

Performance Curves NP

See Page 4-37



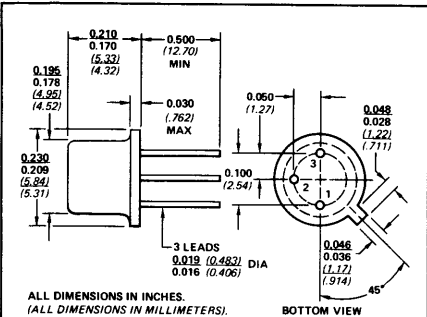
N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

FOR AMPLIFIERS AND CHOPPERS

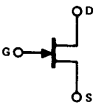
- Features NF = 1 dB @ 1 KHz

ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage (Note 1) -30 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 +200°C
Lead Temperature
(1/16" from case for 10 seconds) 300°C



TO-18



PIN	OUT
1	S
2	D
3	G, C

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Characteristic			U197		U198		U199		Unit	Test Conditions		
			Min	Max	Min	Max	Min	Max				
1	S T A T I C	IGSS	Gate Reverse Current		-0.5		-0.5		-0.5	nA	VGS = -20 V, VDS = 0	150°C
2					-0.5		-0.5		-0.5	μA		
3		BVGSS	Gate-Source Breakdown Voltage	-30		-30		-30	V	IG = -1 μA, VDS = 0		
4		VGS(off)	Gate-Source Cutoff Voltage	-0.2	-1.0	-0.8	-4.0	-3.0		-10	VDS = 20 V, ID = 10 nA	
5		ID(off)	Drain Cutoff Current		0.5 (-1)		0.5 (-4)		0.5 (-10)	nA (V)	VDS = 10 V, VGS = ()	
6		IDSS	Saturation Drain Current	0.1	1.0	0.6	6.0	3.0	20	mA	VDS = 20 V, VGS = 0	
7	D Y N A M I C	gfs	Common-Source Forward Transconductance (Note 3)	200		600		1500		μmho	VDS = 20 V, VGS = 0	f = 1 kHz
8		rds(on)	Drain-Source ON Resistance		4000		1500		650	ohm	VGS = 0, VDS = 0	
9		Csgs + Cdgs	Source-Gate and Drain-Gate Capacitance		3		3		3	pF	VDS = 0, VGS = -10 V	f = 1 MHz
10		Ciss	Common-Source Input Capacitance		7		7		7		VDS = 20 V, VGS = 0	

NOTES:

1. Due to symmetrical geometry, these units may be operated with source and drain leads interchanged.
2. Derate linearly to +175°C free-air temperature at the rate of 2 mW/°C.
3. Pulse test duration = 2 ms.

NP

Performance Curves NC
See Page 4-23

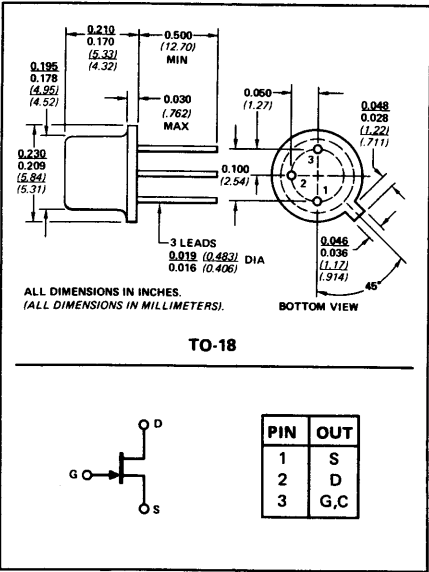
U200 U201 U202



N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

FOR ANALOG SWITCHES, COMMUTATORS
AND CHOPPERS

- ON Resistance < 50 ohms (U202)
- ID(off) < 1 nA



ABSOLUTE MAXIMUM RATINGS (25°C)

- Gate-Drain or Gate-Source Voltage -30 V
- Gate Current 50 mA
- Total Device Dissipation at 25°C Case Temperature
(Derate 10 mW/°C) 1.8 W
- 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			U200		U201		U202		Unit	Test Conditions			
			Min	Max	Min	Max	Min	Max					
1	S T A T I C	IGSS	Gate Reverse Current			-1		-1		-1	nA	VGS = -20 V, VDS = 0	150°C
2		BVGSS	Gate-Source Breakdown Voltage		-30		-30		-30		μA		
3		VGS(off)	Gate-Source Cutoff Voltage		-0.5	-3	-1.5	-5	-3.5	-10	V	IG = -1 μA, VDS = 0	
4												VDS = 20 V, ID = 10 nA	
5		ID(off)	Drain Cutoff Current			1		1		1	nA	VDS = 10 V, VGS = -12 V	150°C
						1		1		1	μA		
6		IDSS	Saturation Drain Current (Note 1)		3	25	15	75	30	150	mA	VDS = 20 V, VGS = 0	
7	D Y N	rds(on)	Drain-Source ON Resistance			150		75		50	ohm	VGS = 0, ID = 0	f = 1 kHz
8		Ciss	Common-Source Input Capacitance (Note 1)			30		30		30	pF	VDS = 20 V, VGS = 0	f = 1 MHz
9		Crss	Common-Source Reverse Transfer Capacitance			8		8		8		VDS = 0, VGS = -12 V	

NOTES: 1. Pulse test required, pulsewidth = 300 μsec, duty cycle ≤ 3%. NC

Performance Curves NC

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N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

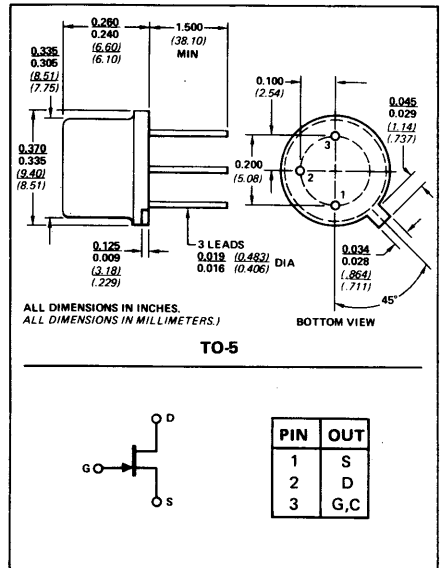


FOR MEDIUM POWER AUDIO AND RF AMPLIFIERS

- Power Output 0.5 W up to 100 MHz
- No Thermal Runaway
- No Secondary Breakdown

ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain and Gate-Source Voltage	-50 V
Gate Current	25 mA
Total Device Dissipation at 25°C	
Ambient Temperature (Note 2)	0.8 W
Total Device Dissipation at 25°C	
Case Temperature (Note 3)	3 W
Storage Temperature Range	-65 to +200°C
Operating Junction Temperature Range	-55 to +200°C



ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Characteristic				U221			U222			Unit	Test Conditions		
				Min	Typ	Max	Min	Typ	Max				
1	S T A T I C	IGSS	Gate Reverse Current				-1.0			-1.0	nA	VGS = -20 V, VDS = 0	
2		BVGSS	Gate-Source Breakdown Voltage		-50			-50			V	IG = -10 μA, VDS = 0	
3		VGS(off)	Gate-Source Cutoff Voltage		-3.5		-8	-6		-10		VDS = 20 V, ID = 10 nA	
4		IDSS	Saturation Drain Current (Note 1)		50	85	150	100	130	300	mA	VDS = 10 V, VGS = 0	
5	D Y N A M I C	gfs	Common-Source Forward Transconductance (Note 1)		15,000	20,000		20,000	30,000		μmho	VDS = 20 V, VGS = 0	f = 1 kHz
6		Ciss	Common-Source Input Capacitance			20	28		20	28	pF		f = 1 MHz
7		Crss	Common-Source Reverse Transfer Capacitance			4	7		4	7			

NOTES:

1. Pulse test duration = 2 ms.
2. Derate linearly to 200°C free-air temperature at rate of 4.67 mW/°C.
3. Derate linearly to 200°C junction temperature at rate of 17.2 mW/°C.

NC

Performance Curves NP

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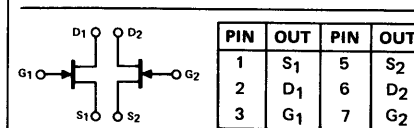
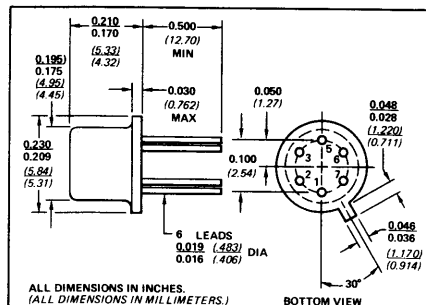
U231 U232 U233 U234 U235

MATCHED DUAL N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS



MATCHED FET PAIRS FOR DIFFERENTIAL AMPLIFIERS

- $I_G < 50 \text{ pA}$ at 25°C
- $g_{oss} < 10 \text{ } \mu\text{mhos}$ ($I_D = 200 \text{ } \mu\text{A}$)
- Matched V_{GS} , ΔV_{GS} , I_G , g_{fs} , and g_{oss}



ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage -50 V
 Gate Current 50 mA
 Total Device Dissipation at 25°C
 (Derate 1.7 mW/°C to 200°C) 300 mW
 Storage Temperature Range -65 to +200°C

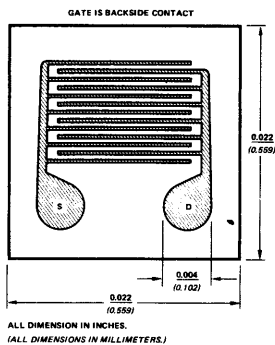
ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Characteristic		Min	Max	Unit	Test Conditions						
1	S T A T I C	IGSS Gate Reverse Current		-100	pA	VGS = -30 V, VDS = 0	150°C				
2				-500	nA						
3		BVGSS Gate-Source Breakdown Voltage	-50		V	IG = -1 μA, VDS = 0					
4		VGS(off) Gate-Source Cutoff Voltage	-0.5	-4.5		VDS = 20 V, ID = 1 nA					
5		VGS Gate-Source Voltage	0.3	-4.0							
6		IG Gate Operating Current		-50	pA	VDG = 20 V, ID = 200 μA	125°C				
7				-250	nA						
7	IDSS Saturation Drain Current	0.5	5.0	mA	VDS = 20 V, VGS = 0						
8	D Y N A M I C	gfs Common-Source Forward Transconductance (Note 1)	1000	3000	μmho	VDS = 20 V, VGS = 0	f = 1 kHz				
9			1000				f = 100 MHz				
10		gfs Common-Source Forward Transconductance (Note 1)	600	1600		VDG = 20 V, ID = 200 μA	f = 1 kHz				
11		gos Common-Source Output Conductance		35				VDS = 20 V, VGS = 0			
12		gos Common-Source Output Conductance		10	VDG = 20 V, ID = 200 μA						
13		Ciss Common-Source Input Capacitance		6	pF	VDS = 20 V, VGS = 0	f = 1 MHz				
13		Crss Common-Source Reverse Transfer Capacitance		2							
14	ēn Equivalent Input Noise Voltage		150	nV/√Hz	f = 100 Hz						
Characteristic		U231 Max	U232 Max	U233 Max	U234 Max	U235 Max	Unit	Test Conditions			
15	M A T C H I N G	IG1-IG2 Differential Gate Current	10	10	10	10	10	nA	VDG = 20 V, ID = 200 μA	125°C	
16		(IDSS1-IDSS2) IDSS1 Drain Current Match at Zero Gate Voltage (Note 1)	5	5	5	10	15	%	VDS = 20 V, VGS = 0		
17		VGS1-VGS2 Differential Gate-Source Voltage	5	10	15	20	25	mV	VDG = 20 V, ID = 200 μA	TA = 25°C TB = 125°C TA = -55°C TB = 25°C	
18		ΔVGS1-VGS2 ΔT Gate-Source Voltage Differential Drift	10	25	50	75	100	μV/°C			f = 1 kHz
19			10	25	50	75	100				
20		(gfs1-gfs2) gfs1 Transconductance Match (Note 1)	3	5	5	10	15	%			
21		gos1-gos2 Differential Output Conductance	5	5	5	5	5	μmho			

NOTE:

1. Pulse test required, pulsewidth = 300 μs , duty cycle $\leq 3\%$

NP



N-CHANNEL DEPLETION MODE SILICON JUNCTION FIELD-EFFECT TRANSISTOR

APPLICATION

- Moderate Low $R_{DS(ON)}$ Exceptionally Suitable For Switching and Commutators
- High Forward Transconductance and Moderately Low Capacitance Allows Operation as UHF/VHF Amplifier to 400 MHz

PRINCIPAL DEVICES

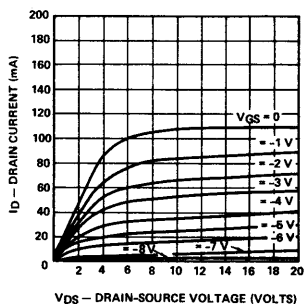
2N3970-72, 2N4091-93, 2N4391-3
2N4856-61, 2N4856A, -61A, 2N5564-66
2N5653-54, E111-13

PACKAGE TYPES

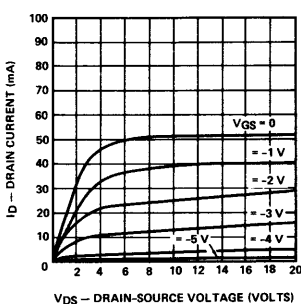
TO-18, TO-71, TO-72
TO-92, TO-106

PERFORMANCE CURVES (25°C unless otherwise noted)

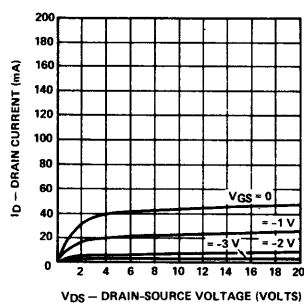
Output Characteristic



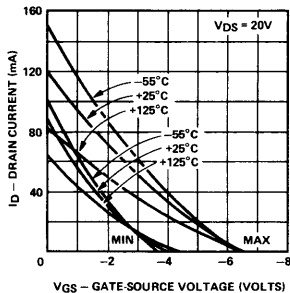
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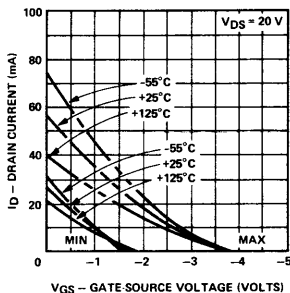
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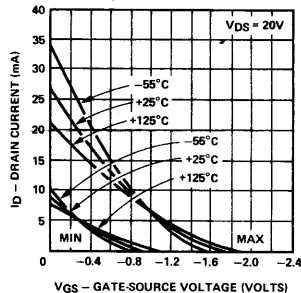
Transfer Characteristics



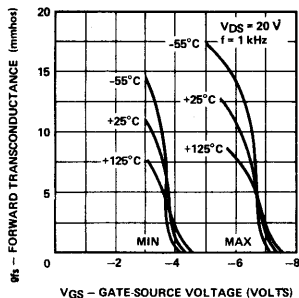
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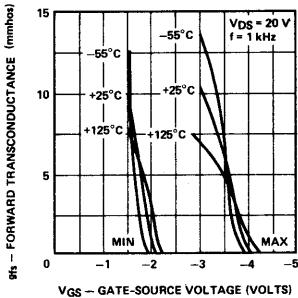
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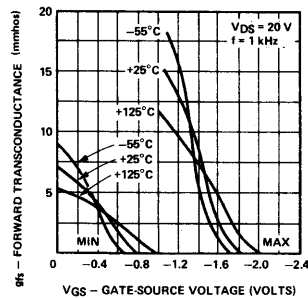
Transconductance Characteristics



Transconductance Characteristics

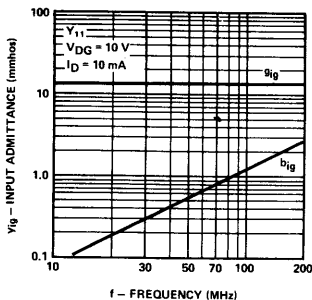


Transconductance Characteristics

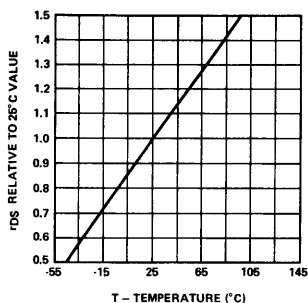


PERFORMANCE CURVES (Cont'd) (25°C unless otherwise noted)

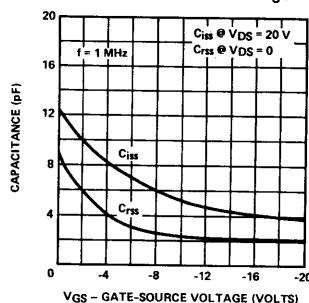
Common-Gate Input Admittance vs Frequency



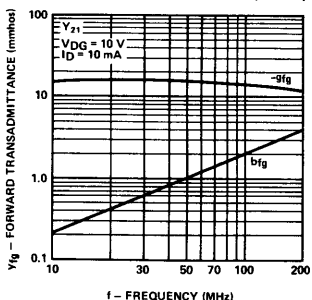
ON Resistance vs Ambient Temperature



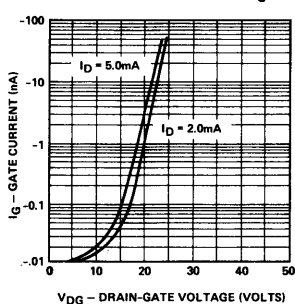
Common-Source Capacitances vs Gate-Source Voltage



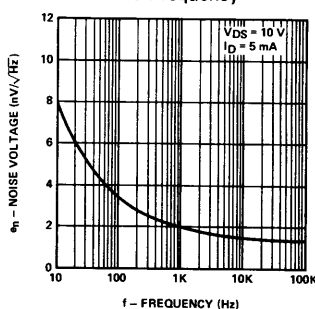
Common-Gate Forward Transmittance vs Frequency



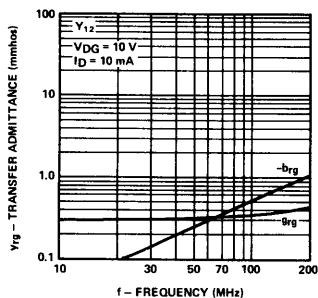
Gate Operating Current vs Drain-Gate Voltage



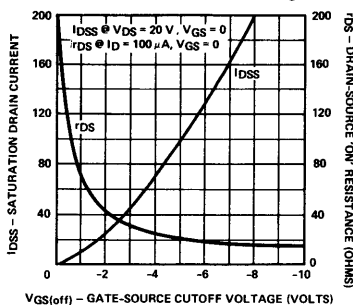
Equivalent Input Noise Voltage vs Frequency



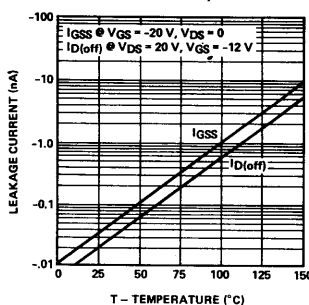
Common-Gate Reverse Transfer Admittance vs Frequency



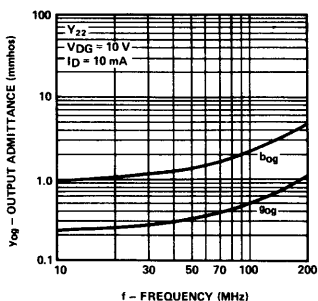
Drain Current & ON Resistance vs Gate-Source Cutoff Voltage



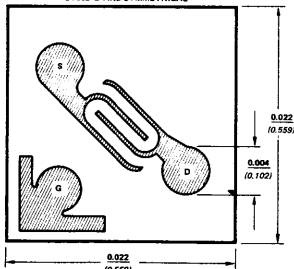
Leakage Current vs Ambient Temperature



Common-Gate Output Admittance vs Frequency



GATE ALSO BACKSIDE CONTACT
S AND D ARE SYMMETRICAL



ALL DIMENSIONS IN INCHES
(ALL DIMENSIONS IN MILLIMETERS)

N-CHANNEL DEPLETION MODE SILICON JUNCTION FIELD-EFFECT TRANSISTOR

APPLICATIONS

- General Purpose Amplifiers and Switches
Where Low to Medium Transconductance
and Low Leakage are Required

PRINCIPAL DEVICES

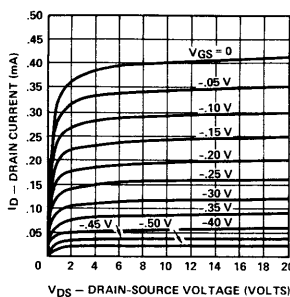
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2N4302-04	2N4338-41	2N5196-99
2N5545-47	E201-03	E400-02
U197-99	U231-35	VCR4N
VCR20N		

PACKAGE TYPES

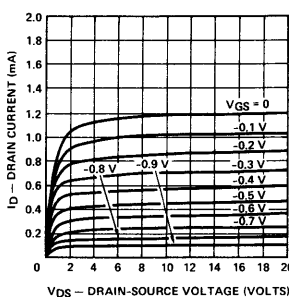
TO-18	TO-106
TO-71	SI-200

PERFORMANCE CURVES (25°C unless otherwise noted)

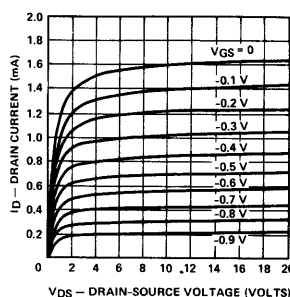
Output Characteristic



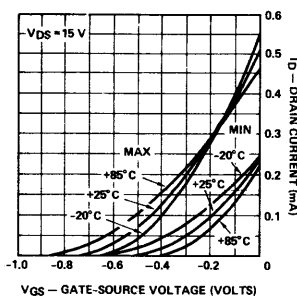
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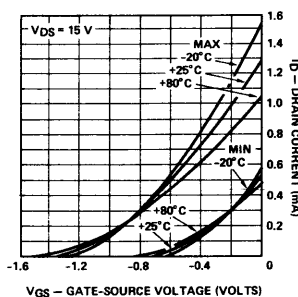
Output Characteristic



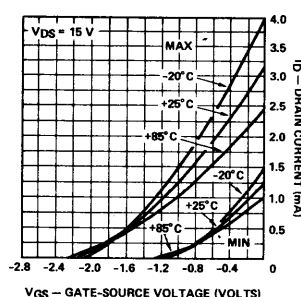
Transfer Characteristics



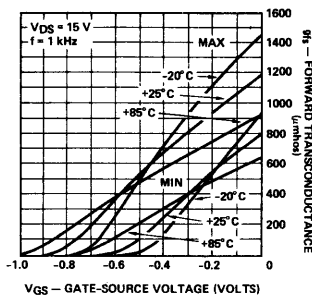
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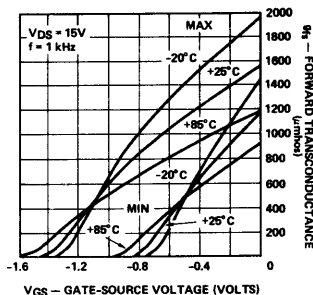
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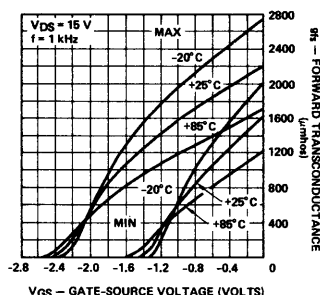
Transconductance Characteristics



Transconductance Characteristics

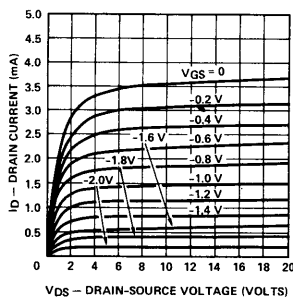


Transconductance Characteristics

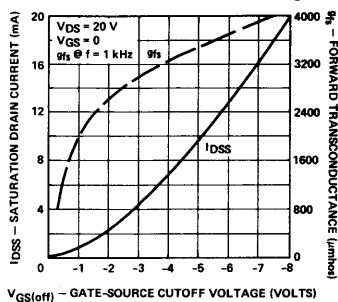


PERFORMANCE CURVES (Cont'd) (25°C unless otherwise noted)

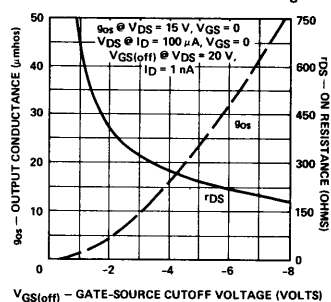
Output Characteristic



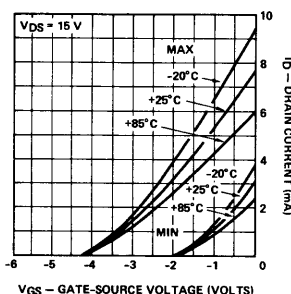
Drain Current and Transconductance vs Gate-Source Cutoff Voltage



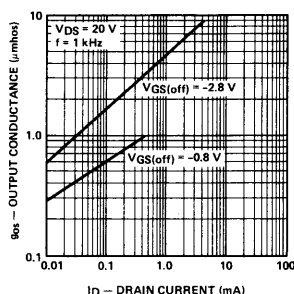
ON Resistance & Output Conductance vs Gate-Source Cutoff Voltage



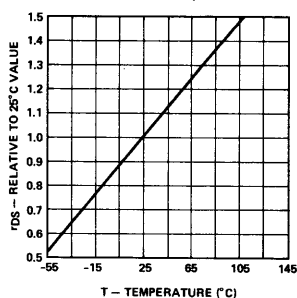
Transfer Characteristics



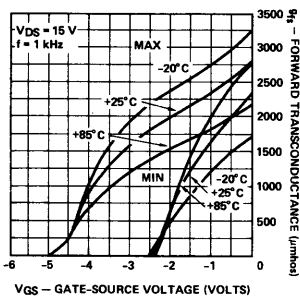
Common-Source Output Conductance vs Drain Current



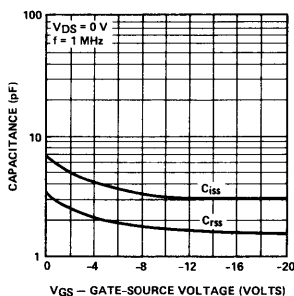
ON Resistance vs Ambient Temperature



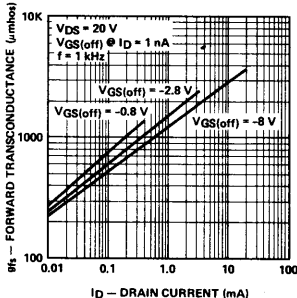
Transconductance Characteristics



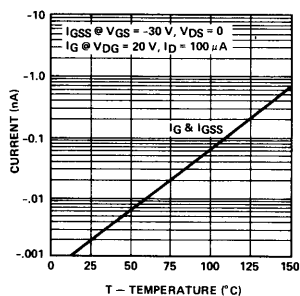
Common-Source Capacitances vs Gate-Source Voltage



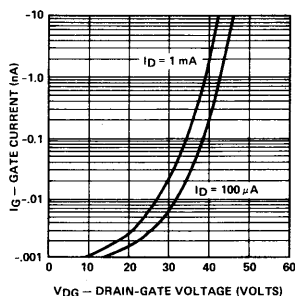
Common-Source Forward Transconductance vs Drain Current



Gate Currents vs Ambient Temperature



Gate Operating Current vs Drain-Gate Voltage



Equivalent Input Noise Voltage vs Frequency

