

FDW2521C

Complementary PowerTrench® MOSFET

General Description

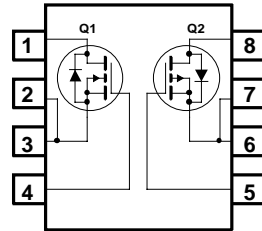
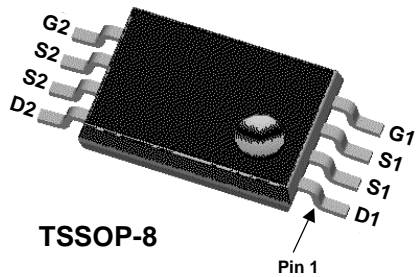
This complementary MOSFET device is produced using Fairchild's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance.

Applications

- DC/DC conversion
- Power management
- Load switch

Features

- **Q1: N-Channel**
5.5 A, 20 V. $R_{DS(ON)} = 21\text{ m}\Omega @ V_{GS} = 4.5\text{ V}$
 $R_{DS(ON)} = 35\text{ m}\Omega @ V_{GS} = 2.5\text{ V}$
- **Q2: P-Channel**
-3.8 A, 20 V. $R_{DS(ON)} = 43\text{ m}\Omega @ V_{GS} = -4.5\text{ V}$
 $R_{DS(ON)} = 70\text{ m}\Omega @ V_{GS} = -2.5\text{ V}$
- High performance trench technology for extremely low $R_{DS(ON)}$
- Low profile TSSOP-8 package



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

Symbol	Parameter	Q1	Q2	Units
V_{DSS}	Drain-Source Voltage	20	-20	V
V_{GSS}	Gate-Source Voltage	± 12	± 12	V
I_D	Drain Current - Continuous (Note 1a)	5.5	-3.8	A
	- Pulsed	30	-30	
P_D	Power Dissipation (Note 1a) (Note 1b)	1.0		W
		0.6		
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150		$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a) (Note 1b)	125	$^\circ\text{C/W}$
		208	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
2521C	FDW2521C	13"	12mm	3000 units

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

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Off Characteristics							
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ $V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	Q1 Q2	20 -20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C $I_D = -250\ \mu\text{A}$, Referenced to 25°C	Q1 Q2		14 -16		$\text{mV}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}$ $V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$	Q1 Q2			1 -1	μA
I_{GSS}	Gate-Body Leakage	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$ $V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$	Q1 Q2			± 100 ± 100	nA
On Characteristics (Note 2)							
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ $V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	Q1 Q2	0.6 -0.6	0.8 -1.0	1.5 -1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C $I_D = -250\ \mu\text{A}$, Referenced to 25°C	Q1 Q2		-3.2 3.0		$\text{mV}/^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 4.5\text{ V}, I_D = 5.5\text{ A}$ $V_{GS} = 2.5\text{ V}, I_D = 4.2\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 5.5\text{ A}, T_J = 125^\circ\text{C}$ $V_{GS} = -4.5\text{ V}, I_D = -3.8\text{ A}$ $V_{GS} = -2.5\text{ V}, I_D = -3.0\text{ A}$ $V_{GS} = -4.5\text{ V}, I_D = -3.8\text{ A}, T_J = 125^\circ\text{C}$	Q1 Q2		17 24 23 36 56 49	21 35 34 43 70 69	$\text{m}\Omega$
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 4.5\text{ V}, V_{DS} = 5\text{ V}$ $V_{GS} = -4.5\text{ V}, V_{DS} = -5\text{ V}$	Q1 Q2	30 -15			A
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{ V}, I_D = 5.5\text{ A}$ $V_{DS} = -5\text{ V}, I_D = -3.5\text{ A}$	Q1 Q2		26 13.2		S
Dynamic Characteristics							
C_{iss}	Input Capacitance	Q1: $V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$	Q1 Q2		1082 1030		pF
C_{oss}	Output Capacitance	Q2: $f = 1.0\text{ MHz}$	Q1 Q2		277 280		pF
C_{rss}	Reverse Transfer Capacitance	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$	Q1 Q2		130 120		pF
Switching Characteristics							
$t_{d(on)}$	Turn-On Delay Time	Q1: $V_{DD} = 10\text{ V}, I_D = 1\text{ A}$, $V_{GS} = 4.5\text{ V}, R_{GEN} = 6\ \Omega$	Q1 Q2		8 11	20 20	ns
t_r	Turn-On Rise Time	Q2: $V_{DD} = -5\text{ V}, I_D = -1\text{ A}$, $V_{GS} = -4.5\text{ V}, R_{GEN} = 6\ \Omega$	Q1 Q2		8 18	27 32	ns
$t_{d(off)}$	Turn-Off Delay Time	Q1: $V_{DD} = -5\text{ V}, I_D = -1\text{ A}$, $V_{GS} = -4.5\text{ V}, R_{GEN} = 6\ \Omega$	Q1 Q2		24 34	38 55	ns
t_f	Turn-Off Fall Time	Q2: $V_{DD} = -5\text{ V}, I_D = -1\text{ A}$, $V_{GS} = -4.5\text{ V}, R_{GEN} = 6\ \Omega$	Q1 Q2		8 34	16 55	ns
Q_g	Total Gate Charge	Q1: $V_{DS} = 10\text{ V}, I_D = 5.5\text{ A}, V_{GS} = 4.5\text{ V}$	Q1 Q2		12 9.7	17 16	nC
Q_{gs}	Gate-Source Charge	Q2: $V_{DS} = -5\text{ V}, I_D = -3.8\text{ A}, V_{GS} = -4.5\text{ V}$	Q1 Q2		2 2.2		nC
Q_{gd}	Gate-Drain Charge		Q1 Q2		3 2.4		nC

Electrical Characteristics (continued) $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Drain-Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Drain-Source Diode Forward Current		Q1 Q2			0.83 -0.83	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 0.83\text{ A}$ (Note 2) $V_{GS} = 0\text{ V}, I_S = -0.83\text{ A}$ (Note 2)	Q1 Q2		0.7 -0.7	1.2 -1.2	V

Notes:

1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.

- a) $R_{\theta JA}$ is 125°C/W (steady state) when mounted on a 1 inch² copper pad on FR-4.
- b) $R_{\theta JA}$ is 208°C/W (steady state) when mounted on a minimum copper pad on FR-4.

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

Typical Characteristics: Q1

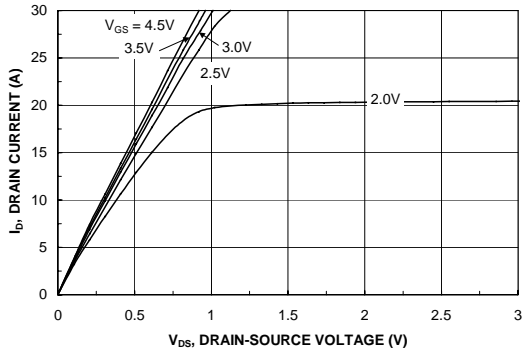


Figure 1. On-Region Characteristics.

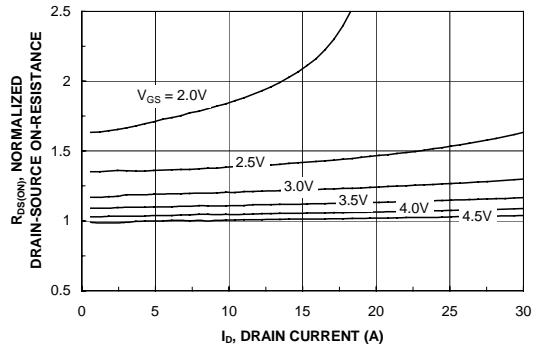


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

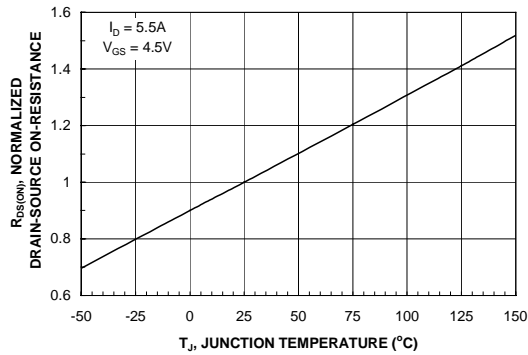


Figure 3. On-Resistance Variation with Temperature.

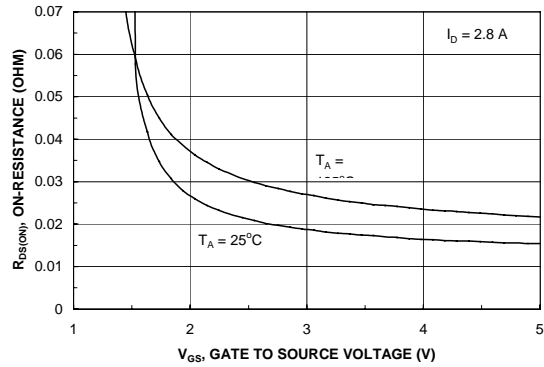


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

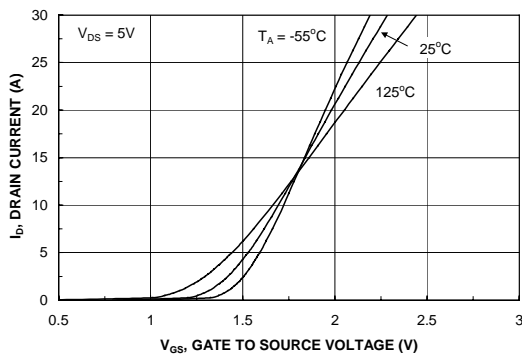


Figure 5. Transfer Characteristics.

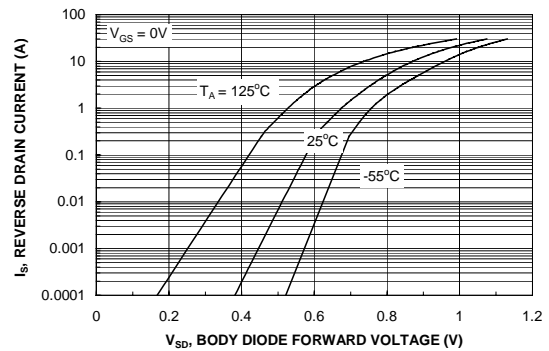


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics: Q1

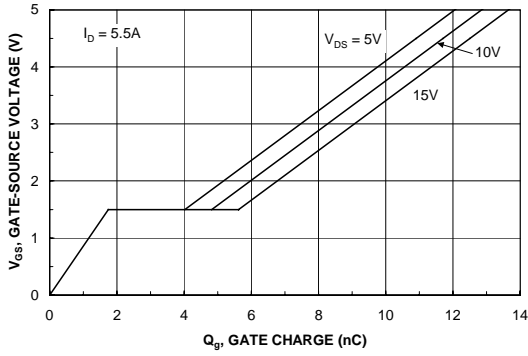


Figure 7. Gate Charge Characteristics.

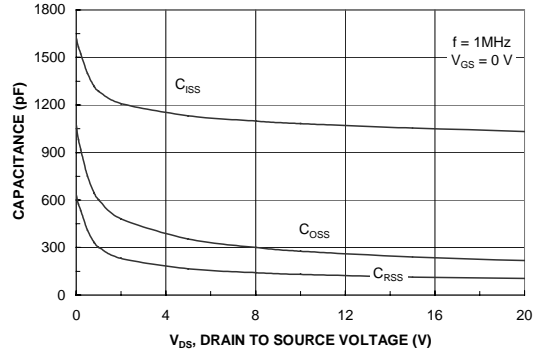


Figure 8. Capacitance Characteristics.

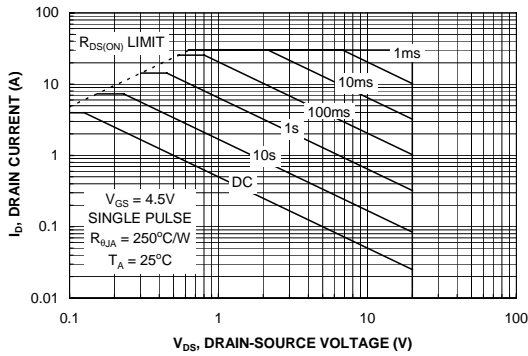


Figure 9. Maximum Safe Operating Area.

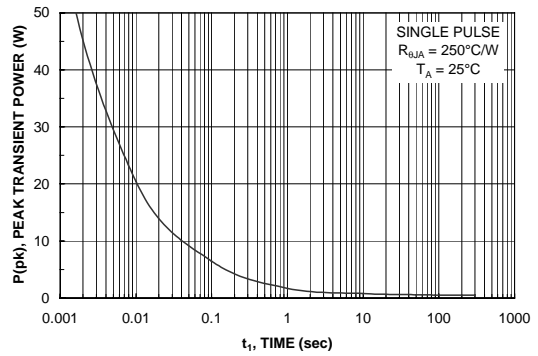


Figure 10. Single Pulse Maximum Power Dissipation.

Typical Characteristics: Q2

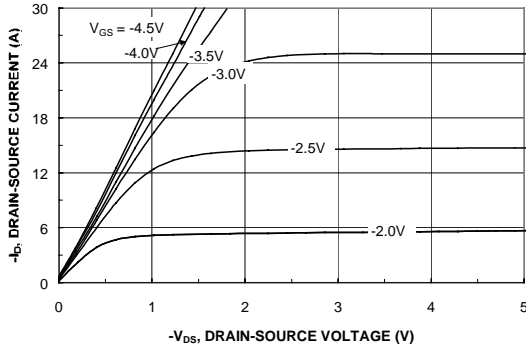


Figure 11. On-Region Characteristics.

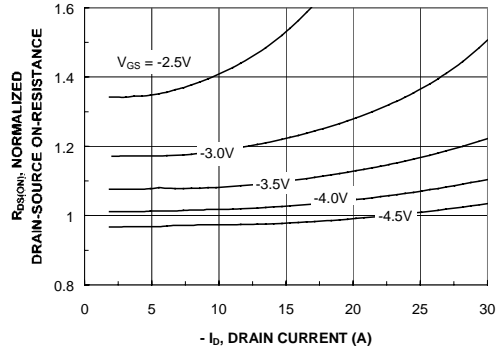


Figure 12. On-Resistance Variation with Drain Current and Gate Voltage.

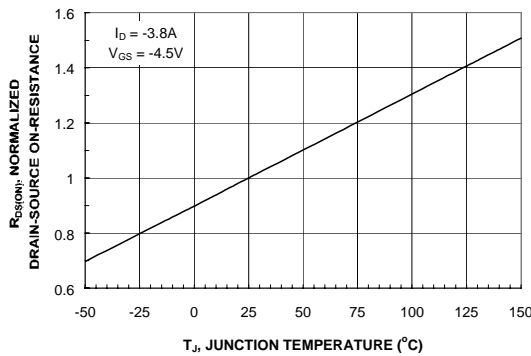


Figure 13. On-Resistance Variation with Temperature.

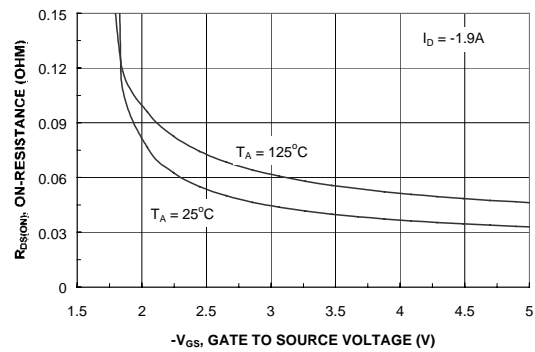


Figure 14. On-Resistance Variation with Gate-to-Source Voltage.

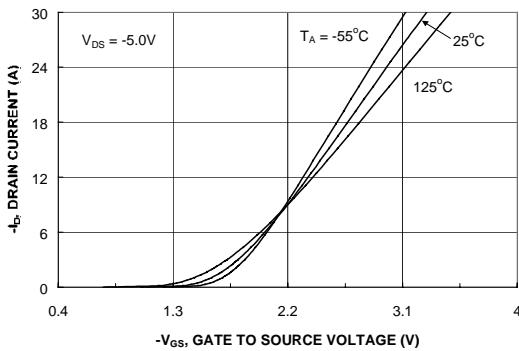


Figure 15. Transfer Characteristics.

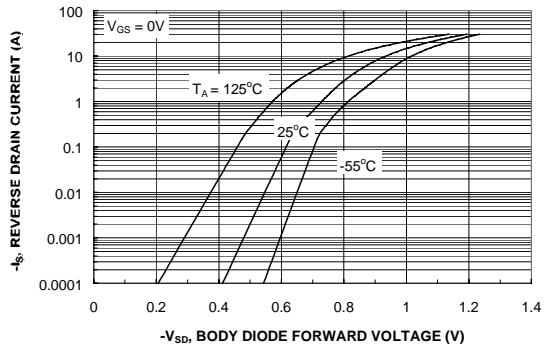


Figure 16. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics: Q2

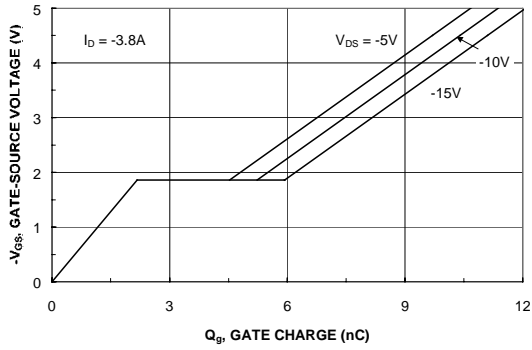


Figure 17. Gate Charge Characteristics.

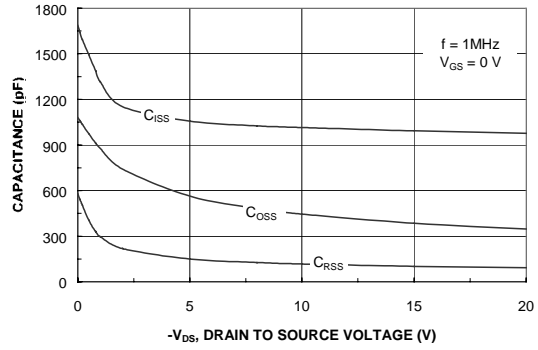


Figure 18. Capacitance Characteristics.

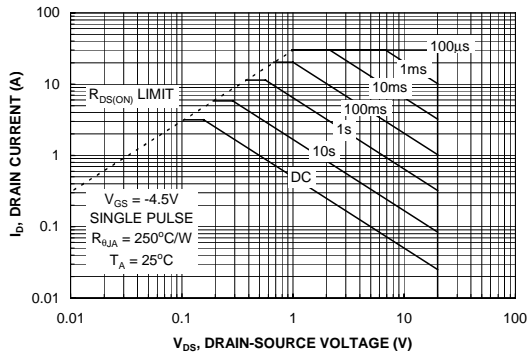


Figure 19. Maximum Safe Operating Area.

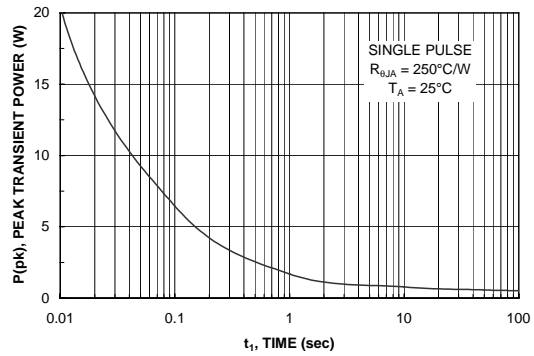


Figure 20. Single Pulse Maximum Power Dissipation.

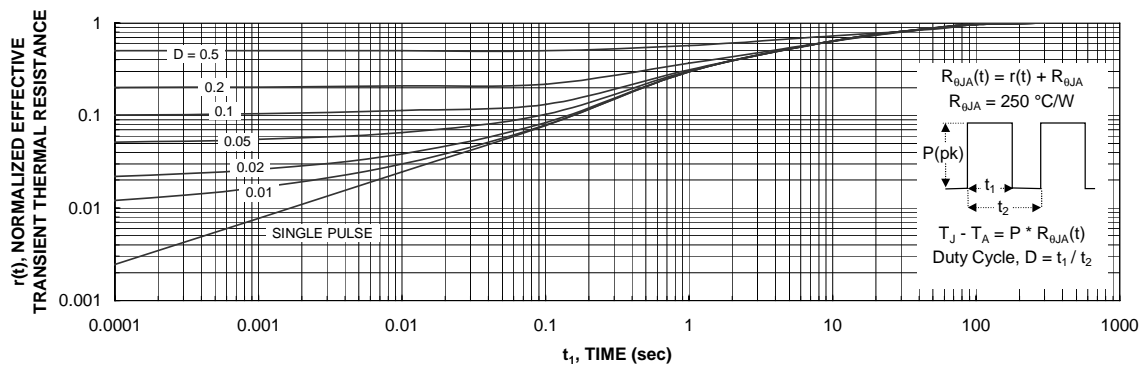


Figure 21. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b. Transient thermal response will change depending on the circuit board design.

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACE _x [™]	FAST [®]	MICROWIRE [™]	SILENT SWITCHER [®]	UHC [™]
Bottomless [™]	FAST _r [™]	OPTOLOGIC [®]	SMART START [™]	UltraFET [®]
CoolFET [™]	FRFET [™]	OPTOPLANAR [™]	SPM [™]	VCX [™]
CROSSVOLT [™]	GlobalOptoisolator [™]	PACMAN [™]	STAR*POWER [™]	
DenseTrench [™]	GTO [™]	POP [™]	Stealth [™]	
DOME [™]	HiSeC [™]	Power247 [™]	SuperSOT [™] -3	
EcoSPARK [™]	I ² C [™]	PowerTrench [®]	SuperSOT [™] -6	
E ² CMOS [™]	ISOPLANAR [™]	QFET [™]	SuperSOT [™] -8	
EnSigna [™]	LittleFET [™]	QS [™]	SyncFET [™]	
FACT [™]	MicroFET [™]	QT Optoelectronics [™]	TinyLogic [™]	
FACT Quiet Series [™]	MicroPak [™]	Quiet Series [™]	TruTranslation [™]	

STAR*POWER is used under license

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. 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.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.
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.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.



LittleDiode supplies new, hard to find or obsolete electronic components and semiconductors all over the world.

With over two million different components listed you are sure to find the part you need.

Feel free to visit us today at our online store:

LittleDiode.com

Looking forward to providing you with the best possible service.