FAIRCHILD
SEMICONDUCTOR®

January 2009
QFET®

FQD16N25C
250V N-Channel MOSFET

Features

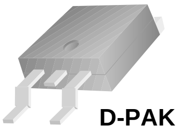
- 16A, 250V, $R_{DS(on)} = 0.27\Omega$ @$V_{GS} = 10$ V
- Low gate charge (typical 41 nC)
- Low Crss (typical 68 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- RoHS Compliant

100% LEAD-FREE IMPLEMENTATION

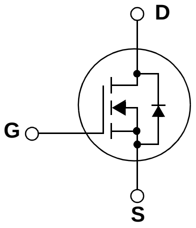
Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switching DC/DC converters, switch mode power supplies, DC-AC converters for uninterrupted power supplies and motor controls.



D-PAK
FQD Series



Absolute Maximum Ratings

Symbol	Parameter		FQD16N25C	Units
V_{DSS}	Drain-Source Voltage		250	V
I_D	Drain Current - Continuous (T_C = 25°C)		16	A
	- Continuous (T_C = 100°C)		10.1	A
I_{DM}	Drain Current - Pulsed	(Note 1)	64	A
V_{GSS}	Gate-Source Voltage		± 30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	432	mJ
I_{AR}	Avalanche Current	(Note 1)	16	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	160	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	5.5	V/ns
P_D	Power Dissipation (T_C = 25°C)		160	W
	- Derate above 25°C		1.28	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		300	°C

Thermal Characteristics

Symbol	Parameter	FQD16N25C	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.78	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	110	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQD16N25C	FQD16N25CTM	D-PAK	380mm	16mm	2,500
FQD16N25C	FQD16N25CTF	D-PAK	380mm	16mm	2,000

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	250	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	--	0.31	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 250 V, V_{GS} = 0 V	--	--	10	μA
		V_{DS} = 200 V, T_C = 125°C	--	--	100	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30 V, V_{DS} = 0 V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 8A	--	0.22	0.27	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D =8 A (Note 4)	--	10.5	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	830	1080	pF
C_{oss}	Output Capacitance		--	170	220	pF
C_{rss}	Reverse Transfer Capacitance		--	68	89	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 125 V, I_D = 16A, R_G = 25 Ω (Note 4, 5)	--	15	40	ns
t_r	Turn-On Rise Time		--	130	270	ns
$t_{d(off)}$	Turn-Off Delay Time		--	135	280	ns
t_f	Turn-Off Fall Time		--	105	220	ns
Q_g	Total Gate Charge	V_{DS} = 200 V, I_D = 16A, V_{GS} = 10 V (Note 4, 5)	--	41	53.5	nC
Q_{gs}	Gate-Source Charge		--	5.6	--	nC
Q_{gd}	Gate-Drain Charge		--	22.7	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	16	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	64	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 16 A	--	--	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 16 A, dI_F / dt = 100 A/μs (Note 4)	--	260	--	ns
Q_{rr}	Reverse Recovery Charge		--	2.47	--	μC

NOTES:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 2.7mH, I_{AS} = 16A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
3. $I_{SD} \leq$ 16A, di/dt ≤300A/μs, $V_{DD} \leq BV_{DSS}$, Starting T_J = 25°C
4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Performance Characteristics

Figure 1. On-Region Characteristics

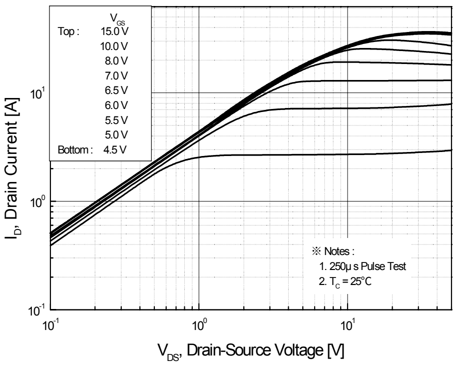


Figure 2. Transfer Characteristics

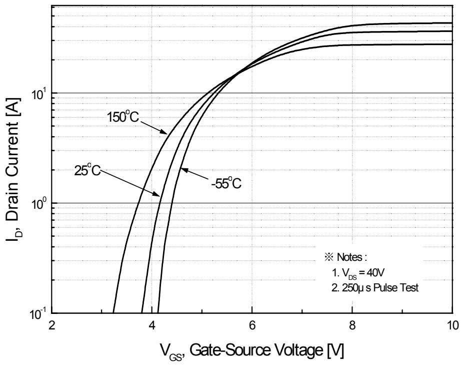


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

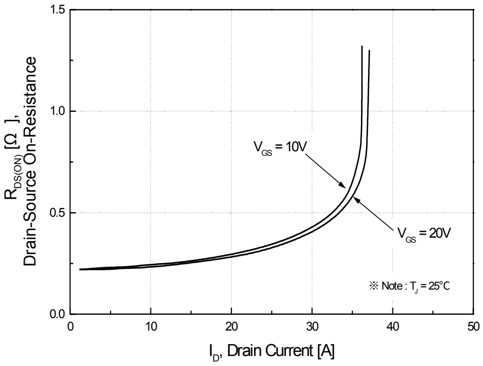


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

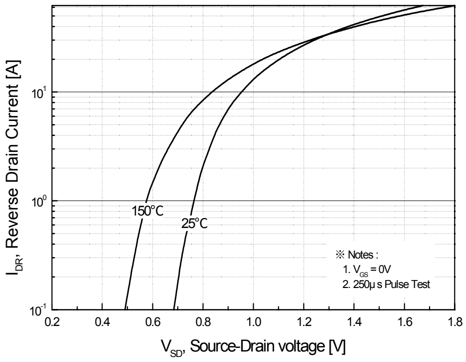


Figure 5. Capacitance Characteristics

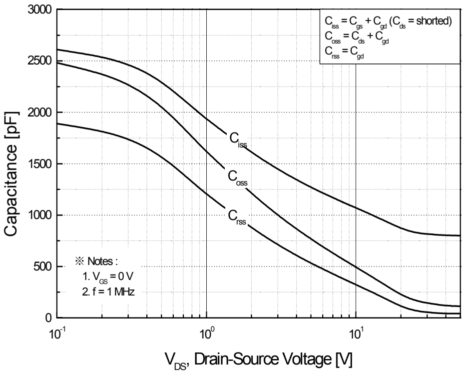
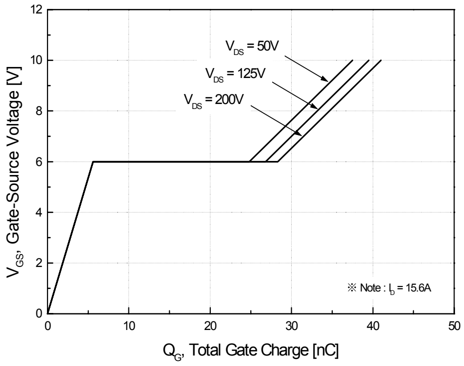


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

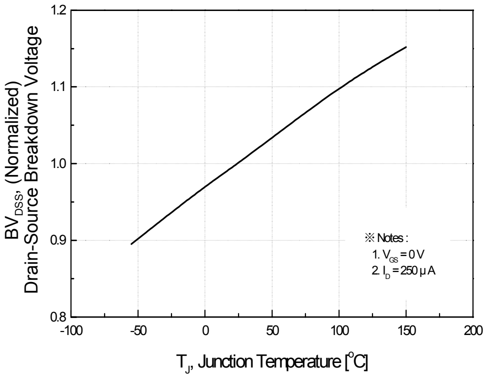


Figure 7. Breakdown Voltage Variation vs. Temperature

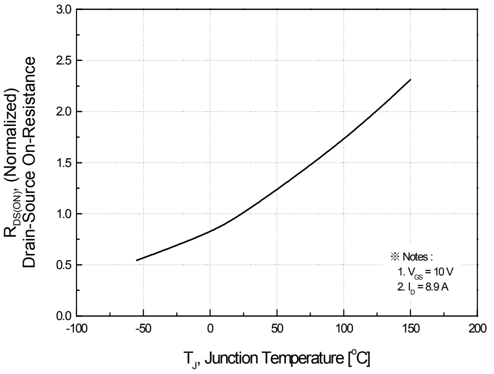


Figure 8. On-Resistance Variation vs. Temperature

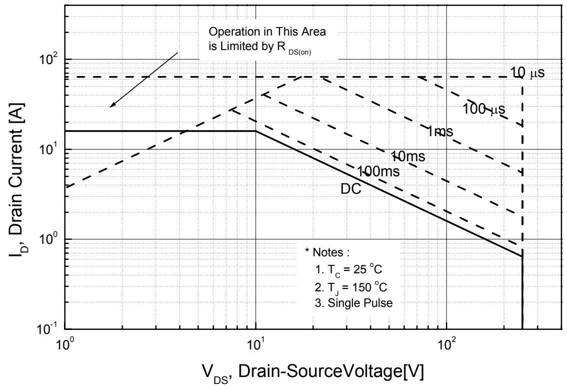


Figure 9. Maximum Safe Operating Area

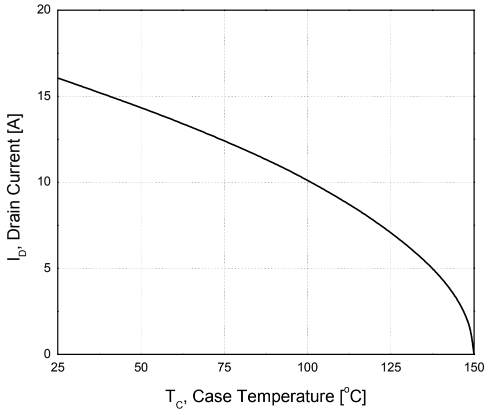


Figure 10. Maximum Drain Current vs. Case Temperature

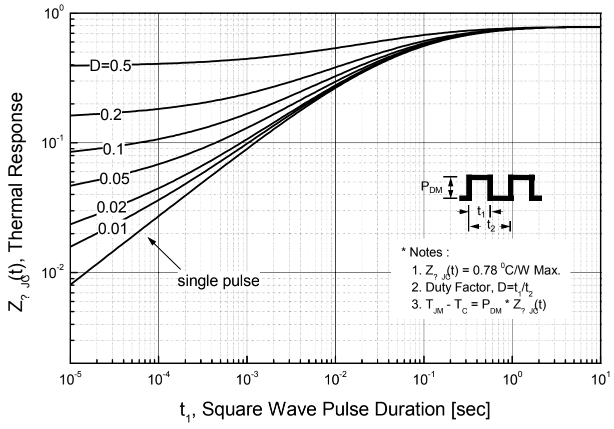
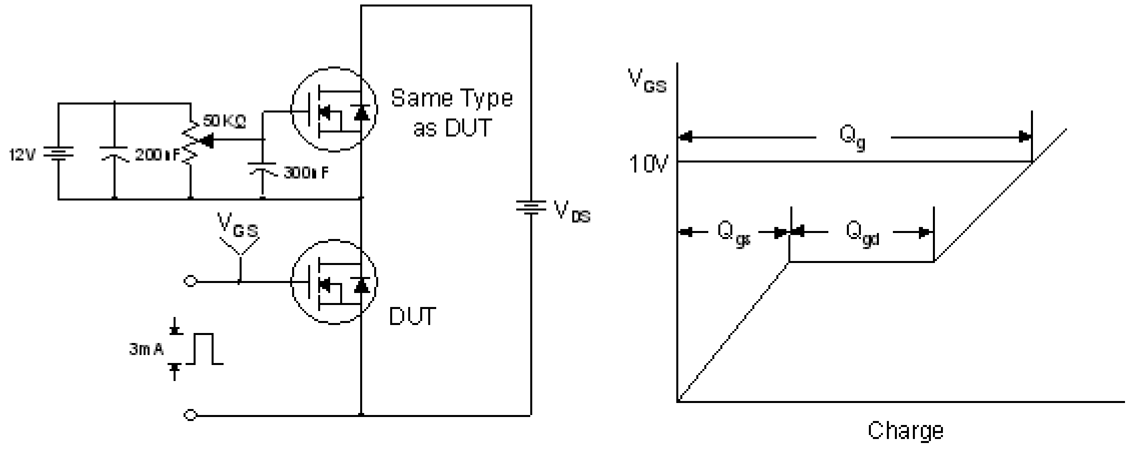
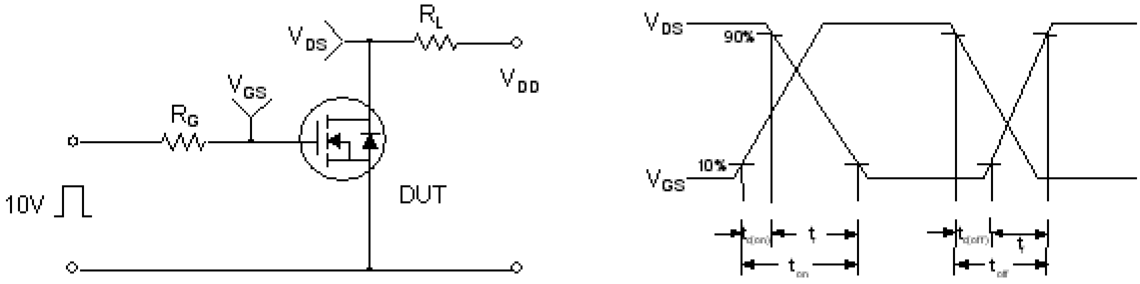


Figure 11. Transient Thermal Response Curve

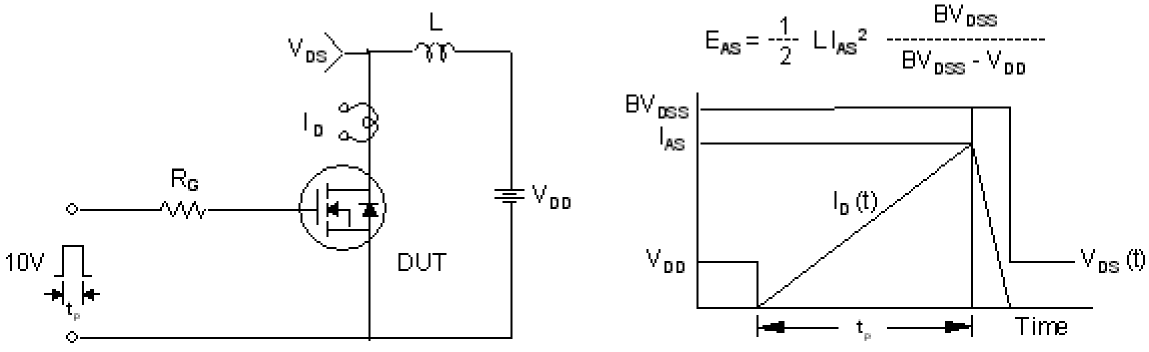
Gate Charge Test Circuit & Waveform



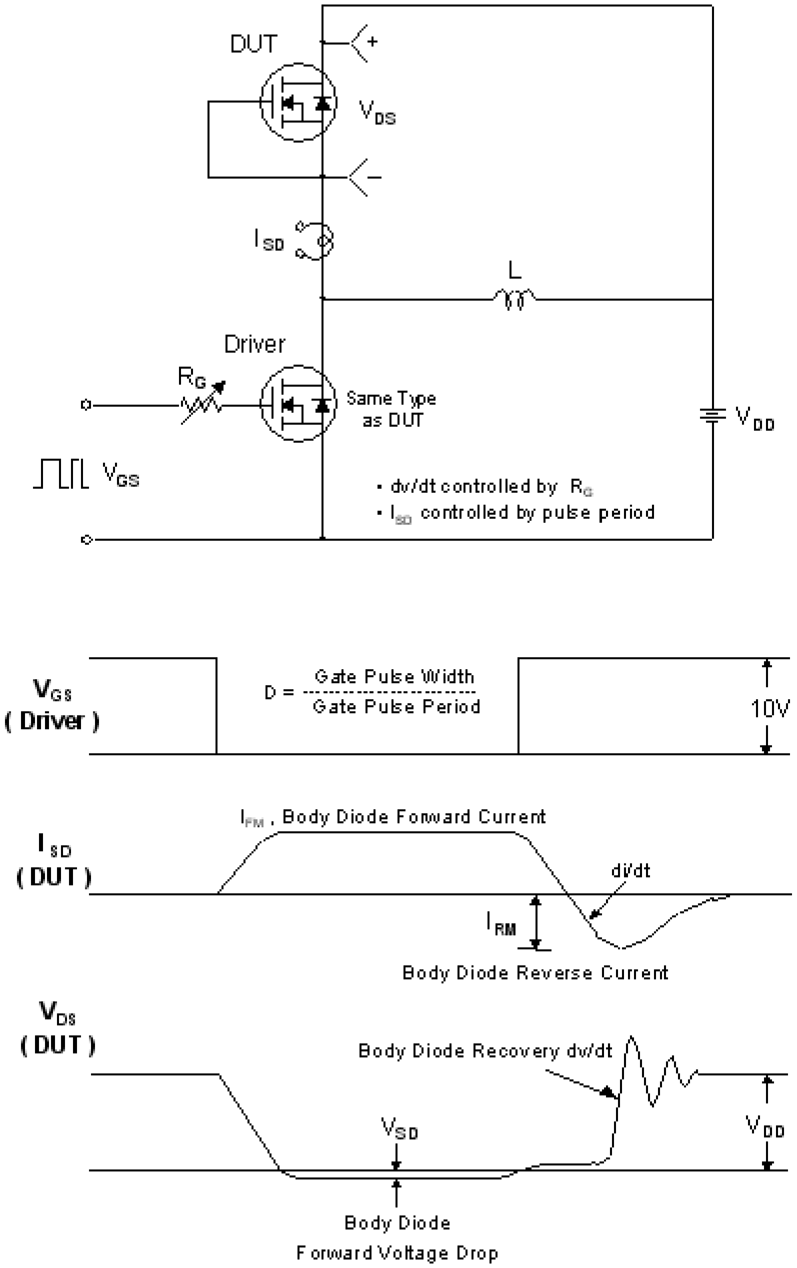
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

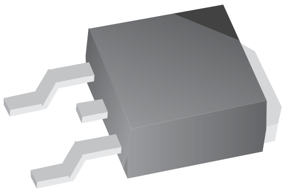


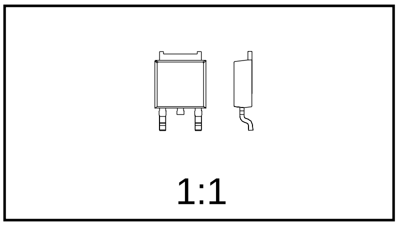
Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-252 (DPAK) (FS PKG Code 36)

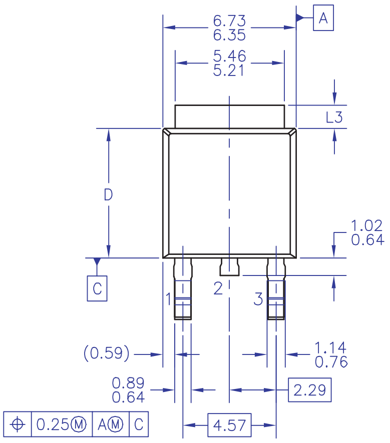


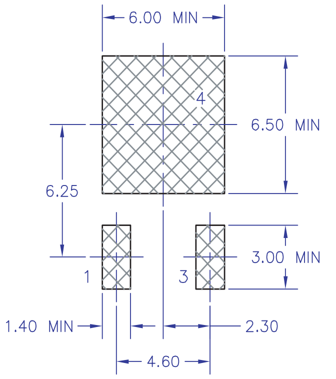


Scale 1:1 on letter size paper

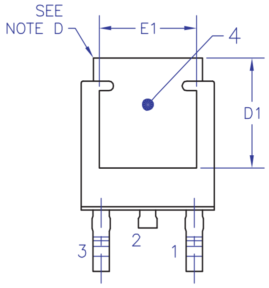
Dimensions shown below are in:
millimeters

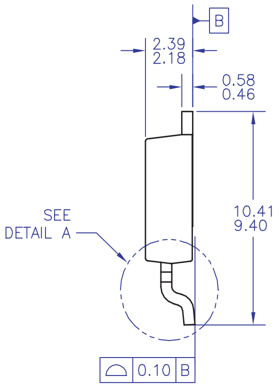
Part Weight per unit (gram): 0.33

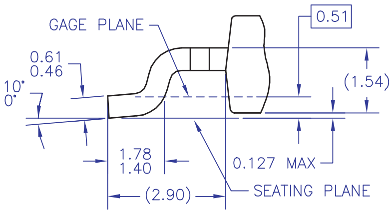




LAND PATTERN RECOMMENDATION







DETAIL A
(ROTATED −90°)
SCALE: 12X

NOTES: UNLESS OTHERWISE SPECIFIED

A) ALL DIMENSIONS ARE IN MILLIMETERS.

B) THIS PACKAGE CONFORMS TO JEDEC, TO−252, ISSUE C, VARIATION AA & AB, DATED NOV. 1999.

C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M−1994.

D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED CORNERS OR EDGE PROTRUSION.

E) DIMENSIONS L3,D,E1&D1 TABLE:

	OPTION AA	OPTION AB
L3	0.89−1.27	1.52−2.03
D	5.97−6.22	5.33−5.59
E1	4.32 MIN	3.81 MIN
D1	5.21 MIN	4.57 MIN

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2. A critical component in 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.

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Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
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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