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FAIRCHILD

SEMICONDUCTOR ™

August 2000

$QFET^{TM}$

FQS4900

Dual N & P-Channel, Logic Level MOSFET

General Description

These dual N and P-channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. This device is well suited for high interface in telephone sets.

Features

- N-Channel 1.3A, 60V, $R_{DS(on)}$ = 0.55 Ω @ V_{GS} = 10 V
  $R_{DS(on)}$ = 0.65 Ω @ V_{GS} = 5 V
  P-Channel -0.3A, -300V, $R_{DS(on)}$ = 15.5 Ω @ V_{GS} = -10 V
  $R_{DS(on)}$ = 16 Ω @ V_{GS} =- 5 V
- Low gate charge (typical N-Channel 1.6 nC)
  (typical P-Channel 3.6 nC)
- Fast switching
- Improved dv/dt capability
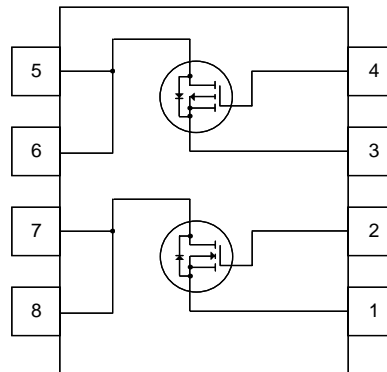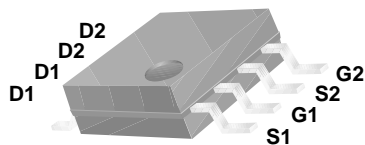
Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter		N-Channel	P-Channel	Units
V_{DSS}	Drain-Source Voltage		60	-300	V
I_D	Drain Current - Continuous (T_A = 25°C)		1.3	-0.3	A
	- Continuous (T_A = 70°C)		0.82	-0.19	A
I_{DM}	Drain Current - Pulsed	(Note 1)	5.2	-1.2	A
V_{GSS}	Gate-Source Voltage		± 20		V
dv/dt	Peak Diode Recovery dv/dt	(Note 2)	7.0	4.5	V/ns
P_D	Power Dissipation (T_A = 25°C)		2.0		W
	(T_A = 70°C)		1.3		W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150		°C

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{θJA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	°C/W

Rev. A, August 2000

Electrical Characteristics $T_A = 25°C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Off Characteristics							
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0$ V, $I_D = 250$ μA	N-Ch	60	--	--	V
		$V_{GS} = 0$ V, $I_D = -250$ μA	P-Ch	-300	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 60$ V, $V_{GS} = 0$ V	N-Ch	--	--	1	μA
		$V_{DS} = 48$ V, $T_C = 55°C$		--	--	10	μA
		$V_{DS} = -300$ V, $V_{GS} = 0$ V	P-Ch	--	--	-1	μA
		$V_{DS} = -240$ V, $T_C = 55°C$		--	--	-10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 20$ V, $V_{DS} = 0$ V	All	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -20$ V, $V_{DS} = 0$ V	All	--	--	-100	nA
On Characteristics							
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = 4$V, $I_D = 20$ mA	N-Ch	1.0	--	1.95	V
		$V_{DS} = 4$V, $I_D = -20$ mA	P-Ch	-1.0	--	-1.95	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10$ V, $I_D = 0.65$ A	N-Ch	--	0.39	0.55	Ω
		$V_{GS} = 5$ V, $I_D = 0.65$ A		--	0.46	0.65	Ω
		$V_{GS} = -10$ V, $I_D = -0.15$ A	P-CH	--	11.2	15.5	Ω
		$V_{GS} = -5$ V, $I_D = -0.15$ A		--	11.4	16	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 10$ V, $I_D = 0.65$ A	N-CH	--	1.7	--	S
		$V_{DS} = -10$ V, $I_D = -0.15$ A	P-CH	--	0.6	--	S
Switching Characteristics							
$t_{d(on)}$	Turn-On Delay Time	N-Channel $V_{DD} = 30$ V, $I_D = 1.3$ A, $R_G = 25$ Ω	N-Ch	--	5.7	21	ns
			P-Ch	--	10	30	ns
t_r	Turn-On Rise Time		N-Ch	--	21	50	ns
			P-Ch	--	25	60	ns
$t_{d(off)}$	Turn-Off Delay Time	P-Channel $V_{DD} = -150$ V, $I_D = -0.3$ A, $R_G = 25$ Ω	N-Ch	--	11	32	ns
			P-Ch	--	35	80	ns
t_f	Turn-Off Fall Time		N-Ch	--	17	45	ns
			P-Ch	--	47	105	ns
Q_g	Total Gate Charge	N-Channel $V_{DS} = 48$ V, $I_D = 1.3$ A, $V_{GS} = 5$ V	N-Ch	--	1.6	2.1	nC
			P-Ch	--	3.6	4.7	nC
Q_{gs}	Gate-Source Charge		N-Ch	--	0.28	--	nC
		P-Channel $V_{DS} = -240$ V, $I_D = -0.3$ A, $V_{GS} = -5$ V	P-Ch	--	0.42	--	nC
Q_{gd}	Gate-Drain Charge		N-Ch	--	0.82	--	nC
			P-Ch	--	2.1	--	nC
Drain-Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Drain-Source Diode Forward Current		N-Ch	--	--	1.3	A
			P-Ch	--	--	-0.3	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0$ V, $I_S = 1.3$ A	N-Ch	--	--	1.5	V
		$V_{GS} = 0$ V, $I_S = -0.3$ A	P-Ch	--	--	-4.0	V

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
3. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
4. Essentially independent of operating temperature
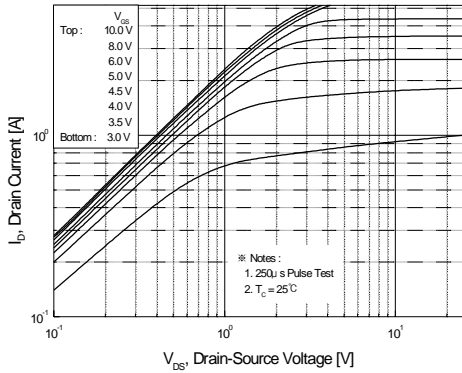
Typical Characteristics : N-Channel
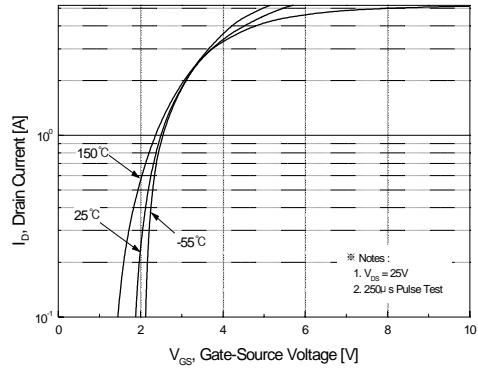

Figure 1. On-Region Characteristics
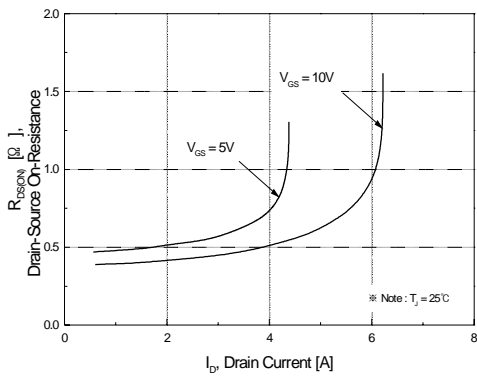

Figure 2. Transfer Characteristics

**Figure 3. On-Resistance Variation vs.
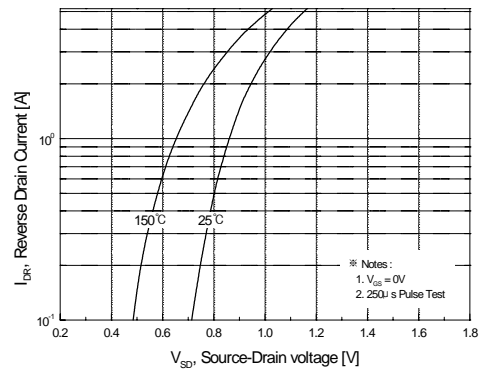Drain Current and Gate Voltage**

**Figure 4. Body Diode Forward Voltage
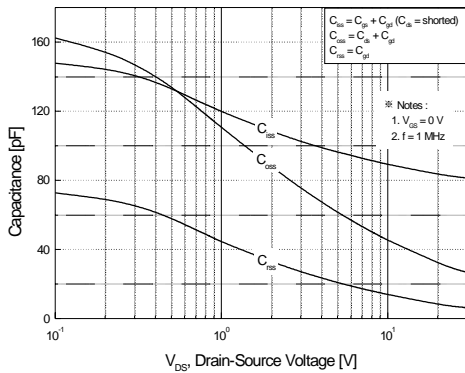Variation vs. Source Current
and Temperature**

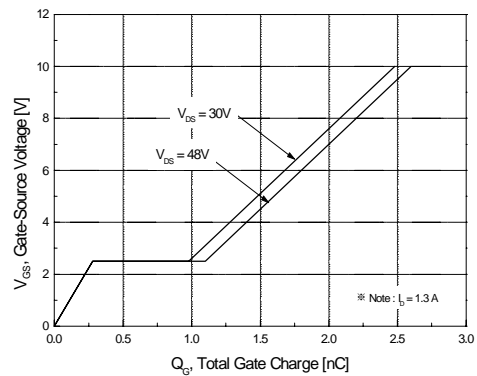

Figure 5. Capacitance Characteristics

Figure 6. Gate Charge Characteristics
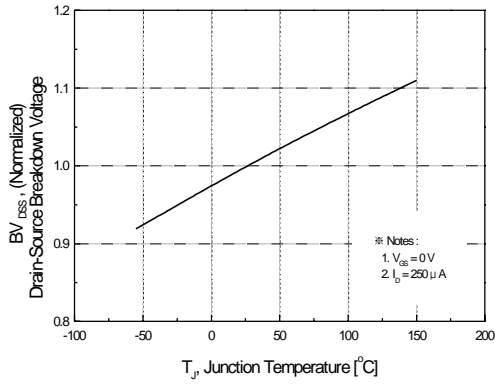
Typical Characteristics : N-Channel (Continued)
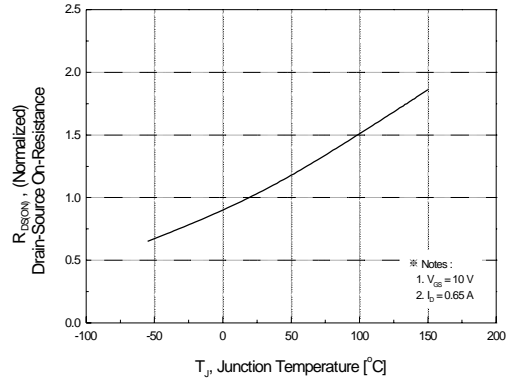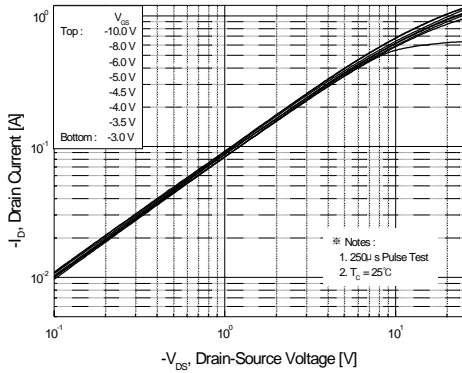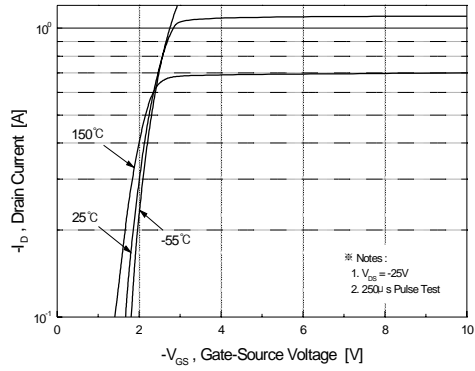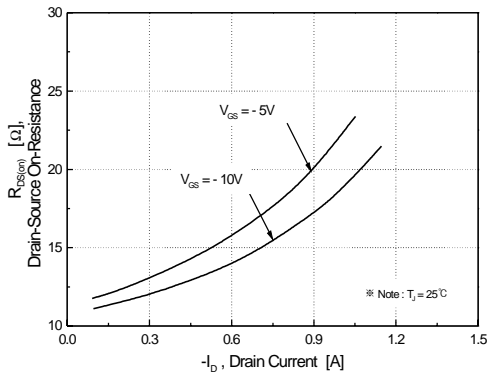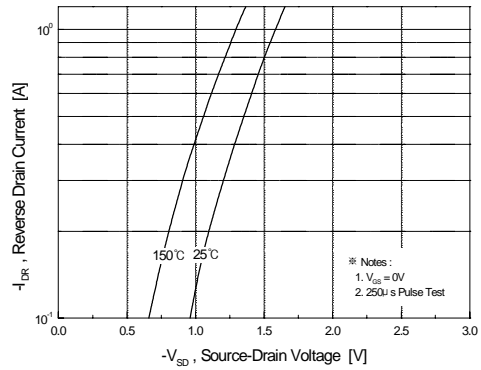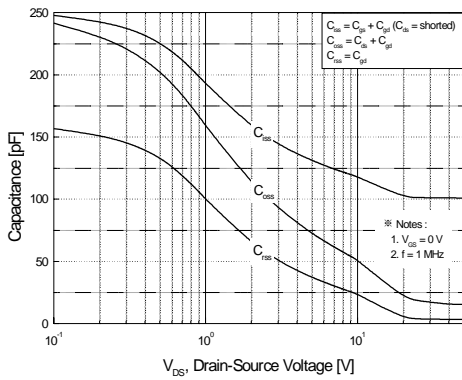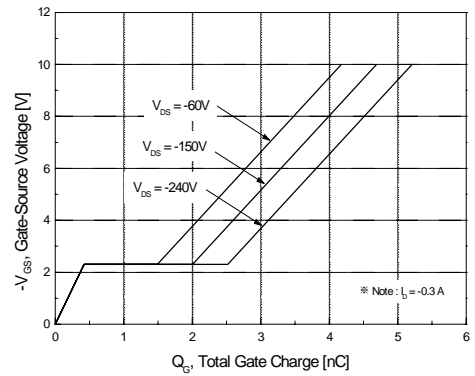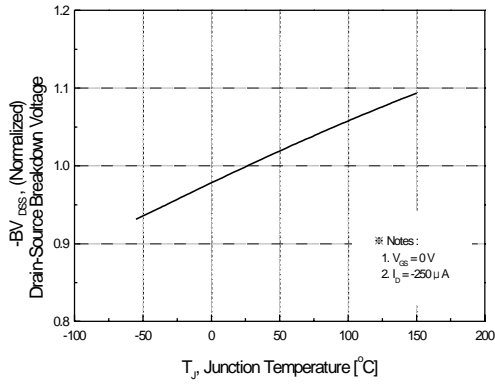

Figure 7. Breakdown Voltage Variation vs. Temperature
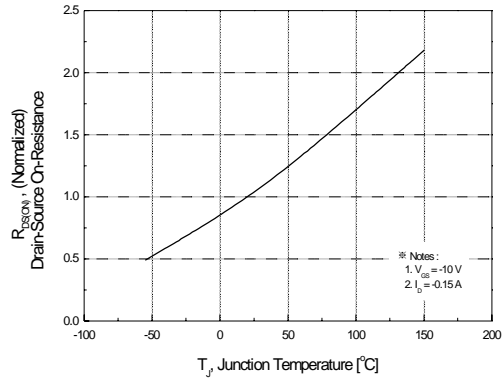

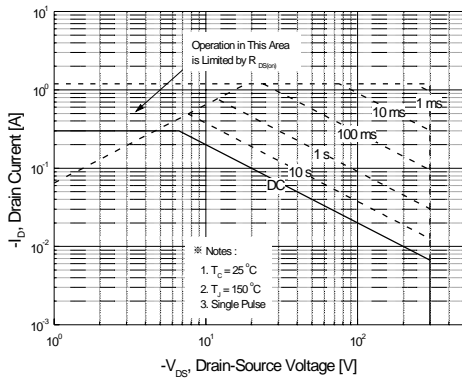**Figure 8. On-Resistance Variation vs. Temperature**
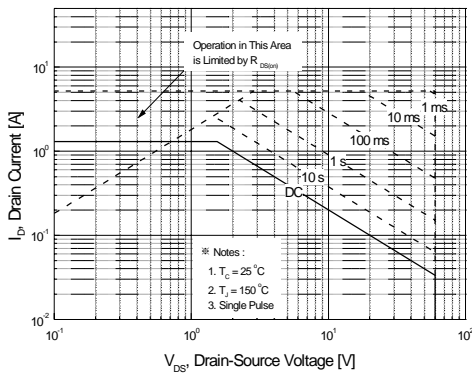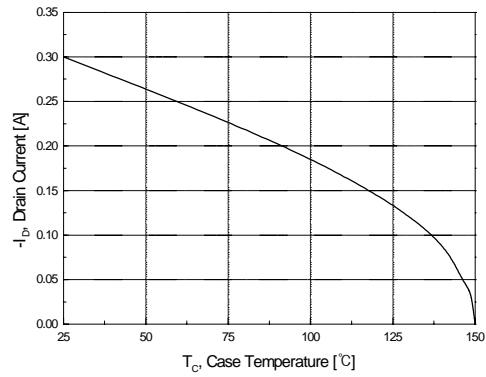

Figure 9. Maximum Safe Operating Area
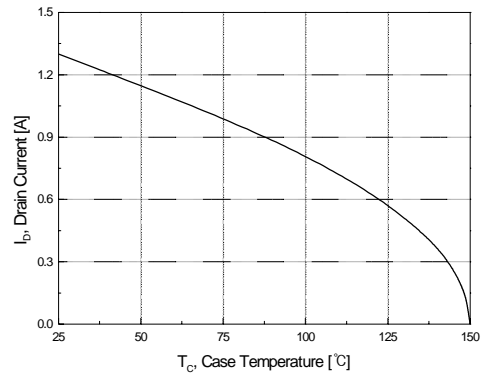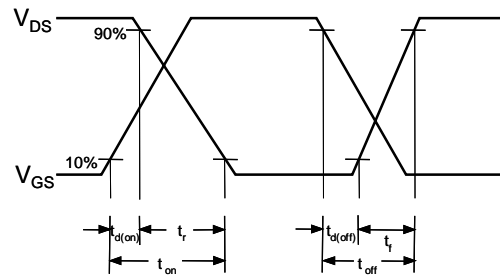

Figure 10. Maximum Drain Current vs. Case Temperature
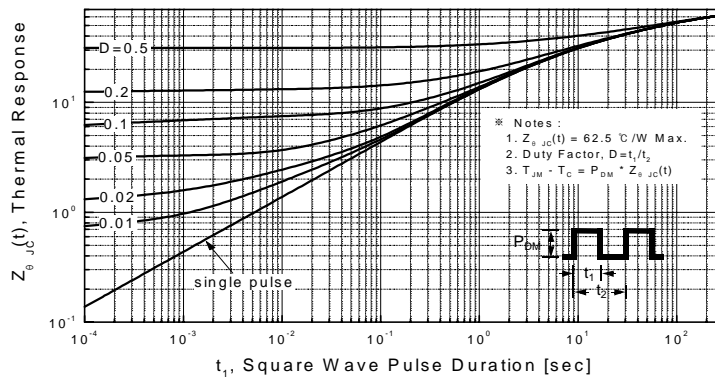
Figure 11. Transient Thermal Response Curve

Typical Characteristics : P-Channel (Continued)

Figure 1. On-Region Characteristics

Figure 2. Transfer Characteristics

Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

Figure 4. Body Diode Forward Voltage
Variation vs. Source Current
and Temperature

Figure 5. Capacitance Characteristics

Figure 6. Gate Charge Characteristics

Typical Characteristics : P-Channel (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature

Figure 9. Maximum Safe Operating Area

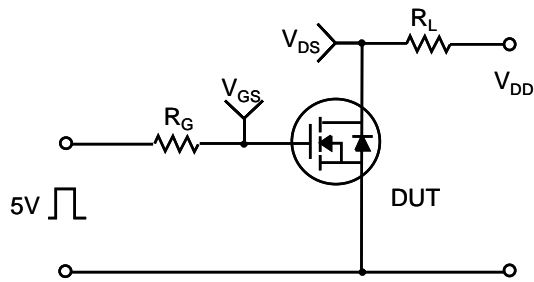**Figure 10. Maximum Drain Current vs. Case Temperature**
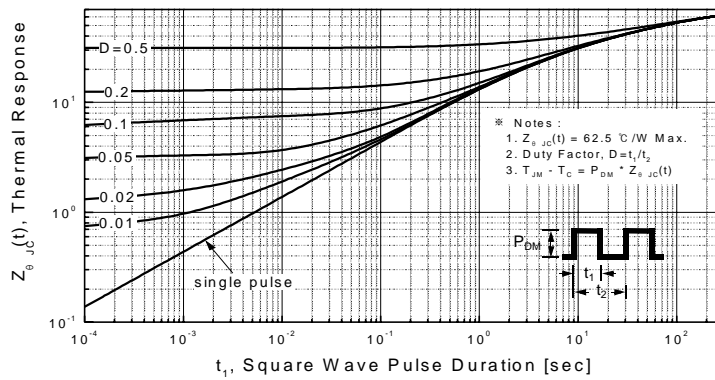
Figure 11. Transient Thermal Response Curve
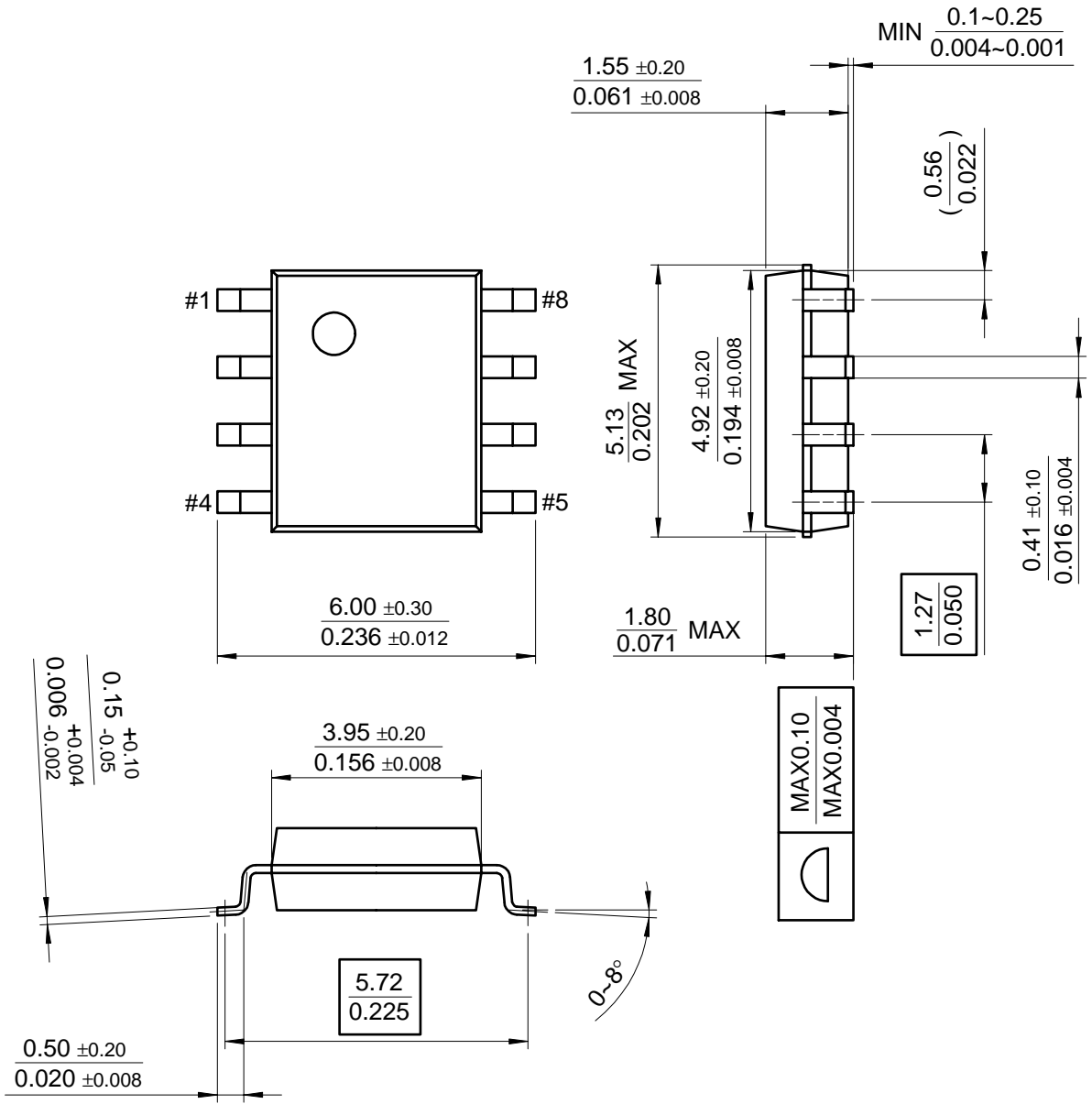
Gate Charge Test Circuit & Waveform
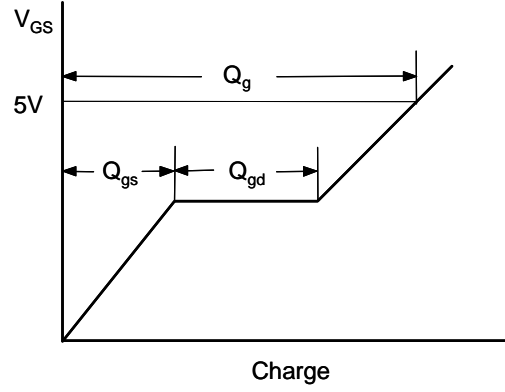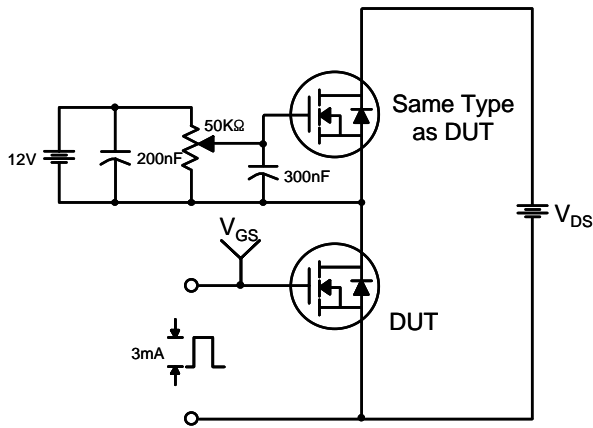
Resistive Switching Test Circuit & Waveforms

Package Dimensions

8-SOP

$$\text{MIN} \frac{0.1\sim0.25}{0.004\sim0.001}$$

$$\frac{1.55 \pm0.20}{0.061 \pm0.008}$$

$$\left(\frac{0.56}{0.022}\right)$$

$$\frac{5.13}{0.202} \text{ MAX}$$

$$\frac{4.92 \pm0.20}{0.194 \pm0.008}$$

$$\frac{0.41 \pm0.10}{0.016 \pm0.004}$$

$$\frac{6.00 \pm0.30}{0.236 \pm0.012}$$

$$\frac{1.80}{0.071} \text{ MAX}$$

$$\frac{1.27}{0.050}$$

$$\frac{0.15}{0.006} \begin{array}{c}+0.10\\-0.05\end{array} \frac{+0.004}{-0.002}$$

$$\frac{3.95 \pm0.20}{0.156 \pm0.008}$$

$$\frac{\text{MAX0.10}}{\text{MAX0.004}}$$

$$\frac{5.72}{0.225}$$

$$0\text{-}8°$$

$$\frac{0.50 \pm0.20}{0.020 \pm0.008}$$

#1   #8
#4   #5

Rev. A, August 2000

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FACT Quiet Series™	QS™	
FAST®	Quiet Series™	
FASTr™	SuperSOT™-3	
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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.

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