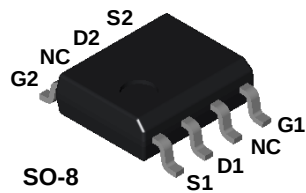


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**NPDS402
NPDS403
NPDS404
NPDS406**



N-Channel General Purpose Dual Amplifier

Sourced from Process 98.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{DG}	Drain-Gate Voltage	50	V
V_{GS}	Gate-Source Voltage	50	V
I_{GF}	Forward Gate Current	10	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations

General Purpose Dual Amplifier

(continued)

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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OFF CHARACTERISTICS

$V_{(BR)GSS}$	Gate-Source Breakdown Voltage	$I_G = 1.0 \mu A, V_{DS} = 0$	- 50		V
I_{GSS}	Gate Reverse Current	$V_{GS} = 30 V, V_{DS} = 0$		25	pA
$V_{GS(0\#)}$	Gate-Source Cutoff Voltage	$V_{DS} = 15 V, I_D = 1.0 nA$	- 0.5	- 2.5	V
V_{GS}	Gate-Source Voltage	$V_{DG} = 15 V, I_D = 200 \mu A$		- 2.3	V
$V_{G1 - G2}$	Voltage Gate 1-Gate 2	$I_G = 1.0 \mu A, V_{DS} = 0$	+ / - 50		V

ON CHARACTERISTICS

I_{DSS}	Zero-Gate Voltage Drain Current*	$V_{DS} = 10 V, V_{GS} = 0$	0.5	10	mA
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SMALL SIGNAL CHARACTERISTICS

g_{fs}	Common Source Forward Transconductance	$V_{DS} = 10 V, V_{GS} = 0, f = 1.0 kHz$ $V_{DS} = 15 V, I_D = 200 \mu A, f = 1.0 kHz$	2000 1000	7000 2000	$\mu mhos$ $\mu mhos$
g_{oss}	Common Source Output Conductance	$V_{DS} = 10 V, V_{GS} = 0, f = 1.0 kHz$		20	$\mu mhos$
g_{os}	Common Source Output Conductance	$V_{DS} = 15 V, I_D = 200 \mu A, f = 1.0 kHz$		2.0	$\mu mhos$
C_{iss}	Input Capacitance	$V_{DG} = 15 V, I_D = 200 \mu A,$ $f = 1.0 MHz$		8.0	pF
C_{rss}	Reverse Transfer Capacitance	$V_{DG} = 15 V, I_D = 200 \mu A,$ $f = 1.0 MHz$		3.0	pF
CMMR	Common Mode Rejection	$V_{DG} = 10 \text{ to } 20 V, I_D = 200 \mu A$	95		dB
$V_{GS1} - V_{GS2}$	Differential Match	$V_{DG} = 10 V, I_D = 200 \mu A,$ NPDS402 NPDS403 NPDS404 NPDS406		10 10 15 40	mV mV mV mV
$\Delta V_{GS1} - V_{GS2}$	Differential Drift	$V_{DG} = 10 V, I_D = 200 \mu A,$ $T_A = -55 \text{ to } 25^\circ C$ NPDS402 NPDS403 NPDS404 NPDS406 $V_{DG} = 10 V, I_D = 200 \mu A$ $T_A = 25 \text{ to } 125^\circ C$ NPDS402 NPDS403 NPDS404 NPDS406		10 25 25 80 10 25 25 80	$\mu V/^\circ C$ $\mu V/^\circ C$ $\mu V/^\circ C$ $\mu V/^\circ C$ $\mu V/^\circ C$ $\mu V/^\circ C$ $\mu V/^\circ C$ $\mu V/^\circ C$

*Pulse Test: Pulse Width ≤ 300 ms, Duty Cycle $\leq 2\%$

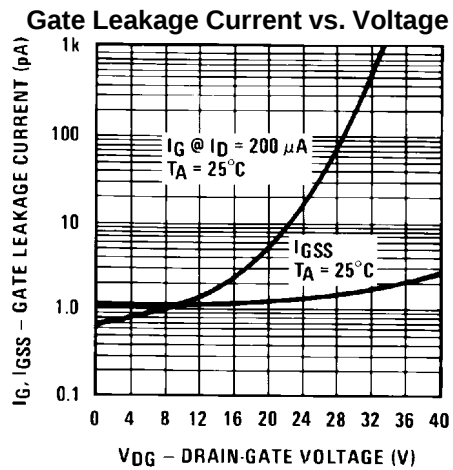
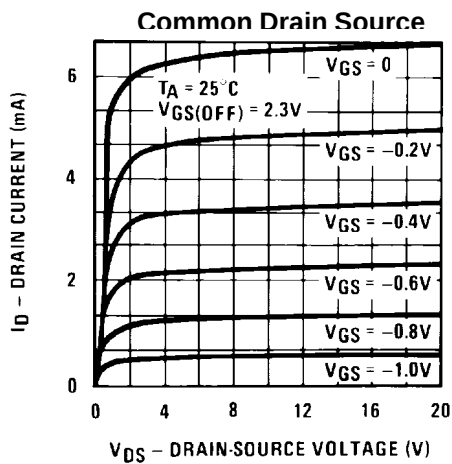
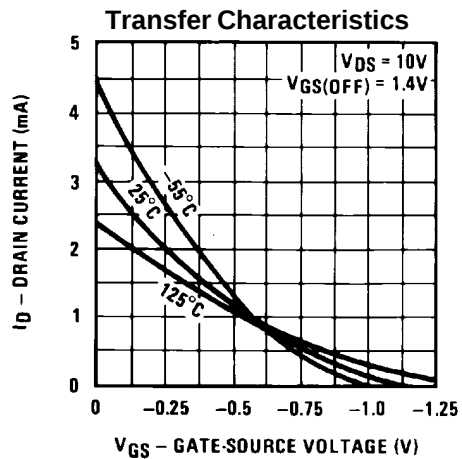
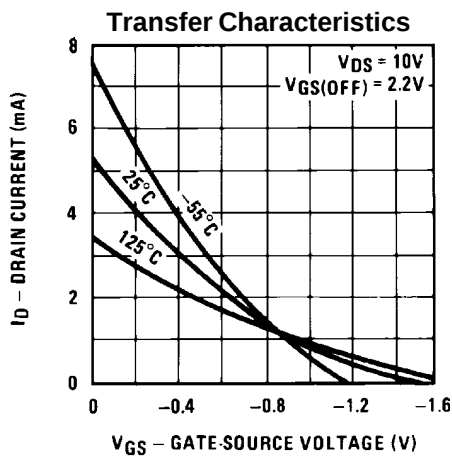
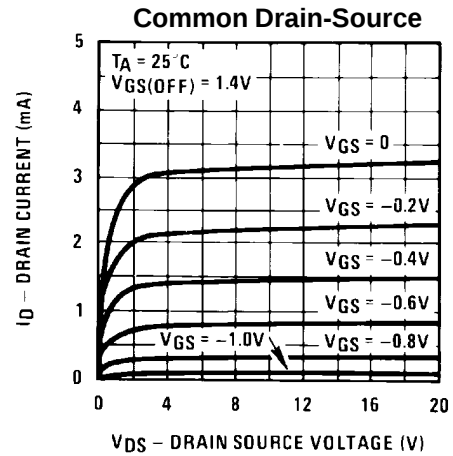
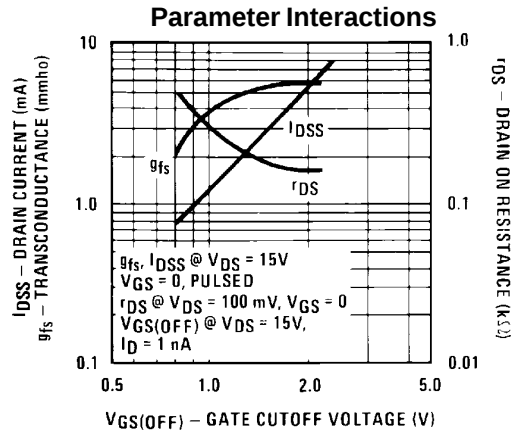
NPDS402 / NPDS403 / NPDS404 / NPDS406

General Purpose Dual Amplifier

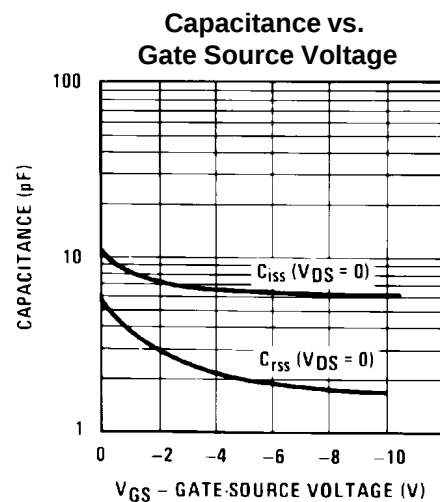
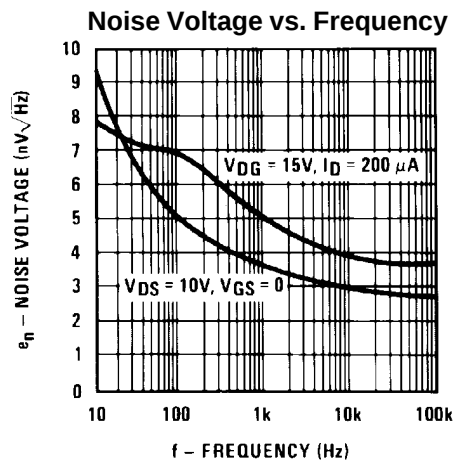
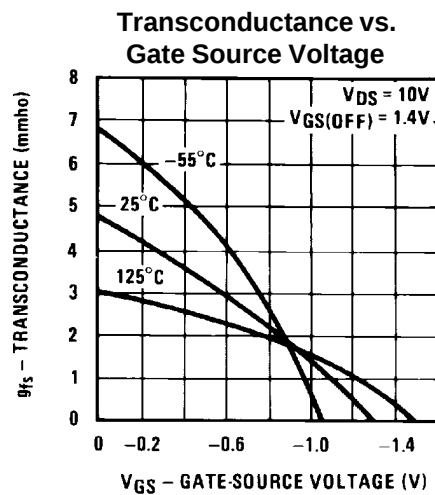
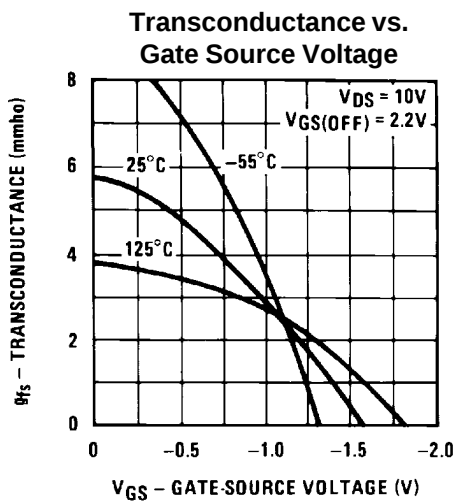
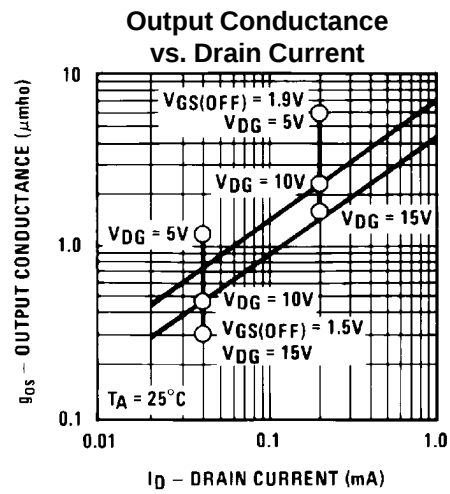
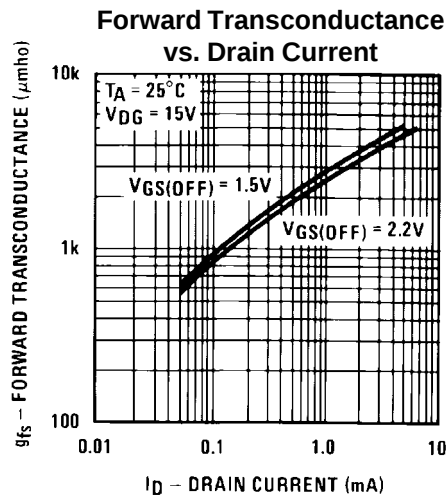
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NPDS402 / NPDS403 / NPDS404 / NPDS406

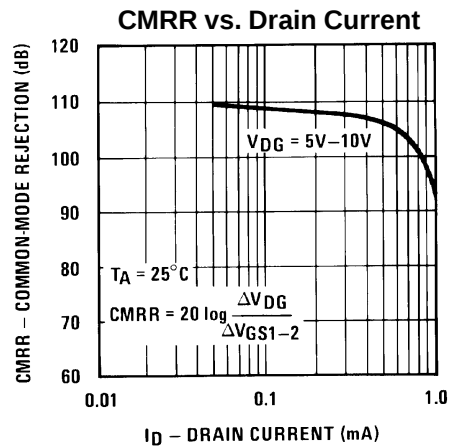
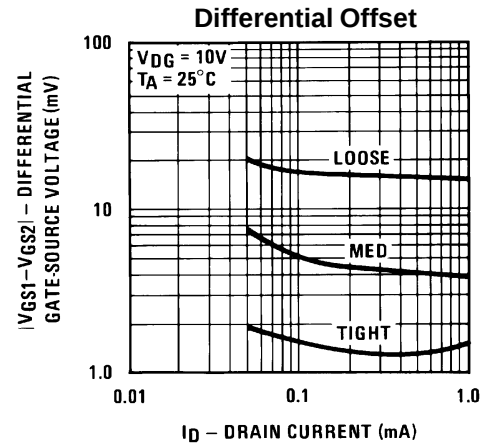
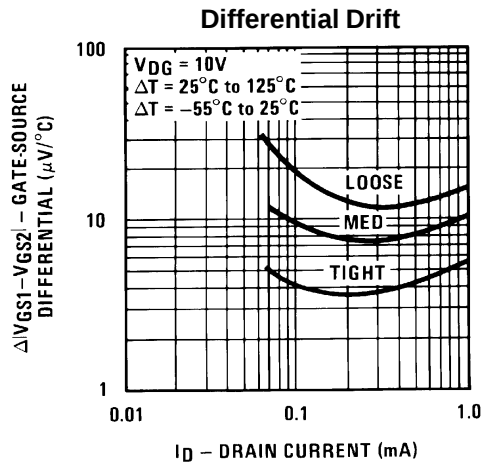
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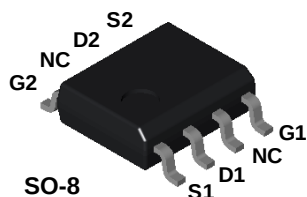
Typical Characteristics (continued)



Typical Characteristics (continued)



NPDS55565 NPDS55566



N-Channel General Purpose Dual Amplifier

Sourced from Process 96.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{DG}	Drain-Gate Voltage	40	V
V_{GS}	Gate-Source Voltage	40	V
I_{GF}	Gate Current	10	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

General Purpose Dual Amplifier

(continued)

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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OFF CHARACTERISTICS

$V_{(BR)GSS}$	Gate-Source Breakdown Voltage	$I_G = 1.0 \mu A, V_{DS} = 0$	- 40		V
I_{GSS}	Gate Reverse Current	$V_{GS} = 20 V, V_{DS} = 0$ $V_{GS} = 20 V, V_{DS} = 0, T_A = 150 ^\circ C$		100 200	pA μA
$V_{GS(off)}$	Gate-Source Cutoff Voltage	$V_{DS} = 15 V, I_D = 1.0 nA$	- 0.5	- 3.0	V
$V_{GS(f)}$	Forward Gate-Source Voltage	$V_{DS} = 0, I_D = 2.0 mA$		1.0	V
$V_{G1 - G2}$	Voltage Gate 1 - Gate 2	$V_{DS} = 0, I_G = + / - 1.0 \mu A$	+ / - 40		V

ON CHARACTERISTICS

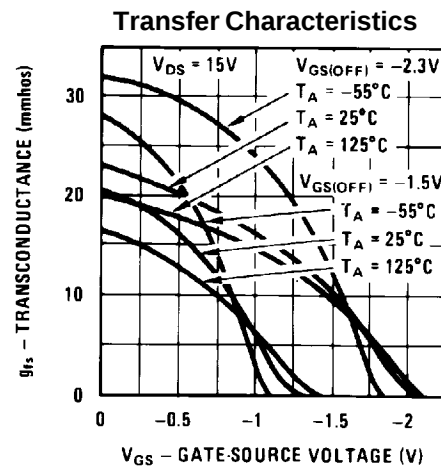
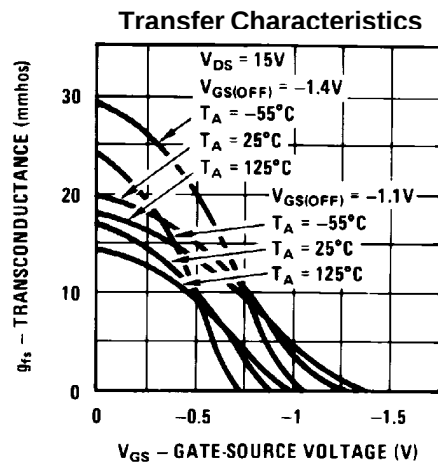
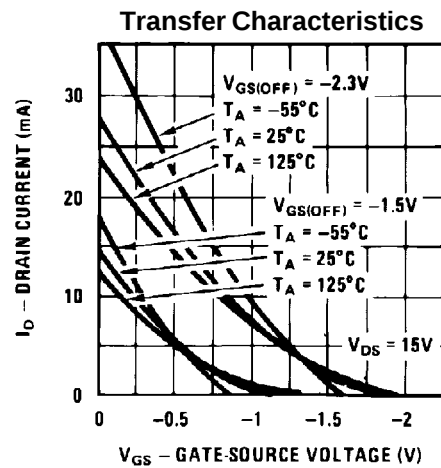
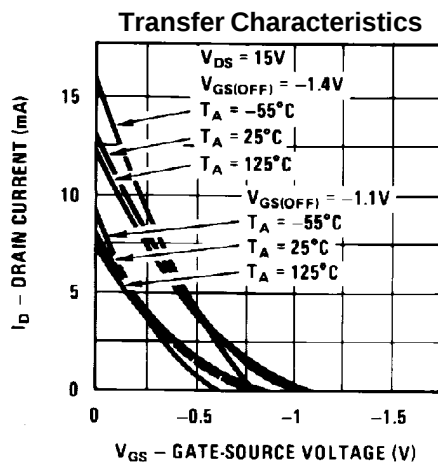
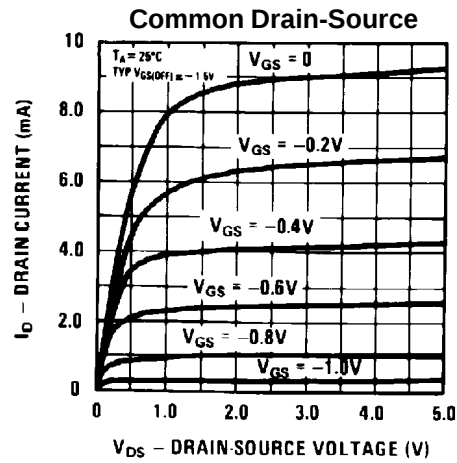
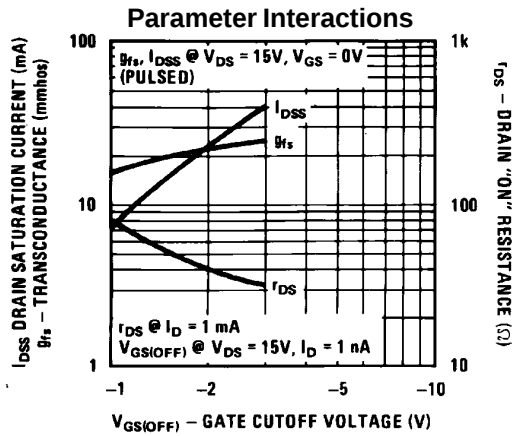
I_{DSS}	Zero-Gate Voltage Drain Current*	$V_{DS} = 15 V, V_{GS} = 0$	5.0	30	mA
$r_{DS(on)}$	Drain-Source On Resistance	$I_D = 1.0 mA, V_{GS} = 0$		100	Ω

SMALL SIGNAL CHARACTERISTICS

g_{fs}	Common Source Forward Transconductance	$V_{DS} = 15 V, I_D = 2.0 mA, f = 1.0 kHz$ $V_{DS} = 15 V, I_D = 2.0 mA,$ $f = 100 MHz$	7500 7000	12,500	$\mu mhos$ $\mu mhos$
g_{oss}	Common Source Output Conductance	$V_{DS} = 15 V, I_D = 2.0 mA, f = 1.0 kHz$		45	$\mu mhos$
C_{iss}	Input Capacitance	$V_{DG} = 15 V, I_D = 2.0 mA, f = 1.0 MHz$		12	pF
C_{rss}	Reverse Transfer Capacitance	$V_{DS} = 15 V, I_D = 2.0 mA, f = 1.0 kHz$		3.0	pF
e_n	Equivalent Short-Circuit Input Noise Voltage	$V_{DG} = 15 V, I_D = 2.0 mA, f = 10 Hz$		50	nV/ $\sqrt{Hz}$
NF	Noise Figure	$V_{DG} = 15 V, I_D = 2.0 mA, f = 10 Hz$ $R_G = 1.0 m\Omega$		1.0	dB
$I_{DSS1} - I_{DSS2}$	I_{DSS} Match	$V_{DS} = 15 V, V_{GS} = 0$		5.0	%
$g_{fs1} - g_{fs2}$	g_{fs} Match	$V_{DS} = 15 V, I_D = 2.0 mA, f = 1.0 kHz$		10	%
$V_{GS1} - V_{GS2}$	Differential Match	$V_{DG} = 15 V, I_D = 2.0 mA,$ NPDS5565 NPDS5566		10 20	mV mV
$\Delta V_{GS1} - V_{GS2}$	Differential Drift	$V_{DS} = 10 V, V_{GS} = 0, f = 1.0 kHz$ $T_A = 25 \text{ to } 125 ^\circ C$ NPDS5565 NPDS5566 $V_{DG} = 15 V, I_D = 2.0 mA,$ $T_A = -55 \text{ to } 25 ^\circ C$ NPDS5565 NPDS5566		25 50 25 50	$\mu V/^\circ C$ $\mu V/^\circ C$ $\mu V/^\circ C$ $\mu V/^\circ C$

NPDS5565 / NPDS5566

Typical Characteristics (continued)

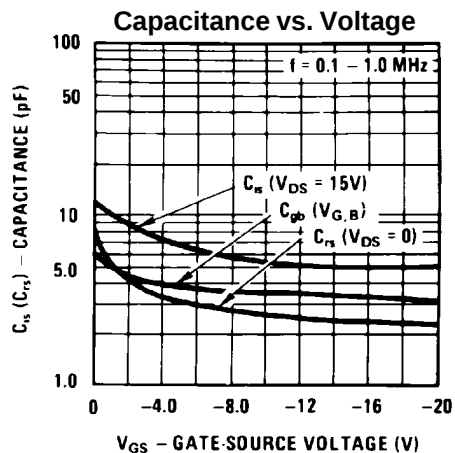
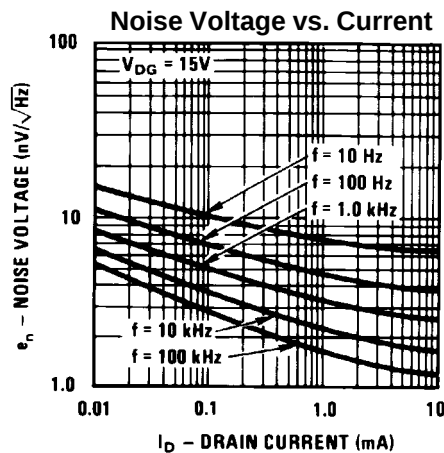
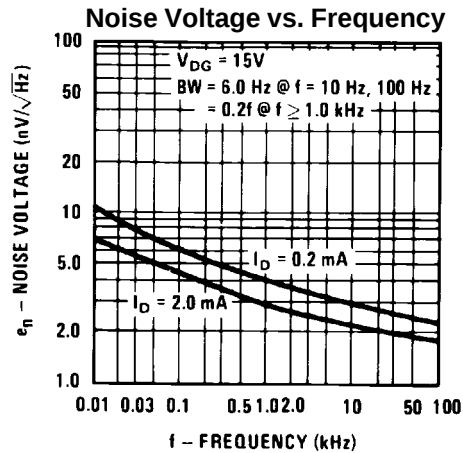
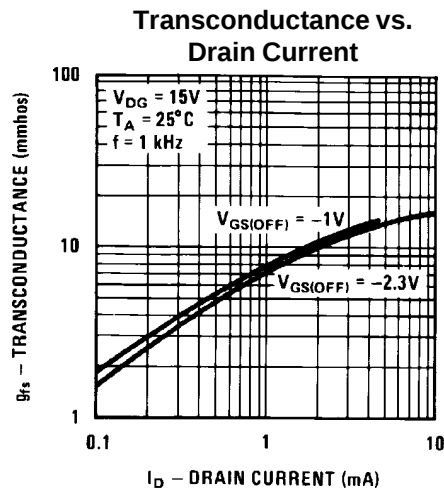
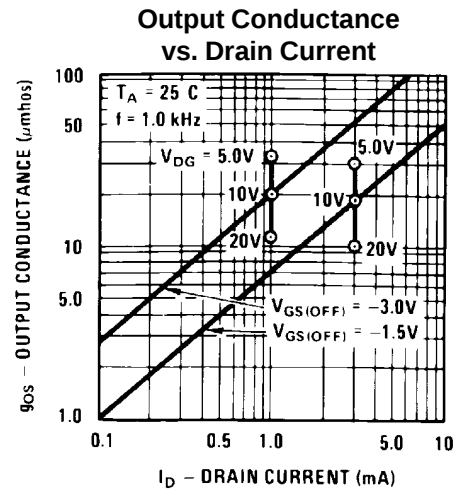
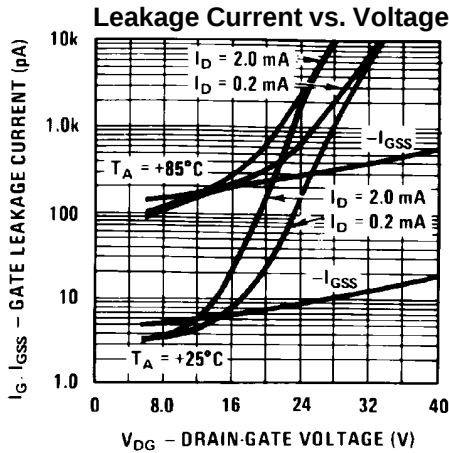


General Purpose Dual Amplifier

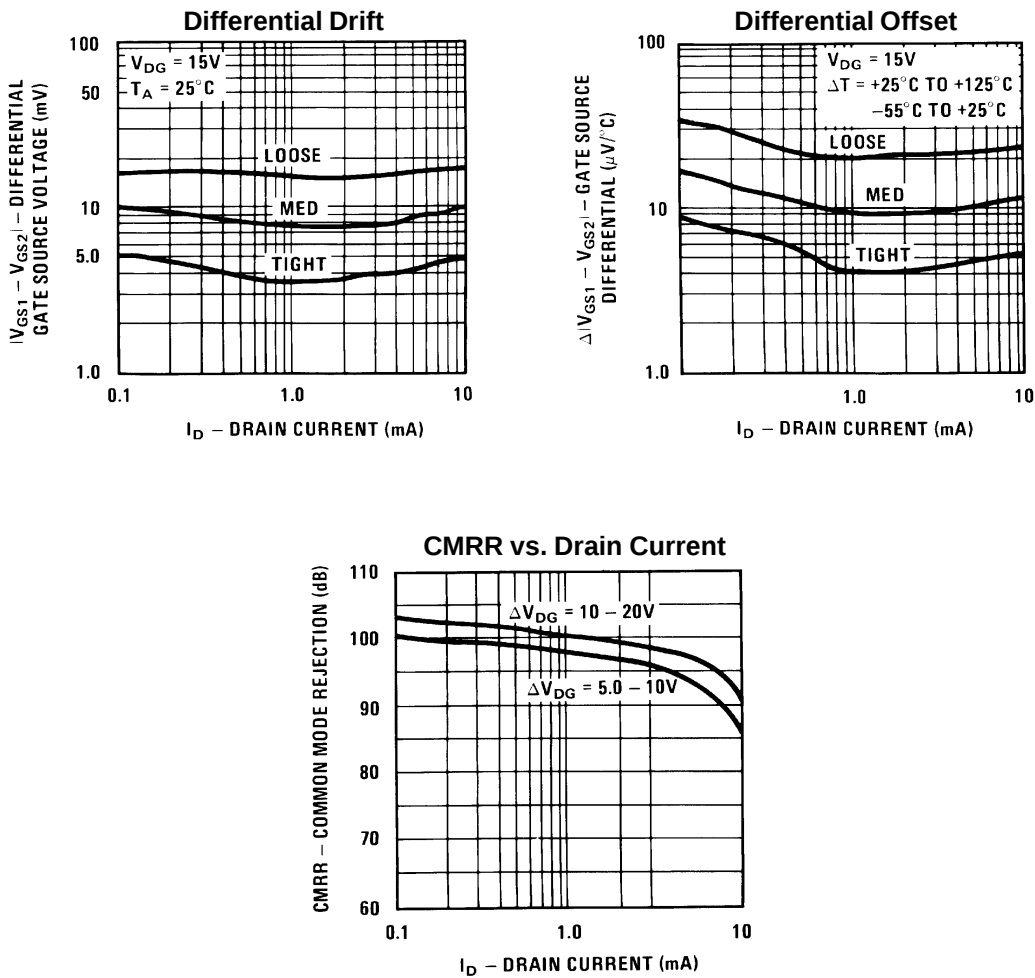
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NPDS5565 / NPDS5566

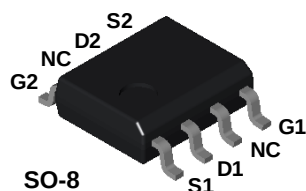
Typical Characteristics (continued)



Typical Characteristics (continued)



NPDS5911 NPDS5912



N-Channel General Purpose Dual Amplifier

Sourced from Process 93.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{DG}	Drain-Gate Voltage	25	V
V_{GS}	Gate-Source Voltage	25	V
I_{GF}	Forward Gate Current	10	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

General Purpose Dual Amplifier

(continued)

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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OFF CHARACTERISTICS

$V_{(BR)GSS}$	Gate-Source Breakdown Voltage	$I_G = 1.0 \mu A, V_{DS} = 0$	- 25		V
I_{GSS}	Gate Reverse Current	$V_{GS} = 15 V, V_{DS} = 0$ $V_{GS} = 15 V, V_{DS} = 0, T_A = 150 ^\circ C$		100 250	pA nA
$V_{GS(off)}$	Gate-Source Cutoff Voltage	$V_{DS} = 10 V, I_D = 1.0 nA$	- 1.0	- 5.0	V
V_{GS}	Gate-Source Voltage	$V_{DG} = 10 V, I_D = 5.0 mA$	- 0.3	- 4.0	V
$V_{G1 - G2}$	Voltage Gate 1 - Gate 2	$V_{DS} = 0, I_G = + / - 1.0 \mu A$	+ / - 25		V

ON CHARACTERISTICS

I_{DSS}	Zero-Gate Voltage Drain Current*	$V_{DS} = 10 V, V_{GS} = 0$	7.0	40	mA
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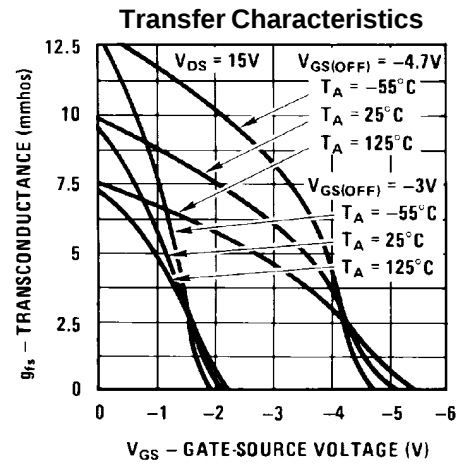
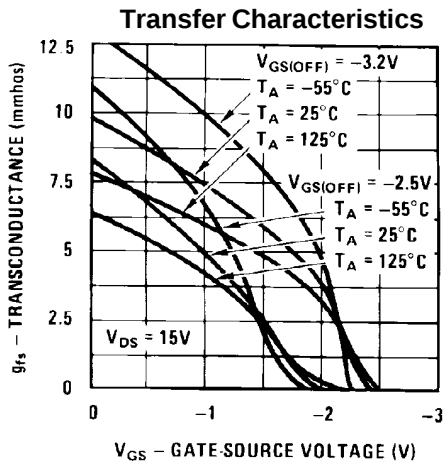
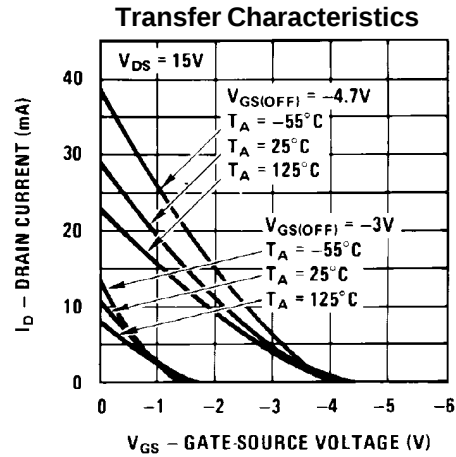
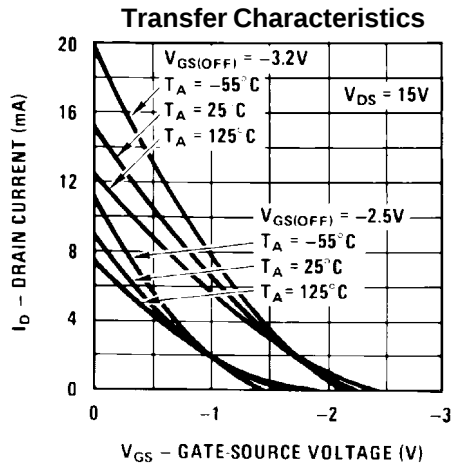
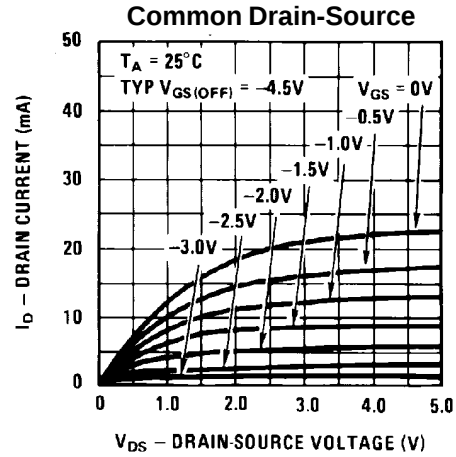
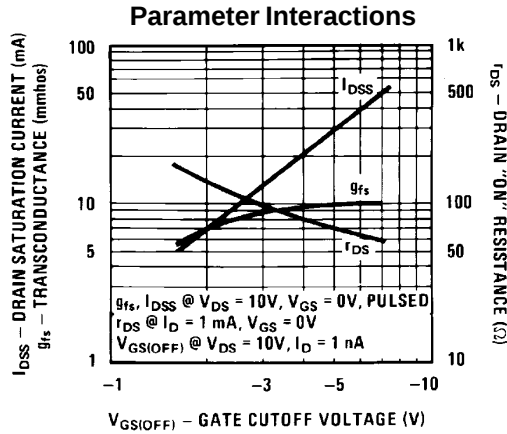
SMALL SIGNAL CHARACTERISTICS

g_{fs}	Common Source Forward Transconductance	$V_{DS} = 10 V, I_D = 5.0mA, f = 1.0 kHz$ $V_{DS} = 10 V, I_D = 5.0 mA, f = 100 MHz$	5000 5000	10,000 10,000	$\mu mhos$ $\mu mhos$
g_{oss}	Common Source Output Conductance	$V_{DS} = 10 V, I_D = 5.0mA, f = 1.0 kHz$ $V_{DS} = 10V, I_D = 5.0mA, f = 100 MHz$		100 150	$\mu mhos$ $\mu mhos$
C_{iss}	Input Capacitance	$V_{DG} = 10 V, I_D = 5.0mA, f = 1.0 MHz$		5.0	pF
C_{rss}	Reverse Transfer Capacitance	$V_{DS} = 10 V, I_D = 5.0mA, f = 1.0 kHz$		1.2	pF
e_n	Equivalent Short-Circuit Input Noise Voltage	$V_{DG} = 10 V, I_D = 5.0 mA, f = 10 kHz$		20	nV/ $\sqrt{Hz}$
NF	Noise Figure	$V_{DG} = 10 V, I_D = 5.0 mA, f = 10 kHz$ $R_G = 100 k\Omega$		1.0	dB
$I_{DSS1} - I_{DSS2}$	I_{DSS} Match	$V_{DS} = 10 V, V_{GS} = 0$		5.0	%
$g_{fs1} - g_{fs2}$	g_{fs} Match	$V_{DS} = 10 V, I_D = 5.0mA, f = 1.0 kHz$		5.0	%
$g_{oss1} - g_{oss2}$	g_{oss} Match	$V_{DS} = 10 V, I_D = 5.0mA, f = 1.0 kHz$		20	$\mu mhos$
$I_{G1} - I_{G2}$	I_G Match	$V_{DS} = 10 V, I_D = 5.0mA, T_A = 125^\circ C$		20	nA
$V_{GS1} - V_{GS2}$	Differential Match	$V_{DG} = 10 V, I_D = 5.0 mA,$ NPDS5911 NPDS5912		10 15	mV mV
$\Delta V_{GS1} - V_{GS2}$	Differential Drift	$V_{DG} = 10 V, V_{GS} = 0, I_D = 5.0 mA,$ $T_A = 25 \text{ to } 125 ^\circ C$ NPDS5911 NPDS5912 $V_{DG} = 10 V, I_D = 5.0 mA,$ $T_A = -55 \text{ to } 25 ^\circ C$ NPDS5911 NPDS5912		20 40 20 40	$\mu V/^\circ C$ $\mu V/^\circ C$ $\mu V/^\circ C$ $\mu V/^\circ C$

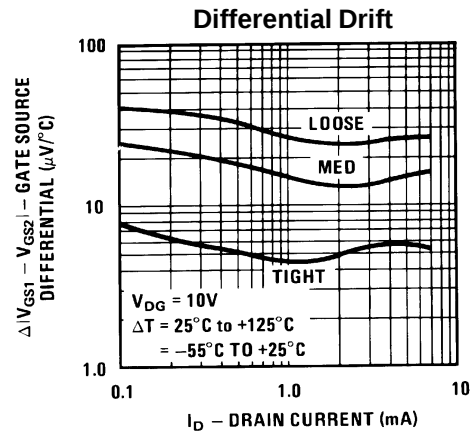
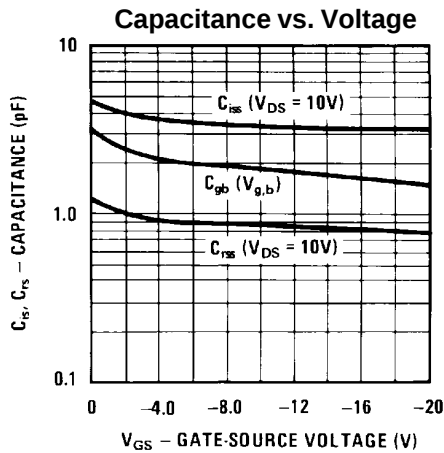
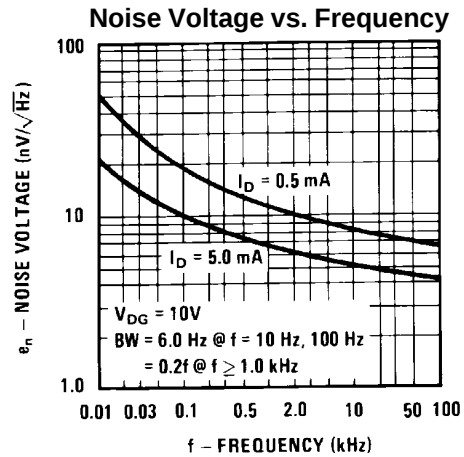
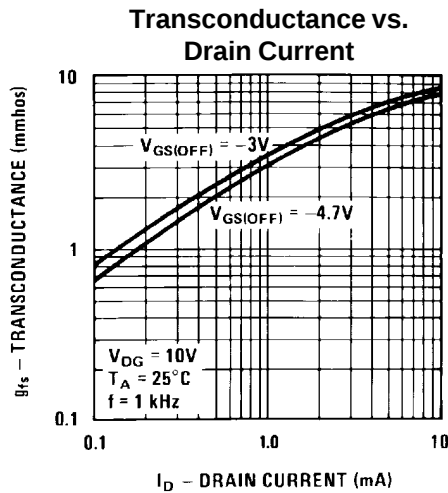
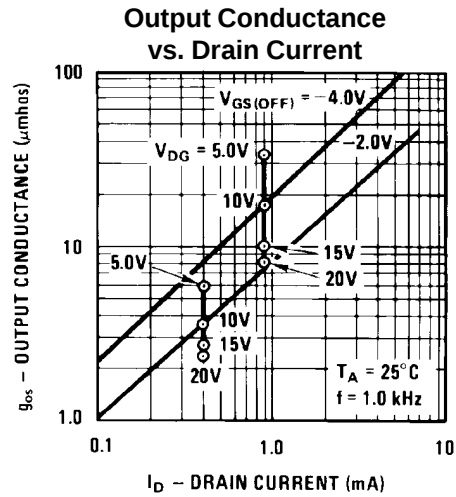
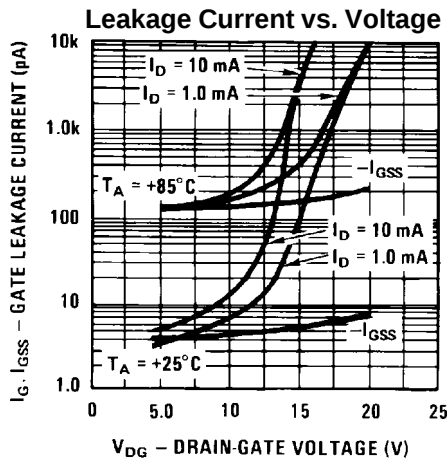
*Pulse Test: Pulse Width ≤ 300 ms, Duty Cycle $\leq 2\%$

NPDS5911 / NPDS5912

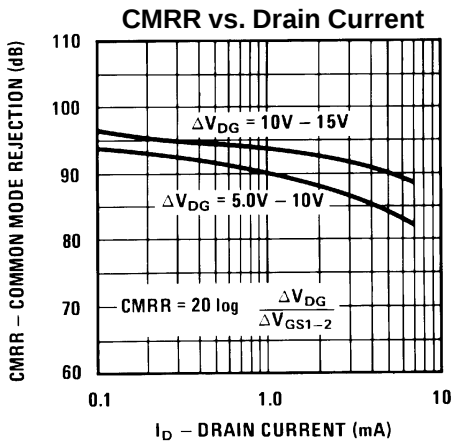
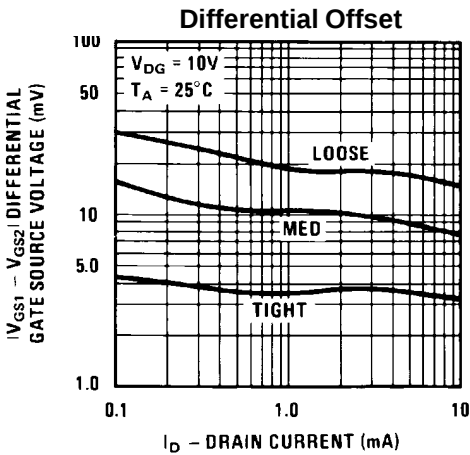
Typical Characteristics (continued)



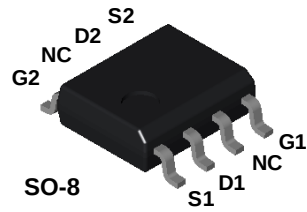
Typical Characteristics (continued)



Typical Characteristics (continued)



**NPDS8301
NPDS8302
NPDS8303**



N-Channel General Purpose Dual Amplifier

Sourced from Process 83.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{DG}	Drain-Gate Voltage	40	V
V _{GS}	Gate-Source Voltage	40	V
I _{GF}	Forward Gate Current	10	mA
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

1) These ratings are based on a maximum junction temperature of 150 degrees C.

2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

General Purpose Dual Amplifier

(continued)

Electrical Characteristics

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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OFF CHARACTERISTICS

V _{(BR)GSS}	Gate-Source Breakdown Voltage	I _G = 1.0 μA, V _{DS} = 0	- 40		V
I _{GSS}	Gate Reverse Current	V _{GS} = 20 V, V _{DS} = 0		100	pA
V _{GS(off)}	Gate-Source Cutoff Voltage	V _{DS} = 20 V, I _D = 1.0 nA	- 0.5	- 3.5	V
V _{GS}	Gate-Source Voltage	V _{DS} = 20 V, I _D = 200 μA	- 0.3	- 3.5	V

ON CHARACTERISTICS

I _{DSS}	Zero-Gate Voltage Drain Current*	V _{DS} = 20 V, V _{GS} = 0	0.5	6.0	mA
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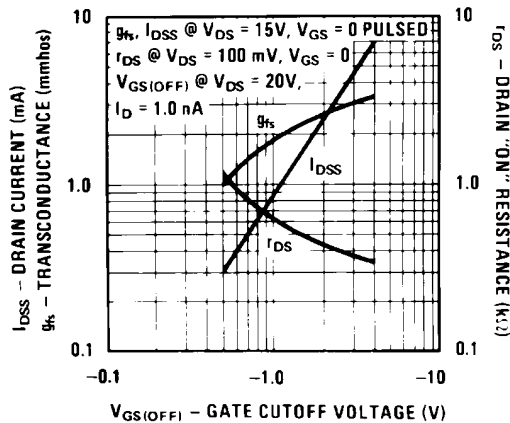
SMALL SIGNAL CHARACTERISTICS

g _{fs}	Common Source Forward Transconductance	V _{DS} = 20 V, V _{GS} = 0, f = 1.0 kHz V _{DS} = 20 V, I _D = 200 μA, f = 1.0 kHz	1000 700	4000 1200	μmhos μmhos
g _{oss}	Common Source Output Conductance	V _{DS} = 20 V, I _D = 200 μA, f = 1.0 kHz		20	μmhos
g _{os}	Common Source Output Conductance	V _{DS} = 20 V, I _D = 200 μA, f = 1.0 kHz		5.0	μmhos
V _{GS1} - V _{GS2}	Differential Match	V _{DG} = 20 V, I _D = 200 μA, NPDS8301 NPDS8302 NPDS8303		5.0 10 15	mV mV mV
ΔV _{GS1} - V _{GS2}	Differential Drift	V _{DS} = 20 V, I _D = 200 μA, T _A = 25 to 85 °C NPDS8301 NPDS8302 NPDS8303		10 15 25	μV/°C μV/°C μV/°C

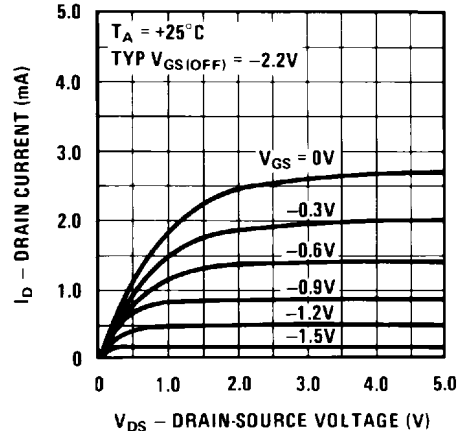
*Pulse Test: Pulse Width ≤ 300 ms, Duty Cycle ≤ 2%

Typical Characteristics

Parameter Interactions

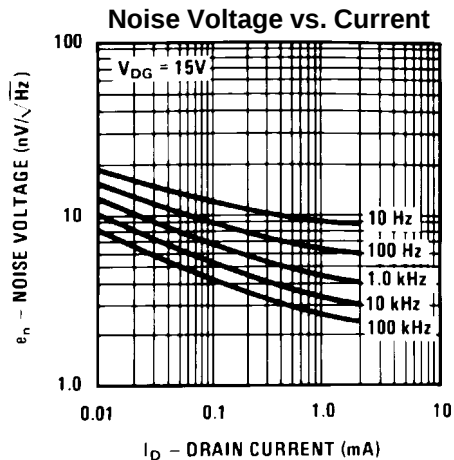
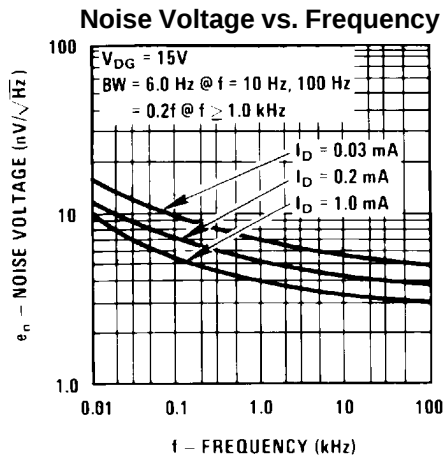
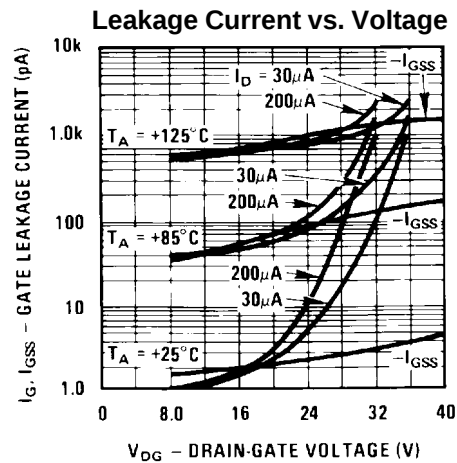
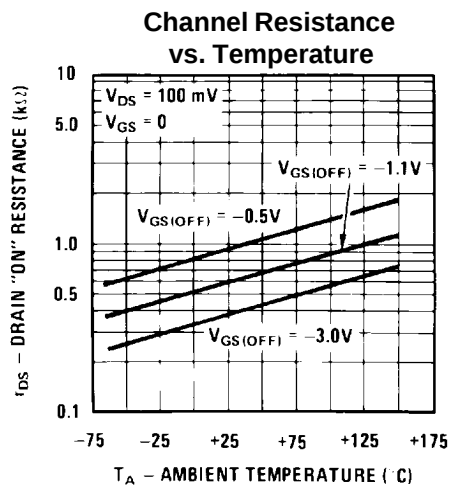
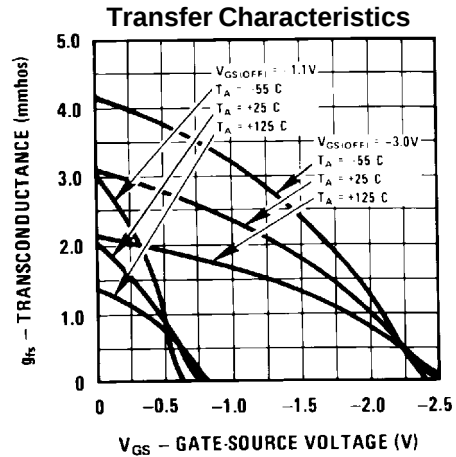
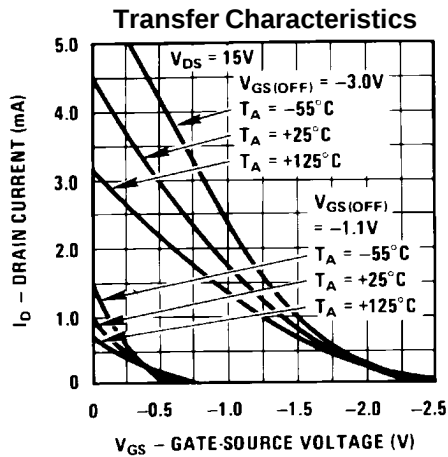


Common Drain-Source

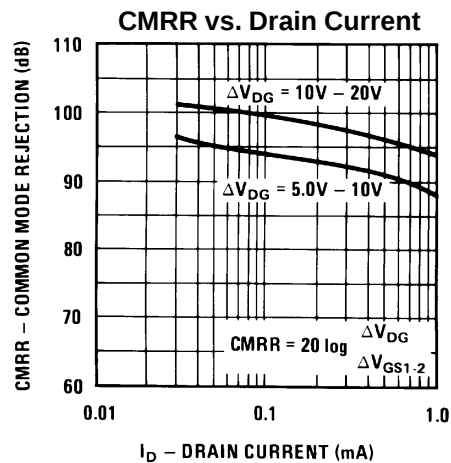
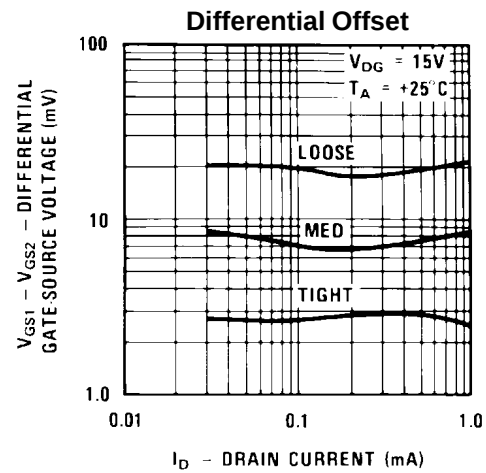
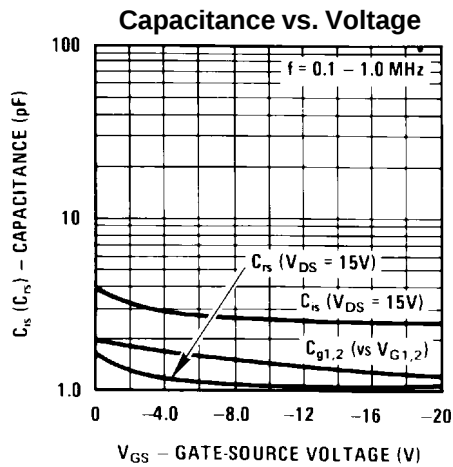
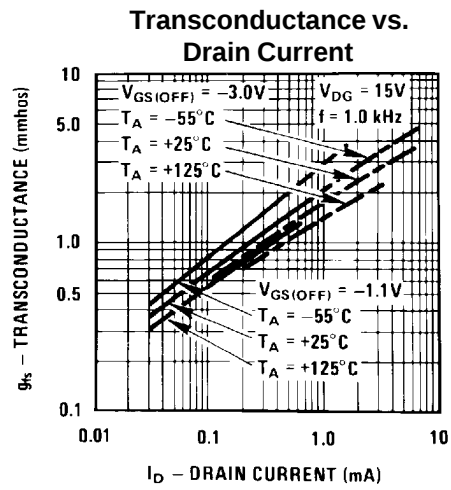
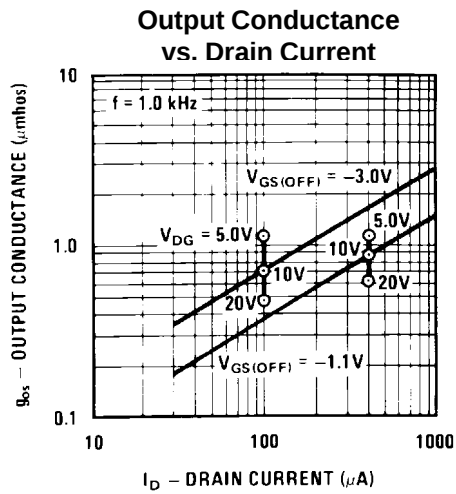


NPDS8301 / NPDS8302 / NPDS8303

Typical Characteristics (continued)



Typical Characteristics (continued)



NPN EPITAXIAL MJE800/801/803 SILICON DARLINGTON TRANSISTOR

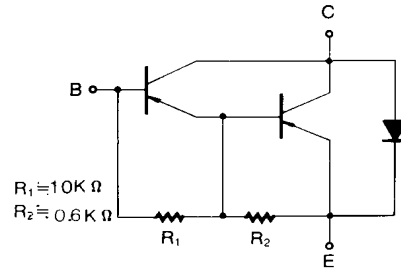
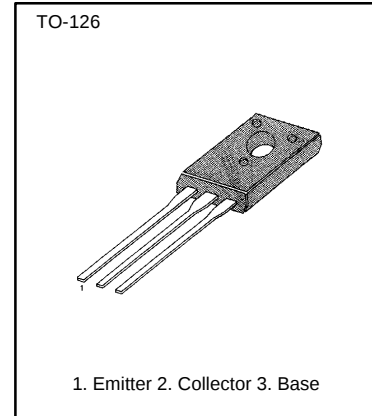
HIGH DC CURRENT GAIN

MIN $h_{FE} = 750$ $I_C = -1.5$ and $-2.0A$ DC
MONOLITHIC CONSTRUCTION WITH
BUILT-IN BASE-EMITTER RESISTORS

• Complement to MJE700/701/702/703

ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Rating	Unit
Collector- Base Voltage	V_{CBO}	60	V
: MJE800/801		80	V
: MJE802/803			
Collector-Emitter Voltage	V_{CEO}	60	V
: MJE800/801		80	V
: MJE802/803			
Emitter- Base Voltage	V_{EBO}	5	V
Collector Current	I_C	4	A
Base Current	I_B	0.1	A
Collector Dissipation ($T_C = 25^\circ C$)	P_C	40	W
Junction Temperature	T_J	150	$^\circ C$
Storage Temperature	T_{STG}	-55 ~ 150	$^\circ C$

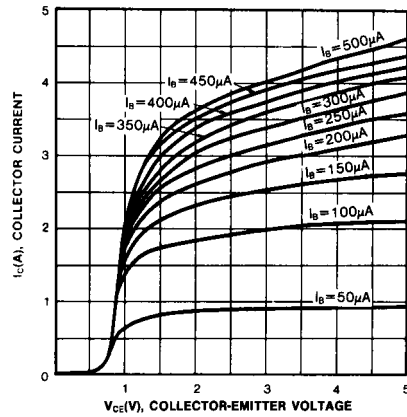


ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ C$)

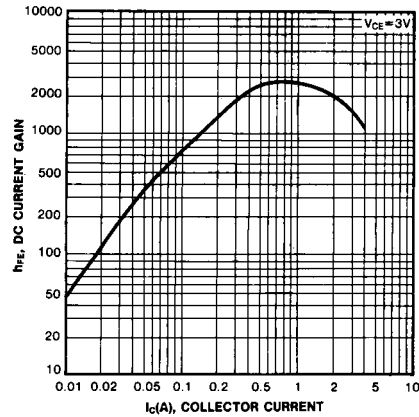
Characteristic	Symbol	Test Condition	Min	Max	Unit
Collector Emitter Breakdown Voltage	BV_{CEO}	$I_C = 50mA, I_B = 0$	60		V
: MJE800/801			80		V
: MJE802/803					
Collector Cutoff Current	I_{CEO}	$V_{CE} = 60V, I_B = 0$		100	μA
: MJE800/801		$V_{CE} = 80V, I_B = 0$		100	μA
: MJE802/803					
Collector Cutoff Current	I_{CBO}	$V_{CB} = \text{Rated } BV_{CEO}, I_E = 0$		100	μA
		$V_{CB} = \text{Rated } BV_{CEO}, I_E = 0$		500	μA
		$T_C = 100^\circ C$			
Emitter Cutoff Current	I_{EBO}	$V_{BE} = 5V, I_C = 0$		2	mA
DC Current Gain : MJE800/802	h_{FE}	$V_{CE} = 3V, I_C = 1.5A$	750		
: MJE801/803		$V_{CE} = 3V, I_C = 2A$	750		
: ALL DEVICES		$V_{CE} = 3V, I_C = 4A$	100		
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 1.5A, I_B = 30mA$		2.5	V
: MJE800/802		$I_C = 2A, I_B = 40mA$		2.8	V
: MJE801/803		$I_C = 4A, I_B = 40mA$		3	V
: ALL DEVICES					
Base-Emitter On Voltage	$V_{BE(on)}$	$V_{CE} = 3V, I_C = 1.5A$		1.2	V
: MJE800/802		$V_{CE} = 3V, I_C = 2A$		2.5	V
: MJE801/803		$V_{CE} = 3V, I_C = 4A$		3	V
: ALL DEVICES					

NPN EPITAXIAL MJE800/801/803 SILICON DARLINGTON TRANSISTOR

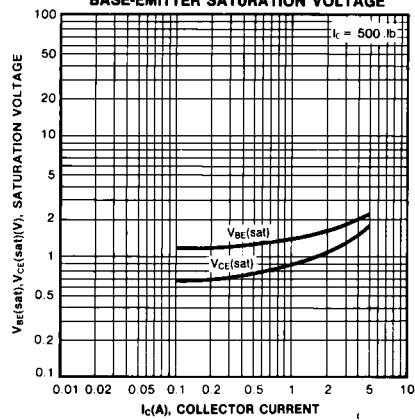
STATIC CHARACTERISTIC



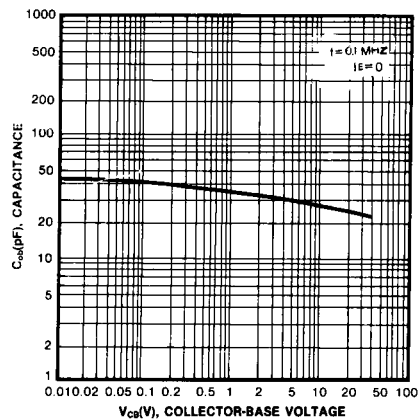
DC CURRENT GAIN



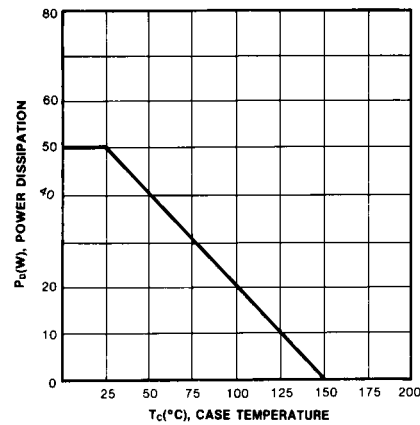
**COLLECTOR-EMITTER SATURATION VOLTAGE
BASE-EMITTER SATURATION VOLTAGE**



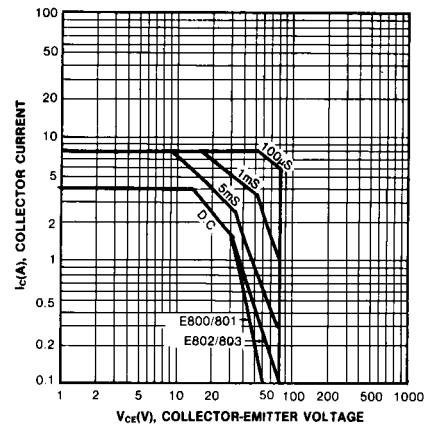
COLLECTOR OUTPUT CAPACITANCE



POWER DERATING



SAFE OPERATING AREA



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