FAIRCHILD SEMICONDUCTOR TM

July 1999

FDG6304P
Dual P-Channel, Digital FET

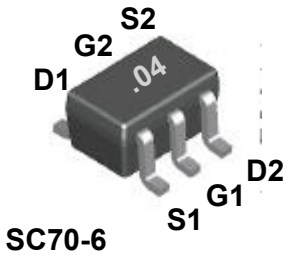
General Description

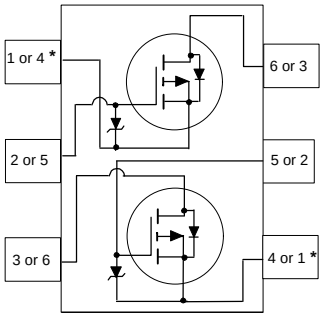
These dual P-Channel logic level enhancement mode field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is especially tailored to minimize on-state resistance. This device has been designed especially for low voltage applications as a replacement for bipolar digital transistors and small signal MOSFETs.

Features

- -25 V, -0.41 A continuous, -1.5 A peak.
  $R_{DS(ON)}$ = 1.1 Ω @ V_{GS}= -4.5 V,
  $R_{DS(ON)}$ = 1.5 Ω @ V_{GS}= -2.7 V.
- Very low level gate drive requirements allowing direct operation in 3 V circuits ($V_{GS(th)}$ < 1.5 V).
- Gate-Source Zener for ESD ruggedness (>6kV Human Body Model).
- Compact industry standard SC70-6 surface mount package.

SC70-6	SOT-23	SuperSOT™-6	SuperSOT™-8	SO-8	SOT-223





*The pinouts are symmetrical; pin 1 and 4 are interchangeable.
Units inside the carrier can be of either orientation and will not affect the functionality of the device.

Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter	FDG6304P	Units
V_{DSS}	Drain-Source Voltage	-25	V
V_{GSS}	Gate-Source Voltage	-8	V
I_D	Drain/Output Current - Continuous	-0.41	A
	- Pulsed	-1.5	
P_D	Maximum Power Dissipation (Note 1)	0.3	W
T_J,T_{STG}	Operating and Storage Temperature Range	-55 to 150	°C
ESD	Electrostatic Discharge Rating MIL-STD-883D Human Body Model (100 pF / 1500 Ω)	6.0	kV
THERMAL CHARACTERISTICS			
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1)	415	°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)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250 µA	-0.65	-0.82	-1.5	V
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Temp.Coefficient	I_D = -250 µA, Referenced to 25°C		2		mV /°C
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = -4.5 V, I_D = -0.41 A		0.85	1.1	Ω
		T_J =125°C		1.2	1.9	
		V_{GS} = -2.7 V, I_D = -0.25 A		1.15	1.5	
$I_{D(ON)}$	On-State Drain Current	V_{GS} = -4.5 V, V_{DS} = -5 V	-1.5			A
g_{FS}	Forward Transconductance	V_{DS} = -5 V, I_D = -0.41 A		0.9		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			34		pF
C_{rss}	Reverse Transfer Capacitance			10		pF
SWITCHING CHARACTERISTICS (Note 2)						
$t_{D(on)}$	Turn - On Delay Time	V_{DD} = -5 V, I_D = -0.5 A, V_{GS} = -4.5 V, R_{GEN} = 6 Ω		7	15	ns
t_r	Turn - On Rise Time			8	16	ns
$t_{D(off)}$	Turn - Off Delay Time			55	80	ns
t_f	Turn - Off Fall Time			35	60	ns
Q_g	Total Gate Charge	V_{DS} = -5 V, I_D = -0.41 A, V_{GS} = -4.5 V		1.1	1.5	nC
Q_{gs}	Gate-Source Charge			0.31		nC
Q_{gd}	Gate-Drain Charge			0.29		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I_S	Maximum Continuous Source Current				-0.25	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = -0.25 A (Note 2)		-0.85	-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. $R_{\theta JA}$ = 415°C/W on minimum pad mounting on FR-4 board in still air.
2. Pulse Test: Pulse Width ≤ 300µs, Duty Cycle ≤ 2.0%.

Typical Electrical Characteristics

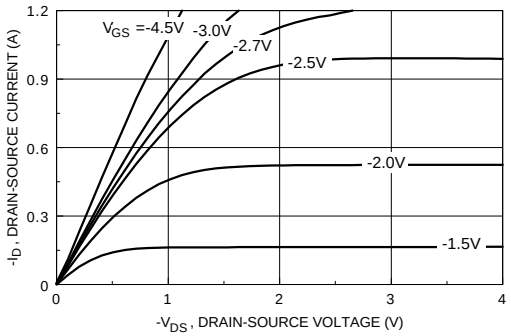


Figure 1. On-Region Characteristics.

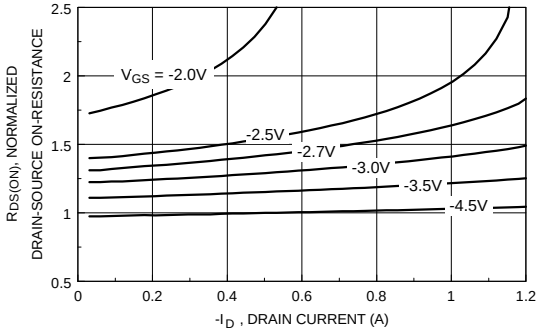


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

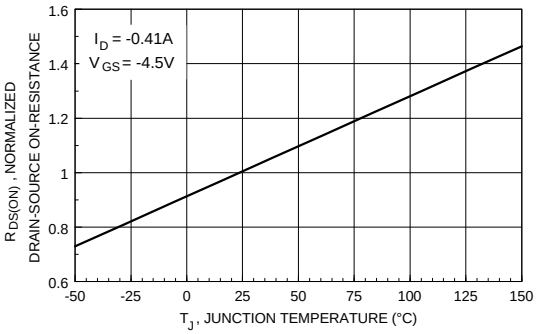


Figure 3. On-Resistance Variation with Temperature.

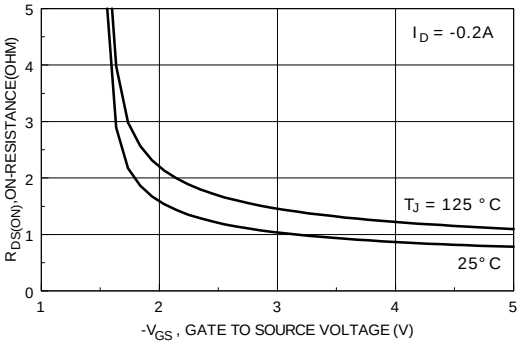


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

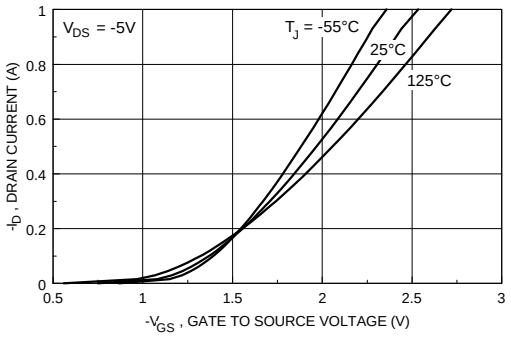


Figure 5. Transfer Characteristics.

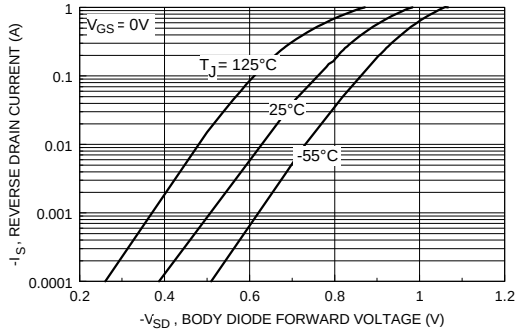


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical Characteristics

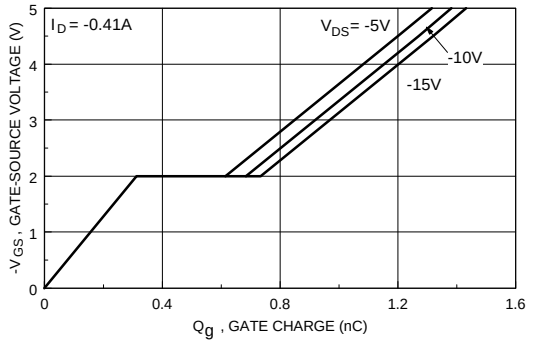


Figure 7. Gate Charge Characteristics.

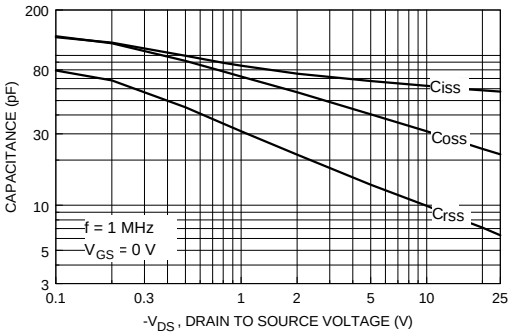


Figure 8. Capacitance Characteristics.

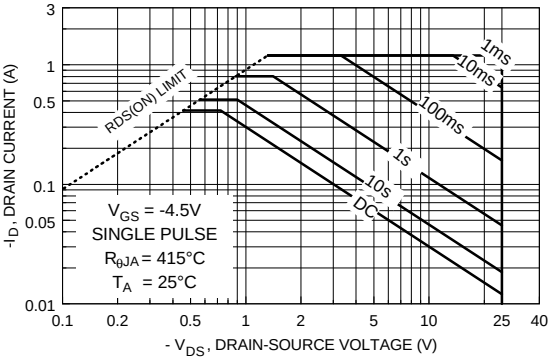


Figure 9. Maximum Safe Operating Area.

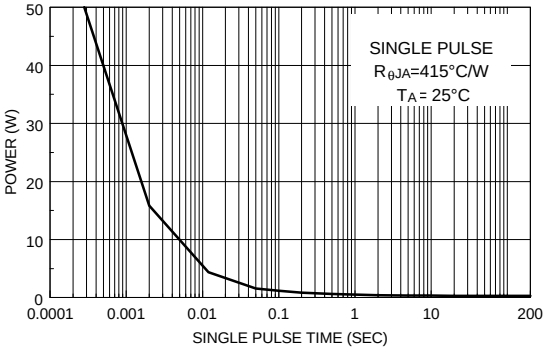


Figure 10. Single Pulse Maximum Power Dissipation.

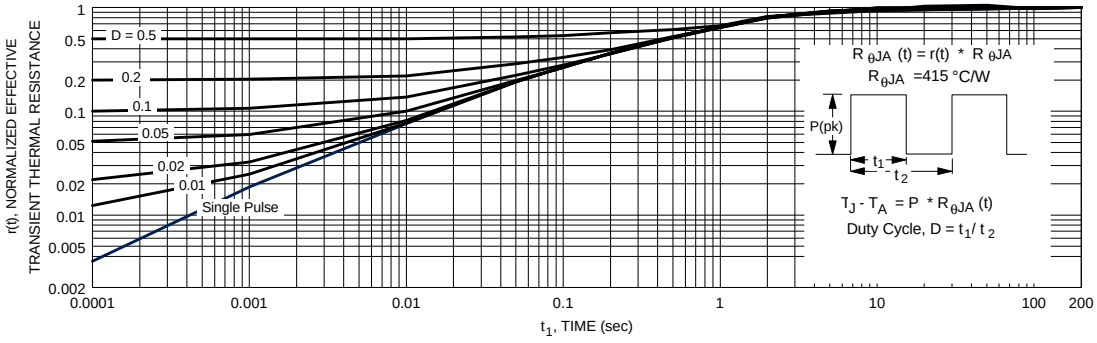


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in note 1.
Transient thermalresponse will change depending on the circuit board design.

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