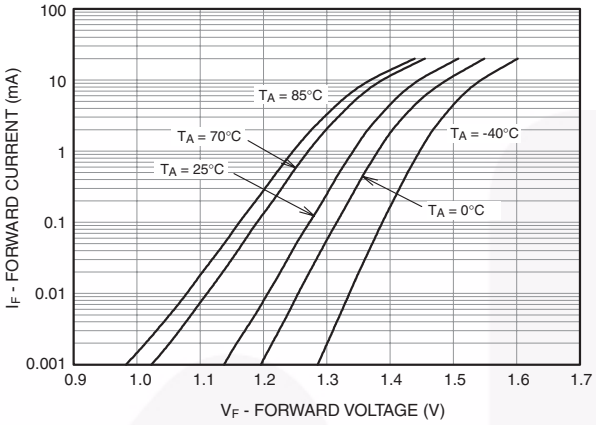


Fig. 2 Current Transfer Ratio vs. Input Forward Current

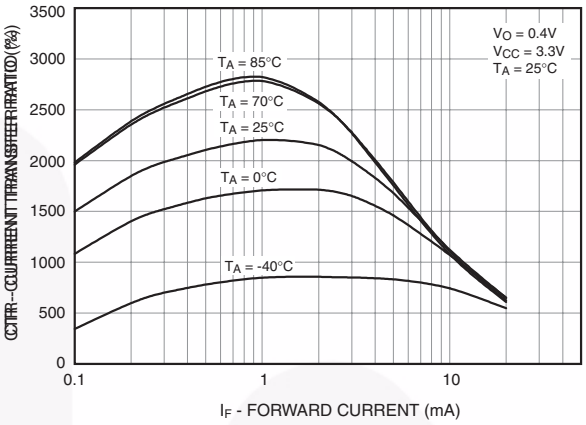


Fig. 3 DC Transfer Characterstics

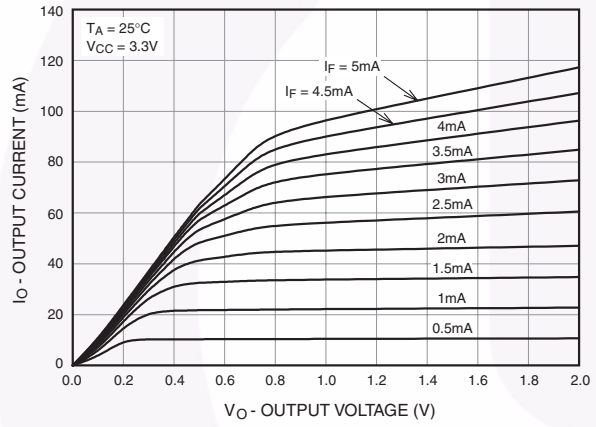


Fig. 4 Supply Current vs Input Forward Current

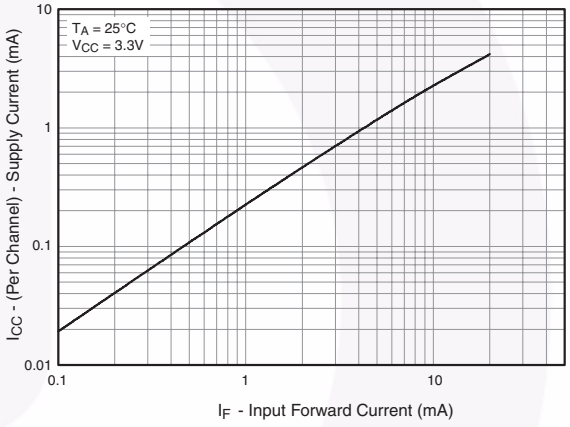


Fig. 5 Output Current vs Input Forward Current

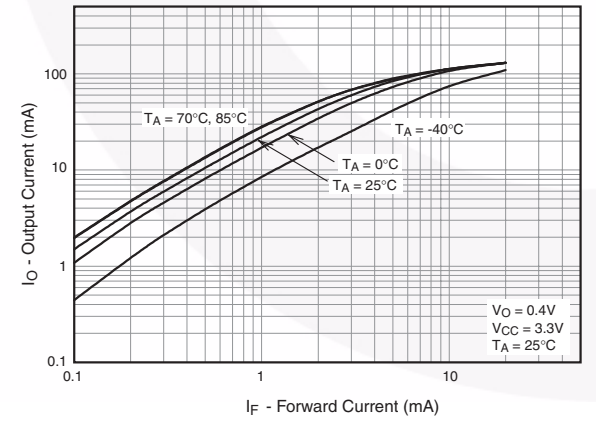
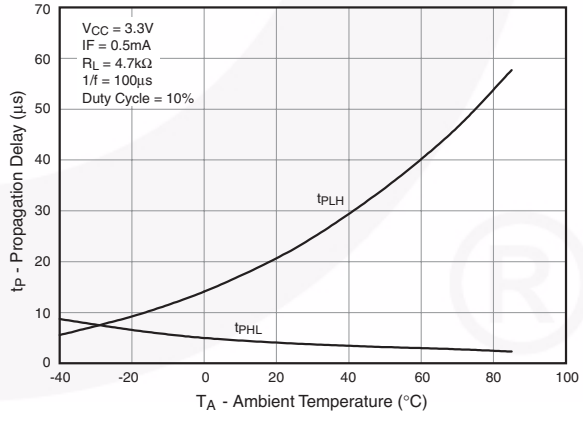


Fig. 6 Propagation Delay vs. Ambient Temperature



Typical Performance Curves (Continued)

Fig. 7 Propagation Delay To Logic Low vs Pulse Period

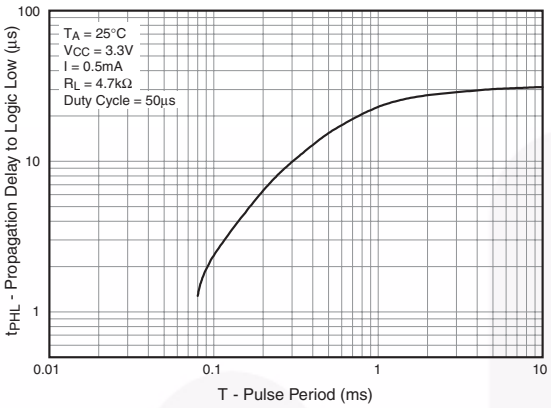
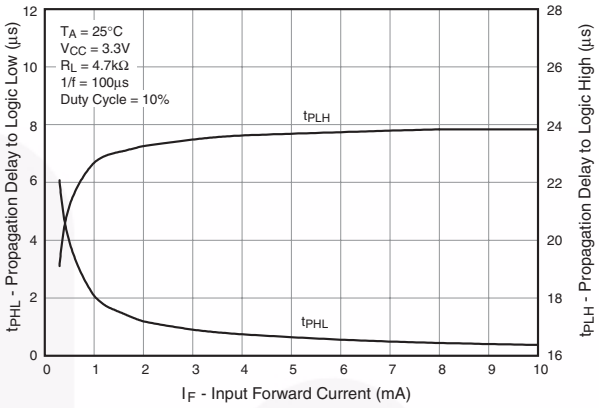


Fig. 8 Propagation Delay vs. Input Forward Current



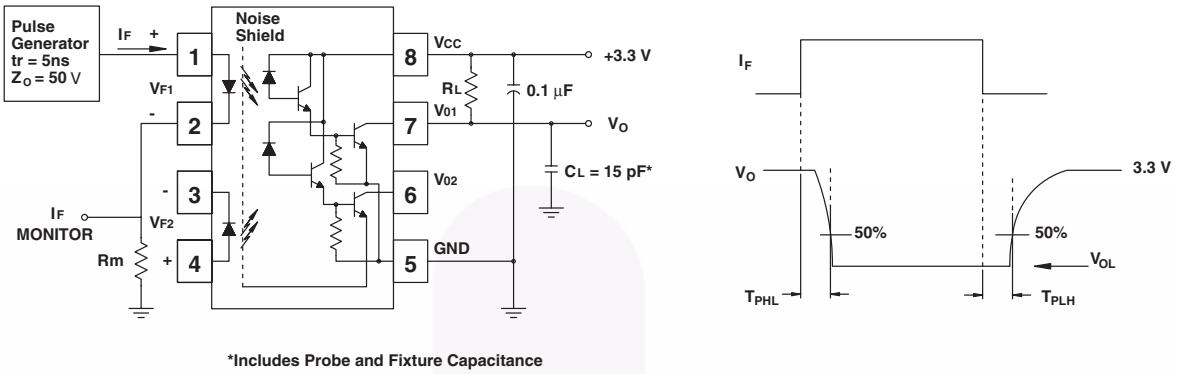


Fig. 9 Switching Time Test Circuit

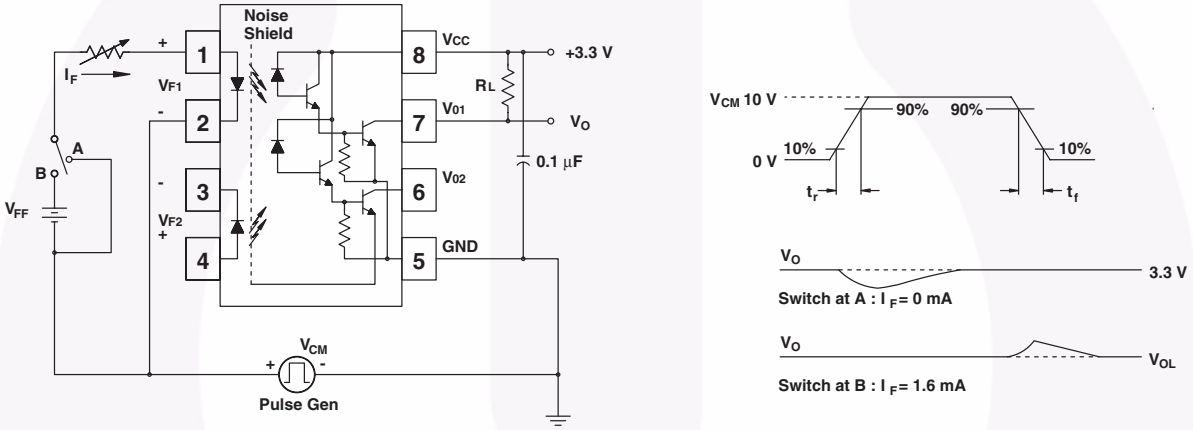
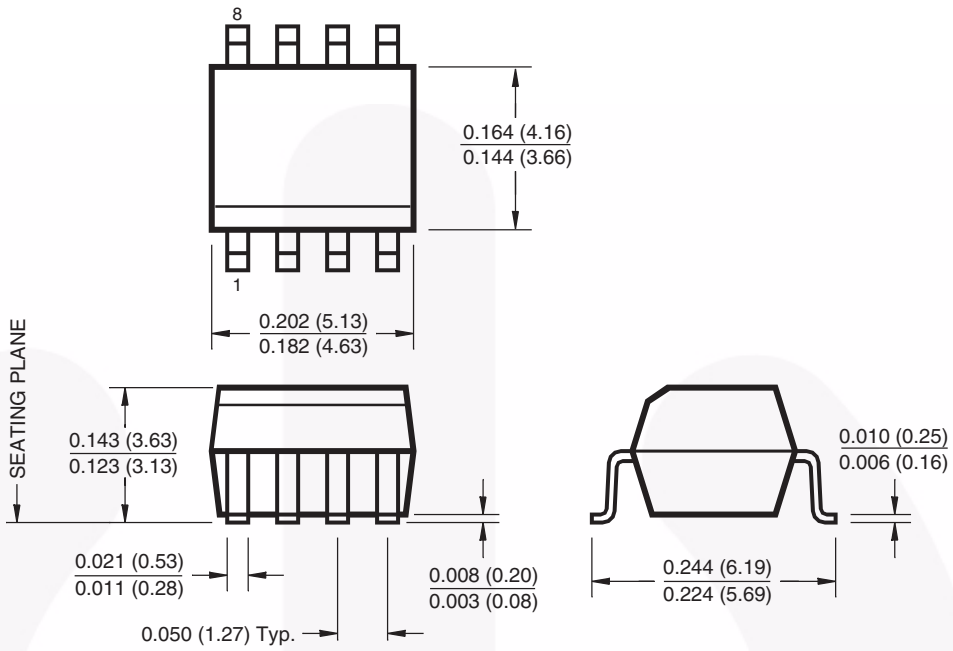


Fig. 10 Common Mode Immunity Test Circuit

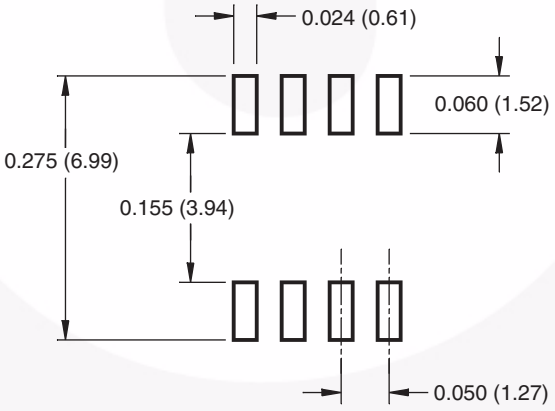
Package Dimensions

8-pin SOIC Surface Mount



Lead Coplanarity: 0.004 (0.10) MAX

Recommended Pad Layout



Dimensions in inches (mm).

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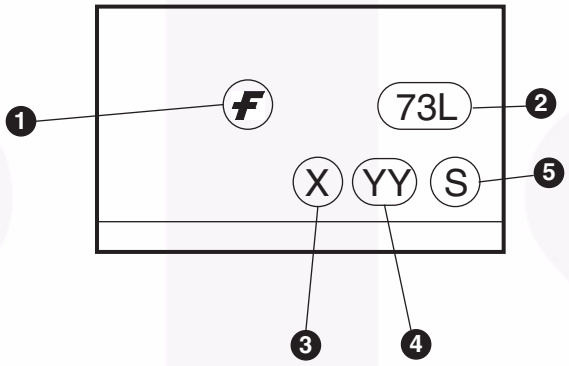
http://www.fairchildsemi.com/packaging/

Ordering Information

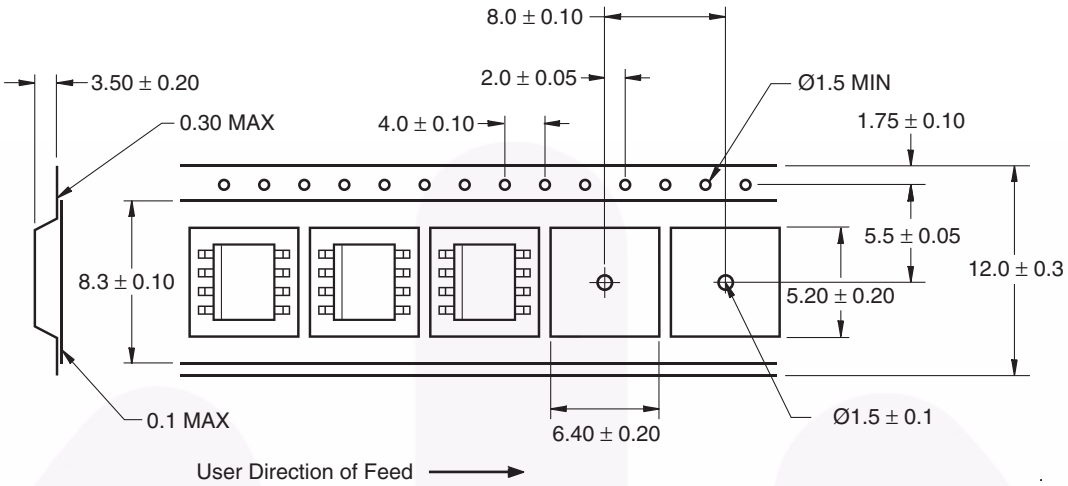
Option	Order Entry Identifier	Description
No Suffix	FOD073L	Shipped in tubes (50 units per tube)
R2	FOD073LR2	Tape and reel (2,500 units per reel)

Marking Information



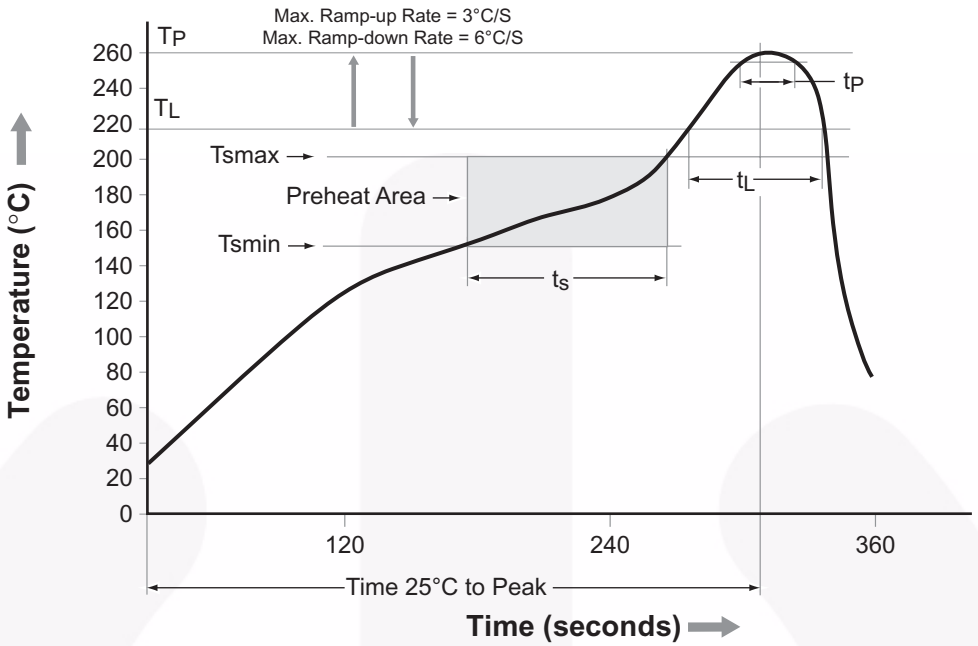
Definitions	
1	Fairchild logo
2	Device number
3	One digit year code, e.g., ‘3’
4	Two digit work week ranging from ‘01’ to ‘53’
5	Assembly package code

Carrier Tape Specifications



Dimensions in mm

Reflow Profile



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (t_S) from (Tsmin to Tsmax)	60–120 seconds
Ramp-up Rate (t_L to t_P)	3°C/second max.
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60–150 seconds
Peak Body Package Temperature	260°C +0°C / –5°C
Time (t_P) within 5°C of 260°C	30 seconds
Ramp-down Rate (T_P to T_L)	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

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