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Fairchild Semiconductor
FDC6304P

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FAIRCHILD SEMICONDUCTOR TM

July 1997

FDC6304P
Digital FET, Dual P-Channel

General Description

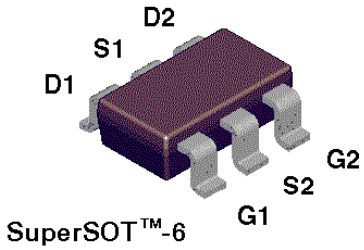
These P-Channel enhancement mode field effect transistor are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is tailored to minimize on-state resistance at low gate drive conditions. This device is designed especially for application in battery power applications such as notebook computers and cellular phones. This device has excellent on-state resistance even at gate drive voltages as low as 2.5 volts.

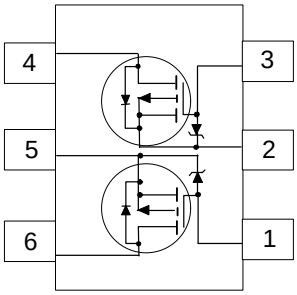
Features

- -25 V, -0.46 A continuous, -1.0 A Peak.
  $R_{DS(ON)}$ = 1.5 Ω @ V_{GS}= -2.7 V
  $R_{DS(ON)}$ = 1.1 Ω @ V_{GS} = -4.5 V.
- Very low level gate drive requirements allowing direct operation in 3V circuits. $V_{GS(th)}$ < 1.5 V.
- Gate-Source Zener for ESD ruggedness. >6kV Human Body Model.

SOT-23	SuperSOT™-6	SuperSOT™-8	SO-8	SOT-223	SOIC-16

Mark: .304





Absolute Maximum Ratings T_A = 25°C unless other wise noted

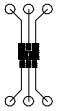
Symbol	Parameter		FDC6304P	Units
V_{DSS}	Drain-Source Voltage		-25	V
V_{GSS}	Gate-Source Voltage		-8	V
I_D	Drain Current	- Continuous	-0.46	A
		- Pulsed	-1	
P_D	Maximum Power Dissipation	(Note 1a)	0.9	W
		(Note 1b)	0.7	
T_J,T_{STG}	Operating and Storage Temperature Range		-55 to 150	°C
ESD	Electrostatic Discharge Rating MIL-STD-883D Human Body Model (100pf / 1500 Ohm)		6.0	kV
THERMAL CHARACTERISTICS				
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	140	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	60	°C/W

Electrical Characteristics (T_A = 25 °C unless otherwise noted)

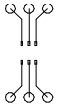
Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = -250 µA	-25			V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	I_D = -250 µA, Referenced to 25 °C		-22		mV /°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -20 V, V_{GS} = 0 V			-1	µA
		T_J = 55°C			-10	µA
I_{GSS}	Gate - Body Leakage Current	V_{GS} = -8 V, V_{DS} = 0 V			-100	nA
ON CHARACTERISTICS (Note 2)						
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Temp. Coefficient	I_D = -250 µA, Referenced to 25 °C		2.1		mV /°C
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250 µA	-0.65	-0.86	-1.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = -2.7 V, I_D = -0.25 A		1.22	1.5	Ω
		V_{GS} = -4.5 V, I_D = -0.5 A		0.87	1.1	
		T_J =125°C		1.21	2	
$I_{D(ON)}$	On-State Drain Current	V_{GS} = -2.7 V, V_{DS} = -5 V	-0.5			A
		V_{GS} = -4.5 V, V_{DS} = -5 V	-1			
g_{FS}	Forward Transconductance	V_{DS} = -5 V, I_D = -0.5 A		0.8		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = -10 V, V_{GS} = 0 V, f = 1.0 MHz		62		pF
C_{oss}	Output Capacitance			35		pF
C_{rss}	Reverse Transfer Capacitance			9.5		pF
SWITCHING CHARACTERISTICS (Note 2)						
$t_{D(on)}$	Turn - On Delay Time	V_{DD} = -6 V, I_D = -0.5 A, V_{GS} = -4.5 V, R_{GEN} = 50 Ω		7	20	ns
t_r	Turn - On Rise Time			8	20	ns
$t_{D(off)}$	Turn - Off Delay Time			55	110	ns
t_f	Turn - Off Fall Time			35	70	ns
Q_g	Total Gate Charge	V_{DS} = -5 V, I_D = - 0.25 A, V_{GS} = -4.5 V		1.1	1.5	nC
Q_{gs}	Gate-Source Charge			0.32		nC
Q_{gd}	Gate-Drain Charge			0.28		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I_S	Maximum Continuous Drain-Source Diode Forward Current				-0.5	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = -0.5 A (Note 2)		-0.88	-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. 140°C/W on a 0.125 in² pad of 2oz copper.



b. 180°C/W on a 0.005 in² of pad of 2oz copper.

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

Typical Electrical Characteristics

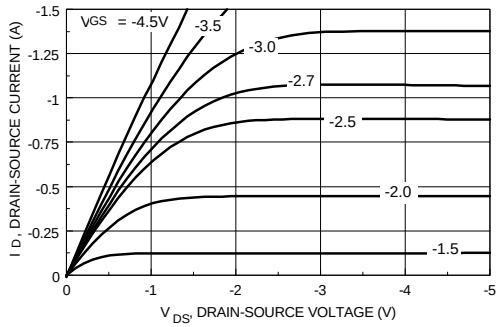


Figure 1. On-Region Characteristics.

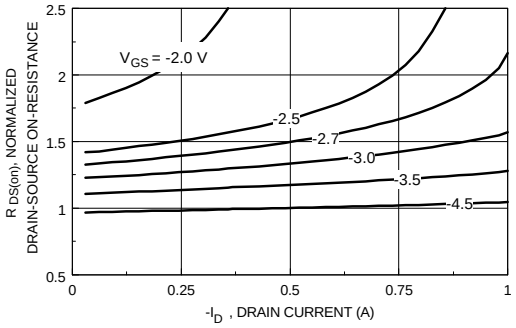


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

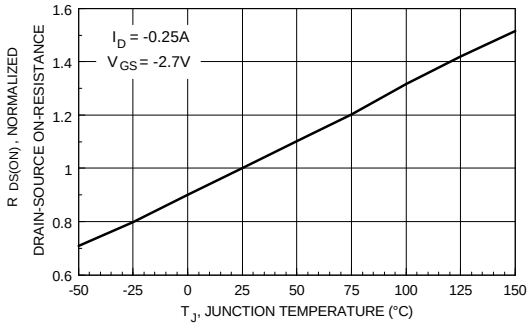


Figure 3. On-Resistance Variation with Temperature.

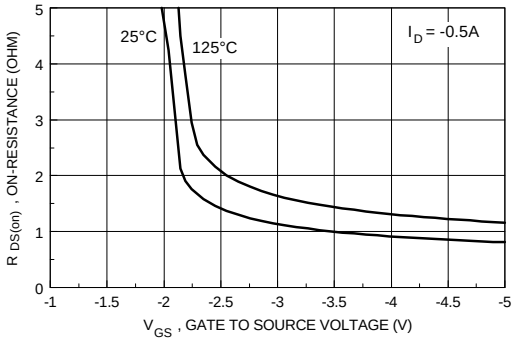


Figure 4. On Resistance Variation with Gate-To- Source Voltage.

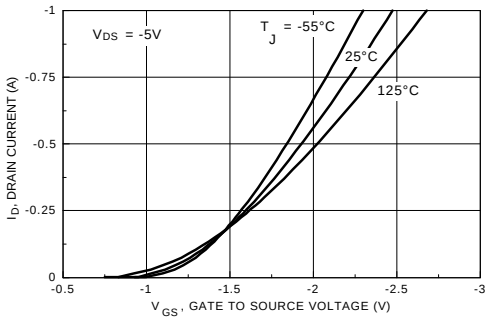


Figure 5. Transfer Characteristics.

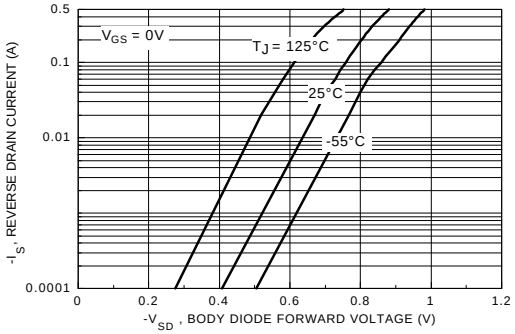


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical And Thermal Characteristics

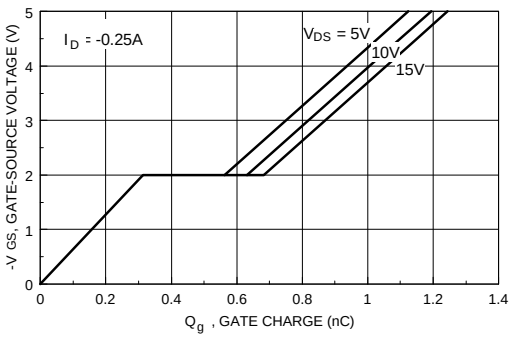


Figure 7. Gate Charge Characteristics.

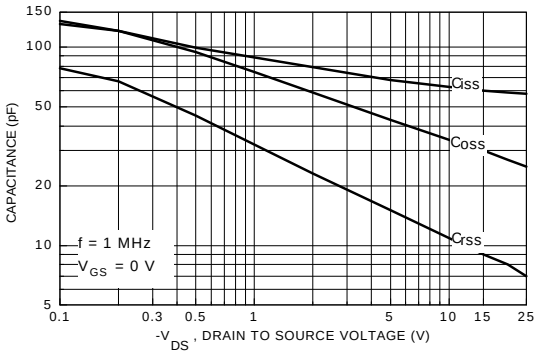


Figure 8. Capacitance Characteristics.

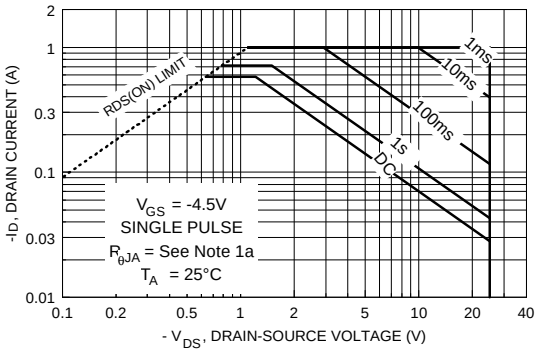


Figure 9. Maximum Safe Operating Area.

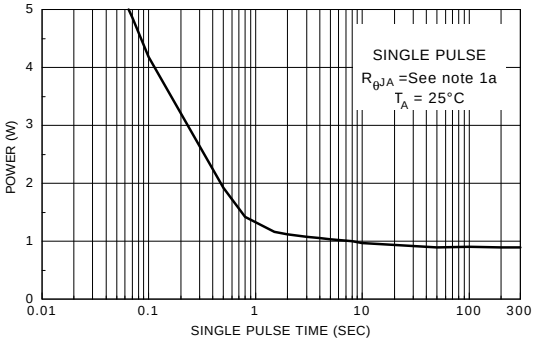


Figure 10. Single Pulse Maximum Power Dissipation.

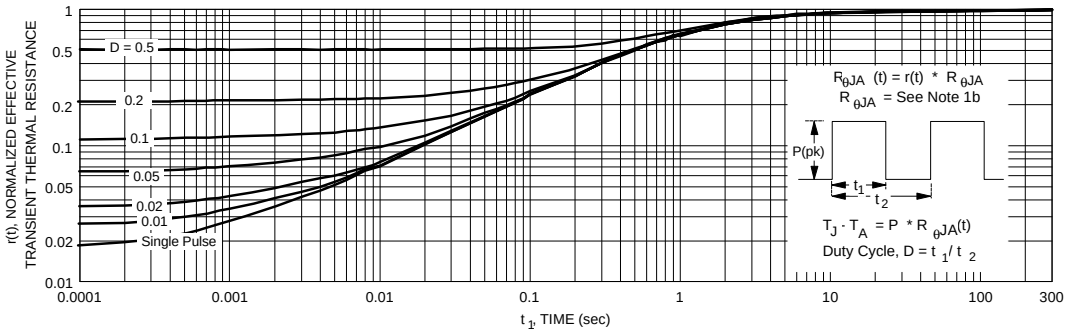


Figure 11. Transient Thermal Response Curve.

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

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