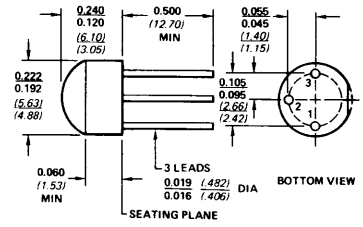
Performance Curves NZF
See Page 4-49

N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTOR

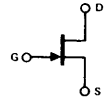
FOR VHF/UHF AMPLIFIER, OSCILLATOR AND MIXER APPLICATIONS

This epoxy-encapsulated FET is characterized for high-frequency, small-signal applications in either common-source or common-gate configuration.

- **High Power Gain**
  - **20 to 23 dB at 100 MHz, Common-Source**
  - **17 to 20 dB at 100 MHz, Common-Gate**
- **Noise Figure — 1.3 dB Typical at 100 MHz**
- **High Dynamic Range — > 100 dB**
- **High Transconductance**
  - **g_{fs} = 6000 μmhos at 450 MHz**
  - **$|g_{fg}|$ = 5500 μmhos at 450 MHz**



TO-106



PIN	OUT
1	S
2	D
3	G

ABSOLUTE MAXIMUM RATINGS (25°C)

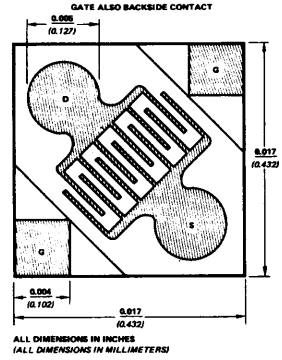
Gate-Drain or Gate-Source Voltage . . . . . -25 V
Gate Current . . . . . 10 mA
Total Device Dissipation
(25°C Free-Air Temperature) . . . . . 350 mW
Power Derating (to +125°C) . . . . . 3.5 mW/°C
Storage Temperature Range . . . . . -55 to +125°C
Operating Temperature Range . . . . . -55 to +125°C
Lead Temperature
(1/16" from case for 10 seconds) . . . . . 300°C

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

		Characteristic		E300 Min	E300 Typ	E300 Max	Unit	Test Conditions	
1	STATIC	I_{GSS}	Gate Reverse Current (Note 1)			-500	pA	V_{GS} = -15 V, V_{DS} = 0	
2	STATIC	$V_{GS(off)}$	Gate-Source Cutoff Voltage	-1		-6	V	V_{DS} = 10 V, I_D = 1 nA	
3	STATIC	BV_{GSS}	Gate-Source Breakdown Voltage	-25			V	V_{DS} = 0, I_G = -1 μA	
4	STATIC	I_{DSS}	Saturation Drain Current (Note 2)	6		30	mA	V_{DS} = 10 V, V_{GS} = 0	
5	STATIC	$V_{GS(f)}$	Gate-Source Forward Voltage			1	V	I_G = 1 mA, V_{DS} = 0	
6	DYN	g_{fs}	Common-Source Forward Transconductance (Note 2)	4,500		9,000	μmho	V_{DG} = 10 V, I_D = 5 mA	f = 1 kHz
7	DYN	g_{os}	Common-Source Output Transconductance			200	μmho	V_{DG} = 10 V, I_D = 5 mA	f = 1 kHz
8	DYN	C_{iss}	Common-Source Input Capacitance		3.5	5.5	pF	V_{DG} = 10 V, I_D = 5 mA	f = 1 MHz
9	DYN	C_{rss}	Common-Source Reverse Transfer Capacitance		0.8	1.7	pF	V_{DG} = 10 V, I_D = 5 mA	f = 1 MHz
10	DYN	C_{oss}	Common-Source Output Capacitance		1.5		pF	V_{DG} = 10 V, I_D = 5 mA	f = 1 MHz
11	HI FREQ	$\|y_{fs}\|$	Common-Source Forward Transadmittance		6,200		μmho	V_{DG} = 15 V, I_D = 5 mA	f = 100 MHz
12	HI FREQ	$\|y_{fs}\|$	Common-Source Forward Transadmittance		6,000		μmho	V_{DG} = 15 V, I_D = 5 mA	f = 450 MHz
13	HI FREQ	$\|y_{fg}\|$	Common-Gate Forward Transadmittance		6,000		μmho	V_{DG} = 15 V, I_D = 5 mA	f = 100 MHz
14	HI FREQ	$\|y_{fg}\|$	Common-Gate Forward Transadmittance		5,500		μmho	V_{DG} = 15 V, I_D = 5 mA	f = 450 MHz
15	HI FREQ	G_{fg}	Common-Gate Power Gain		17		dB	V_{DG} = 15 V, I_D = 5 mA	f = 100 MHz (Note 3)
16	HI FREQ	NF	Noise Figure (Single Sideband)		2		dB	V_{DG} = 15 V, I_D = 5 mA	f = 100 MHz (Note 3)

NOTES:
1. Approximately doubles for every 10°C increase in T_A.
2. Pulse test duration = 2 ms.
3. Typical values for performance at 100 MHz in a common-gate circuit operating 3 dB bandwidth is 2 MHz.

NZF



N-CHANNEL DEPLETION MODE SILICON CHANNEL FIELD-EFFECT TRANSISTOR

APPLICATION

- **High Transconductance and low input Capacitance is Suitable for Frequency Amplifiers, Oscillators and Mixers**

PRINCIPAL DEVICES

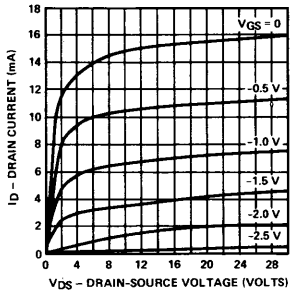
2N5397-98; U257, 2N5911-12
E114, E210-12, E300, E420-21

PACKAGE TYPES

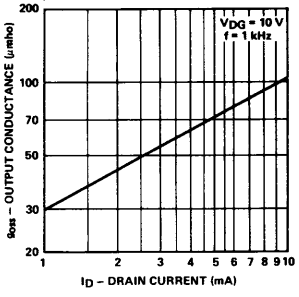
TO-72, TO-78, TO-106, SI-200

PERFORMANCE CURVES (25°C unless otherwise noted)

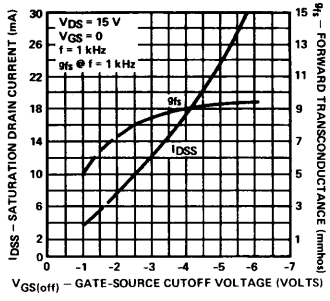
Output Characteristic



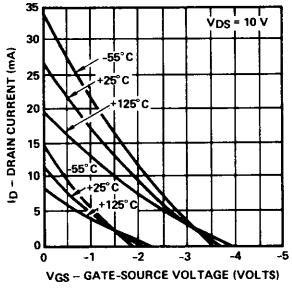
Common-Source Output Conductance vs Drain Current



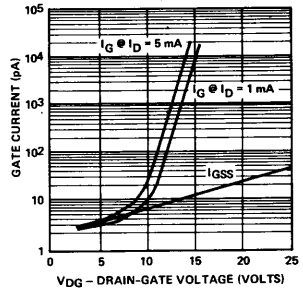
Saturation Drain Current and Forward Transconductance vs Gate-Source Cutoff Voltage



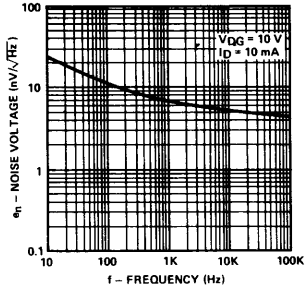
Transfer Characteristics



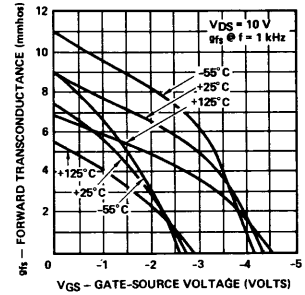
Gate Currents vs Operating Point



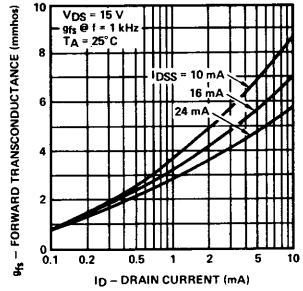
Equivalent Input Noise Voltage vs Frequency



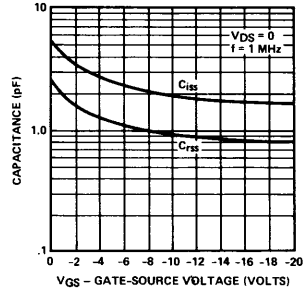
Transconductance Characteristics



Forward Transconductance vs Drain Current

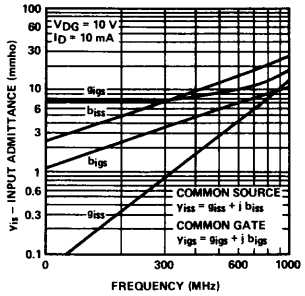


Common-Source Capacitances vs Gate-Source Voltage

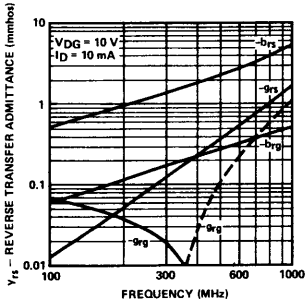


PERFORMANCE CURVES (Cont'd) (25°C unless otherwise noted)

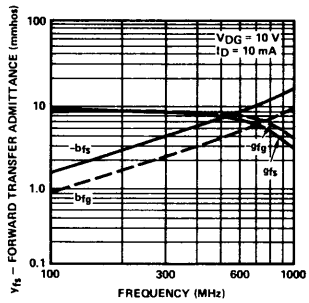
Input Admittance



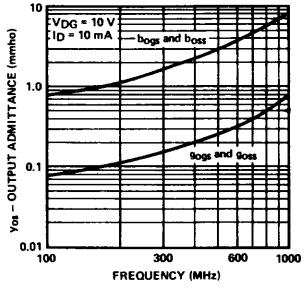
Reverse Transfer Admittance



Forward Transfer Admittance



Output Admittance



Performance Curves NH
See Page 4-28

N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

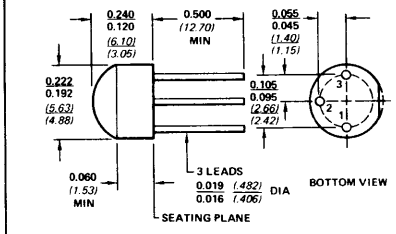
FOR VHF/UHF AMPLIFIER, OSCILLATOR AND MIXER APPLICATIONS

These epoxy-encapsulated FETs are characterized for high-frequency, small-signal applications which require low input capacitance and low output conductance.

- C_{iss} = 3 pF Typical
- C_{rss} = 0.8 pF Typical
- g_{oss} = 60 μmho Typical @ 100 MHz
- Noise Figure = 1.7 dB @ 100 MHz (E304)

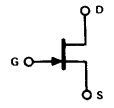
ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage . . . . . -30 V
Gate Current . . . . . 10 mA
Total Device Dissipation
(25°C Free-Air Temperature) . . . . . 350 mW
Power Derating (to +125°C) . . . . . 3.5 mW/°C
Storage Temperature Range . . . . . -55 to +125°C
Operating Temperature Range . . . . . -55 to +125°C
Lead Temperature (1/16" from case for 10 seconds) . . . 300°C



ALL DIMENSIONS IN INCHES
(ALL DIMENSIONS IN MILLIMETERS)

TO-106



PIN	OUT
1	S
2	D
3	G

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

		Characteristic		E304 Min	E304 Typ	E304 Max	E305 Min	E305 Typ	E305 Max	Unit	Test Conditions	
1	STATIC	I_{GSS}	Gate Reverse Current (Note 1)			-100			-100	pA	V_{DS} = 0, V_{GS} = -20 V	
2	STATIC	$V_{GS(off)}$	Gate Source Cutoff Voltage	-2		-6	-0.5		-3	V	V_{DS} = 15 V, I_D = 1 nA	
3	STATIC	BV_{GSS}	Gate Source Breakdown Voltage	-30			-30				V_{DS} = 0, I_G = -1 μA	
4	STATIC	I_{DSS}	Saturation Drain Current (Note 2)	5		15	1		8	mA	V_{DS} = 15 V, V_{GS} = 0	
5	DYNAMIC	g_{fs}	Common-Source Forward Transconductance (Note 2)	4,500		7,500	3,000			μmho	V_{DS} = 15 V, V_{GS} = 0	f = 1 kHz
6	DYNAMIC	g_{os}	Common-Source Output Transconductance			50			50	μmho	V_{DS} = 15 V, V_{GS} = 0	f = 1 kHz
7	DYNAMIC	C_{iss}	Common-Source Input Capacitance		3.0			3.0		pF	V_{DS} = 15 V, V_{GS} = 0	f = 1 MHz
8	DYNAMIC	C_{rss}	Common-Source Reverse Transfer Capacitance		0.8			0.8		pF	V_{DS} = 15 V, V_{GS} = 0	f = 1 MHz
9	DYNAMIC	C_{oss}	Common-Source Output Capacitance		1.0			1.0		pF	V_{DS} = 15 V, V_{GS} = 0	f = 1 MHz
10	HIGH FREQUENCY	g_{fs}	Common-Source Forward Transconductance					3,000		μmho	V_{DS} = 15 V, V_{GS} = 0	f = 100 MHz
11	HIGH FREQUENCY	g_{fs}	Common-Source Forward Transconductance		4,200					μmho	V_{DS} = 15 V, V_{GS} = 0	f = 400 MHz
12	HIGH FREQUENCY	g_{oss}	Common-Source Output Conductance		60			60		μmho	V_{DS} = 15 V, V_{GS} = 0	f = 100 MHz
13	HIGH FREQUENCY	g_{oss}	Common-Source Output Conductance		80					μmho	V_{DS} = 15 V, V_{GS} = 0	f = 400 MHz
14	HIGH FREQUENCY	b_{oss}	Common-Source Output Susceptance		800			800		μmho	V_{DS} = 15 V, V_{GS} = 0	f = 100 MHz
15	HIGH FREQUENCY	b_{oss}	Common-Source Output Susceptance		3,600					μmho	V_{DS} = 15 V, V_{GS} = 0	f = 400 MHz
16	HIGH FREQUENCY	g_{iss}	Common-Source Input Conductance		80			80		μmho	V_{DS} = 15 V, V_{GS} = 0	f = 100 MHz
17	HIGH FREQUENCY	g_{iss}	Common-Source Input Conductance		800					μmho	V_{DS} = 15 V, V_{GS} = 0	f = 400 MHz
18	HIGH FREQUENCY	b_{iss}	Common-Source Input Susceptance		2,000			2,000		μmho	V_{DS} = 15 V, V_{GS} = 0	f = 100 MHz
19	HIGH FREQUENCY	b_{iss}	Common-Source Input Susceptance		7,500					μmho	V_{DS} = 15 V, V_{GS} = 0	f = 400 MHz
20	HIGH FREQUENCY	G_{ps}	Common-Source Power Gain		20					dB	V_{DS} = 15 V, I_D = 5 mA	f = 100 MHz
21	HIGH FREQUENCY	G_{ps}	Common-Source Power Gain		11					dB	V_{DS} = 15 V, I_D = 5 mA	f = 400 MHz
22	HIGH FREQUENCY	NF	Noise Figure (Single Sideband)		1.7					dB	V_{DS} = 15 V, I_D = 5 mA, R_G = 1 KΩ	f = 100 MHz
23	HIGH FREQUENCY	NF	Noise Figure (Single Sideband)		3.8					dB	V_{DS} = 15 V, I_D = 5 mA, R_G = 1 KΩ	f = 400 MHz

NOTES:
1. Approximately doubles for every 10°C increase in T_A.
2. Pulse test duration = 2 ms.

NH

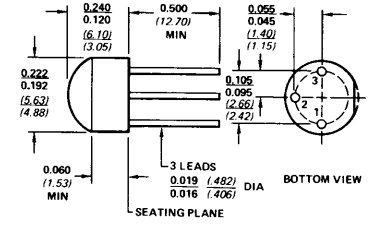
Performance Curves NZT
See Page 4-51

N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

FOR VHF/UHF AMPLIFIER, OSCILLATOR AND MIXER APPLICATIONS

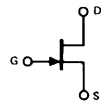
These epoxy-encapsulated FETs are characterized for high frequency, small-signal applications in either common-source or common-gate configurations.

- **High Power Gain – 10 dB at 450 MHz, Common-Gate**
- **Noise Figure – 3.4 dB Typical at 450 MHz**
- **High Dynamic Range – > 100 dB**
- **High Transconductance – g_{fs} = 12,000 μmho at 450 MHz**



ALL DIMENSIONS IN INCHES
(ALL DIMENSIONS IN MILLIMETERS)

TO-106



PIN	OUT
1	S
2	D
3	G

ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage . . . . . -25 V
Gate Current . . . . . 10 mA
Total Device Dissipation (25° C Free Air) . . . . . 350 mW
Power Derating (to +125°C) . . . . . 3.5 mW/°C
Storage Temperature Range . . . . . -55 to +125°C
Operating Temperature Range . . . . . -55 to +125°C
Lead Temperature (1/16" from case for 10 seconds) . . . 300°C

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

		Characteristic		E308			E309			E310			Unit	Test Conditions	
				Min	Typ	Max	Min	Typ	Max	Min	Typ	Max			
1	STATIC	I_{GSS}	Gate Reverse Current (Note 1)			-1.0			-1.0			-1.0	nA	V_{GS} = -15 V, V_{DS} = 0	
2						-1.0			-1.0			-1.0	μA		T = 125°C
3		BV_{GSS}	Gate-Source Breakdown Voltage	-25			-25			-25			V	I_G = -1 μA, V_{DS} = 0	
4		$V_{G(off)}$	Gate-Source Cutofff Voltage	-1.0		-6.5	-1.0		-4.0	-2.0		-6.5		V_{DS} = 10 V, I_D = 1 nA	
5		$V_{GS(f)}$	Gate-Source Forward Voltage			1.0			1.0			1.0		V_{DS} = 0, I_G = 10 mA	
6		I_{DSS}	Saturation Drain Current (Note 2)	12		60	12		30	24		60	mA	V_{DS} = 10 V, V_{GS} = 0	
7	DYNAMIC	g_{fs}	Common-Source Forward Transconductance (Note 2)	8,000		20,000	10,000		20,000	8,000		18,000	μmho	V_{DS} = 10 V, I_D = 10 mA f = 1 kHz	
8		g_{os}	Common-Source Output Conductance			200			150			150			
9		g_{fg}	Common-Gate Forward Transconductance		13,000			13,000			12,000				
10		g_{ogs}	Common-Gate Output Conductance		150			100			150				
11		C_{gd}	Drain-Gate Capacitance		1.8	2.5		1.8	2.5		1.8	2.5	pF	V_{GS} = -10 V, V_{DS} = 0 f = 1 MHz	
12		C_{gs}	Gate-Source Capacitance		4.3	5.0		4.3	5.0		4.3	5.0			
13		$\bar{e}_n$	Equivalent Short-Circuit Input Noise Voltage		10			10			10		$\frac{nV}{\sqrt{Hz}}$	V_{DS} = 10 V, I_D = 10 mA f = 100 Hz	
14	HI FREQ	g_{fs}	Common-Source Forward Transconductance		12			12			12		mmho	V_{DS} = 10 V, I_D = 10 mA f = 100 MHz	
15		g_{igs}	Common-Gate Input Conductance		12			12			12				
16		g_{iss}	Common-Source Input Conductance		0.7			0.7			0.5				
17		g_{oss}	Common-Source Output Conductance		0.25			0.25			0.25				
18		G_{ps}	Common-Source Power Gain		16			16			16		dB		
19		NF	Noise Figure		1.5			1.5			1.5				

NOTES:
1. Approximately doubles for every 10°C increase in T_A.
2. Pulse test duration = 2 ms.

NZT