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FAIRCHILD SEMICONDUCTOR™

August 2000

QFET™

FQS4900

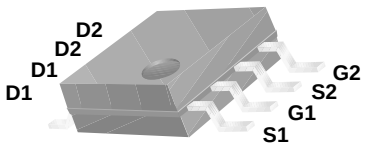
Dual N & P-Channel, Logic Level MOSFET

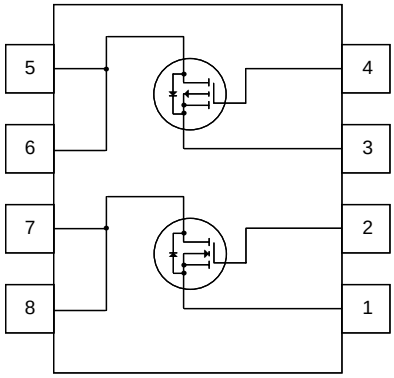
General Description

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 Curent - 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
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	°C/W

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} = 4V, I_D = 20 mA	N-Ch	1.0	--	1.95	V
		V_{DS} = 4V, 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

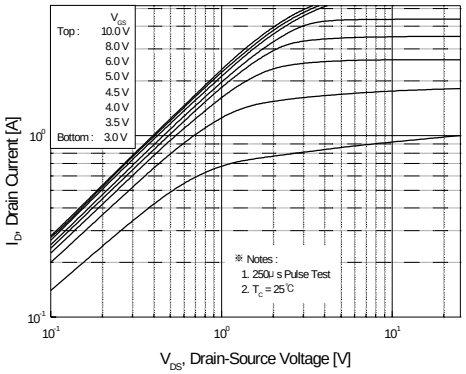


Figure 1. On-Region Characteristics

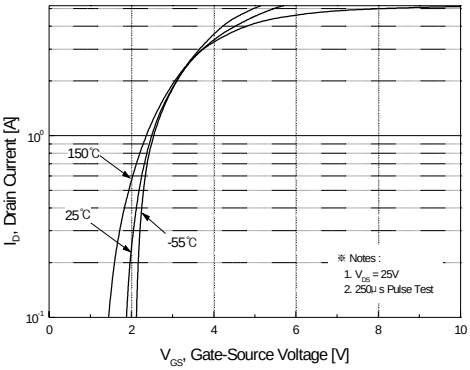


Figure 2. Transfer Characteristics

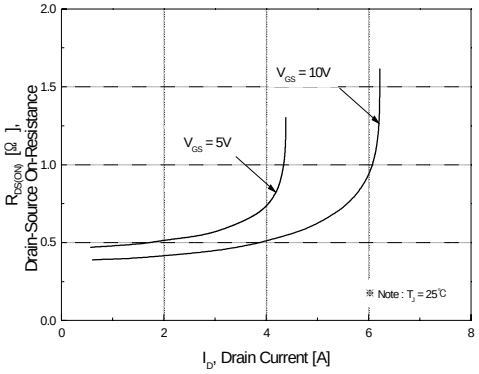


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

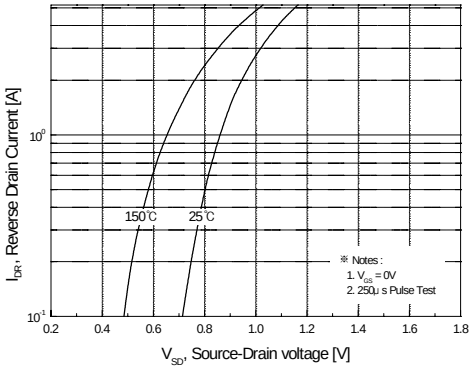


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

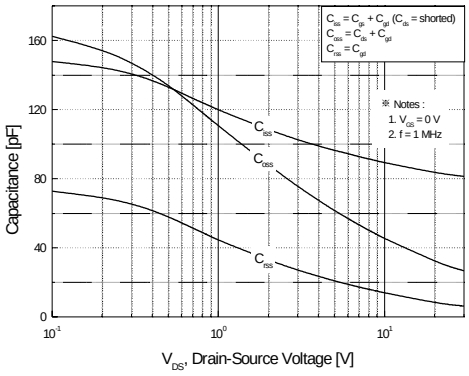


Figure 5. Capacitance Characteristics

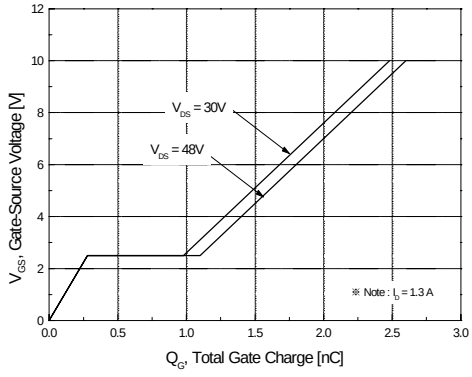


Figure 6. Gate Charge Characteristics

Typical Characteristics : N-Channel (Continued)

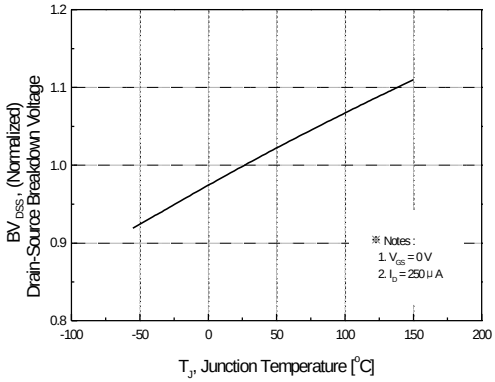


Figure 7. Breakdown Voltage Variation vs. Temperature

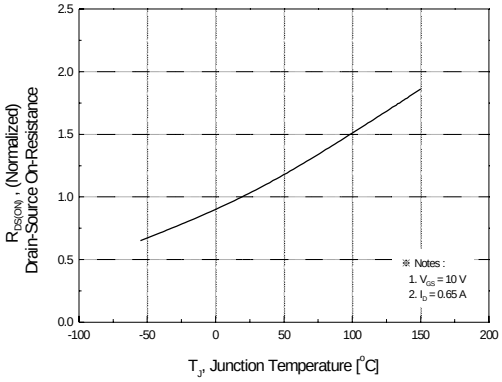


Figure 8. On-Resistance Variation vs. Temperature

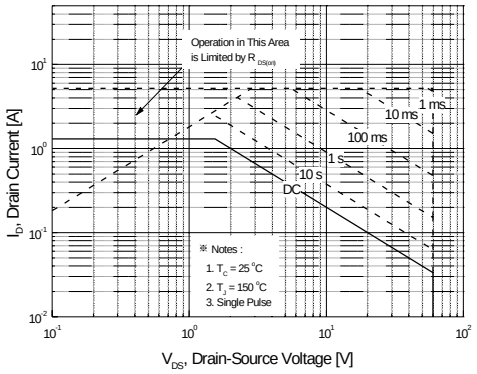


Figure 9. Maximum Safe Operating Area

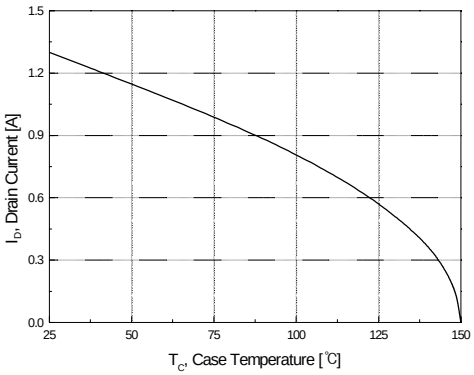


Figure 10. Maximum Drain Current vs. Case Temperature

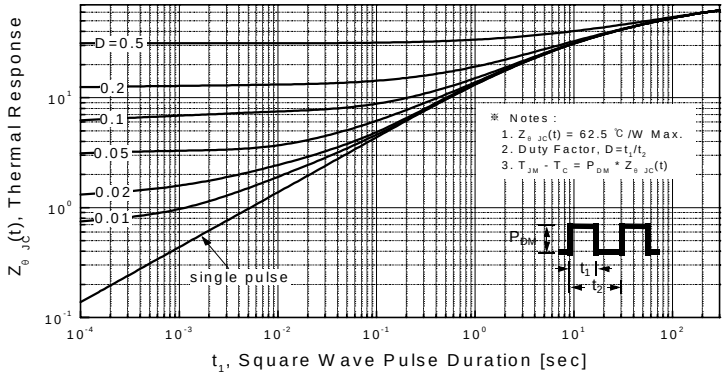


Figure 11. Transient Thermal Response Curve

Typical Characteristics : P-Channel (Continued)

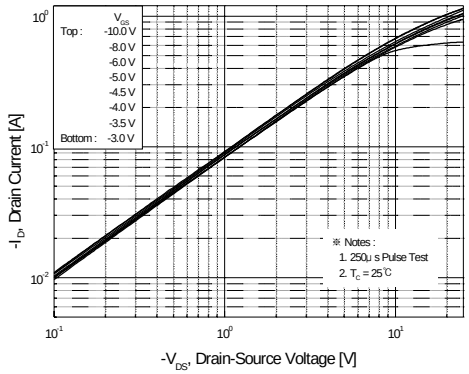


Figure 1. On-Region Characteristics

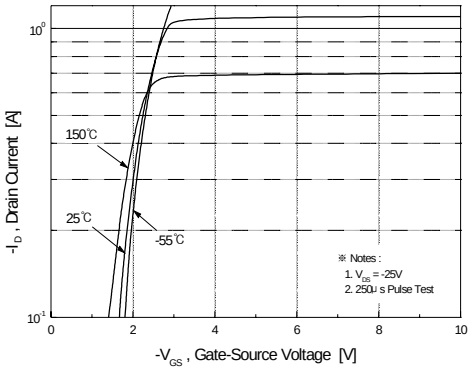


Figure 2. Transfer Characteristics

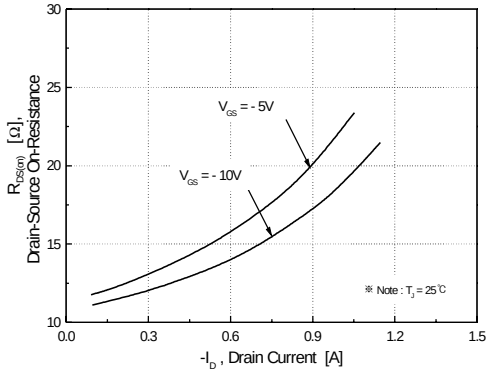
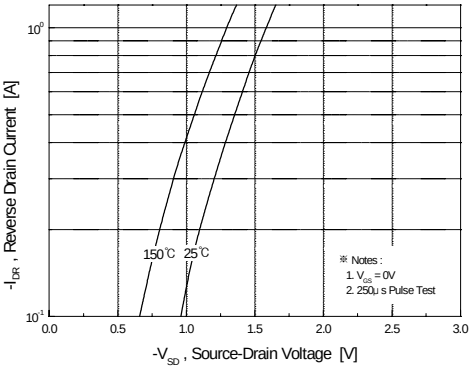


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage



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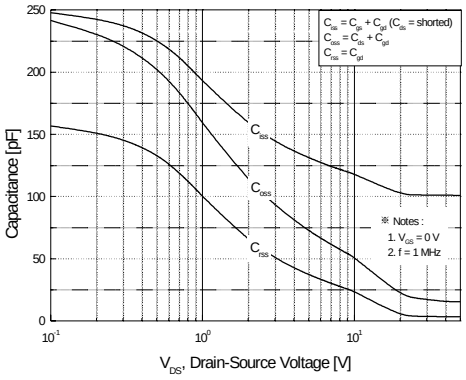


Figure 5. Capacitance Characteristics

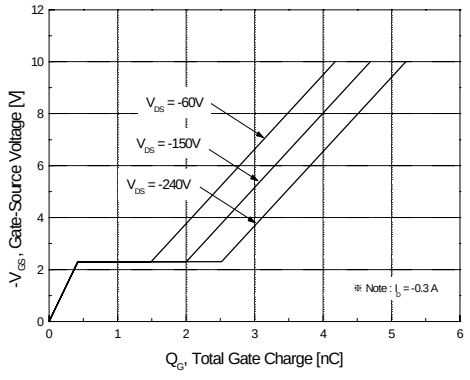


Figure 6. Gate Charge Characteristics

Typical Characteristics : P-Channel (Continued)

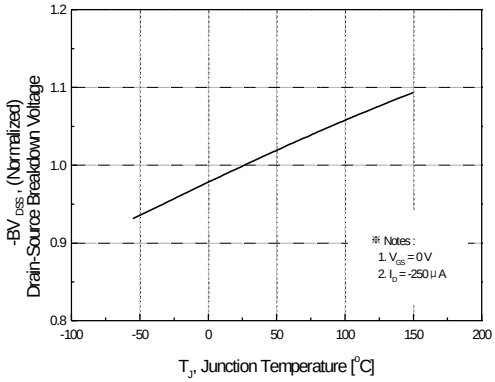


Figure 7. Breakdown Voltage Variation vs. Temperature

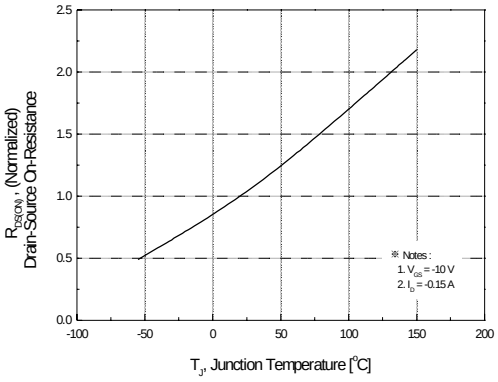
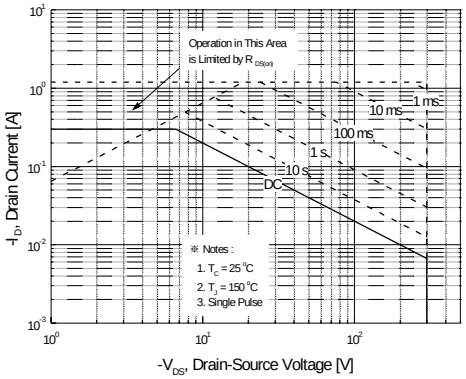


Figure 8. On-Resistance Variation vs. Temperature



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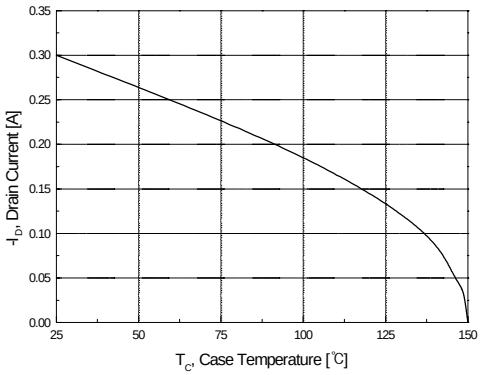


Figure 10. Maximum Drain Current vs. Case Temperature

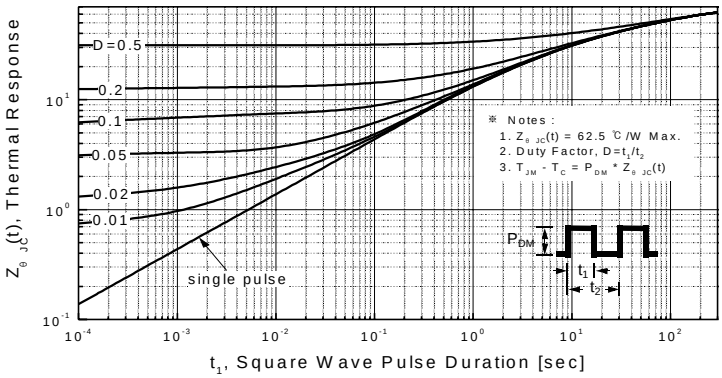
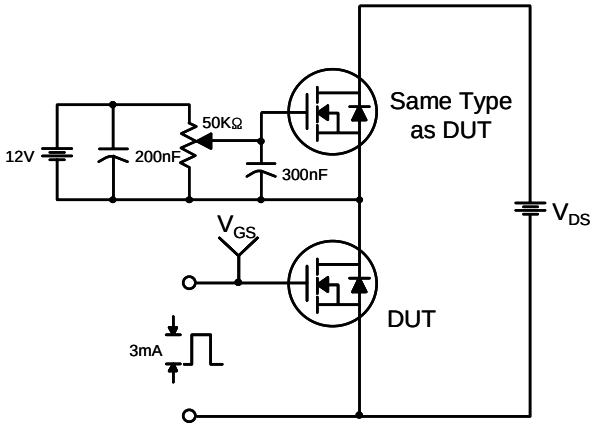
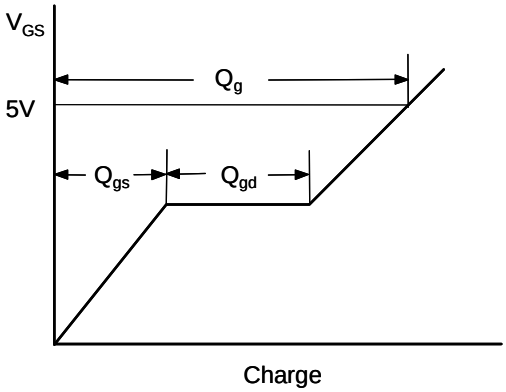


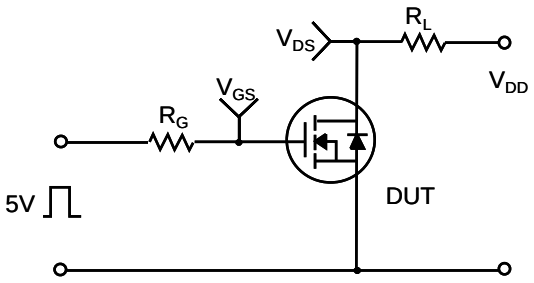
Figure 11. Transient Thermal Response Curve

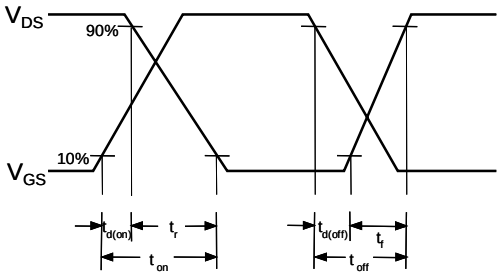
Gate Charge Test Circuit & Waveform





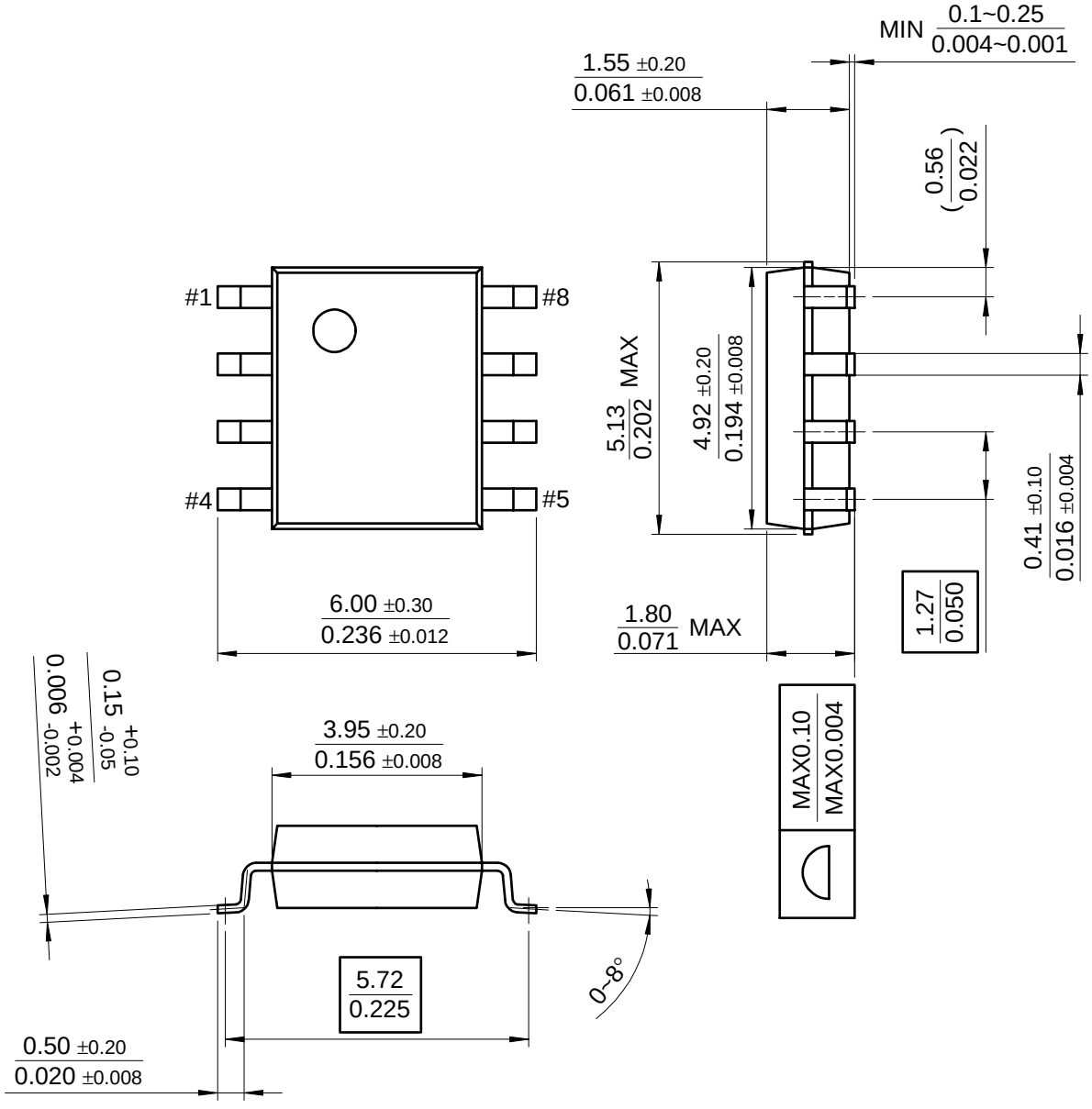
Resistive Switching Test Circuit & Waveforms





Package Dimensions

8-SOP



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