



FDMS3626S

PowerTrench® Power Stage

25V Asymmetric Dual N-Channel MOSFET

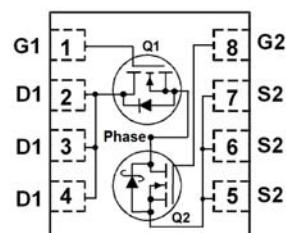
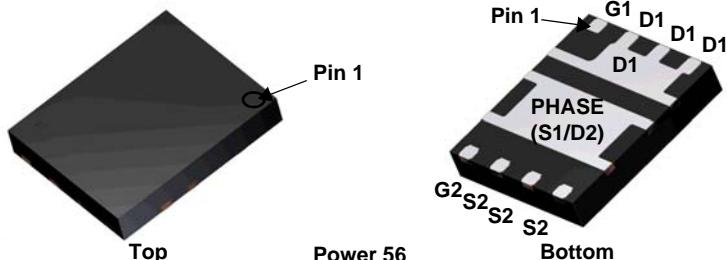
Features

Q1: N-Channel

- Max $r_{DS(on)} = 5.0 \text{ m}\Omega$ at $V_{GS} = 10 \text{ V}$, $I_D = 17.5 \text{ A}$
- Max $r_{DS(on)} = 5.7 \text{ m}\Omega$ at $V_{GS} = 4.5 \text{ V}$, $I_D = 16 \text{ A}$

Q2: N-Channel

- Max $r_{DS(on)} = 2.6 \text{ m}\Omega$ at $V_{GS} = 10 \text{ V}$, $I_D = 25 \text{ A}$
- Max $r_{DS(on)} = 3.2 \text{ m}\Omega$ at $V_{GS} = 4.5 \text{ V}$, $I_D = 22 \text{ A}$
- Low inductance packaging shortens rise/fall times, resulting in lower switching losses
- MOSFET integration enables optimum layout for lower circuit inductance and reduced switch node ringing
- RoHS Compliant



MOSFET Maximum Ratings $T_A = 25 \text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Q1	Q2	Units	
V_{DS}	Drain to Source Voltage	25	25	V	
V_{GS}	Gate to Source Voltage	(Note 4)	± 12	V	
I_D	Drain Current -Continuous (Package limited)	$T_C = 25 \text{ }^\circ\text{C}$	30	A	
	-Continuous	$T_A = 25 \text{ }^\circ\text{C}$	17.5^{1a}		
	-Pulsed	70	100		
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	29	45	mJ
P_D	Power Dissipation for Single Operation	$T_A = 25 \text{ }^\circ\text{C}$	2.2^{1a}	W	
	Power Dissipation for Single Operation	$T_A = 25 \text{ }^\circ\text{C}$	1.0^{1c}		
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150		°C	

Thermal Characteristics

R_{QJA}	Thermal Resistance, Junction to Ambient	57^{1a}	50^{1b}	°C/W
R_{QJA}	Thermal Resistance, Junction to Ambient	125^{1c}	120^{1d}	
R_{QJC}	Thermal Resistance, Junction to Case	3.0	3.0	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
08OD 10OD	FDMS3626S	Power 56	13 "	12 mm	3000 units

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
--------	-----------	-----------------	------	-----	-----	-----	-------

Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$ $I_D = 1 \text{ mA}, V_{GS} = 0 \text{ V}$	Q1 Q2	25 25			V
$\Delta \text{BV}_{\text{DSS}} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}, \text{referenced to } 25^\circ\text{C}$ $I_D = 10 \text{ mA}, \text{referenced to } 25^\circ\text{C}$	Q1 Q2		12 25		$\text{mV}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}$	Q1 Q2			1 500	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = 12 \text{ V}/-8 \text{ V}, V_{DS} = 0 \text{ V}$	Q1 Q2			± 100 ± 100	nA

On Characteristics

$V_{GS(\text{th})}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$ $V_{GS} = V_{DS}, I_D = 1 \text{ mA}$	Q1 Q2	0.8 1.1	1.2 1.4	2.0 2.2	V
$\Delta V_{GS(\text{th})} / \Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}, \text{referenced to } 25^\circ\text{C}$ $I_D = 10 \text{ mA}, \text{referenced to } 25^\circ\text{C}$	Q1 Q2		-4 -3		$\text{mV}/^\circ\text{C}$
$r_{DS(\text{on})}$	Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 17.5 \text{ A}$ $V_{GS} = 4.5 \text{ V}, I_D = 16 \text{ A}$ $V_{GS} = 10 \text{ V}, I_D = 17.5 \text{ A}, T_J = 125^\circ\text{C}$	Q1		3.8 4.4 5.4	5.0 5.7 7.0	$\text{m}\Omega$
		$V_{GS} = 10 \text{ V}, I_D = 25 \text{ A}$ $V_{GS} = 4.5 \text{ V}, I_D = 22 \text{ A}$ $V_{GS} = 10 \text{ V}, I_D = 25 \text{ A}, T_J = 125^\circ\text{C}$	Q2		2.1 2.6 2.9	2.6 3.2 3.8	
g_{FS}	Forward Transconductance	$V_{DS} = 5 \text{ V}, I_D = 17.5 \text{ A}$ $V_{DS} = 5 \text{ V}, I_D = 25 \text{ A}$	Q1 Q2		100 227		s

Dynamic Characteristics

C_{iss}	Input Capacitance	Q1: $V_{DS} = 13 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHZ}$	Q1 Q2		1570 2545		pF
C_{oss}	Output Capacitance	Q2: $V_{DS} = 13 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHZ}$	Q1 Q2		448 716		pF
			Q1 Q2		61 103		pF
R_g	Gate Resistance		Q1 Q2		0.4 0.9		Ω

Switching Characteristics

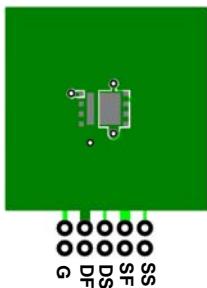
$t_{d(\text{on})}$	Turn-On Delay Time	Q1: $V_{DD} = 13 \text{ V}, I_D = 17.5 \text{ A}, R_{\text{GEN}} = 6 \Omega$	Q1 Q2		7 8		ns
t_r	Rise Time	Q2: $V_{DD} = 13 \text{ V}, I_D = 25 \text{ A}, R_{\text{GEN}} = 6 \Omega$	Q1 Q2		2 4		ns
$t_{d(\text{off})}$	Turn-Off Delay Time	Q2: $V_{DD} = 13 \text{ V}, I_D = 25 \text{ A}, R_{\text{GEN}} = 6 \Omega$	Q1 Q2		23 31		ns
t_f	Fall Time		Q1 Q2		2 3		ns
Q_g	Total Gate Charge	$V_{GS} = 0 \text{ V} \text{ to } 10 \text{ V}$	Q1		26 41		nC
Q_g	Total Gate Charge	$V_{GS} = 0 \text{ V} \text{ to } 4.5 \text{ V}$	$V_{DD} = 13 \text{ V}, I_D = 17.5 \text{ A}$	Q1 Q2	12 19		nC
Q_{gs}	Gate to Source Gate Charge		Q2 $V_{DD} = 13 \text{ V}, I_D = 25 \text{ A}$	Q1 Q2	3.3 4.9		nC
Q_{gd}	Gate to Drain "Miller" Charge			Q1 Q2	2.7 4.3		nC

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

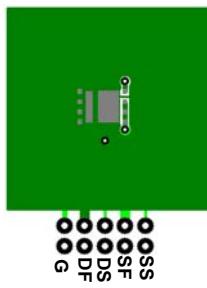
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Drain-Source Diode Characteristics							
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 17.5 \text{ A}$ (Note 2) $V_{GS} = 0 \text{ V}, I_S = 25 \text{ A}$ (Note 2)	Q1 Q2		0.8 0.8	1.2 1.2	V
t_{rr}	Reverse Recovery Time	Q1 $I_F = 17.5 \text{ A}, dI/dt = 100 \text{ A}/\mu\text{s}$	Q1 Q2		23 23		ns
Q_{rr}	Reverse Recovery Charge	Q2 $I_F = 25 \text{ A}, dI/dt = 300 \text{ A}/\mu\text{s}$	Q1 Q2		9 22		nC

Notes:

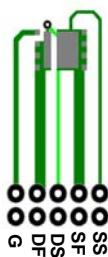
1. R_{thJA} is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. R_{thJC} is guaranteed by design while R_{thCA} is determined by the user's board design.



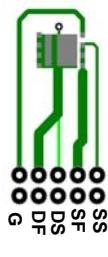
a. 57 °C/W when mounted on a 1 in² pad of 2 oz copper



b. 50 °C/W when mounted on a 1 in² pad of 2 oz copper



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



d. 120 °C/W when mounted on a minimum pad of 2 oz copper

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

3. Q1: E_{AS} of 29 mJ is based on starting $T_J = 25^\circ\text{C}$; N-ch: $L = 1.2 \text{ mH}, I_{AS} = 7 \text{ A}, V_{DD} = 23 \text{ V}, V_{GS} = 10 \text{ V}$. 100% test at $L = 0.1 \text{ mH}, I_{AS} = 16 \text{ A}$.

Q2: E_{AS} of 45 mJ is based on starting $T_J = 25^\circ\text{C}$; N-ch: $L = 0.4 \text{ mH}, I_{AS} = 15 \text{ A}, V_{DD} = 23 \text{ V}, V_{GS} = 10 \text{ V}$. 100% test at $L = 0.1 \text{ mH}, I_{AS} = 23.8 \text{ A}$.

4. As an N-ch device, the negative V_{GS} rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

Typical Characteristics (Q1 N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

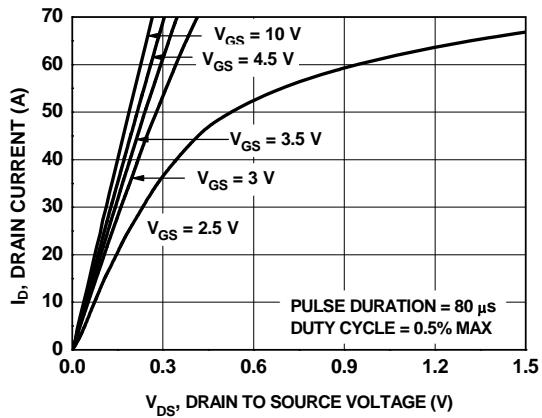


Figure 1. On Region Characteristics

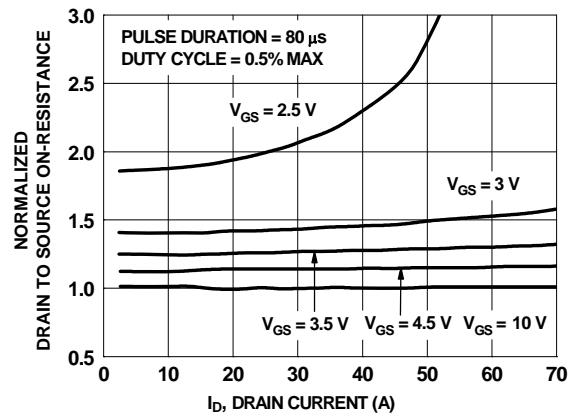


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

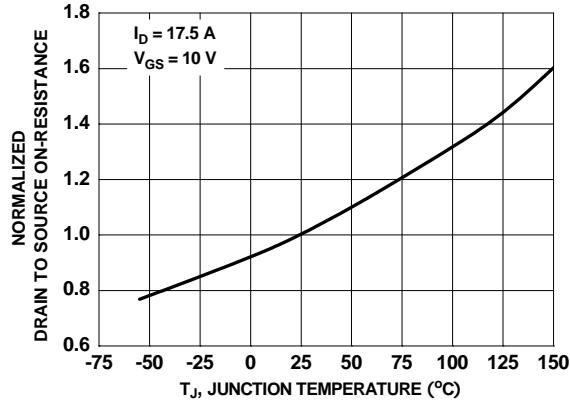


Figure 3. Normalized On Resistance vs Junction Temperature

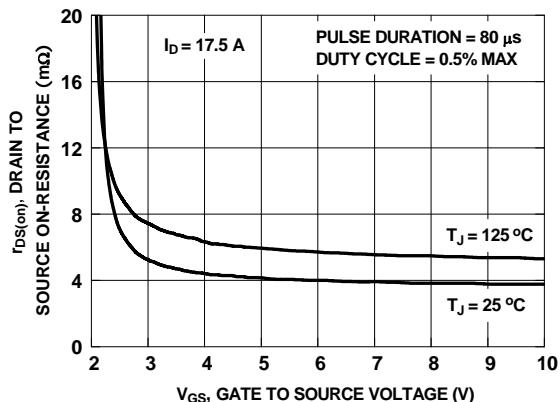


Figure 4. On-Resistance vs Gate to Source Voltage

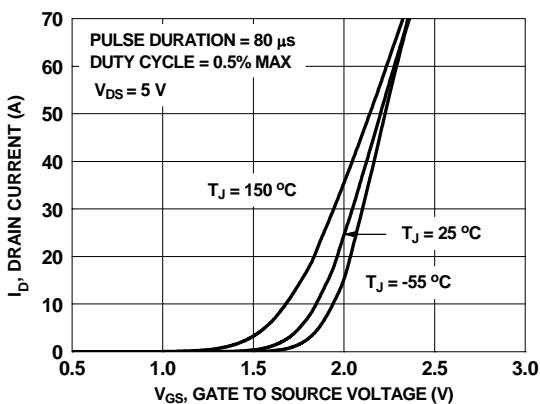


Figure 5. Transfer Characteristics

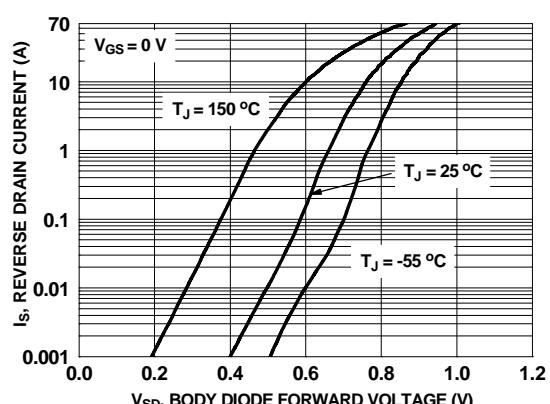


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (Q1 N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

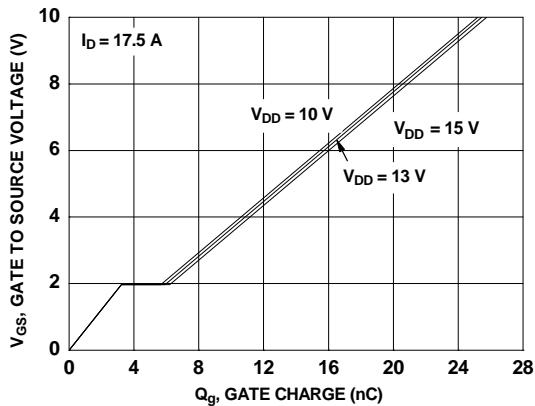


Figure 7. Gate Charge Characteristics

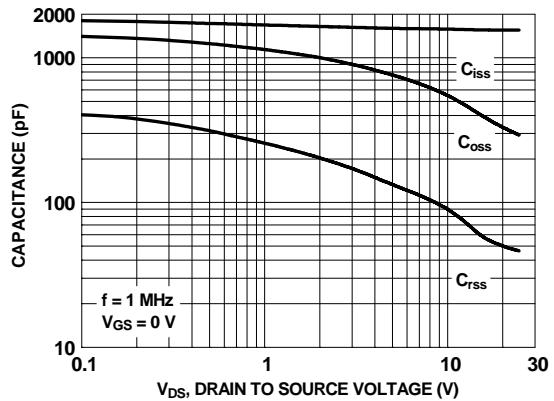


Figure 8. Capacitance vs Drain to Source Voltage

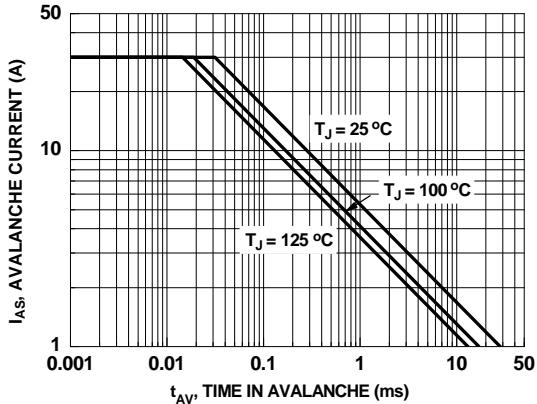


Figure 9. Unclamped Inductive Switching Capability

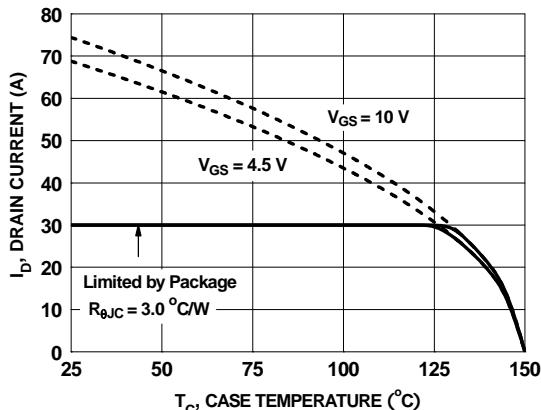


Figure 10. Maximum Continuous Drain Current vs Case Temperature

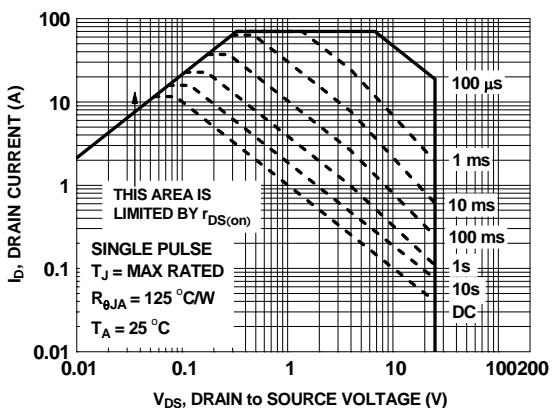


Figure 11. Forward Bias Safe Operating Area

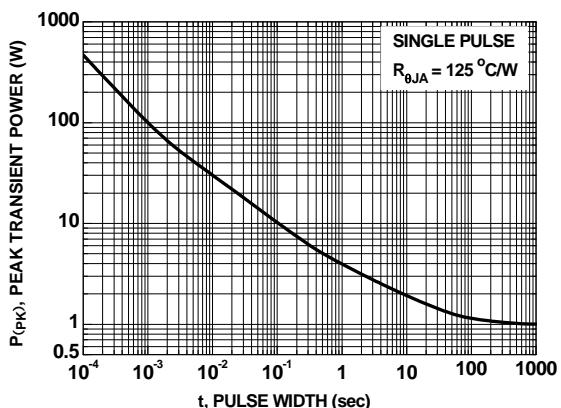


Figure 12. Single Pulse Maximum Power Dissipation

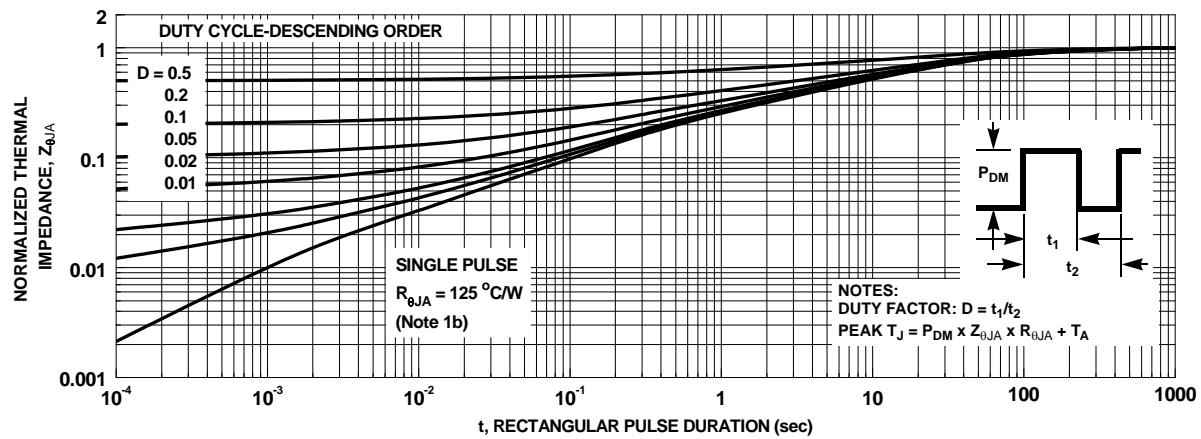
Typical Characteristics (Q1 N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

Figure 13. Junction-to-Ambient Transient Thermal Response Curve

Typical Characteristics (Q2 N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

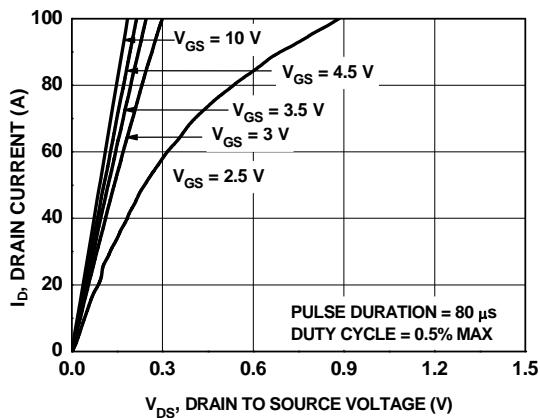


Figure 14. On-Region Characteristics

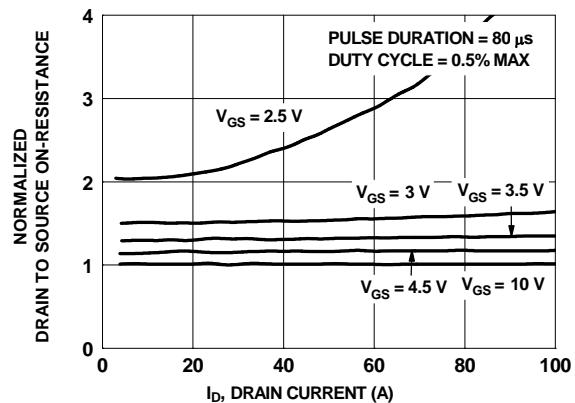


Figure 15. Normalized on-Resistance vs Drain Current and Gate Voltage

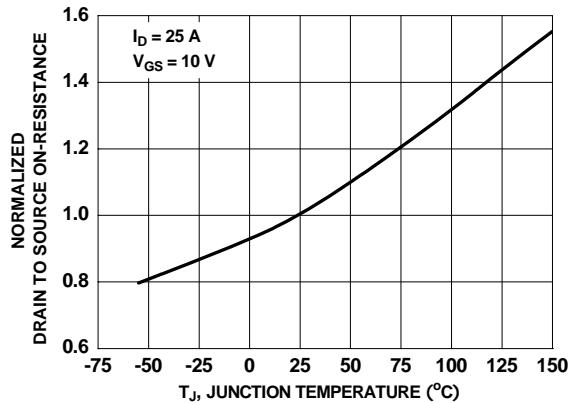


Figure 16. Normalized On-Resistance vs Junction Temperature

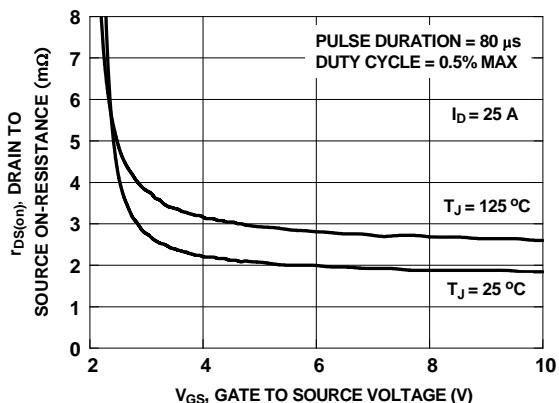


Figure 17. On-Resistance vs Gate to Source Voltage

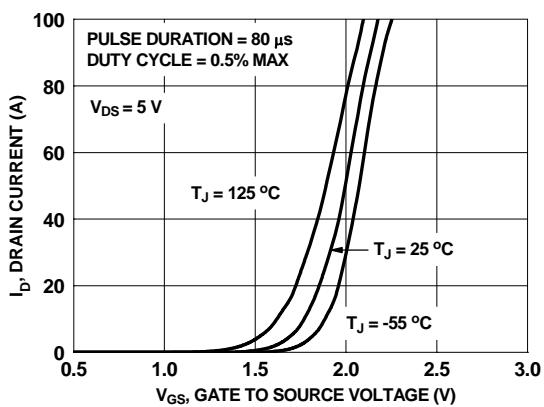


Figure 18. Transfer Characteristics

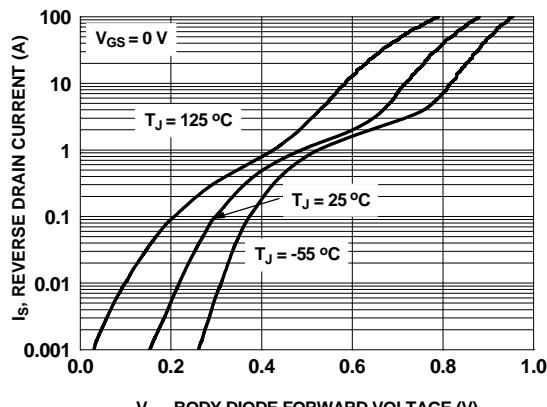


Figure 19. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (Q2 N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

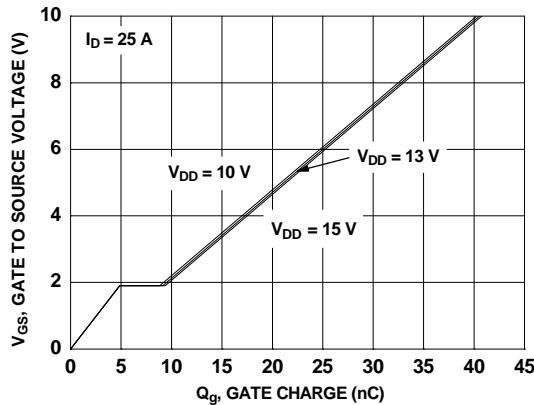


Figure 20. Gate Charge Characteristics

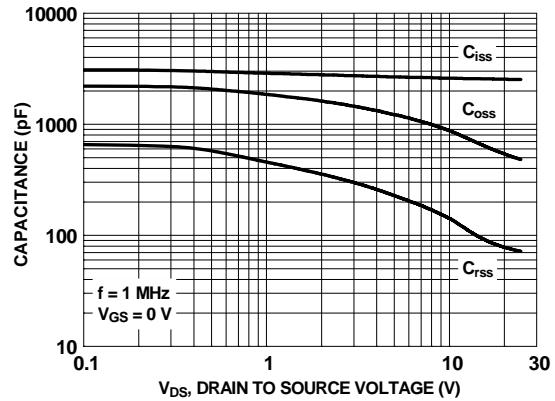


Figure 21. Capacitance vs Drain to Source Voltage

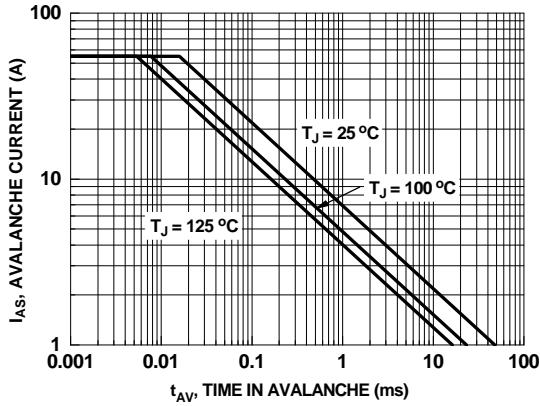


Figure 22. Unclamped Inductive Switching Capability

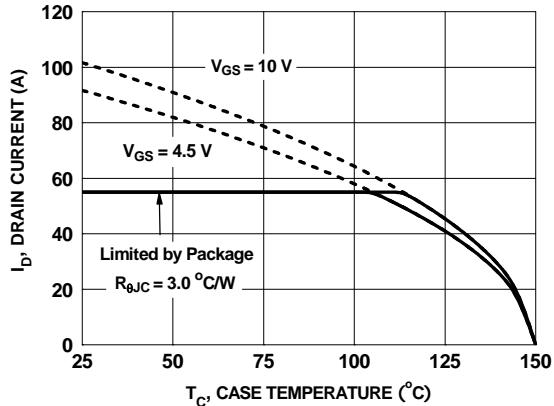


Figure 23. Maximum Continuous Drain Current vs Case Temperature

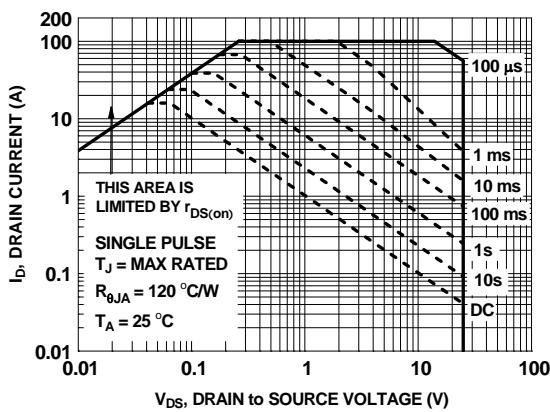


Figure 24. Forward Bias Safe Operating Area

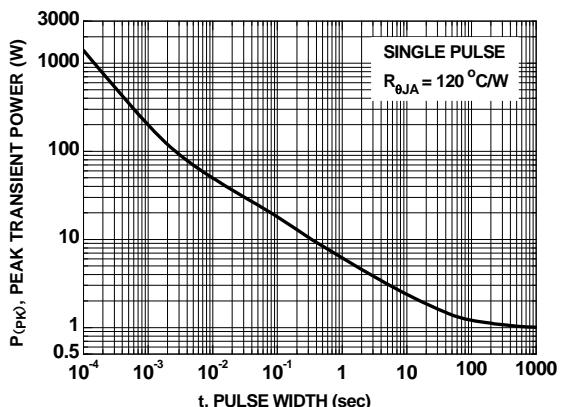


Figure 25. Single Pulse Maximum Power Dissipation

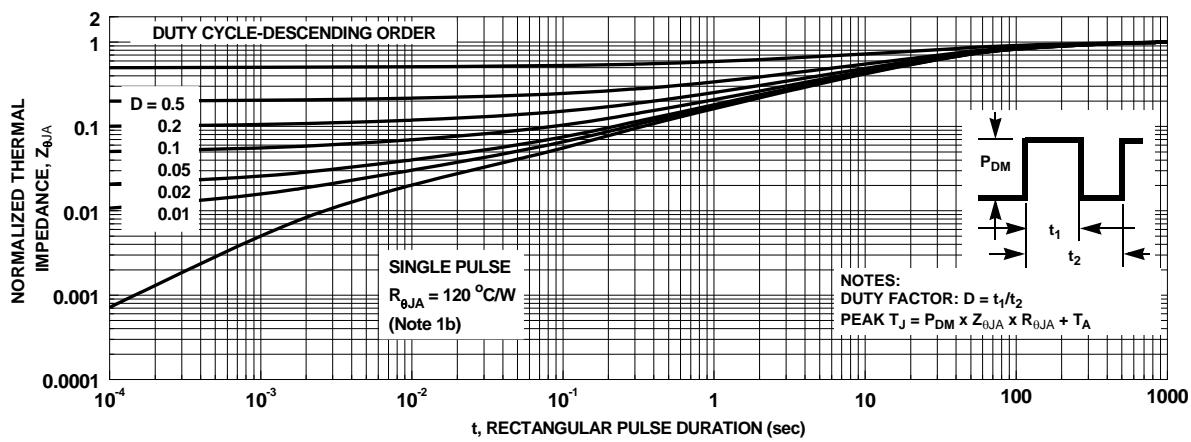
Typical Characteristics (Q2 N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

Figure 26. Junction-to-Ambient Transient Thermal Response Curve

Typical Characteristics (continued)

SyncFET Schottky body diode Characteristics

Fairchild's SyncFET process embeds a Schottky diode in parallel with PowerTrench MOSFET. This diode exhibits similar characteristics to a discrete external Schottky diode in parallel with a MOSFET. Figure 27 shows the reverse recovery characteristic of the FDMS3626S.

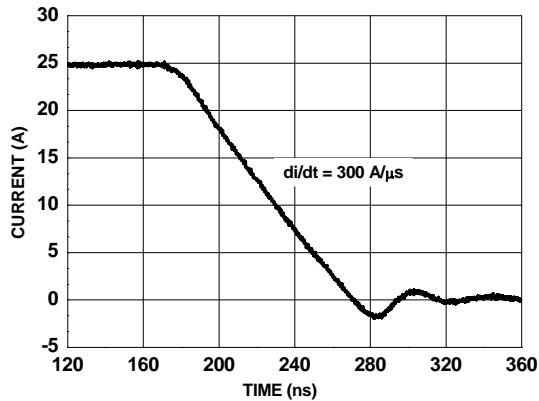


Figure 27. FDMS3626S SyncFET body diode reverse recovery characteristic

Schottky barrier diodes exhibit significant leakage at high temperature and high reverse voltage. This will increase the power in the device.

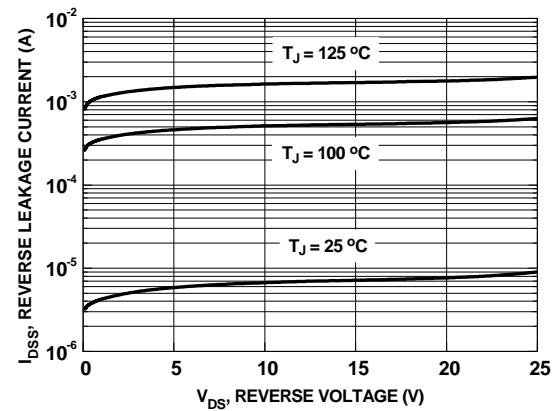
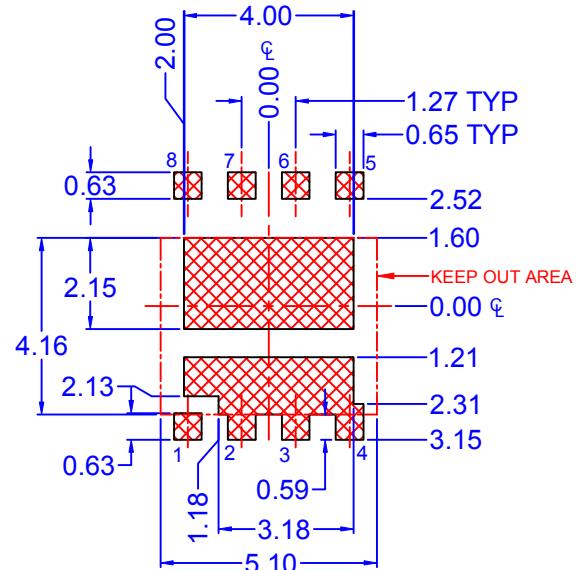
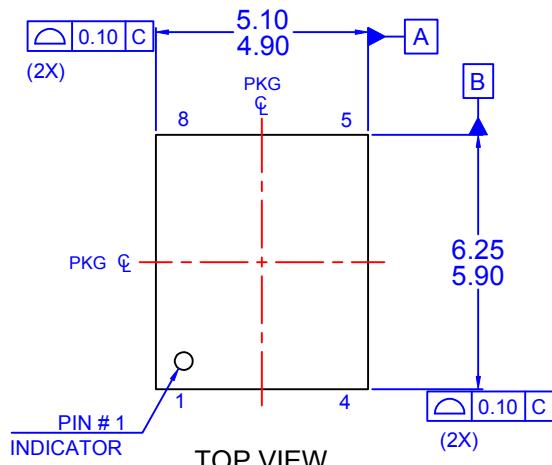
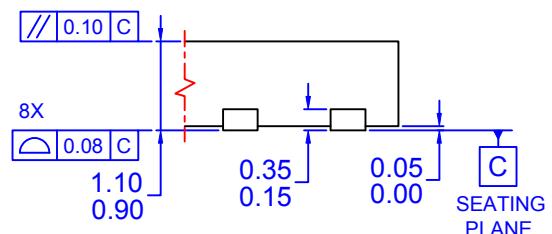
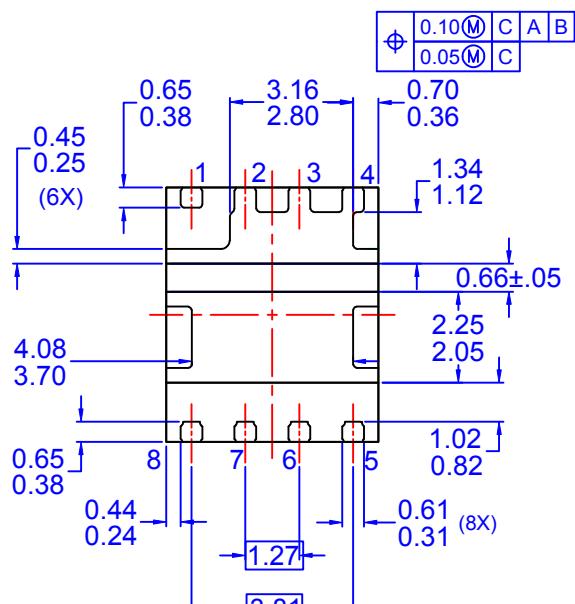


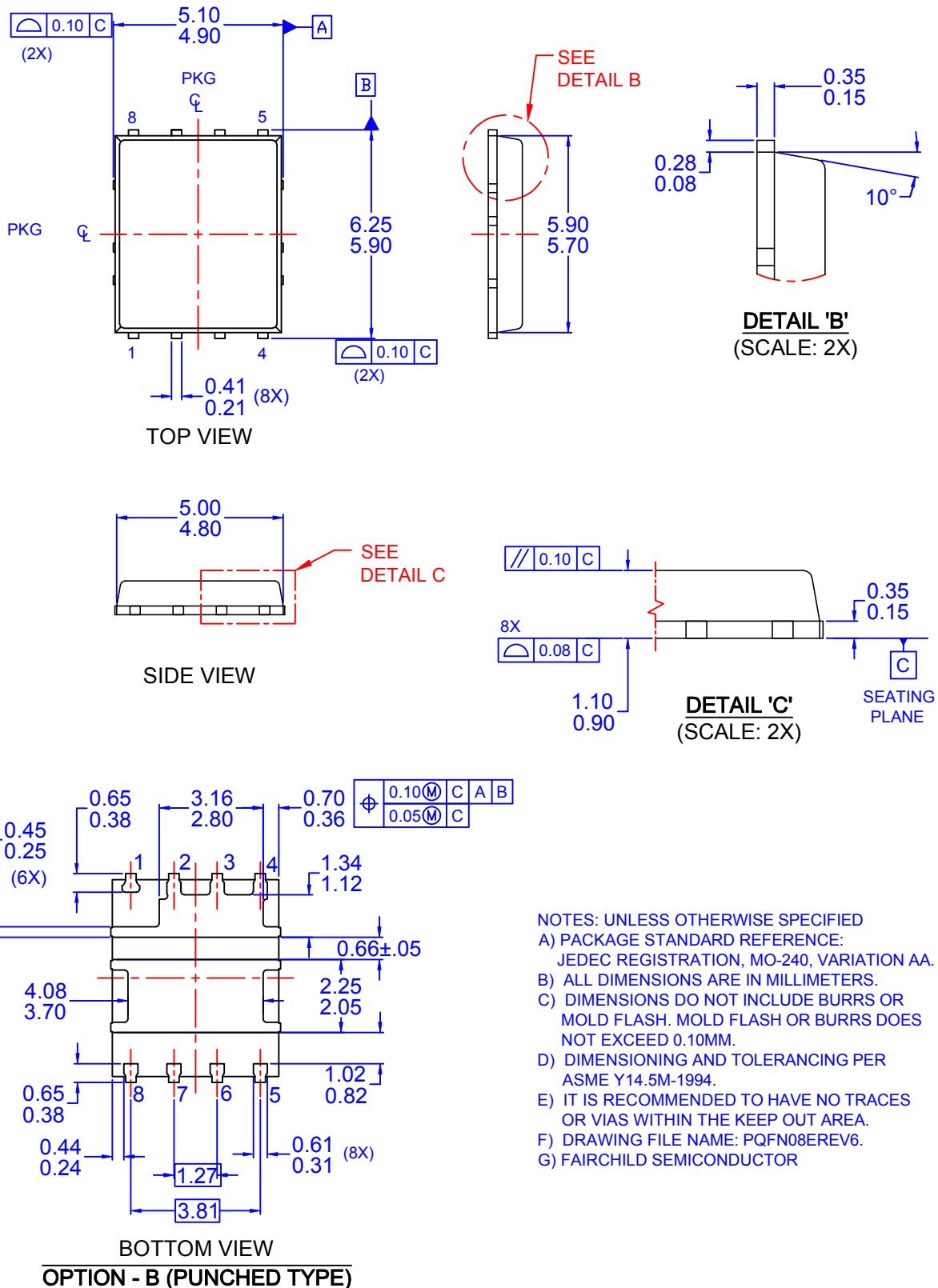
Figure 28. SyncFET body diode reverse leakage versus drain-source voltage



SIDE VIEW



DETAIL 'A'
(SCALE: 2X)





TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™
 AttitudeEngine™
 Awinda®
 AX-CAP®*
 BitSiC™
 Build it Now™
 CorePLUS™
 CorePOWER™
 CROSSVOLT™
 CTL™
 Current Transfer Logic™
 DEUXPEED®
 Dual Cool™
 EcosPARK®
 EfficientMax™
 ESBG™
 F®
 Fairchild®
 Fairchild Semiconductor®
 FACT Quiet Series™
 FACT®
 FastvCore™
 FETBench™
 FPS™
 FPF™
 Global Power Resource™
 GreenBridge™
 Green FPS™
 Green FPS™ e-Series™
 Gmax™
 GTO™
 IntelliMAX™
 ISOPLANAR™
 Making Small Speakers Sound Louder and Better™
 MegaBuck™
 MICROCOUPLER™
 MicroFET™
 MicroPak™
 MicroPak2™
 MillerDrive™
 MotionMax™
 MotionGrid™
 MTI®
 MTx®
 MVN®
 mWSaver®
 OptoHi™
 OPTOLOGIC®

OPTOPLANAR®
 Power Supply WebDesigner™
 PowerTrench®
 PowerXST™
 Programmable Active Droop™
 QFET®
 QS™
 Quiet Series™
 RapidConfigure™
 Saving our world, 1mW/W/kW at a time™
 SignalWise™
 SmartMax™
 SMART START™
 Solutions for Your Success™
 SPM®
 STEALTH™
 SuperFET®
 SuperSOT™-3
 SuperSOT™-6
 SuperSOT™-8
 SupreMOS®
 SyncFET™
 Sync-Lock™

SYSTEM GENERAL®
 TinyBoost®
 TinyBuck®
 TinyCalc™
 TinyLogic®
 TINYOPTO™
 TinyPower™
 TinyPWM™
 TinyWire™
 TranSiC™
 TriFault Detect™
 TRUECURRENT®*
 μSerDes™
 UHC®
 Ultra FRFET™
 UniFET™
 VCX™
 VisualMax™
 VoltagePlus™
 XS™
 Xsens™
 仙童®

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT [HTTP://WWW.FAIRCHILDSEMI.COM](http://WWW.FAIRCHILDSEMI.COM). FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

AUTHORIZED USE

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Terms of Use

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

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.

Rev. I77