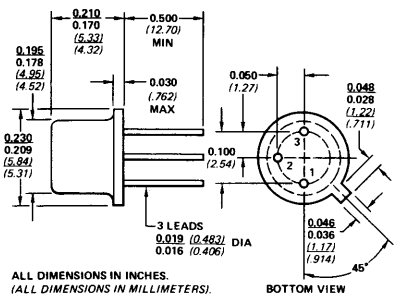
Performance Curves PJ
See Page 4-59

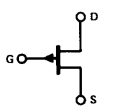
P-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTOR

FOR LOW NOISE PREAMPLIFIERS

- **Low-Noise Figure for Source Resistance from 12K to 50 Meg**
- **Typical Short-Circuit Equivalent Noise Voltage of 18 $nV/\sqrt{Hz}$ at 1 kHz**



TO-18



PIN	OUT
1	S
2	G,C
3	D

ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage (Note 1) ..... 20 V
Gate Current ..... 50 mA
Total Device Dissipation at (or below) 25°C
Free-Air Temperature (Note 2) ..... 300 mW
Storage Temperature Range ..... -65 to +150°C

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

		Characteristic		Min	Max	Unit	Test Conditions	
1	STATIC	I_{GSS}	Gate Reverse Current		30	nA	V_{GS} = 20 V, V_{DS} = 0	
2					30	μA	V_{GS} = 5 V, V_{DS} = 0 V, T_A = 150°C	
3		BV_{GSS}	Gate-Source Breakdown Voltage	20		V	I_G = 1 μA, V_{DS} = 0	
4		$V_{GS(off)}$	Gate-Source Breakdown Voltage		5	V	V_{DS} = -5 V, I_D = -1 μA	
5		I_{DSS}	Drain Current at Zero Gate Voltage	-0.6	-6.0	mA	V_{DS} = -5 V, V_{GS} = 0	
6	DYN	g_{fs}	Common-Source Forward Transconductance	800		μmho	V_{DS} = -5 V, V_{GS} = 0	f = 1 kHz
7		C_{iss}	Common-Source Input Capacitance (Output Shorted)		65	pF	V_{DS} = -5 V, V_{GS} = 1 V	f = 1 MHz
8		$\bar{e}_n$	Short-Circuit Equivalent Input Noise Voltage		25	$\frac{nV}{\sqrt{Hz}}$	V_{DS} = -5 V, V_{GS} = 0	f = 1 kHz

NOTES:
1. Due to symmetrical geometry, these units may be operated with source and drain leads interchanged.
2. Derate linearly to 150°C free-air temperature at rate of 2.3 mW/°C.

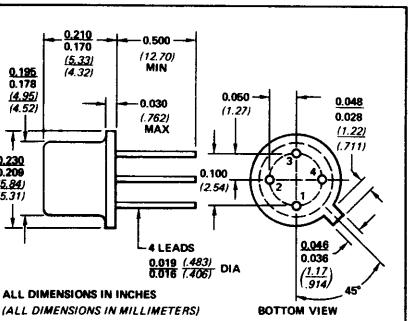
PJ

Performance Curves NRL
See Page 4-41

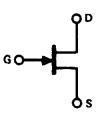
N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTOR

FOR INDUSTRIAL AND CONSUMER SMALL-SIGNAL APPLICATIONS

- $C_{rss} < 4$ pF



TO-72



PIN	OUT
1	S
2	D
3	G
4	C

*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage (Note 1) ..... -25 V
Gate Current ..... 10 mA
Total Device Dissipation at (or below) 25°C
Free-Air Temperature (Note 2) ..... 200 mW
Storage Temperature Range ..... -55 to +150°C
Lead Temperature
(1/16" from case for 10 seconds) ..... 260°C

*ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

		Characteristic		Min	Max	Unit	Test Conditions	
1	STATIC	I_{GSS}	Gate Reverse Current		-2	nA	V_{GS} = -15 V, V_{DS} = 0	
2					-2	μA		100°C
3		BV_{GSS}	Gate-Source Breakdown Voltage	-25		V	I_G = -1 μA, V_{DS} = 0	
4		$V_{GS(off)}$	Gate-Source Cutoff Voltage		-8	V	V_{DS} = 15 V, I_D = 2 nA	
5		V_{GS}	Gate-Source Voltage	-0.5	-7.5	V	V_{DS} = 15 V, I_D = 200 μA	
6		I_{DSS}	Saturation Drain Current	2	20	mA	V_{DS} = 15 V, V_{GS} = 0 (Note 3)	
7	DYNAMIC	g_{fs}	Common-Source Forward Transconductance	2000	6500	μmho	V_{DS} = 15 V, V_{GS} = 0	f = 1 kHz
8		$\lvert y_{fs} \rvert$	Common-Source Forward Transadmittance	1600		μmho	V_{DS} = 15 V, V_{GS} = 0	f = 100 MHz
9		g_{os}	Common-Source Output Conductance		50	μmho	V_{DS} = 15 V, V_{GS} = 0	f = 1 kHz
10		C_{iss}	Common-Source Input Capacitance (Output Shorted)		8	pF	V_{DS} = 15 V, V_{GS} = 0	f = 1 MHz
11		C_{rss}	Common-Source Reverse Transfer Capacitance		4	pF	V_{DS} = 15 V, V_{GS} = 0	f = 1 MHz

NOTES:
1. Due to symmetrical geometry, these units may be operated with source and drain leads interchanged.
2. Derate linearly to 125°C free-air temperature at rate of 2 mW/°C.
3. These parameters are measured during a 2 msec interval 100 msec after d-c power is applied.

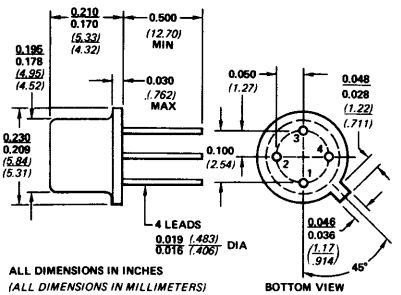
NRL

Performance Curves NH
See Page 4-28

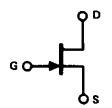
N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTOR

FOR INDUSTRIAL AND CONSUMER VHF-UHF AMPLIFIER APPLICATIONS

- $C_{rss} < 1$ pF
- Similar to 2N4416



TO-72



PIN	OUT
1	S
2	D
3	G
4	C

ABSOLUTE MAXIMUM RATINGS (25°C)

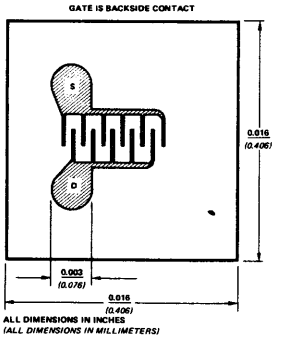
Gate-Drain or Gate-Source Voltage ..... -25 V
Gate Current ..... 10 mA
Total Device Dissipation (Derate 1.7 mW/°C) ..... 300 mW
Storage Temperature Range ..... -65 to +200°C
Lead Temperature
(1/16" from case for 10 seconds) ..... 300°C

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

			Characteristic	Min	Typ	Max	Unit	Test Conditions	
1	STATIC	I_{GSS}	Gate Reverse Current			-1	nA	V_{GS} = -20 V, V_{DS} = 0	
2						-1	μA		100°C
3		BV_{GSS}	Gate-Source Breakdown Voltage	-25			V	I_G = -1 μA, V_{DS} = 0	
4		$V_{GS(off)}$	Gate-Source Cutoff Voltage			-8	V	V_{DS} = 15 V, I_D = 1 nA	
5		I_{DSS}	Saturation Drain Current	3		30	mA	V_{DS} = 15 V, V_{GS} = 0	
6	DYNAMIC	g_{fs}	Common-Source Forward Transconductance (Note 1)	3000	4500	8500	μmho	V_{DS} = 15 V, V_{GS} = 0	f = 1 kHz
7		g_{os}	Common-Source Output Conductance		75	150	μmho	V_{DS} = 15 V, V_{GS} = 0	f = 1 kHz
8		C_{iss}	Common-Source Input Capacitance		3.5	4	pF	V_{DS} = 15 V, V_{GS} = 0	f = 1 MHz
9		C_{rss}	Common-Source Reverse Transfer Capacitance		0.7	1	pF	V_{DS} = 15 V, V_{GS} = 0	f = 1 MHz
10	H	G_{ps}	Common-Source Power Gain		15		dB	V_{DS} = 15 V, I_D = 3 mA	f = 100 MHz
11	F	NF	Noise Figure		2		dB	V_{DS} = 15 V, I_D = 3 mA, R_G = 1 K	f = 100 MHz

NOTE:
1. Pulse duration = 2 ms.

NH



N-CHANNEL DEPLETION MODE SILICON JUNCTION FIELD-EFFECT TRANSISTOR

APPLICATIONS

- **VHF/UHF Amplifiers, Oscillators, and Mixers**
- **Low Input Capacitance High Speed Switch**
- **General Purpose Applications Requiring High g_{fs}**

PRINCIPAL DEVICES

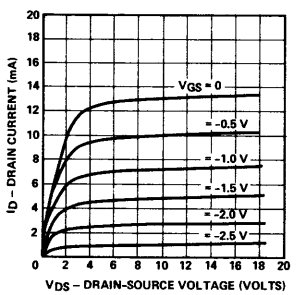
2N3966 2N4416-16A 2N4417 2N5078
2N5103-5 2N5484-86 2N5555 2N5668-70
E304-5 U184

PACKAGE TYPES:

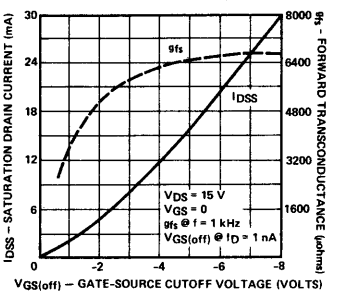
TO-72 TO-92 TO-106 OD-81

PERFORMANCE CURVES (25°C unless otherwise noted)

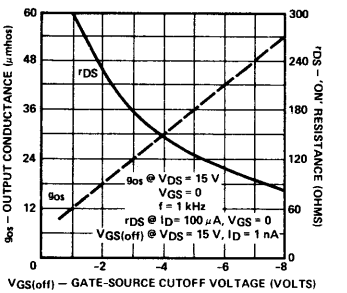
Drain Characteristic



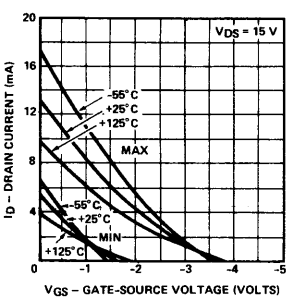
Drain Current & Transconductance vs Gate-Source Voltage



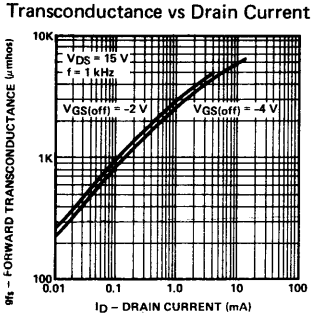
'ON' Resistance & Output Conductance vs Gate-Source Cutoff Voltage



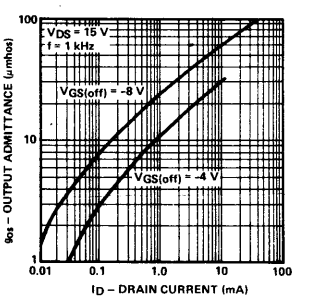
Transfer Characteristics



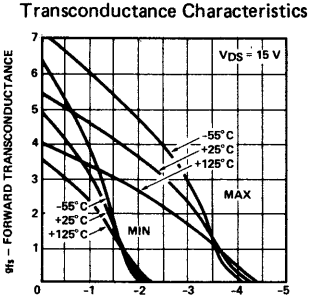
Common-Source Forward Transconductance vs Drain Current



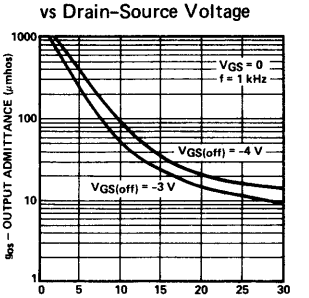
Common-Source Output Admittance vs Drain Current



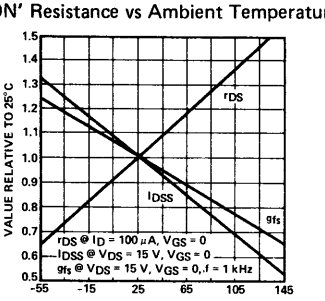
Transconductance Characteristics



Common-Source Output Admittance vs Drain-Source Voltage

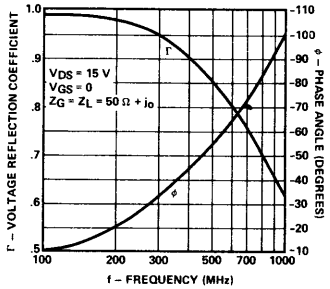


Drain Current, Transconductance and 'ON' Resistance vs Ambient Temperature

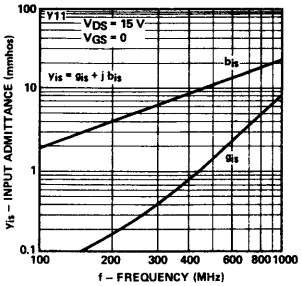


PERFORMANCE CURVES (Cont'd) (25°C unless otherwise noted)

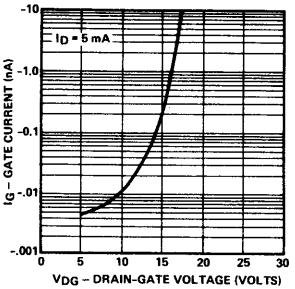
S Parameters S_{11} Common-Source vs Frequency



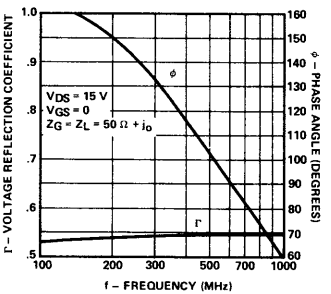
Common-Source Input Admittance vs Frequency



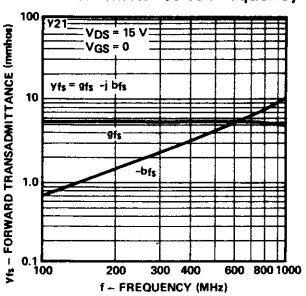
Gate Operating Current vs Drain-Gate Voltage



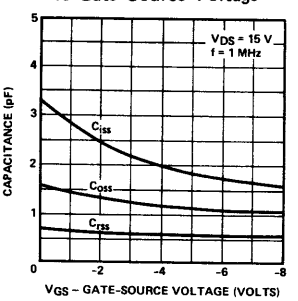
S Parameters S_{21} Common-Source vs Frequency



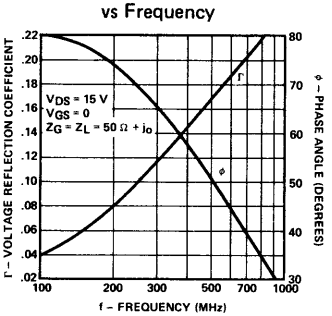
Common-Source Forward Transadmittance vs Frequency



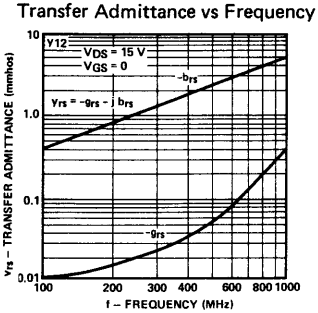
Common-Source Capacitances vs Gate-Source Voltage



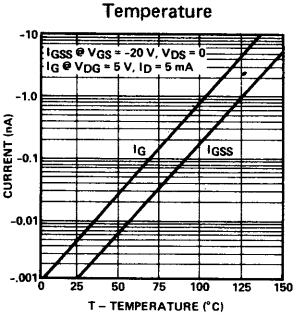
S Parameters S_{12} Common-Source vs Frequency



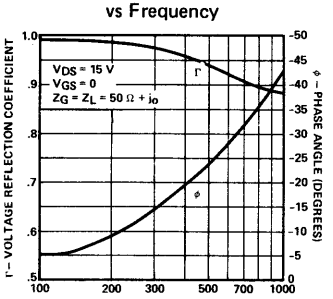
Common-Source Reverse Transfer Admittance vs Frequency



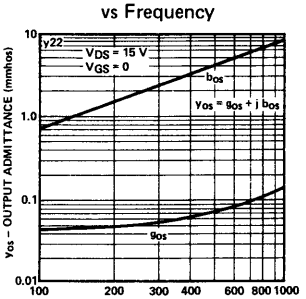
Gate Current vs Ambient Temperature



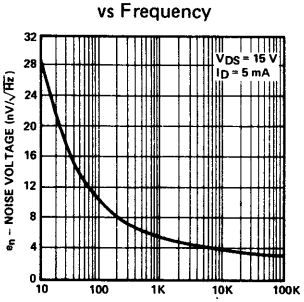
'S Parameters S_{22} Common-Source vs Frequency

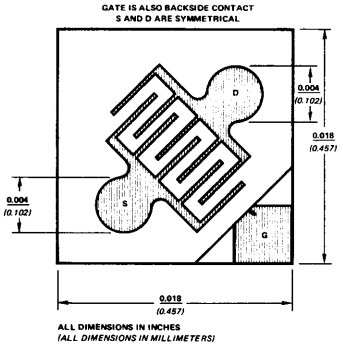


Common-Source Output Admittance vs Frequency



Equivalent Input Noise Voltage vs Frequency





N-CHANNEL DEPLETION MODE SILICON JUNCTION FIELD-EFFECT TRANSISTOR

APPLICATIONS

- Moderately—High g_{fs} is Suitable for General Purpose Amplifiers and Switches
- High Output Impedance Allows Operation in High -μ Amplifiers and High CMRR Differential Pair Amplifiers
- Geometry is also Characterized by High I_G Breakpoint Voltage

PRINCIPAL DEVICES

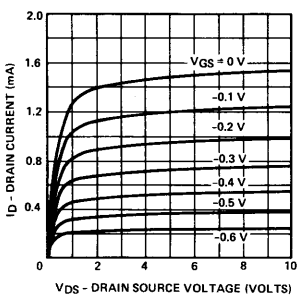
2N3821-24 2N5358-64 2N4084-85 2N5457-59
2N4220-22A 2N3921-22 2N5045-47 2N5163

PACKAGE TYPES

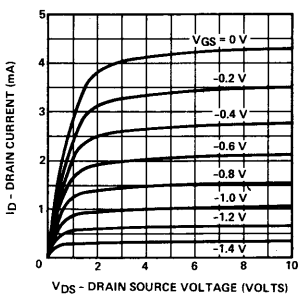
TO-18 TO-72 TO-106
TO-71 TO-92

PERFORMANCE CURVES (25°C unless otherwise noted)

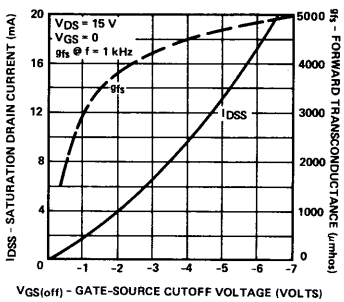
Output Characteristic



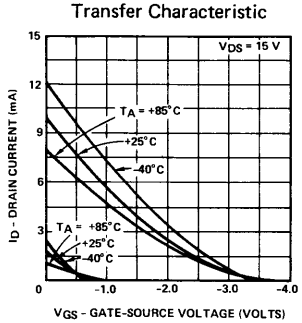
Output Characteristic



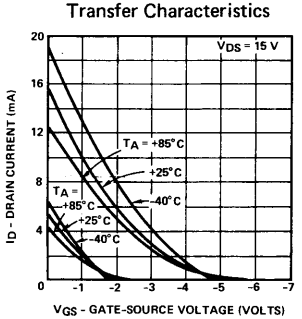
Drain Current & Transconductance vs Gate-Source Voltage



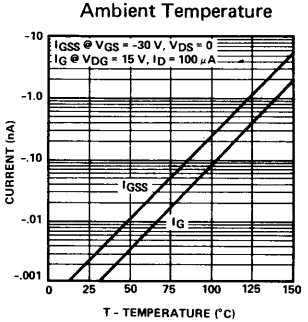
Transfer Characteristic



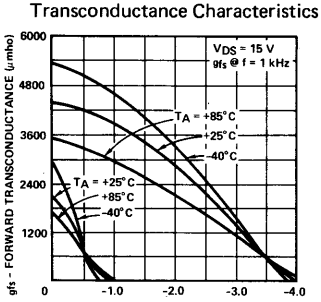
Transfer Characteristics



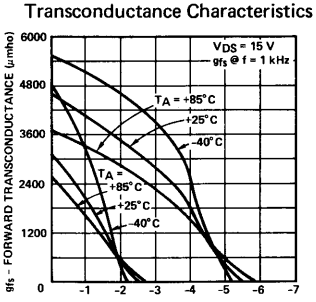
Gate Currents vs Ambient Temperature



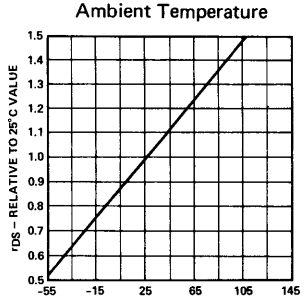
Transconductance Characteristics



Transconductance Characteristics

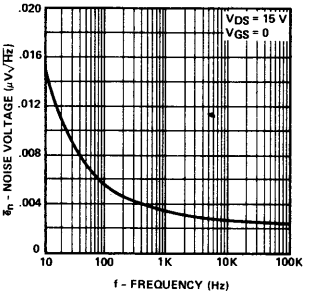


'ON' Resistance vs Ambient Temperature

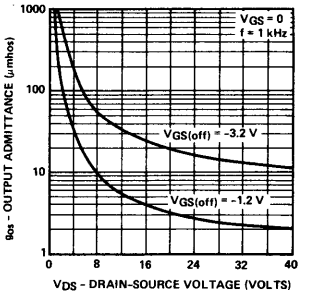


PERFORMANCE CURVES (Con't) (25°C unless otherwise noted)

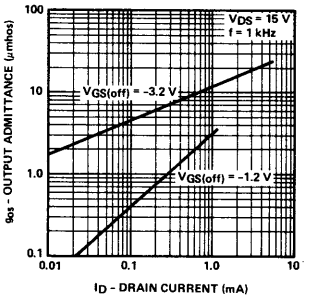
Equivalent Input Noise Voltage vs Frequency



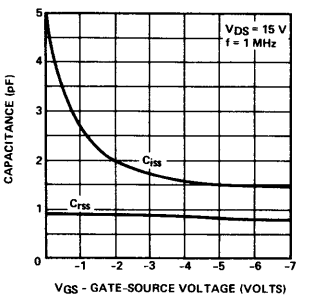
Common-Source Output Admittance vs Drain-Source Voltage



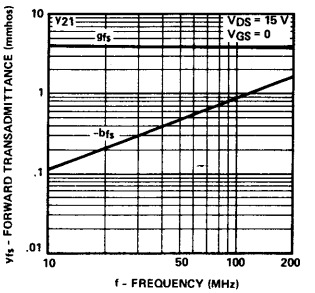
Common-Source Output Admittance vs Drain Current



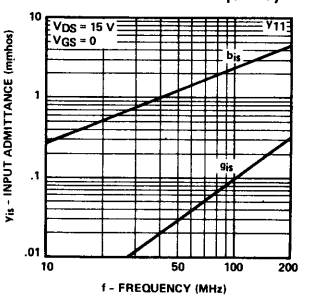
Common-Source Capacitances vs Gate-Source Voltage



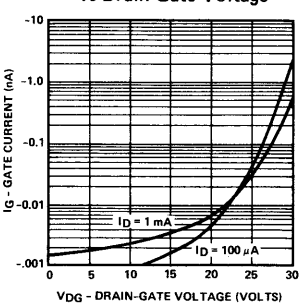
Common-Source Forward Transadmittance vs Frequency



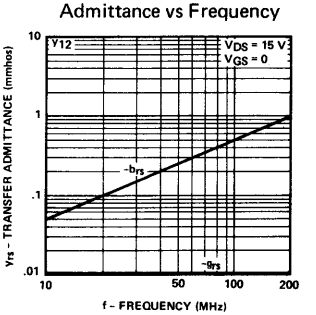
Common-Source Input Admittance vs Frequency



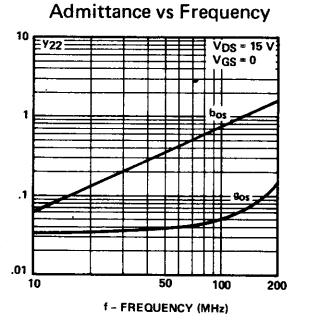
Gate Operating Current vs Drain-Gate Voltage



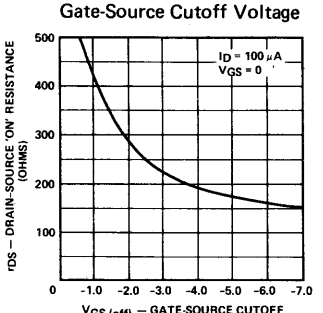
Common-Source Reverse Transfer Admittance vs Frequency



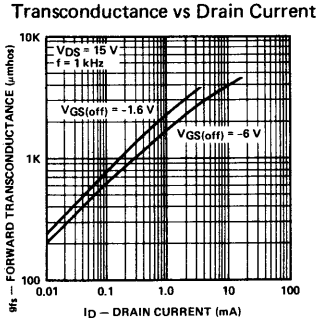
Common-Source Output Admittance vs Frequency



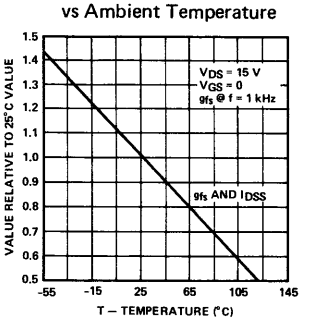
Static Drain-Source 'ON' Resistance vs Gate-Source Cutoff Voltage

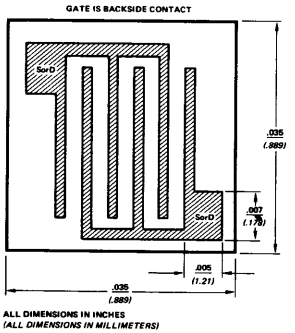


Common-Source Forward Transconductance vs Drain Current



Drain Current and Transconductance vs Ambient Temperature





P-CHANNEL DEPLETION-MODE SILICON JUNCTION FIELD-EFFECT TRANSISTOR

APPLICATIONS

- **Designed for Low Noise, Where P-Channel is Desired**

PRINCIPAL DEVICES

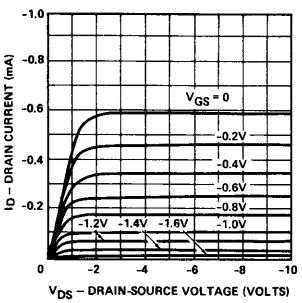
2N3578 U168 VCR6P

PACKAGE TYPES

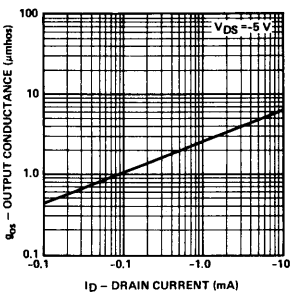
TO-72 TO-18

PERFORMANCE CURVES (25°C unless otherwise noted)

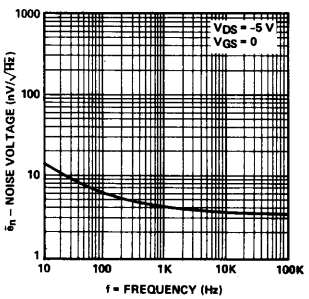
Output Characteristic



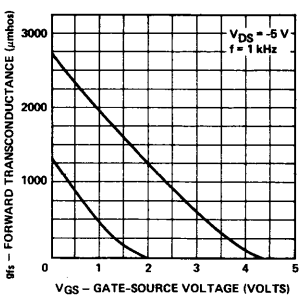
Common-Source Output Conductance vs Drain Current



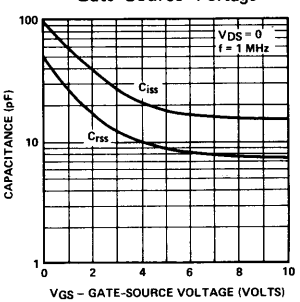
Equivalent Input Noise Voltage vs Frequency



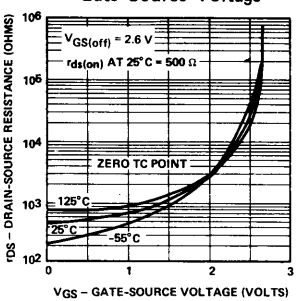
Transconductance Characteristics



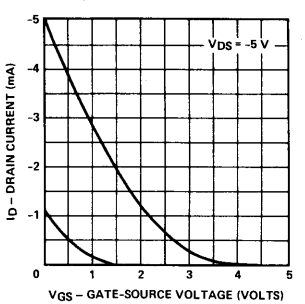
Common-Source Capacitance vs Gate-Source Voltage



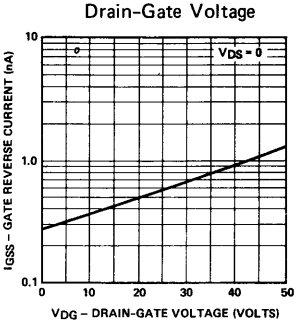
ON Resistance vs Gate-Source Voltage



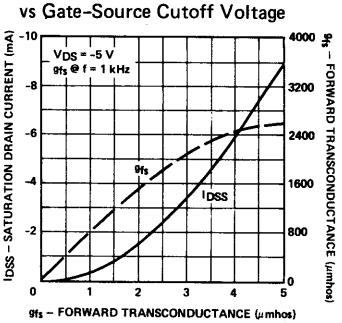
Transfer Characteristics



Gate Current Characteristics vs Drain-Gate Voltage

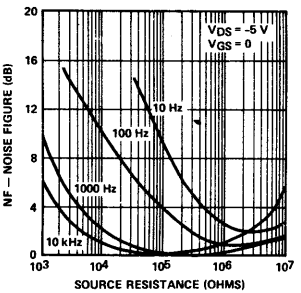


Saturation Drain Current and Forward Transconductance vs Gate-Source Cutoff Voltage

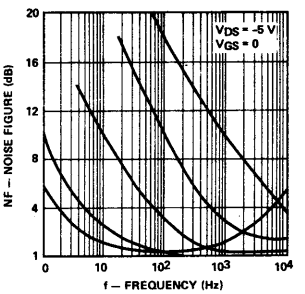


PERFORMANCE CURVES (Cont'd) (25°C unless otherwise noted)

Common-Source Spot Noise Figure vs Source Resistance



Common-Source Spot Noise Figure vs Frequency



Equivalent Input Noise Voltage and Current vs Frequency