

Performance Curves PA PB PC PD

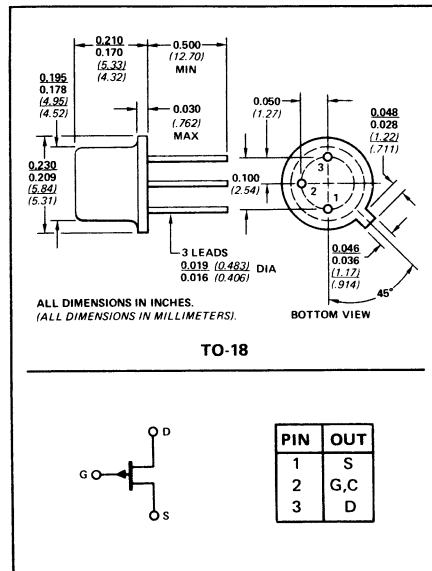
See Pages 4-53, 54, 55, 56



P-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

FOUR FET GEOMETRIES FOR WIDE CHOICE OF CHARACTERISTICS

- JAN Approved Also Available



*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain and Gate-Source Voltage (Note 3) 30 V
 Gate Current, Forward Biased (Note 1) 50 mA
 Total Device Dissipation (Derate 2 mW/°C) 300 mW
 Storage Temperature Range -65 to +200°C

*ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Characteristic			2N2606		2N2607		2N2608		2N2609		Unit	Test Conditions					
			Min	Max	Min	Max	Min	Max	Min	Max							
1	S T A T I C	IGSS	Gate Reverse Current (Note 2)			1		3		10		30	nA	VGS = 30 V, VDS = 0			
2				1		3		10		30	μA	VGS = 5 V, VDS = 0, TA = 150°C					
3		BVGSS	Gate-Source Breakdown Voltage		30		30		30		30	V	IG = 1 μA, VDS = 0				
4		VGS(off)	Gate-Source Cutoff Voltage		1	4	1	4	1	4	1	4	V	VDS = -5 V, ID = 1 μA			
5		IDSS	Saturation Drain Current		-0.10	-0.50	-0.30	-1.50	-0.90	-4.50	-2	-10	mA	VDS = -5 V, VGS = 0			
6	D Y N A M I C	gfs	Common-Source Forward Transconductance		110		330		1000		2500		μmho	VDS = -5 V, VGS = 0		f = 1 kHz	
7		Ciss	Gate-Source Input Capacitance			6		10		17		30	pF	VDS = -5 V, VGS = 1 V		f = 140 kHz	
8		NF	Noise Figure			3		3					dB	VDS = -5 V, VGS = 0		RG = 10 MΩ	f = 1 kHz
9									3		3			RG = 1 MΩ			

*JEDEC Registered Data

NOTES:

1. Not JEDEC Registered
2. I_{GSS} is JEDEC Registered at $V_{GS} = 5\text{ V}$
3. Due to symmetrical geometry, these units may be operated with source and drain leads interchanged.

Performance Curves PA PB PC PD

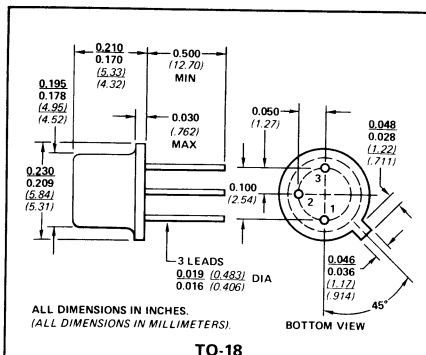
See Pages 4-53, 54, 55, 56

P-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS



LOW PINCH-OFF FETS

- Typical $V_p - 1.2$ V



PIN	OUT
1	S
2	G, C
3	D

*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain and Gate-Source Voltage (Note 3) 30 V
 Gate Current, Forward Biased (Note 1) 50 mA
 Total Device Dissipation (Derate 2mW/°C) 300 mW
 Storage Temperature Range -65 to +200°C

*ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Characteristic		2N2841		2N2842		2N2843		2N2844		Unit	Test Conditions	
		Min	Max	Min	Max	Min	Max	Min	Max			
S T A T I C	1 I_{GSS} Gate Reverse Current (Note 2)		1		3		10		30	nA	$V_{GS} = 30$ V, $V_{DS} = 0$	
	2 BV_{GSS} Gate-Source Breakdown Voltage	30		30		30		30		μ A	$V_{GS} = 5$ V, $V_{DS} = 0$, $T_A = 150^\circ\text{C}$	
	4 $V_{GS(off)}$ Gate-Source Cutoff Voltage		1.7		1.7		1.7		1.7	V	$V_{DS} = -5$ V, $I_D = -1$ μ A	
5	I_{DSS} Saturation Drain Current	-25	-125	-65	-325	-200	-1000	-440	-2200	μ A	$V_{DS} = -5$ V, $V_{GS} = 0$	
6	g_{fs} Common-Source Forward Transconductance	60		180		540		1400		μ mho	$V_{DS} = -5$ V, $V_{GS} = 0$	$f = 1$ kHz
7	C_{iss} Gate-Source Capacitance		6		10		17		30	pF	$V_{DS} = -5$ V, $V_{GS} = 1$ V	$f = 140$ kHz
8	9 NF Noise Figure		3		3					dB	$V_{DS} = -5$ V, $V_{GS} = 0$	$R_G = 10$ M Ω
9						3		3				$R_G = 1$ M Ω

*JEDEC Registered Data

PA

PB

PC

PD

NOTES:

1. Not JEDEC Registered
2. I_{GSS} is JEDEC Registered at $V_{GS} = 5$ V.
3. Due to symmetrical geometry, these units may be operated with source and drain leads interchanged.

Performance Curves NU

See Page 4-47

N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS



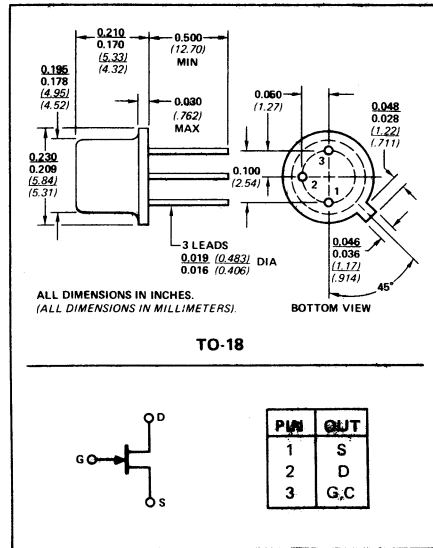
FOR SMALL-SIGNAL AMPLIFIERS

- 3 dB Max Noise Figure at 1 kHz

*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage -50 V
 Gate Current 100 mA
 Total Device Dissipation at (or below)
 25°C Free-Air Temperature (Note 1) 300 mW
 Storage Temperature Range -65 to +300°C
 Maximum Operating Temperature 200°C

*ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)



Characteristic			2N3066		2N3067		2N3068		Unit	Test Conditions		
			Min	Max	Min	Max	Min	Max				
1	S T A T I C	IGSS	Gate Reverse Current		-1.0		-1.0		-1.0	nA	VGS = -30 V, VDS = 0	150°C
2					-1.0		-1.0		-1.0	μA		
3		BVGSS	Gate-Source Breakdown Voltage	-50		-50		-50		V	IG = -1 μA, VDS = 0	
4		VGS(off)	Gate-Source Cutoff Voltage		-9.5		-4.5		-2.2		VDS = 30 V, ID = 1 μA	
5		ID(off)	Drain Cutoff Current		0.5 (-10.0)		0.5 (-5.0)		0.5 (-2.5)	nA (V)	VDS = 30 V, VGS = ()	
6	IDSS	Saturation Drain Current	0.8	4.0	0.2	1.0	0.05	0.25	mA	VDS = 30 V (Note 2), VGS = 0		
7	D Y N A M I C	gfs	Common-Source Forward Transconductance	400	1000	300	1000	200	1000	μmho	VDS = 30 V (Note 2), VGS = 0	f = 1 kHz
8		goss	Common-Source Output Conductance		50		20		5		VDS = 30 V, VGS = 0	f = 1 MHz
9		Coss	Common-Source Output Capacitance		1.5		1.5		1.5	pF		
10		Ciss	Common-Source Input Capacitance		10 (12)		10 (8)		10 (5)	pF (V)	VDS = (), VGS = 0	
11		NF	Noise Figure		3 (15)		3 (10)		3 (5)	dB (V)	VDS = (), VGS = 0, Rgen = 1 meg, BW = 200 Hz	

*JEDEC Registered Data.

NU

NOTES:

- Derate linearly to 200°C free-air temperature at rate of 1.7 mW/°C.
- To minimize heating on high I_{DSS} units, this parameter is measured during a 2 ms interval 100 ms after power is applied. (Not a JEDEC condition.)

Performance Curves NU

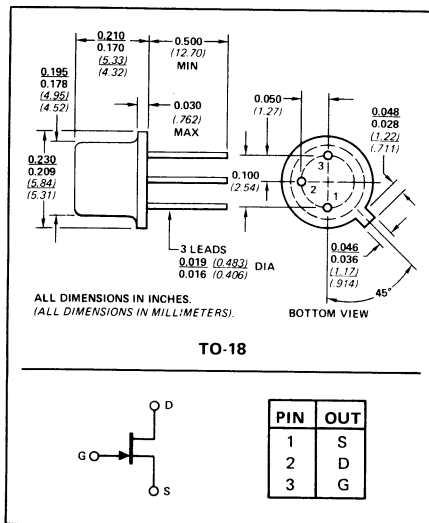
See Page 4-47

N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS



FOR SMALL-SIGNAL AMPLIFIERS

- 3 dB Max Noise Figure at 1 kHz



*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage -50 V
 Gate Current 100 mA
 Total Device Dissipation at (or below)
 25°C Free-Air Temperature (Note 1) 350 mW
 Storage Temperature Range -65 to +300°C
 Maximum Operating Temperature 200°C

*ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Characteristic			2N3069		2N3070		2N3071		Unit	Test Conditions		
			Min	Max	Min	Max	Min	Max				
1	S T A T I C	IGSS	Gate Reverse Current		-1.0		-1.0		-1.0	nA	VGS = -30 V, VDS = 0	150°C
2					-1.0		-1.0		-1.0	μA		
3		BVGSS	Gate-Source Breakdown Voltage	-50		-50		-50		V	IG = -1 μA, VDS = 0	
4		VGS(off)	Gate-Source Cutoff Voltage		-9.5		-4.5		-2.2		VDS = 30 V, ID = 1 μA	
5		ID(off)	Drain Cutoff Current		0.5 (-10.0)		0.5 (-5.0)		0.5 (-2.5)	nA (V)	VDS = 30 V, VGS = ()	
6		IDSS	Saturation Drain Current	2.0	10.0	0.5	2.5	0.1	0.6	mA	VDS = 30 V (Note 2), VGS = 0	
7	D Y N A M I C	gfs	Common-Source Forward Transconductance	1000	2500	750	2500	500	2500	μmho	VDS = 30 V (Note 2), VGS = 0	f = 1 kHz
8		goss	Common-Source Output Conductance		80		30		7		VDS = 30 V, VGS = 0	f = 1 MHz
9		Coss	Common-Source Output Capacitance		1.5		1.5		1.5	pF		
10		Ciss	Common-Source Input Capacitance		15		15		15	pF	VDS = (), VGS = 0	
					(12)		(8)		(5)	(V)		
11		NF	Noise Figure		3		3		3	dB	VDS = (), VGS = 0, Rgen = 1 meg, BW = 200 Hz	f = 1 kHz
				(15)		(10)		(5)	(V)			

*JEDEC registered data.

NU

NOTES:

- Derate linearly to 200°C free-air temperature at rate of 2.0 mW/°C.
- To minimize heating on high I_{DSS} units, this parameter is measured during a 2 ms interval 100 ms after power is applied. (Not a JEDEC condition.)

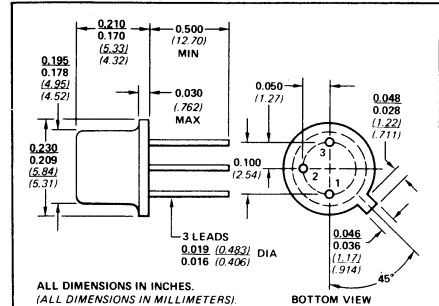
Performance Curves NU

See Page 4-47

N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

FOR LOW NOISE SMALL-SIGNAL AMPLIFIERS

- Low Wide-Band Noise Figure



TO-18



PIN	OUT
1	D
2	S
3	G,C

*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage (Note 2) -30 V
 Gate Current 50 mA
 Total Device Dissipation (Derate 2.3 mW/°C) 400 mW
 Storage Temperature Range -65 to +200°C

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Characteristic			2N3089		2N3089A		Unit	Test Conditions				
			Min	Max	Min	Max						
1	S T A T I C	IGSS	Gate Reverse Current			-1		-1	nA	VGS = -10 V, VDS = 0	100°C	
2				-200		-200						
3			BVGSS(2)	Gate-Source Breakdown Voltage		-30		-30				
4		VGS(off)	Gate-Source Cutoff Voltage		-1	-5	-1	-5	V	IG = -1 μA, VDS = 0		
5		IDSS	Saturation Drain Current (Note 1)		0.5	2	0.5	2		mA		VDS = 10 V, VGS = 0
6	D Y N A M I C	gfs	Common-Source Forward Transconductance (Note 1)		300	2000	300	2000	μmho	VDS = 15 V, VGS = -1 V	f = 1 kHz	
7			giss	Common-Source Input Conductance			100			100	VDS = 15 V, VGS = -1 V	f = 1 MHz
8				gos	Common-Source Output Conductance			50			50	VDS = 15 V, VGS = -1 V
9		Ciss(2)	Common-Source Input Capacitance			6		6	pF	VDS = 15 V, VGS = 0	f = 1 MHz	
10			Crss(2)	Common-Source Reverse Transfer Capacitance			2					2
11	NF			Noise Figure			3					0.5

*JEDEC registered data.

NU

NOTE:

1. Pulse test duration = 2 ms.
2. This parameter is a tighter spec than that on the JEDEC registration. If this limit is critical to a particular application, care should be taken in selecting alternate suppliers.

Performance Curves PA

See Page 4-53

P-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

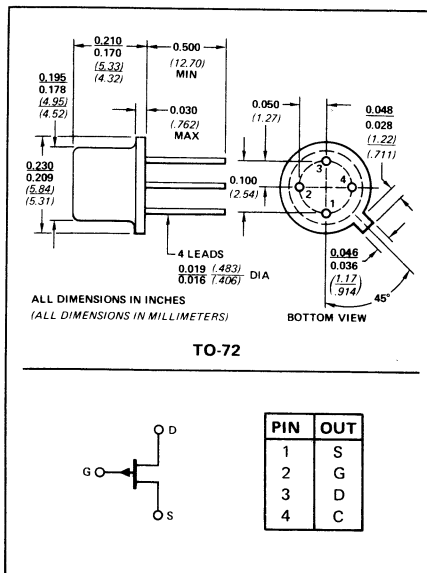


FOR SMALL SIGNAL APPLICATIONS

- $I_{GSS} = 1 \text{ nA}$

*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain and Gate-Source Voltage (Note 1) 20 V
 Gate Current 10 mA
 Total Device Dissipation at (or below)
 25°C Free-Air Temperature (Note 2) 0.3 W
 Storage Temperature Range -65 to +200°C
 Lead Temperature
 (1/16" from case for 10 seconds) 230°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		1	nA	VGS = 15 V, VDS = 0	TA = 150°C
2				1	μA		
3		BVGSS Gate-Source Breakdown Voltage	20		V	IG = 1 μA, VDS = 0	
4		VGS(off) Gate-Source Cutoff Voltage		6		VDS = -10 V, ID = -1 μA	
5		IDSS Saturation Drain Current		-1		mA	
6	D Y N	gfs Common-Source Forward Transconductance	100		μmho	VDS = -10 V, VGS = 0	f = 1 kHz
7		Ciss Common-Source Input Capacitance		4	pF	VDS = -10 V, VGS = 1 V	f = 1 MHz
8		NF Noise Figure		3	dB	VDS = -10 V, VGS = 0, Rgen = 10 MΩ	f = 1 kHz

*JEDEC registered data.

PA

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 rate of 2.0 mW/°C.

Performance Curves PC

See Page 4-55

P-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

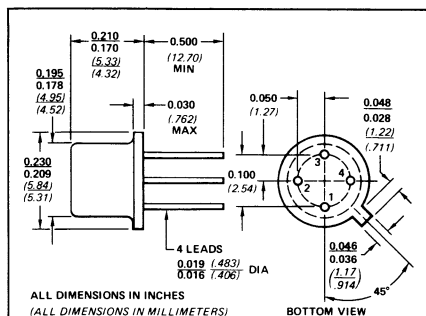


2N3329 2N3330 2N3331 2N3332

2

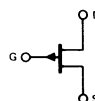
FOR MULTI-PURPOSE AMPLIFIERS, ANALOG MULTIPLIERS AND MODULATORS

- Electrically Equivalent to 2N2497-9 Series



ALL DIMENSIONS IN INCHES
(ALL DIMENSIONS IN MILLIMETERS)

TO-72



PIN	OUT
1	S
2	G
3	D
4	C

*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain and Gate-Source Voltage (Note 1) 20 V
 Gate Current 10 mA
 Total Device Dissipation at (or below)
 25°C Free-Air Temperature (Note 2) 0.3 W
 Storage Temperature Range -65 to +200°C
 Lead Temperature
 (1/16" from case for 10 seconds) 230°C

*ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Characteristic			2N3329		2N3330		2N3331		2N3332		Unit	Test Conditions			
			Min	Max	Min	Max	Min	Max	Min	Max					
1	S T A T I C	IGSS	Gate Reverse Current		0.01		0.01		0.01		μA	VGS = 10 V, VDS = 0			
2					10		10		10	VGS = 10 V, VDS = 0, TA = 150°C					
3		BVGS	Gate-Source Breakdown Voltage	20		20		20		V	IG = 10 μA, VDS = 0				
4		VGS(off)	Gate-Source Cutoff Voltage		5		6		8		VDS = -15 V, ID = -10 μA				
5	D Y N A M I C	IDSS	Saturation Drain Current	-1	-3	-2	-6	-5	-15	-1	-6	mA	VDS = -10 V, VGS = 0		
6		rDS(on)	Drain-Source ON Resistance		1000		800		600			Ω	ID = -100 μA, VGS = 0		
7		gis	Common-Source Input Conductance		0.2		0.2		0.2		0.2	μmho	VDS = -10 V	2N3329: ID = -1 mA 2N3330: ID = -2 mA 2N3331: ID = -5 mA 2N3332: ID = -1 mA	f = 1 kHz
8		grs	Common-Source Reverse Transfer Conductance		0.1		0.1		0.1		0.1				
9		gos	Common-Source Output Conductance		20		40		100		20				
10		gfs	Common-Source Forward Transconductance	1000	2000	1500	3000	2000	4000	1000	2200				
11				900		1350		1800		900					f = 10 MHz
12		Ciss	Common-Source Input Capacitance		20		20		20		20	pF	VDS = -10 V, VGS = 1 V		f = 1 MHz
13	NF	Noise Figure		3		3		4		1	dB	VDS = -5 V, ID = -1 mA Rgen = 1 MΩ		f = 1 kHz	
14	NF	Noise Figure								5		VDS = -5 V, ID = -1 mA Rgen = 10 MΩ		f = 10 Hz	

NOTES:

- Due to symmetrical geometry, these units may be operated with source and drain leads interchanged.
- Derate linearly to 175°C free-air temperature at rate of 2.0 mW/°C

PC

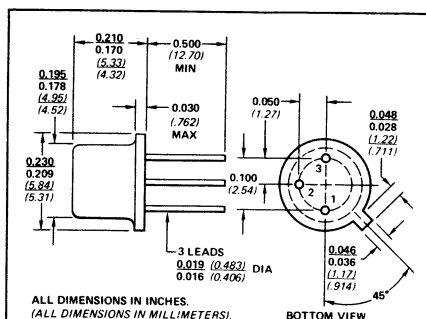
Performance Curves NU

See Page 4-47

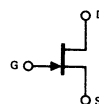
N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS



SMALL SIGNAL AMPLIFIER



TO-18



PIN	OUT
1	S
2	D
3	G,C

*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage -40 V
 Gate Current 10 mA
 Total Device Dissipation at (or below) 25°C
 Free-Air Temperature (Note 1) 300 mW
 Storage Temperature Range -65 to +175°C
 Maximum Operating Case Temperature 150°C

*ELECTRICAL CHARACTERISTICS (25° unless otherwise noted)

Characteristic			2N3365		2N3366		2N3367		Unit	Test Conditions		
			Min	Max	Min	Max	Min	Max				
1	S T A T I C	IGSS	Gate Reverse Current		-5		-5		-5	nA	VGS = -30 V, VDS = 0	100°C
2					-1		-1		-1	μA		
3		BVGSS	Gate-Source Breakdown Voltage	-40		-40		-40		V	IG = -1 μA, VDS = 0	
4		VGS(off)	Gate-Source Cutoff Voltage		-11.5		-6.5		-2.2		VDS = 20 V, ID = 1 μA	
5		ID(off)	Drain Cutoff Current		5 (-12.0)		5 (-7.0)		5 (-2.5)	nA (V)	VDS = 20 V, VGS = ()	
6	IDSS	Saturation Drain Current	0.8	4.0	0.2	1.0	0.05	0.25	mA	VDS = 30 V (Note 2), VGS = 0		
7	D Y N A M I C	gfs	Common-Source Forward Transconductance	400	2000	250	1000	100	1000	μmho	VDS = 30 V (Note 2), VGS = 0	f = 1 kHz
8		goss	Common-Source Output Conductance		50		20		10		VDS = 30 V, VGS = 0	f = 1 MHz
9		Coss	Common-Source Output Capacitance		2.5		2.5		2.5	pF		
10		Ciss	Common-Source Input Capacitance		15		15		15		VDS = 8 V, VGS = 0	f = 1 MHz

*JEDEC Registered Data.

NU

NOTES:

- Derate linearly to 150°C free-air temperature at rate of 2.4 mW/°C.
- To minimize heating on high I_{DSS} units, this parameter is measured during a 2 ms interval 100 ms after power is applied. (Not a JEDEC condition.)

Performance Curves NP

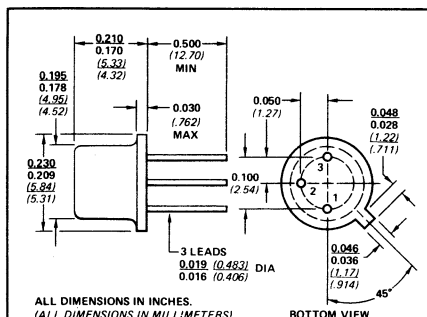
See Page 4-37

N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

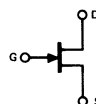
FOR SMALL-SIGNAL LOW-POWER APPLICATIONS



2N3368 2N3369 2N3370



TO-18



PIN	OUT
1	S
2	D
3	G,C

*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage (Note 1) -40 V
 Gate Current 10 mA
 Total Device Dissipation at (or below) 25°C
 Free-Air Temperature (Note 2) 300 mW
 Storage Temperature Range -65 to +175°C
 Maximum Operating Temperature 150°C

*ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Characteristic		2N3368		2N3369		2N3370		Unit	Test Conditions	
		Min	Max	Min	Max	Min	Max			
1	I _{GSS} Gate Reverse Current		-5		-5		-5	nA	V _{GS} = -30 V, V _{DS} = 0	100°C
2			-1.5		-1.5		-1.5	μA		
3	BV _{GSS} Gate-Source Breakdown Voltage	-40		-40		-40		V	I _G = -1 μA, V _{DS} = 0	
4	V _{GS(off)} Gate-Source Cutoff Voltage		-11.5		-6.5		-3.2		V _{DS} = 20 V, I _D = 1 μA	
5	I _{D(off)} Drain Cutoff Current		5 (-12.0)		5 (-7.0)		5 (-3.5)	nA (V)	V _{DS} = 20 V, V _{GS} = ()	
6	I _{DSS} Saturation Drain Current	2.0	12.0	0.5	2.5	0.1	0.6	mA	V _{DS} = 30 V (Note 3), V _{GS} = 0	
7	g _{fs} Common-Source Forward Transconductance	1000	4000	600	2500	300	2500	μmho	V _{DS} = 30 V (Note 3), V _{GS} = 0	f = 1 kHz
8	g _{oss} Common-Source Output Conductance		80		30		15		V _{DS} = 30 V, V _{GS} = 0	
9	C _{oss} Common-Source Output Capacitance		3		3		3	pF	V _{DS} = 30 V, V _{GS} = 0	
10	C _{iss} Common-Source Input Capacitance		20		20		20		V _{DS} = 8 V, V _{GS} = 0	

*JEDEC registered data.

NP

NOTES:

- Due to symmetrical geometry, these units may be operated with source and drain leads interchanged.
- Derate linearly to 150°C free-air temperature at rate of 2.1 mW/°C.
- To minimize heating on high I_{DSS} units, this parameter is measured during a 2 ms interval 100 ms after power is applied. (Not a JEDEC condition.)

Performance Curves PE PF

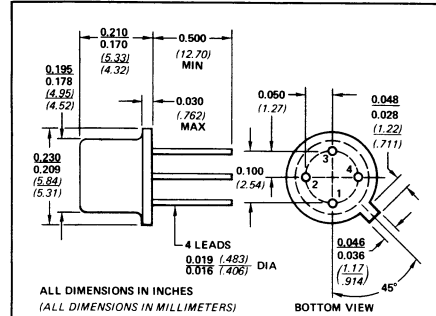
See Pages 4-57, 58

P-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

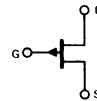


FOR ANALOG SWITCHES, CHOPPERS,
COMMUTATORS, AND AMPLIFIERS

- Low ON Resistance (2N3386)



TO-72



PIN	OUT
1	S
2	G
3	D
4	C

*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain Voltage (Note 1)	30 V
Gate-Source Voltage (Note 1)	30 V
Gate Current	50 mA
Storage Temperature Range	-65 to +200°C
Total Dissipation at 25°C T _A (Note 2)	300 mW

*ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

	Characteristic	2N3376		2N3378		2N3380		2N3382		2N3384		2N3386		Unit	Test Conditions
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
S T A T I C	1 I _{GSS} Gate Reverse Current		3		3		3		15		15		15	nA	V _{GS} = 30 V, V _{DS} = 0
	2 I _{GSS} Gate Reverse Current		3		3		3		15		15		15	μA	V _{GS} = 5 V, V _{DS} = 0, T _A = 150°C
	3 BV _{GSS} Gate-Source Breakdown Voltage	30		30		30		30		30		30		V	I _G = 1 μA, V _{DS} = 0
	4 V _{GS(off)} Gate-Source Cutoff Voltage	1.0	5.0	4.0	5.0	4.0	9.5	1.0	5.0	4.0	5.0	4.0	9.5	V	V _{DS} = -5 V, I _D = -1 μA
D Y N A M I C	5 I _{DSS} Saturation Drain Current	-0.6	-6.0	-3.0	-6.0	-3.0	-20.0	-3.0	-30.0	-15.0	-30.0	-15.0	-50.0	mA	V _{DS} = -10 V, V _{GS} = 0
	6 I _{D(off)} Drain Cutoff Current		-0.4 (6)		-0.4 (6)		-0.6 (10)		-2 (6)		-2 (6)		-2.5 (10)	nA	V _{DS} = -5 V, V _{GS} = ()
	7 r _{DS(on)} Drain-Source ON Resistance		1500		750		600		300		180		150	Ω	V _{GS} = 0, V _{DS} = 0
9	8 g _{fs(1)} Common-Source Forward Transconductance	800	2300	1500	2300	1500	3000	4500	12,500	7500	12,500	7500	15,000	μmho	V _{DS} = -10 V, V _{GS} = 0, f = 1 kHz
	9 C _{gs} Source-Gate Capacitance and C _{dg} Drain-Gate Capacitance		3.0		3.0		3.0		6.0		6.0		6.0	pF	V _{DS} = 0, V _{GS} = 10 V, f = 140 kHz
	10 C _{iss} Common-Source Input Capacitance	5 Typ						16 Typ							V _{DS} = -5 V, V _{GS} = 1 V

*JEDEC registered data.

PF

PE

NOTE::

1. Due to symmetrical geometry, units may be operated with source and drain leads interchanged.
2. Derate linearly to +175°C at 2 mW/°C
3. Pulse measurement 0.1 sec period

Performance Curves NP

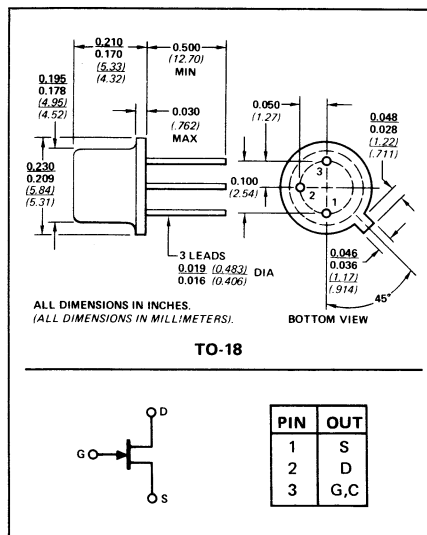
See Page 4-37

2N3436 2N3437 2N3438



N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

FOR SMALL-SIGNAL AMPLIFIERS AND SWITCHES



*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage (Note 1) -50 V
 Gate Current 10 mA
 Total Device Dissipation at (or below) 25°C
 Free-Air Temperature (Note 2) 300 mW
 Storage Temperature Range..... -65 to +200°C

*ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Characteristic			2N3436		2N3437		2N2438		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 = -30 V, VDS = 0	150°C
2					-1.0		-1.0		-1.0	μA		
3		BVGSS	Gate-Source Breakdown Voltage	-50		-50		-50		V	IG = -1 μA, VDS = 0	
4		ID(off)	Drain Cutoff Current		1.0 (-10.0)		1.0 (-5.0)		1.0 (-2.5)	nA (μ)	VDS = 20 V, VGS = ()	
5		VGS(off)	Gate-Source Cutoff Voltage		-9.8		-4.8		-2.3	V	VDS = 20 V, ID = 1 μA	
6	IDSS	Saturation Drain Current	3.0	15.0	0.8	4.0	0.2	1.0	mA	VDS = 20 V, VGS = 0		
7	D Y N A M I C	gfs	Common-Source Forward Transconductance	2500	10,000	1500	6000	800	4500	μmho	VDS = 20 V, VGS = 0	f = 1 kHz
8		goss	Common-Source Output Conductance		35		20		5		VDS = 30 V, VGS = 0	f = 1 MHz
9		Coss	Common-Source Output Capacitance		6		6		6	pF		
10		Ciss	Common-Source Input Capacitance		18 (10)		18 (6)		18 (4)	pF (V)	VGS = 0 V, VDS = ()	
11		NF	Noise Figure		2		2		2	dB	VDS = 10 V, VGS = 0 , Rgen = 1 meg, BW = 6 Hz	f = 1 kHz

*JEDEC Registered Data.

NP

NOTES:

1. Due to symmetrical geometry, these units may be operated with source and drain leads interchanged.
2. Derate linearly to 200°C free-air temperature at rate of 1.7 mW/°C.

Performance Curves NU

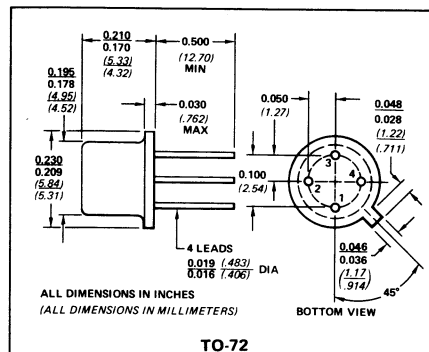
See Page 4-47

N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS



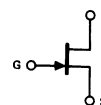
FOR SMALL SIGNAL AMPLIFIERS

- Low, Low-Frequency Noise Figure



*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage	-50 V
Gate Current	10 mA
Total Device Dissipation at (or below) 25°C	
Free-Air Temperature (Note 1)	300 mW
Storage Temperature Range	-65 to +200°C
Maximum Operating Temperature	200°C



PIN	OUT
1	S
2	D
3	G
4	C

*ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Characteristic		2N3452		2N3453		2N3454		2N3455		2N3456		2N3457		Unit	Test Conditions	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max			
S T A T I C	1 I_{GSS} Gate Reverse Current		-0.1		-0.1		-0.1		-0.04		-0.04		-0.04	nA	$V_{GS} = -30$ V,	25°C
	2		-0.4		-0.2		-0.4		-0.15		-0.15		-0.15	μA	$V_{DS} = 0$	150°C
	3 BV_{GSS} Gate-Source Breakdown Voltage	-50		-50		-50		-50		-50		-50		V	$I_G = -1$ μA, $V_{DS} = 0$	
	4 $V_{GS(off)}$ Gate-Source Cutoff Voltage		-9.8		-4.8		-2.3		-9.8		-4.8		-2.3		$V_{DS} = 20$ V, $I_D = 1$ μA	
D Y N A M I C	5 $I_{D(off)}$ Drain Cutoff Current		0.5 (-10.0)		0.5 (-5.0)		0.5 (-2.5)		0.5 (-10.0)		0.5 (-5.0)		0.5 (-2.5)	nA (V)	$V_{DS} = 20$ V, $V_{GS} = ()$	
	6 I_{DSS} Saturation Drain Current (Note 2)	0.8	4.0	0.2	1.0	0.05	0.25	0.8	4.0	0.2	1.0	0.05	0.25	mA	$V_{DS} = 30$ V $V_{GS} = 0$	
	7 g_{fs} Common-Source Forward Transconductance (Note 2)	200	1200	150	900	100	600	400	1200	300	900	150	600	μmho	$V_{DS} = 30$ V, $V_{GS} = 0$	$f = 1$ kHz
	8 g_{oss} Common-Source Output Conductance		15		5		3		15		5		3			$f = 1$ MHz
	9 C_{oss} Common-Source Output Capacitance		1.5		1.5		1.5		1.5		1.5		1.5	pF		
10	C_{iss} Common-Source Input Capacitance		6 (12)		6 (8)		6 (12)		5 (12)		5 (8)		5 (4)	pF (V)	$V_{GS} = 0$, $V_{DS} = ()$	
	11 NF Noise Figure		2 (100)		2 (100)		2 (100)		4 (20)		4 (20)		4 (20)	dB (Hz)	$V_{DS} = 10$ V, $V_{GS} = 0$ $R_{gen} = 1$ meg, $BW = 6$ Hz	$f = ()$

*JEDEC registered data.

NU

NOTES:

- Derate linearly to 150°C free-air temperature at rate of 1.7 mW/°C.
- To minimize heating on high I_{DSS} units, this parameter is measured during a 2 ms interval 100 ms after power is applied. (Not a JEDEC condition.)

Performance Curves NP

See Page 4-37

N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS



2N3458 2N3459 2N3460

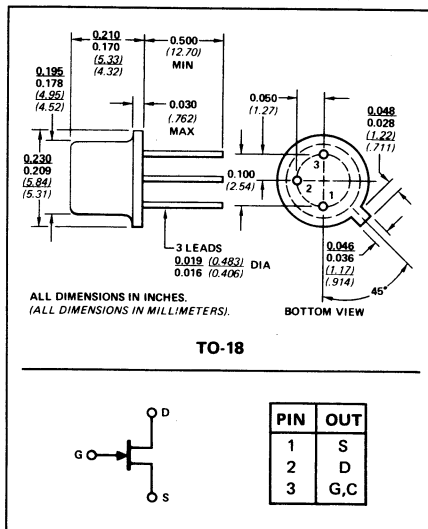
FOR SMALL-SIGNAL LOW-NOISE APPLICATIONS

- High Breakdown Voltage

*ABSOLUTE MAXIMUM RATINGS (25°C)

Gate-Drain or Gate-Source Voltage (Note 1) -50 V
 Gate Current 10 mA
 Total Device Dissipation at (or below) 25°C
 Free-Air Temperature (Note 2) 300 mW
 Storage Temperature Range -65 to +200°C

*ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)



2

Characteristic		2N3458		2N3459		2N3460		Unit	Test Conditions			
		Min	Max	Min	Max	Min	Max					
1	S T A T I C	I _{GSS}	Gate Reverse Current		-0.25		-0.25		-0.25	nA	V _{GS} = -30 V, V _{DS} = 0	150°C
2					-0.5		-0.5		-0.5	μA		
3		BV _{GSS}	Gate-Source Breakdown Voltage	-50		-50		-50		V	I _G = -1 μA, V _{DS} = 0	
4		I _{D(off)}	Drain Cutoff Current		1 (-8)		1 (-4)		1 (-2)	nA (V)	V _{DS} = 20 V, V _{GS} = ()	
5		V _{GS(off)}	Gate-Source Cutoff Voltage		-7.8		-3.4		-1.8	V	V _{DS} = 20 V, I _D = 1 μA	
6	I _{DSS}	Drain Current at Zero Gate Voltage	3.0	15.0	0.8	4.0	0.2	1.0	mA	V _{DS} = 20 V, V _{GS} = 0		
7	D Y N A M I C	g _{fs}	Common-Source Forward Transconductance	2500	10,000	1500	6000	800	4500	μmho	V _{DS} = 20 V, V _{GS} = 0	f = 1 kHz
8		g _{oss}	Common-Source Output Conductance		35		20		5		V _{DS} = 30 V, V _{GS} = 0	f = 1 MHz
9		C _{oss}	Common-Source Output Capacitance		5		5		5			
10		C _{iss}	Common-Source Input Capacitance		18 (10)		18 (6)		18 (4)	pF (V)	V _{GS} = 0 V, V _{DS} = (),	f = 1 MHz
11		NF	Noise Figure		6		4		4	dB	V _{DS} = 10 V, V _{GS} = 0., R _{gen} = 1 meg, BW = 6 Hz	f = 20 Hz

* JEDEC registered data.

NP

NOTES:

1. Due to symmetrical geometry, these units may be operated with source and drain leads interchanged.
2. Derate linearly to 200°C free-air temperature at rate of 1.7 mW/°C.

Performance Curves PJ

See Page 4-59

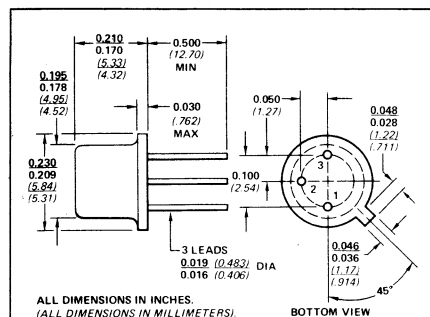
P-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTOR



FOR LOW-NOISE PREAMPLIFIERS

e.g., Hydrophones, IR Sensors, Particle Detectors

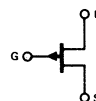
- $< 19 \text{ nV} / \sqrt{\text{Hz}}$ at 1 kHz Short-Circuit Equivalent Noise Voltage
- $< 3 \text{ dB NF}$ at 1 kHz for Source Resistance from 12K to 50 M Ω



TO-18

*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



PIN	OUT
1	S
2	G, C
3	D

*ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

Characteristic		Min	Typ	Max	Unit	Test Conditions	
1 2 3 4 5	I _{GSS} Gate Reverse Current			15	nA	V _{GS} = 20 V, V _{DS} = 0	
				30	μA		150°C
	BV _{GSS} Gate-Source Breakdown Voltage	20			V	I _G = 1 μA, V _{DS} = 0	
4	I _{DSS} Drain Current at Zero Gate Voltage	-0.9	-2.0	-4.5	mA	V _{DS} = -5 V, V _{GS} = 0	
5	V _{GS(off)} Gate-Source Cutoff Voltage	1.5	2.5	4.0	V	V _{DS} = -5 V, I _D = -1 μA	
6	g _{fs} Common-Source Forward Transconductance	1200	2000	3500	μmho	V _{DS} = -5 V, V _{GS} = 0	f = 1 kHz
7	g _{os} Common-Source Output Conductance		2.5	15.0	μmho	V _{DS} = -5 V, V _{GS} = 0	f = 1 kHz
8	C _{iss} Common-Source Input Capacitance (Output Shorted)		54	65	pF	V _{DS} = -5 V, V _{GS} = 1 V	f = 140 kHz
9 10	ē _n Short-Circuit Equivalent Input Noise Voltage			0.1	μV/√Hz	V _{DS} = -5 V, V _{GS} = 0	f = 20 Hz
				18.0	nV/√Hz		f = 1 kHz

* JEDEC registered data.

PJ

NOTES:

- Due to symmetrical geometry, these units may be operated with source and drain leads interchanged.
- Derate linearly to 175°C free-air temperature at rate of 2 mW/°C.