

## DESCRIPTION

The 4N29, 4N30, 4N31, 4N32, 4N33 have a gallium arsenide infrared emitter optically coupled to a silicon planar photodarlington.

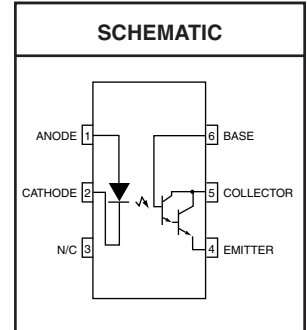
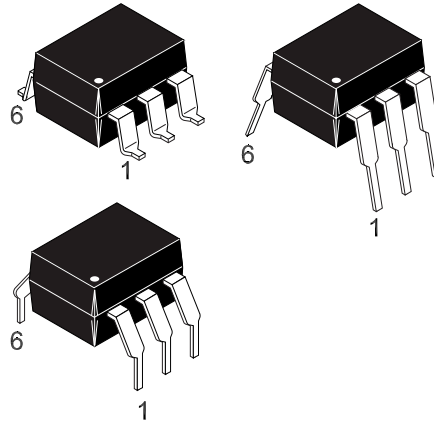
**4N29    4N30    4N31    4N32    4N33**

## FEATURES

- High sensitivity to low input drive current
- Meets or exceeds all JEDEC Registered Specifications
- VDE 0884 approval available as a test option  
-add option .300. (e.g., 4N29.300)

## APPLICATIONS

- Low power logic circuits
- Telecommunications equipment
- Portable electronics
- Solid state relays
- Interfacing coupling systems of different potentials and impedances.



## ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C Unless otherwise specified.)

Parameter	Symbol	Value	Units
<b>TOTAL DEVICE</b>			
Storage Temperature	T <sub>STG</sub>	-55 to +150	°C
Operating Temperature	T <sub>OPR</sub>	-55 to +100	°C
Lead Solder Temperature	T <sub>SOL</sub>	260 for 10 sec	°C
Total Device Power Dissipation @ T <sub>A</sub> = 25°C	P <sub>D</sub>	250	mW
Derate above 25°C		3.3	mW/°C
<b>EMITTER</b>			
Continuous Forward Current	I <sub>F</sub>	80	mA
Reverse Voltage	V <sub>R</sub>	3	V
Forward Current - Peak (300 μs, 2% Duty Cycle)	I <sub>F(pk)</sub>	3.0	A
LED Power Dissipation @ T <sub>A</sub> = 25°C	P <sub>D</sub>	150	mW
Derate above 25°C		2.0	mW/°C
<b>DETECTOR</b>			
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	30	V
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	30	V
Emitter-Collector Breakdown Voltage	BV <sub>ECO</sub>	5	V
Detector Power Dissipation @ T <sub>A</sub> = 25°C	P <sub>D</sub>	150	mW
Derate above 25°C		2.0	mW/°C
Continuous Collector Current	I <sub>C</sub>	150	mA

<b>4N29</b>	<b>4N30</b>	<b>4N31</b>	<b>4N32</b>	<b>4N33</b>
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**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

**INDIVIDUAL COMPONENT CHARACTERISTICS**

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
<b>EMITTER</b>						
*Input Forward Voltage	( $I_F = 10\text{ mA}$ )	$V_F$		1.2	1.5	V
*Reverse Leakage Current	( $V_R = 3.0\text{ V}$ )	$I_R$		0.001	100	$\mu\text{A}$
*Capacitance	( $V_F = 0\text{ V}$ , $f = 1.0\text{ MHz}$ )	C		150		pF
<b>DETECTOR</b>						
*Collector-Emitter Breakdown Voltage	( $I_C = 100\ \mu\text{A}$ , $I_B = 0$ )	$BV_{CEO}$	30	60		
*Collector-Base Breakdown Voltage	( $I_C = 100\ \mu\text{A}$ , $I_E = 0$ )	$BV_{CBO}$	30	100		V
*Emitter-Collector Breakdown Voltage	( $I_E = 100\ \mu\text{A}$ , $I_B = 0$ )	$BV_{ECO}$	5.0	8		V
*Collector-Emitter Dark Current	( $V_{CE} = 10\text{ V}$ , Base Open)	$I_{CEO}$		1	100	nA
DC Current Gain	( $V_{CE} = 5.0\text{ V}$ , $I_C = 500\ \mu\text{A}$ )	$h_{FE}$		5000		

**TRANSFER CHARACTERISTICS**

DC Characteristic	Test Conditions	Symbol	Min	Typ	Max	Units
*Collector Output Current <sup>(1,2)</sup> (4N32, 4N33)	( $I_F = 10\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $I_B = 0$ )	$I_C$ (CTR)	50 (500)			mA (%)
(4N29, 4N30)			10 (100)			
(4N31)			5 (50)			
*Saturation Voltage <sup>(2)</sup> (4N29, 4N30, 4N32, 4N33)	( $I_F = 8.0\text{ mA}$ , $I_C = 2.0\text{ mA}$ )	$V_{CE(sat)}$			1.0	V
(4N31)					1.2	

**TRANSFER CHARACTERISTICS**

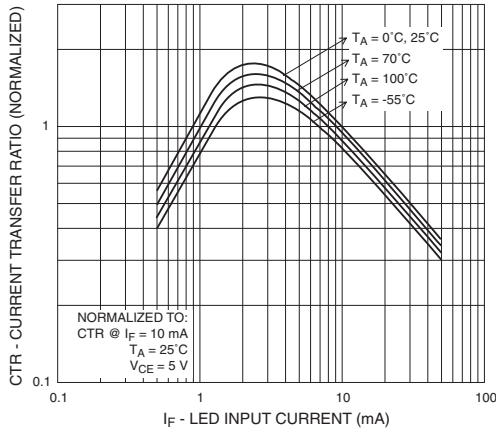
AC Characteristic	Test Conditions	Symbol	Min	Typ	Max	Units
Turn-on Time <sup>(3)</sup>	( $I_F = 200\text{ mA}$ , $I_C = 50\text{ mA}$ , $V_{CC} = 10\text{ V}$ ) (Fig.7)	$t_{on}$			5.0	$\mu\text{s}$
Turn-off Time <sup>(3)</sup> (4N32, 4N33)					100	
(4N29, 4N30, 4N31)			$t_{off}$			
Bandwidth <sup>(4,5)</sup>		BW		30		KHz

**ISOLATION CHARACTERISTICS**

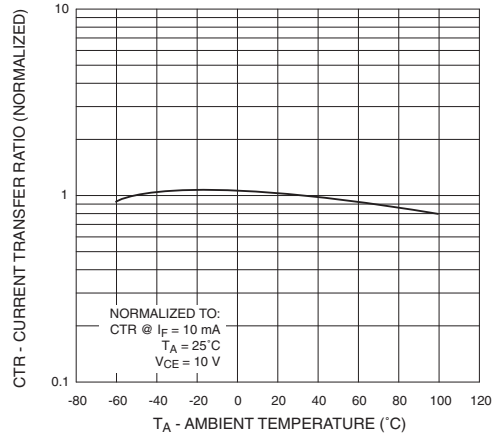
Characteristic	Test Conditions	Symbol	Min	Typ	Max	Units
Input-Output Isolation Voltage <sup>(6)</sup> (4N29, 4N30, 4N31, 4N32, 4N33)	( $I_{I-O} \leq 1\ \mu\text{A}$ , $V_{rms}$ , $t = 1\text{ min.}$ )	$V_{ISO}$	5300			$V_{ac(rms)}$
* (4N32)			VDC	2500		V
* (4N33)			VDC	1500		
Isolation Resistance <sup>(6)</sup>	( $V_{I-O} = 500\text{ VDC}$ )	$R_{ISO}$		$10^{11}$		$\Omega$
Isolation Capacitance <sup>(6)</sup>	( $V_{I-O} = \emptyset$ , $f = 1\text{ MHz}$ )	$C_{ISO}$		0.8		pf

4N29    4N30    4N31    4N32    4N33

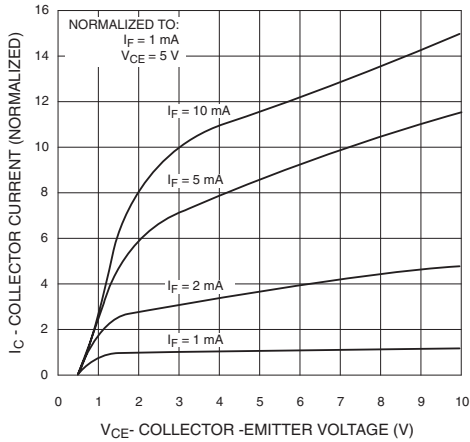
**Fig. 1 Output Current vs. Input Current**



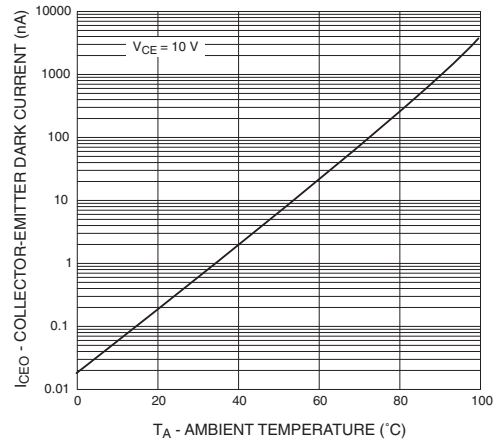
**Fig. 2 Current Transfer Ratio vs. Ambient Temperature**



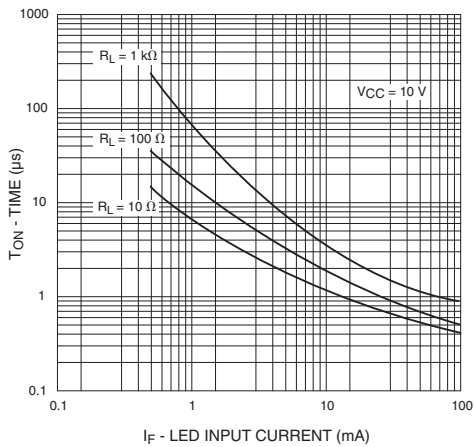
**Fig. 3 Collector Current vs. Collector-Emitter Voltage**



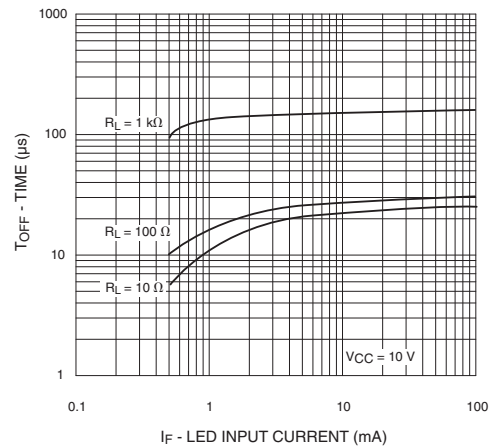
**Fig. 4 Dark Current vs. Ambient Temperature**



**Fig. 5 Turn-On Time vs. Input Current**



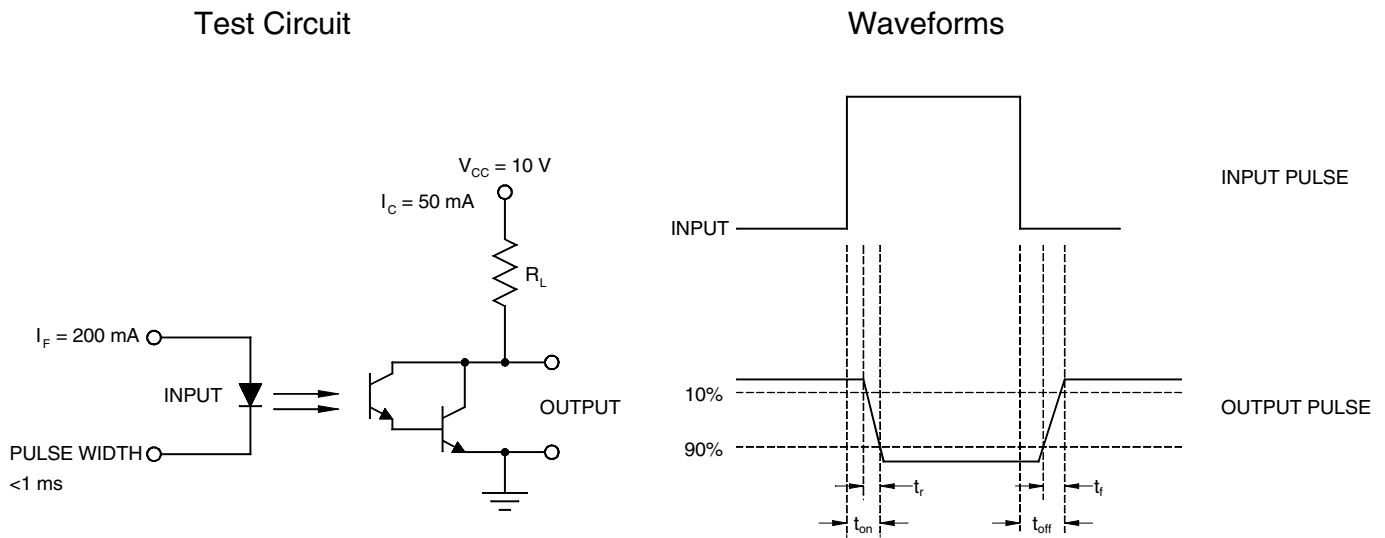
**Fig. 6 Turn-Off Time vs. Input Current**



4N29 4N30 4N31 4N32 4N33

**TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES**

(25°C Free air temperature unless otherwise specified) (Cont.)



**Fig. 7 Switching Time Test Circuit and Waveforms**

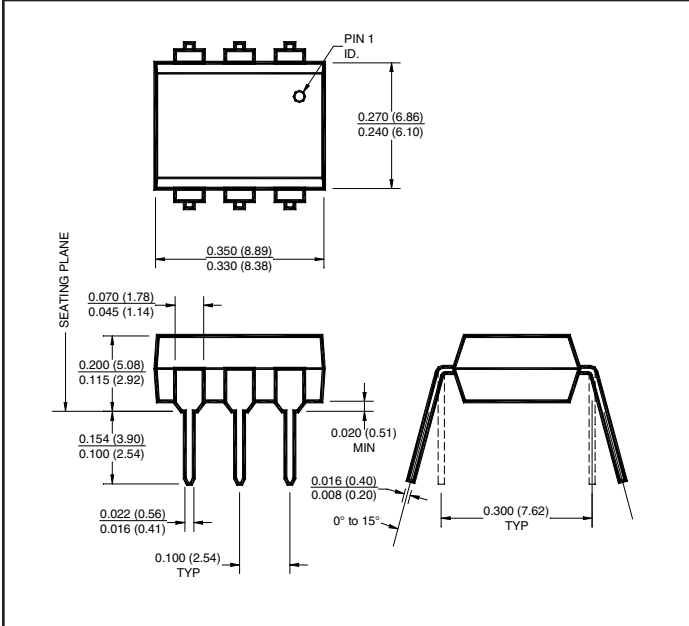
**Notes**

\* Indicates JEDEC registered data.

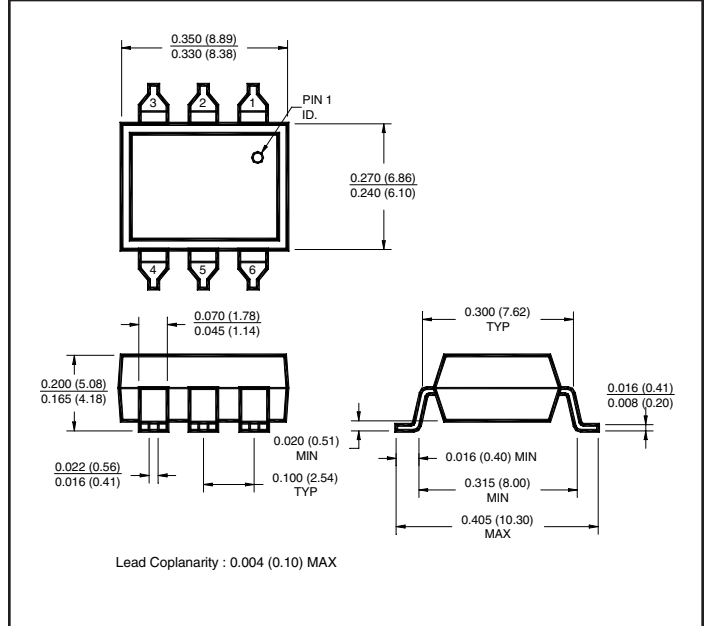
1. The current transfer ratio ( $I_C/I_F$ ) is the ratio of the detector collector current to the LED input current with  $V_{CE} @ 10 \text{ V}$ .
2. Pulse test: pulse width =  $300 \mu\text{s}$ , duty cycle  $\leq 2.0\%$ .
3. For test circuit setup and waveforms, refer to figure 7..
4.  $I_F$  adjusted to  $I_C = 2.0 \text{ mA}$  and  $I_C = 0.7 \text{ mA rms}$ .
5. The frequency at which  $I_C$  is 3dB down from the 1 KHz value.
6. For this test, LED pins 1 and 2 are common, and phototransistor pins 4,5 and 6 are common.

4N29 4N30 4N31 4N32 4N33

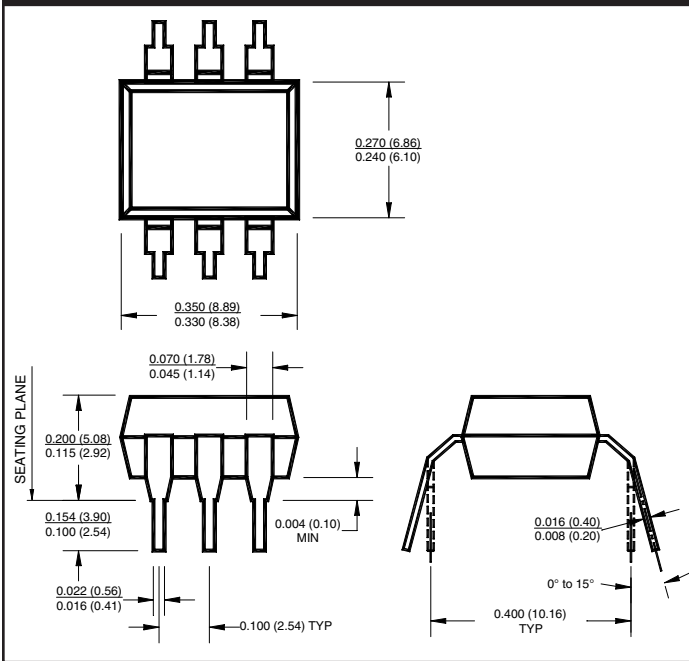
## Package Dimensions (Through Hole)



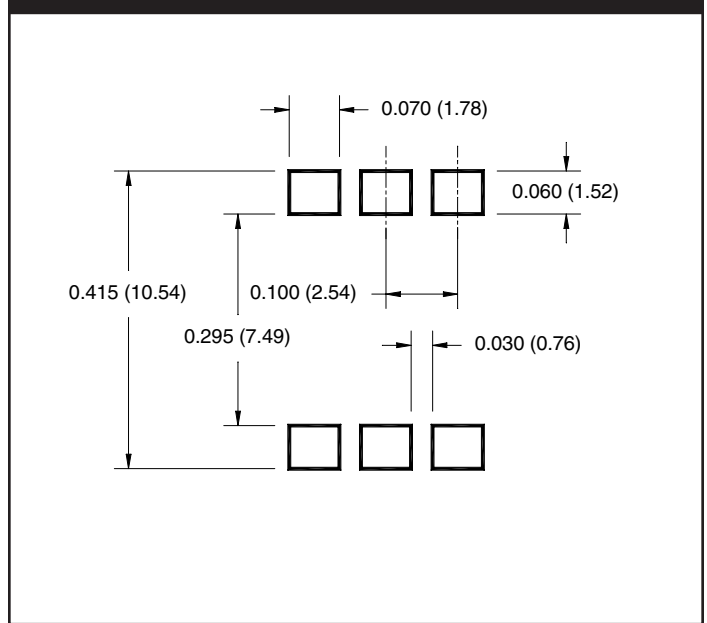
## Package Dimensions (Surface Mount)



## Package Dimensions (0.4" Lead Spacing)



## Recommended Pad Layout for Surface Mount Leadform



**NOTE**

All dimensions are in inches (millimeters)

Call QT Optoelectronics for more information or the phone number of your nearest distributor.

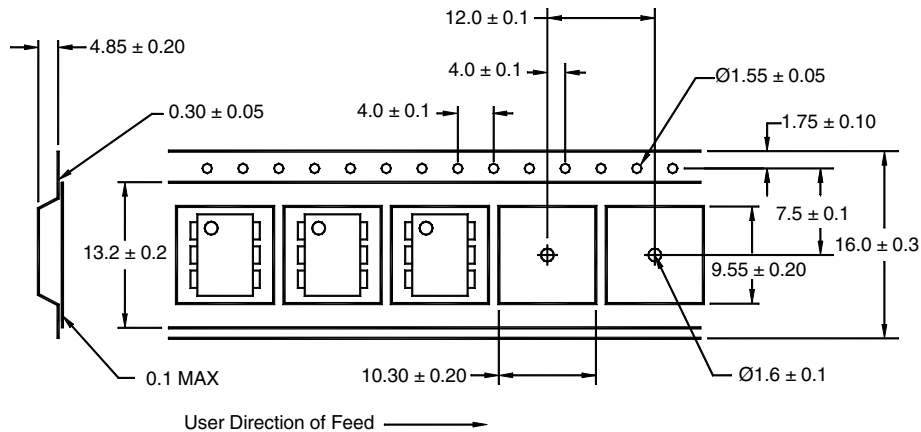
United States 800-533-6786 • France 33 [0] 1.45.18.78.78 • Germany 49 [0] 89/96.30.51 • United Kingdom 44 [0] 1296 394499 • Asia/Pacific 603-7248193

4N29 4N30 4N31 4N32 4N33

## 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 0884
300W	.300W	VDE 0884, 0.4" Lead Spacing
3S	.3S	VDE 0884, Surface Mount
3SD	.3SD	VDE 0884, Surface Mount, Tape & Reel

## QT Carrier Tape Specifications ("D" Taping Orientation)



### NOTE

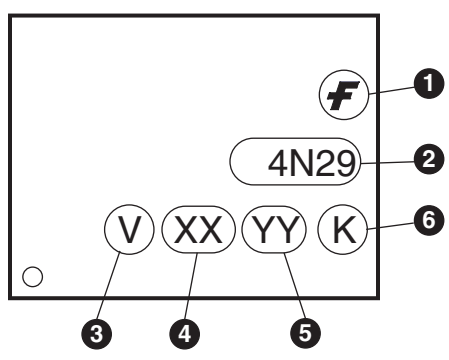
All dimensions are in millimeters

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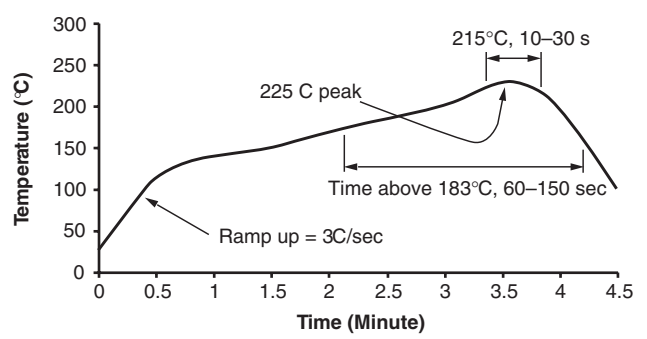
[www.qtopto.com](http://www.qtopto.com)

**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	Two digit year code, e.g., '03'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

**Reflow Profile (Black Package, No Suffix)**



- Peak reflow temperature: 225°C (package surface temperature)
- Time of temperature higher than 183°C for 60–150 seconds
- One time soldering reflow is recommended

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CoolFET™	FRFET™	MicroFET™	PowerTrench®	SuperSOT™-6
CROSSVOLT™	GlobalOptoisolator™	MicroPak™	QFET®	SuperSOT™-8
DOMET™	GTO™	MICROWIRE™	QS™	SyncFET™
EcoSPARK™	HiSeC™	MSX™	QT Optoelectronics™	TinyLogic®
E <sup>2</sup> CMOS™	ꞓC™	MSXPro™	Quiet Series™	TINYOPTO™
EnSigna™	i-Lo™	OCX™	RapidConfigure™	TruTranslation™
FACT™	ImpliedDisconnect™	OCXPro™	RapidConnect™	UHC™
FACT Quiet Series™		OPTOLOGIC®	µSerDes™	UltraFET®
Across the board. Around the world.™		OPTOPLANAR™	SILENT SWITCHER®	VCX™
The Power Franchise®		PACMAN™	SMART START™	
Programmable Active Droop™		POP™	SPM™	

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## PRODUCT STATUS DEFINITIONS

### Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
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