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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

FAIRCHILD
SEMICONDUCTOR®

FDMC8676

N-Channel PowerTrench® MOSFET

30V, 18A, 5.9mΩ

Features

- Max $r_{DS(on)}$ = 5.9mΩ at V_{GS} = 10V, I_D = 14.7A
- Max $r_{DS(on)}$ = 9.3mΩ at V_{GS} = 4.5V, I_D = 11.5A
- Low Profile - 1mm max in Power 33
- RoHS Compliant

General Description

This device has been designed specifically to improve the efficiency of DC/DC converters. Using new techniques in MOSFET construction, the various components of gate charge and capacitance have been optimized to reduce switching losses. Low gate resistance and very low Miller charge enable excellent performance with both adaptive and fixed dead time gate drive circuits. Very low $r_{DS(on)}$ has been maintained to provide an extremely versatile device.

Applications

- High efficiency DC-DC converter
- Notebook DC-DC conversion
- Multi purpose point of load

Bottom

Top

Pin 1

Power 33

D	5		4	G
D	6		3	S
D	7		2	S
D	8		1	S
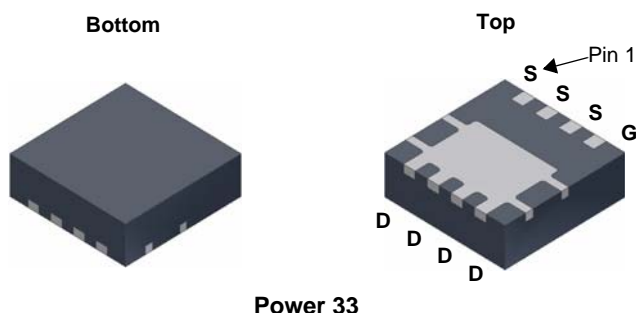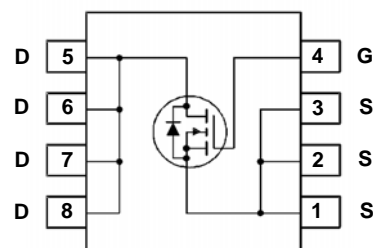
MOSFET Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			30	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current -Continuous (Package limited)	T_C = 25°C		18	A
	-Continuous (Silicon limited)	T_C = 25°C		66	
	-Continuous	T_A = 25°C	(Note 1a)	16	
	-Pulsed			60	
P_D	Power Dissipation	T_C = 25°C		41	W
	Power Dissipation	T_A = 25°C	(Note 1a)	2.3	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	216	mJ
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case		3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	53	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC8676	FDMC8676	Power 33	13''	12mm	3000units

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Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
Off Characteristics							
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250µA, V_{GS} = 0V		30			V
$\dfrac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250µA, referenced to 25°C			32		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24V, V_{GS} = 0V				1	µA
			T_J = 125°C			100	
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V				±100	nA
On Characteristics							
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250µA		1.0	1.8	3.0	V
$\dfrac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250µA, referenced to 25°C			-5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 14.7A			4.7	5.9	mΩ
		V_{GS} = 4.5V, I_D = 11.5A			7.1	9.3	
		V_{GS} =10V, I_D = 14.7A, T_J = 125°C			6.8	9.1	
g_{FS}	Forward Transconductance	V_{DD} = 5V, I_D = 14.7A			56		S
Dynamic Characteristics							
C_{iss}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz			1455	1935	pF
C_{oss}	Output Capacitance				760	1010	pF
C_{rss}	Reverse Transfer Capacitance				105	155	pF
R_g	Gate Resistance	f = 1MHz			0.8		Ω
Switching Characteristics							
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15V, I_D = 14.7A, V_{GS} = 10V, R_{GEN} = 6Ω			9	19	ns
t_r	Rise Time				3	10	ns
$t_{d(off)}$	Turn-Off Delay Time				22	36	ns
t_f	Fall Time				2	10	ns
Q_g	Total Gate Charge	V_{GS} = 0V to 10V	V_{DD} = 15V, I_D = 14.7A		21	30	nC
Q_g	Total Gate Charge	V_{GS} = 0V to 4.5V			10	14	nC
Q_{gs}	Gate to Source Charge				4		nC
Q_{gd}	Gate to Drain "Miller" Charge				3		nC
Drain-Source Diode Characteristics							
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 14.7A (Note 2)			0.8	1.3	V
		V_{GS} = 0V, I_S = 1.7A (Note 2)			0.7	1.2	
t_{rr}	Reverse Recovery Time	I_F = 14.7A, di/dt = 100A/µs			33	53	ns
Q_{rr}	Reverse Recovery Charge				17	31	nC

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.
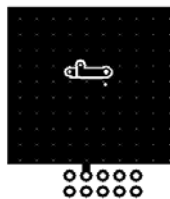
a. 53°C/W when mounted on a 1 in^2 pad of 2 oz copper

b. 125°C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300µs, Duty cycle < 2.0%.

3. Starting T_J = 25°C; N-ch: L =3mH, I_{AS} = 12A, V_{DD} = 30V, V_{GS} = 10V

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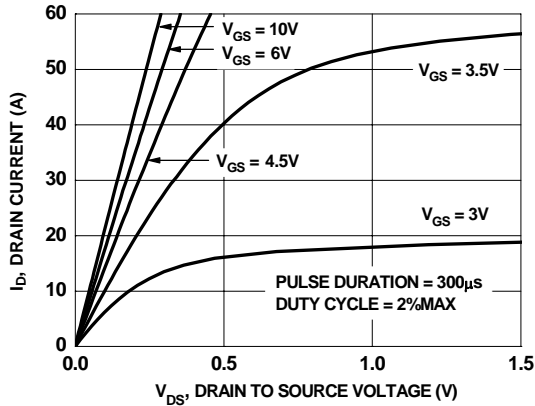## Typical Characteristics T_J = 25°C unless otherwise noted

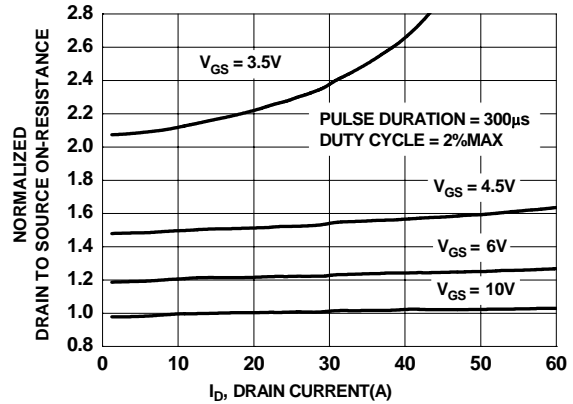Figure 1. On-Region Characteristics

Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage
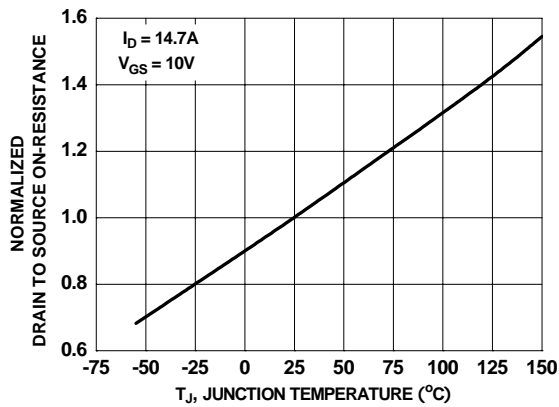

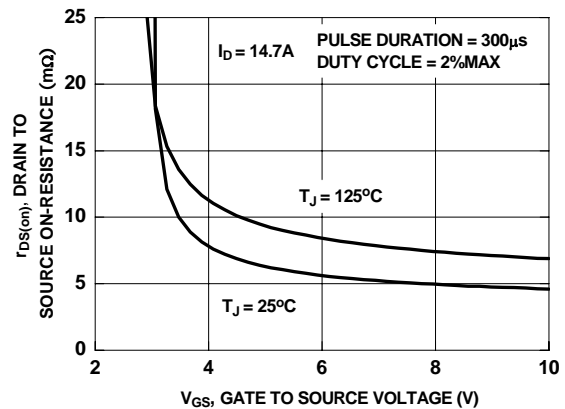Figure 3. Normalized On-Resistance vs Junction Temperature
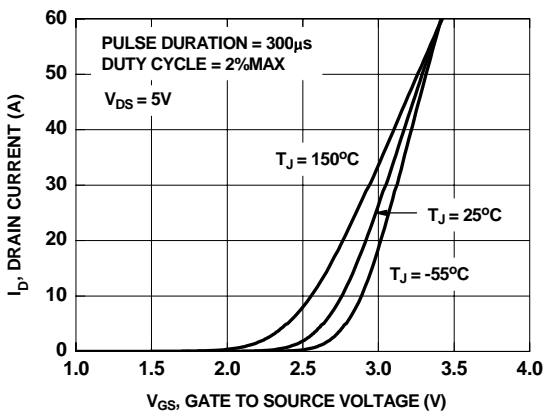

Figure 4. On-Resistance vs Gate to Source Voltage

Figure 5. Transfer Characteristics
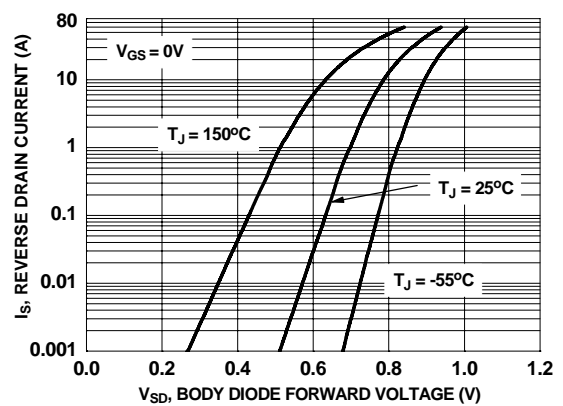

Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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Typical Characteristics T_J = 25°C unless otherwise noted

I_D = 14.7A
V_{DD} = 10V
V_{DD} = 15V
V_{DD} = 20V
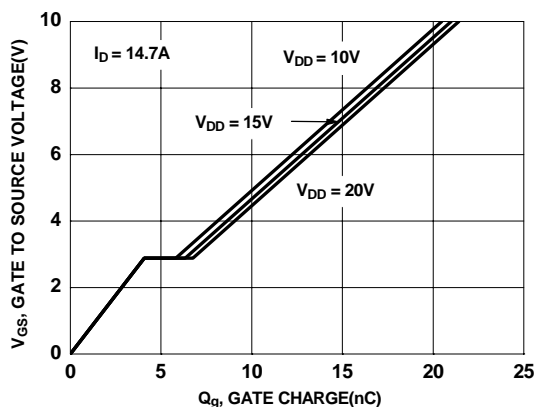
Figure 7. Gate Charge Characteristics

C_{iss}
C_{oss}
C_{rss}
f = 1MHz
V_{GS} = 0V
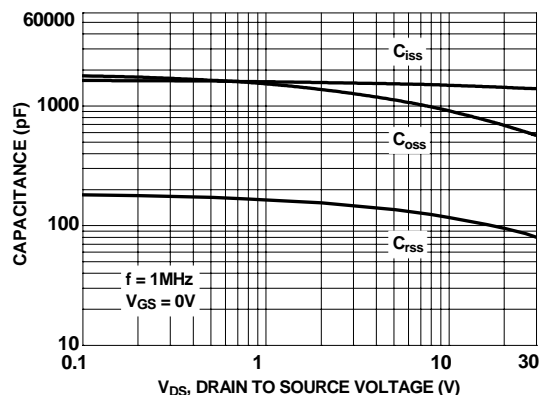
Figure 8. Capacitance vs Drain to Source Voltage
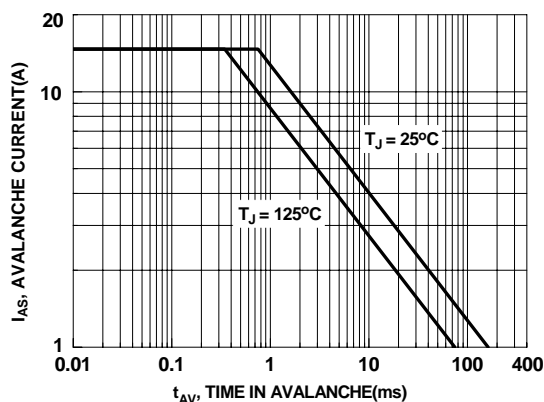
T_J = 25°C
T_J = 125°C

Figure 9. Unclamped Inductive Switching Capability

THIS AREA IS LIMITED BY $r_{DS(on)}$
SINGLE PULSE
T_J = MAX RATED
$R_{\theta JA}$ = 125°C/W
T_A = 25°C
1ms
10ms
100ms
1s
10s
DC
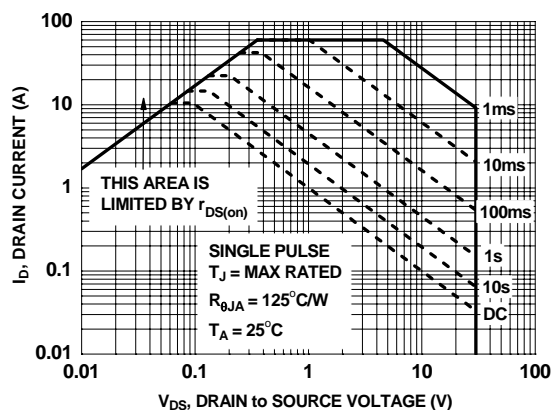
Figure 10. Forward Bias Safe Operating Area

V_{GS} = 10V
SINGLE PULSE
$R_{\theta JA}$ = 125°C/W
T_A = 25°C
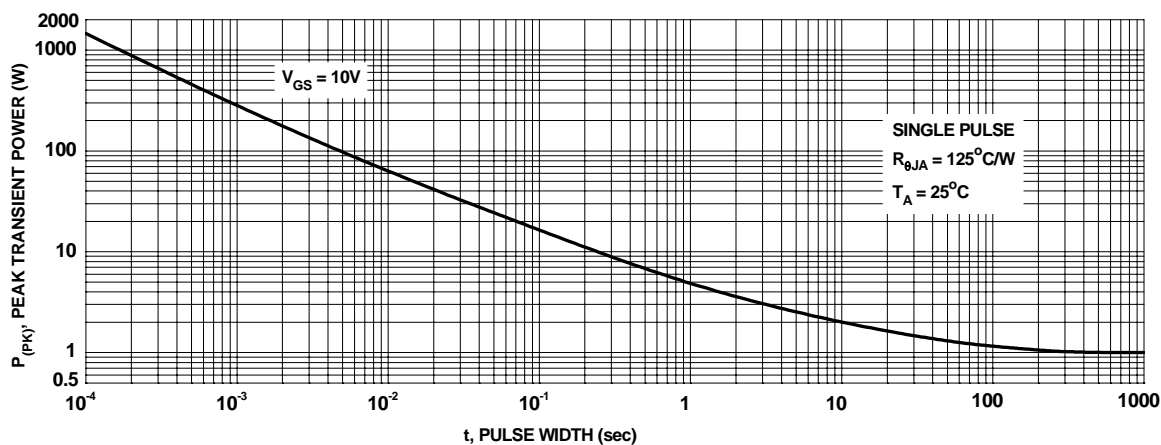
Figure 11. Single Pulse Maximum Power Dissipation

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Typical Characteristics T_J = 25°C unless otherwise noted

Figure 12. Transient Thermal Response Curve
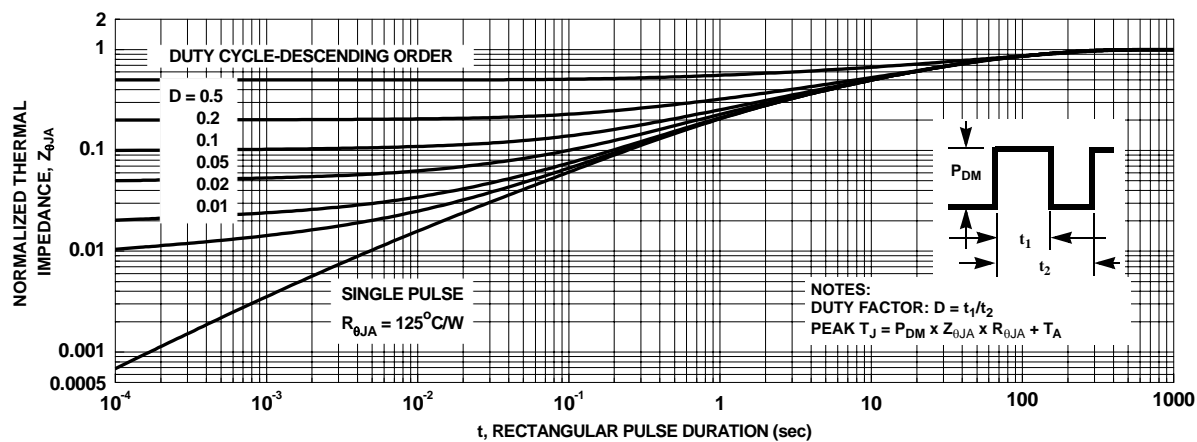
Dimensional Outline and Pad Layout

LAND PATTERN
RECOMMENDATION

DETAIL A
SCALE: 2X
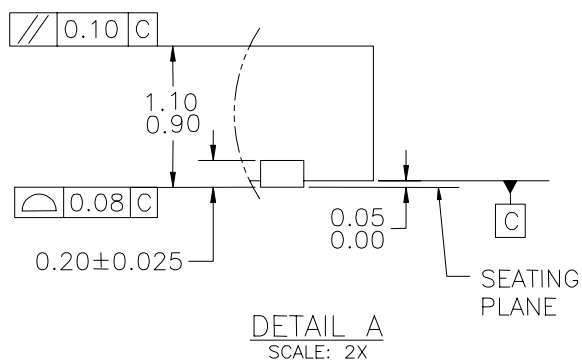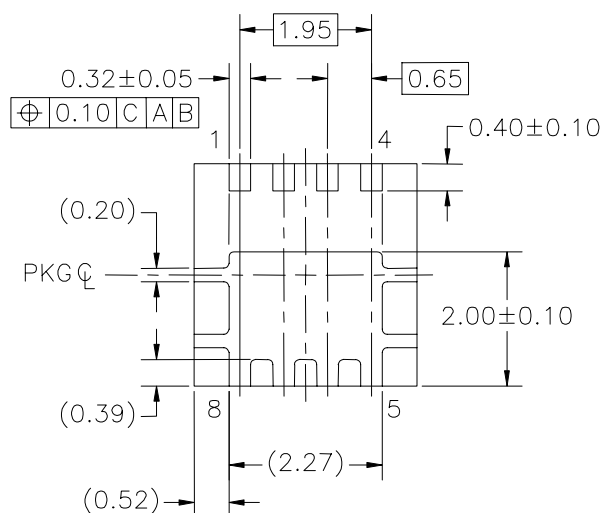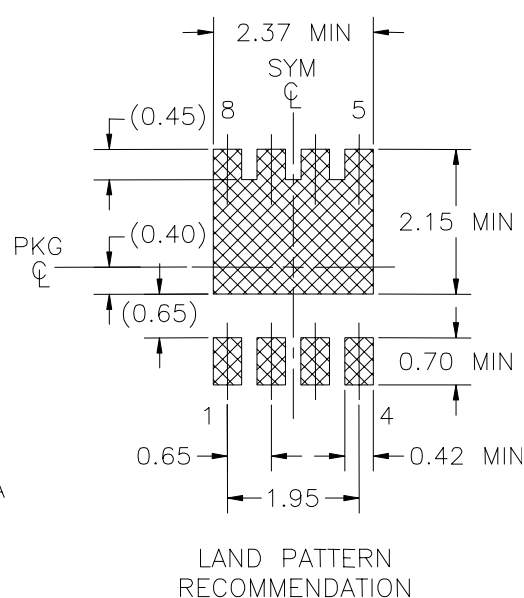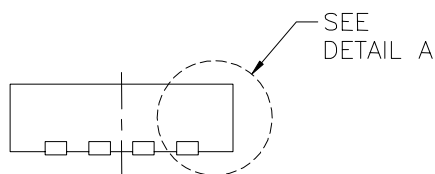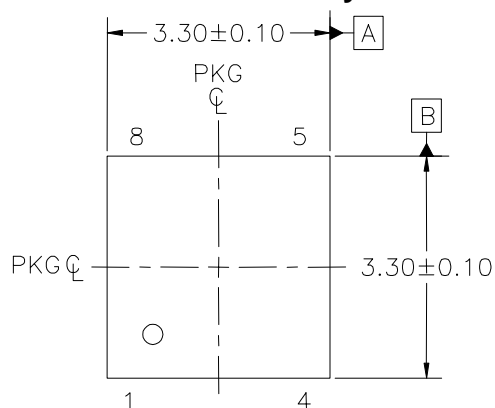
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C) DIMENSIONS DO NOT INCLUDE BURRS
   OR MOLD FLASH. MOLD FLASH OR
   BURRS DOES NOT EXCEED 0.10MM.
D) DIMENSIONING AND TOLERANCING PER
   ASME Y14.5M−1994.
E) DRAWING FILE NAME: PQFN08BREV1

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Definition of Terms

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Preliminary	First Production	This 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	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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