FAIRCHILD
SEMICONDUCTOR®

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FOD852
4-Pin High Operating Temperature Photodarlington Optocoupler

Features

■ Applicable to Pb-free IR reflow soldering
■ Compact 4-pin package
■ High current transfer ratio: 1000% minimum
■ C-UL, UL, and VDE approved
■ High input-output isolation voltage of 5000Vrms
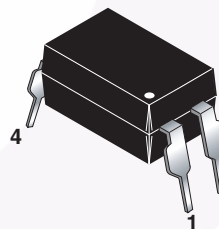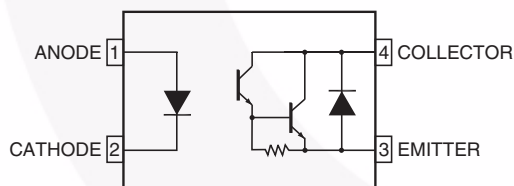■ High operating temperature of 100°C

Applications

■ Power supply regulators
■ Digital logic inputs
■ Microprocessor inputs

Description

The FOD852 consists of gallium arsenide infrared emitting diode driving a silicon photodarlington output (with integral base-emitter resistor) in a 4-pin dual in-line package.

Functional Block Diagram

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Absolute Maximum Ratings (T_A = 25°C 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
TOTAL DEVICE			
T_{STG}	Storage Temperature	-55 to +125	°C
T_{OPR}	Operating Temperature	-30 to +100	°C
T_{SOL}	Lead Solder Temperature	260 for 10 sec	°C
P_{TOT}	Total Device Power Dissipation	200	mW
INPUT			
I_F	Continuous Forward Current	50	mA
V_R	Reverse Voltage	6	V
P_D	LED Power Dissipation	70	mW
OUTPUT			
V_{CEO}	Collector-Emitter Voltage	300	V
V_{ECO}	Emitter-Collector Voltage	0.1	V
I_C	Continuous Collector Current	150	mA
P_C	Collector Power Dissipation	150	mW

Electrical Characteristics (T_A = 25°C unless otherwise specified.)

Individual Component Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
INPUT						
V_F	Forward Voltage	I_F = 10mA		1.2	1.4	V
I_R	Reverse Current	V_R = 4V			10	µA
C_t	Terminal Capacitance	V = 0, f = 1kHz		30	250	pF
OUTPUT						
I_{CEO}	Collector Dark Current	V_{CE} = 200V, I_F = 0			200	nA
BV_{CEO}	Collector-Emitter Breakdown Voltage	I_C = 0.1mA, I_F = 0	300			V
BV_{ECO}	Emitter-Collector Breakdown Voltage	I_E = 10µA, I_F = 0	0.1			V

Transfer Characteristics

Symbol	DC Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
I_C	Collector Current	I_F = 1mA, V_{CE} = 2V	10	40	1 f0	mA
CTR	Current Transfer Ratio[1]		1,000	4,000	15,000	%
$V_{CE\,(sat)}$	Collector-Emitter Saturation Voltage	I_F = 20mA, I_C = 100mA			1.2	V
R_{iso}	Isolation Resistance	DC500V 40~60% R.H.	5×10^{10}	1×10^{11}		Ω
C_f	Floating Capacitance	V = 0, f = 1MHz		0.6	1	pF
f_C	Cut-Off Frequency	V_{CE} = 2V, I_C = 20mA, R_L = 100Ω, -3dB	1	7		kHz
t_r	Response Time (Rise)	V_{CE} = 2V, I_C = 20mA, R_L = 100Ω		100	300	µs
t_f	Response Time (Fall)			20	100	µs

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Units
V_{ISO}	Input-Output Isolation Voltage	f = 60Hz, t = 1 min, $I_{I-O} \leq$ 2µA	5000			Vac(rms)
R_{ISO}	Isolation Resistance	V_{I-O} = 500 VDC	5×10^{10}	10^{11}	–	Ω
C_{ISO}	Isolation Capacitance	V_{I-O} = 0, f = 1MHz		0.6	1.0	pf

Note:

1. Current Transfer Ratio (CTR) = I_C / I_F x 100%.

Typical Electrical/Optical Characteristic Curves (T$_A$ = 25°C Unless otherwise specified.)

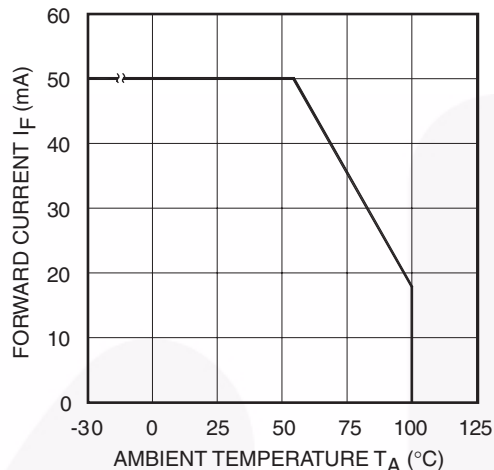**Fig. 1 Forward Current vs. Ambient Temperature**

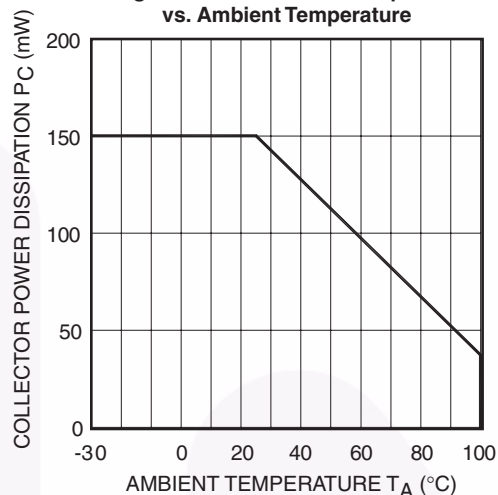**Fig. 2 Collector Power Dissipation vs. Ambient Temperature**

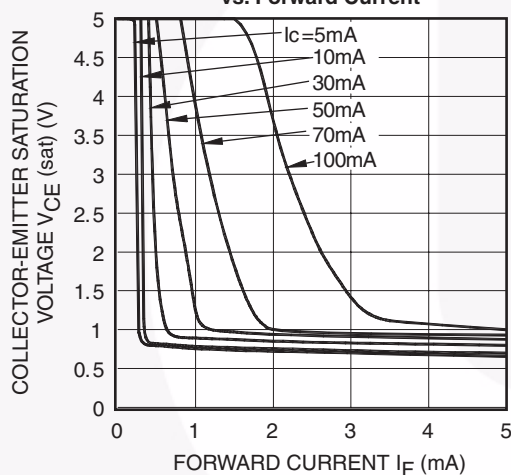**Fig. 3 Collector-Emitted Saturation Voltage vs. Forward Current**
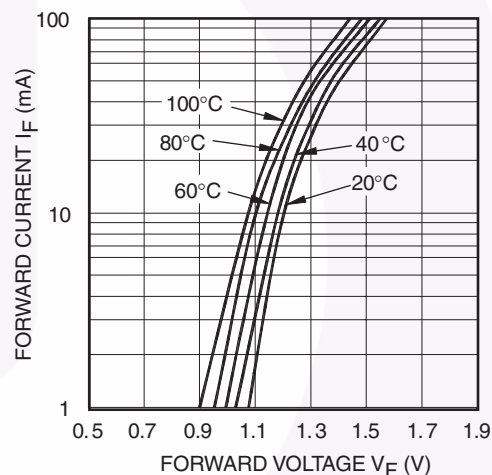

Fig. 4 Forward Current vs. Forward Voltage
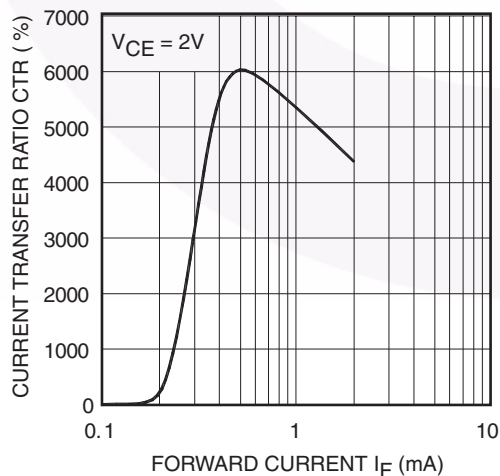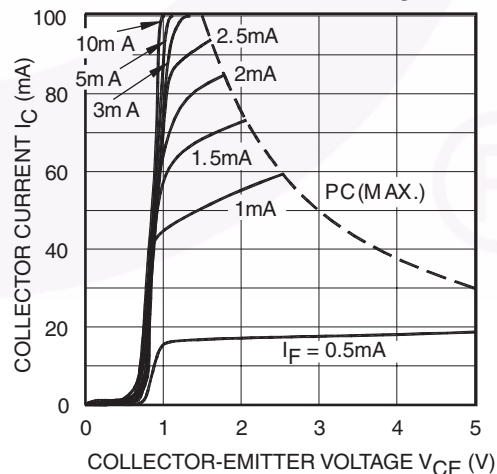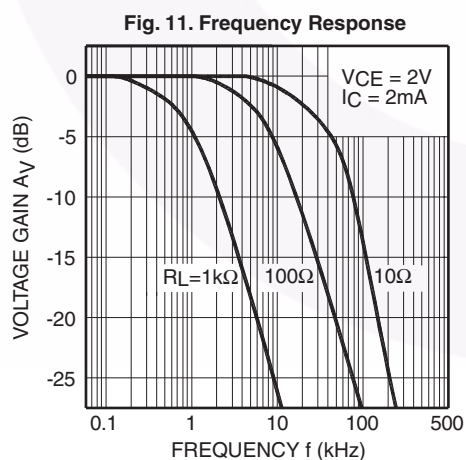

Fig. 5 Current Transfer Ratio vs. Forward Current

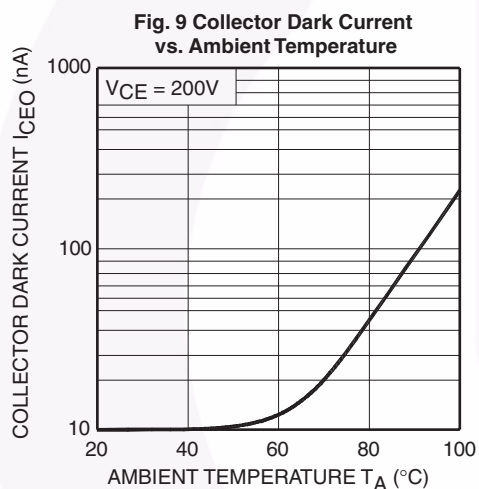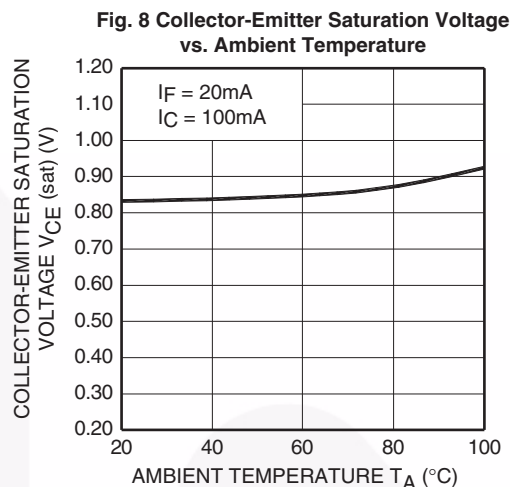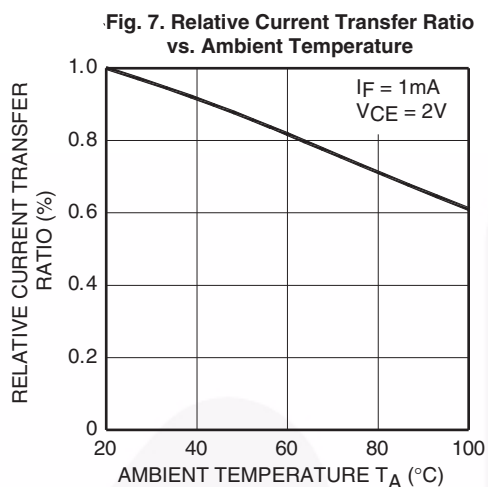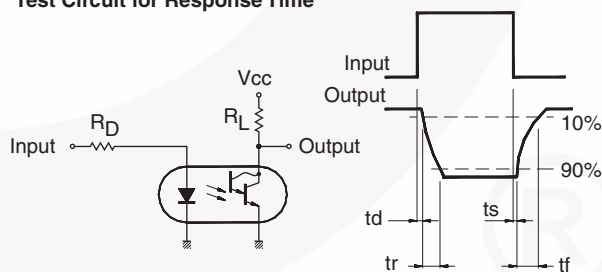**Fig. 6 Collector Current vs. Collector-Emitter Voltage**

Typical Electrical/Optical Characteristic Curves $(T_A = 25°C$ Unless otherwise specified.)

Fig. 7. Relative Current Transfer Ratio vs. Ambient Temperature

$I_F = 1mA$
$V_{CE} = 2V$

RELATIVE CURRENT TRANSFER RATIO (%)

AMBIENT TEMPERATURE T_A (°C)

Fig. 8 Collector-Emitter Saturation Voltage vs. Ambient Temperature

$I_F = 20mA$
$I_C = 100mA$

COLLECTOR-EMITTER SATURATION VOLTAGE V_{CE} (sat) (V)

AMBIENT TEMPERATURE T_A (°C)

Fig. 9 Collector Dark Current vs. Ambient Temperature

$V_{CE} = 200V$

COLLECTOR DARK CURRENT I_{CEO} (nA)

AMBIENT TEMPERATURE T_A (°C)

Fig. 10. Response Time vs. Load Resistance

$V_{CE} = 2V$
$I_C = 20mA$

tr
tf
td
ts

RESPONSE TIME (µs)

LOAD RESISTANCE R_L (kΩ)

Fig. 11. Frequency Response

$V_{CE} = 2V$
$I_C = 2mA$

$R_L = 1kΩ$ 100Ω   10Ω

VOLTAGE GAIN A_V (dB)

FREQUENCY f (kHz)

Test Circuit for Response Time

Input
R_D
Vcc
R_L
Output

Input
Output
10%
90%
td   ts
tr   tf

Test Circuit for Frequency Response

R_D
Vcc
R_L
Output
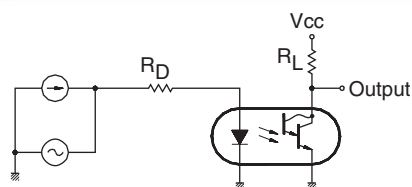
Package Dimensions

Through Hole

Surface Mount

Lead Coplanarity 0.004 (0.10) MAX
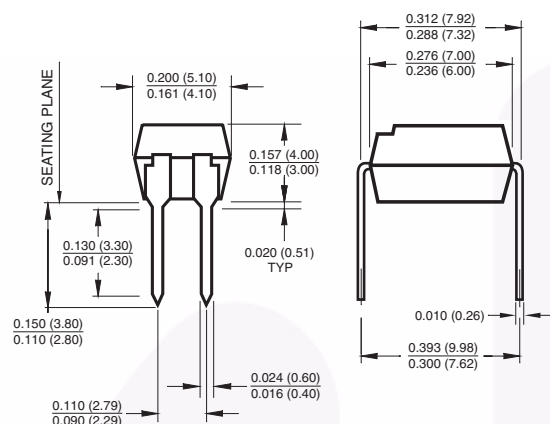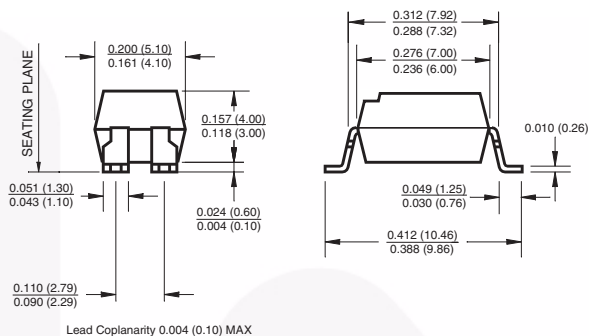
0.4" Lead Spacing
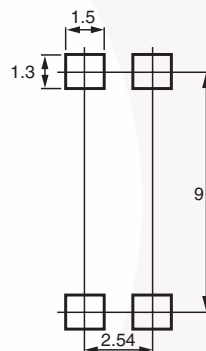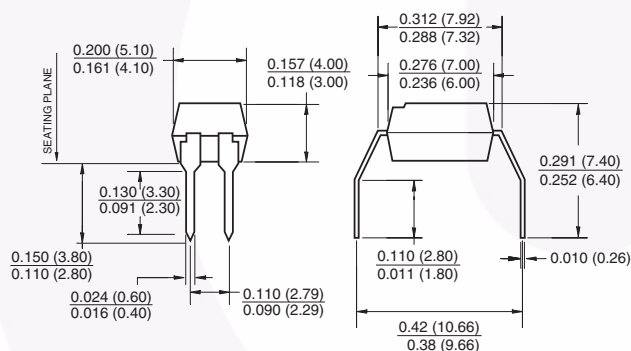

Surface Mount (Footprint Dimensions)

Note:

All dimensions are in inches (millimeters)

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Ordering Information

Option	Order Entry Identifier	Description
S	.S	Surface Mount Lead Bend
SD	.SD	Surface Mount; Tape and reel
W	.W	0.4" Lead Spacing
300	.300	VDE Approved
300W	.300W	VDE Approved, 0.4" Lead Spacing
3S	.3S	VDE Approved, Surface Mount
3SD	.3SD	VDE Approved, Surface Mount, Tape & Reel

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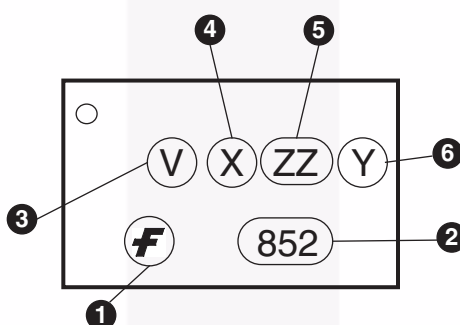
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

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Carrier Tape Specifications
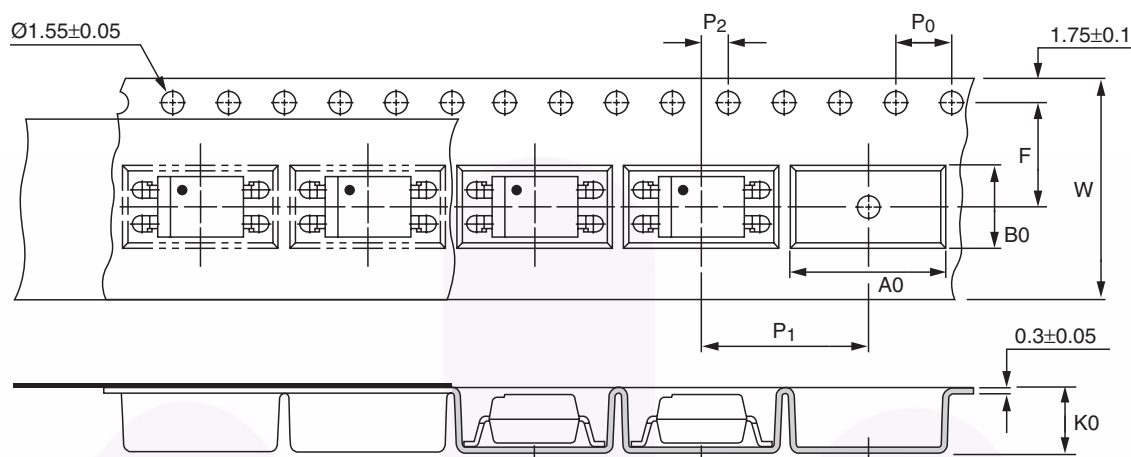
Note:
All dimensions are in millimeters.

Symbol	Description	Dimensions in mm (inches)
W	Tape wide	16 ± 0.3 (.63)
P_0	Pitch of sprocket holes	4 ± 0.1 (.15)
F P_2	Distance of compartment	7.5 ± 0.1 (.295) 2 ± 0.1 (.079)
P_1	Distance of compartment to compartment	12 ± 0.1 (.472)
A0	Compartment	10.45 ± 0.1 (.411)
B0		5.30 ± 0.1 (.209)
K0		4.25 ± 0.1 (.167)

Lead Free Recommended IR Reflow Condition
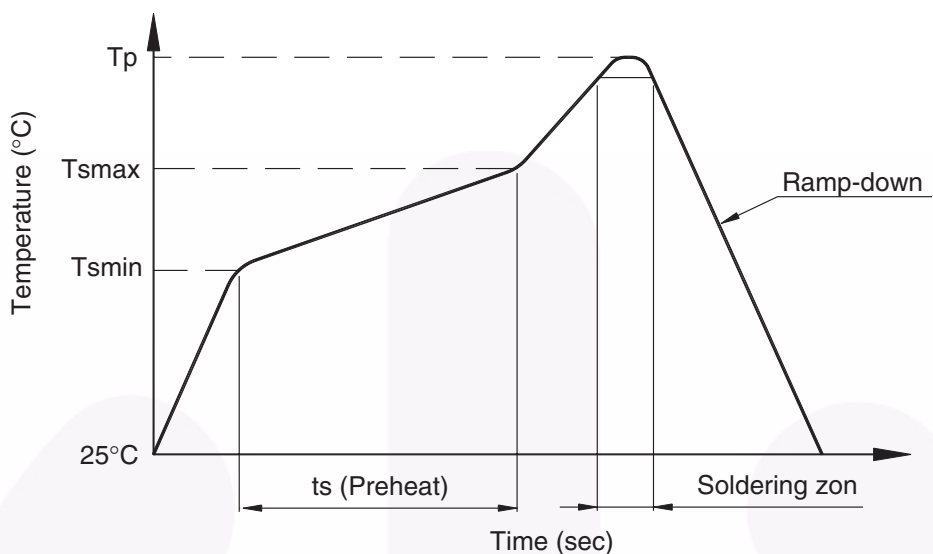
Profile Feature	Pb-Sn solder assembly	Lead Free assembly
Preheat condition (Tsmin-Tsmax / ts)	100°C ~ 150°C 60 ~ 120 sec	150°C ~ 200°C 60 ~120 sec
Melt soldering zone	183°C 60 ~ 120 sec	217°C 30 ~ 90 sec
Peak temperature (Tp)	240 +0/-5°C	260 +0/-5°C
Ramp-down rate	6°C/sec max.	6°C/sec max.
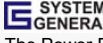
Recommended Wave Soldering condition

Profile Feature	For all solder assembly
Peak temperature (Tp)	Max 260°C for 10 sec

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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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