P-Channel Enhancement-Mode MOSFET Transistors

Product Summary

Part Number	$V_{(BR)DSS}$ Min (V)	$V_{GS(th)}$ (V)	$r_{DS(on)}$ Max (Ω)	$I_{D(on)}$ Min (mA)	C_{rss} Max (pF)	t_{ON} Typ (ns)
3N163	–40	–2 to –5	250	–5	0.7	18
3N164	–30	–2 to –5	300	–3	0.7	18

Features

- Ultra-Low Input Leakage: 0.02 pA Typ.
- High Gate Breakdown Voltage: ±125 V
- Normally Off

Benefits

- High Input Impedance Isolation
- Minimize Handling ESD Problems
- High Off Isolation without Power

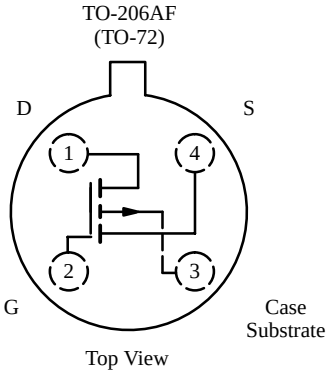
Applications

- Ultra-High Input Impedance Amplifier
- Smoke Detectors
- Electrometers
- Analog Switching
- Digital Switching

Description

The 3N163/164 are lateral p-channel MOSFETs designed for analog switch and preamplifier applications where high speed and low parasitic capacitances are required.

The hermetic TO-206AF package is compatible with military processing per military standards (see Military information).



Absolute Maximum Ratings (T_A = 25°C Unless Otherwise Noted)

Drain-Source Voltage (3N163) . . . . . –40 V
(3N164) . . . . . –30 V

Gate-Source Voltage . . . . . ±30 V

Continuous Drain Current . . . . . –50 mA

Lead Temperature ($^1/_{16}$" from case for 10 seconds) . . . . . 300°C

Storage Temperature . . . . . –65 to 200°C

Operating Junction Temperature . . . . . –55 to 150°C

Power Dissipation[a] . . . . . 375 mW

Notes:
a. Derate 3 mW/°C above 25°C

Updates to this data sheet may be obtained via facsimile by calling Siliconix FaxBack, 1-408-970-5600. Please request FaxBack document #70228.

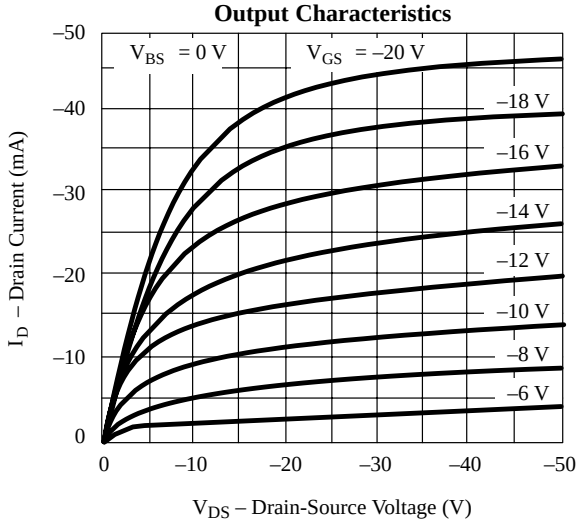
Specifications[a]

Parameter	Symbol	Test Conditions	Typ[b]	Limits 3N163 Min	Limits 3N163 Max	Limits 3N164 Min	Limits 3N164 Max	Unit
Static								
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	I_D = –10 µA, V_{DS} = 0 V	–70	–40		–30		V
Source-Drain Breakdown Voltage	$V_{(BR)SDS}$	I_S = –10 µA, V_{GD} = V_{BD} = 0 V	–70	–40		–30		V
Gate-Threshold Voltage	$V_{GS(th)}$	I_D = –10 µA, V_{GS} = V_{DS}	–2.5	–2	–5	–2	–5	V
Gate-Source Voltage	V_{GS}	I_D = –0.5 mA, V_{DS} = –15 V	–3.5	–3	–6.5	–2.5	–6.5	V
Gate-Body Leakage	I_{GSS}	V_{GS} = –40 V, V_{DS} = 0 V	<–1		–10			pA
		T_A = 125°C[d]	–1					pA
		V_{GS} = –30 V, V_{DS} = 0 V	<–1				–10	pA
		T_A = 125°C[d]	–1					pA
Zero-Gate Voltage Drain Current	I_{DSS}	V_{DS} = –15 V, V_{GS} = 0 V	–8		–200		–400	pA
		T_A = 125°C[d]	–20					nA
Zero-Gate Voltage Source Current	I_{SDS}	V_{GD} = V_{BD} = 0 V, V_{SD} = –20 V	–10		–400		–800	pA
		T_A = 125°C[d]	–25					nA
On-State Drain Current[c]	$I_{D(on)}$	V_{DS} = –15 V, V_{GS} = –10 V	–10	–5	–30	–3	–30	mA
Drain-Source On-Resistance	$r_{DS(on)}$	V_{GS} = –20 V, I_D = –100 µA	180		250		300	Ω
		T_A = 125°C[d]	270					Ω
Dynamic								
Forward Transconductance[c]	g_{fs}	V_{DS} = –15 V, I_D = –10 mA f = 1 kHz	2.7	2	4	1	4	mS
Common-Source Output Conductance[c]	g_{os}	V_{DS} = –15 V, I_D = –10 mA f = 1 kHz	150		250		250	µS
Input Capacitance	C_{iss}	V_{DS} = –15 V, I_D = –10 mA f = 1 MHz	2.4		3.5		3.5	pF
Output Capacitance	C_{oss}	V_{DS} = –15 V, I_D = –10 mA f = 1 MHz	2.5		3		3	pF
Reverse Transfer Capacitance	C_{rss}	V_{DS} = –15 V, I_D = –10 mA f = 1 MHz	0.5		0.7		0.7	pF
Switching[e]								
Turn-On Time	$t_{d(on)}$	V_{DD} = –15 V, R_L = 1500 Ω I_D ≅ –10 mA, V_{GEN} = –12 V R_G = 50 Ω	5		12		12	ns
	t_r	V_{DD} = –15 V, R_L = 1500 Ω I_D ≅ –10 mA, V_{GEN} = –12 V R_G = 50 Ω	13		24		24	ns
Turn-Off Time	$t_{d(off)}$	V_{DD} = –15 V, R_L = 1500 Ω I_D ≅ –10 mA, V_{GEN} = –12 V R_G = 50 Ω	25		50		50	ns

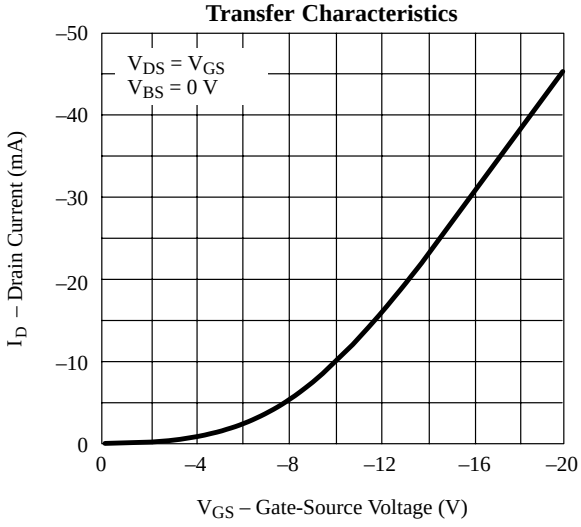
Notes:
a. T_A = 25°C unless otherwise noted. MRA
b. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
c. Pulse test: PW ≤ 300 µs duty cycle ≤ 3%.
d. This parameter not registered with JEDEC.
e. Switching time is essentially independent of operating temperature.

Typical Characteristics

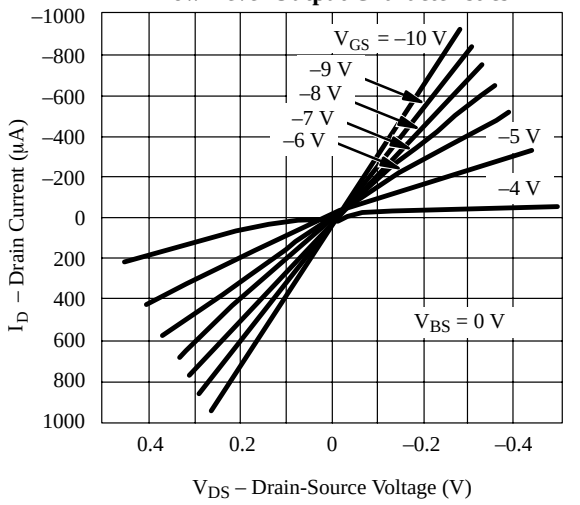
Output Characteristics



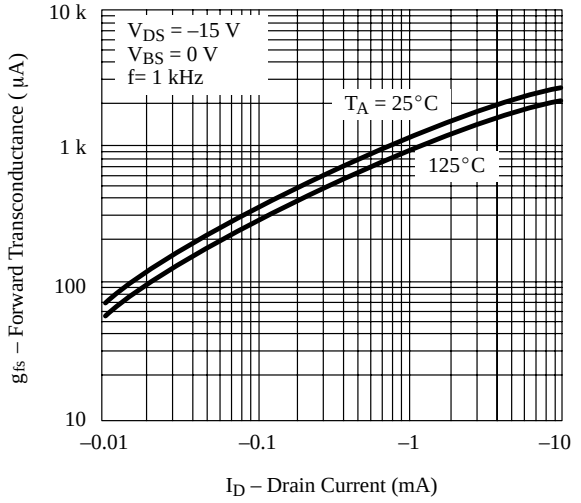
Transfer Characteristics



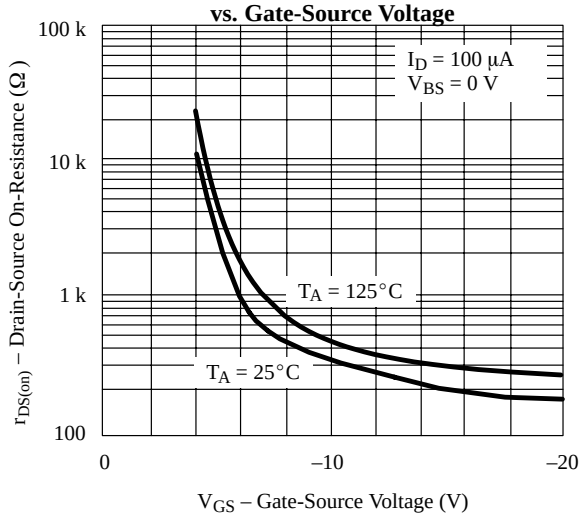
Low-Level Output Characteristics



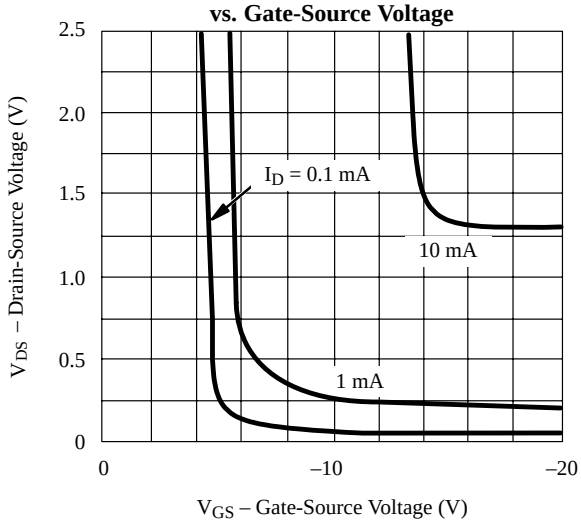
Common-Source Forward Transconductance vs. Drain Current



Drain-Source On-Resistance vs. Gate-Source Voltage

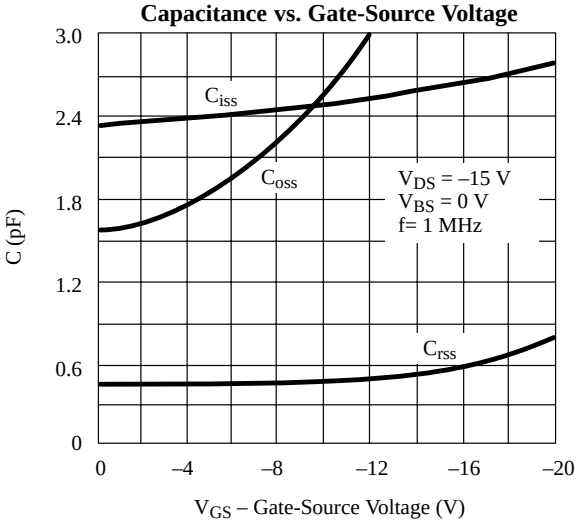


Low-Level Drain-Source On-Voltage vs. Gate-Source Voltage

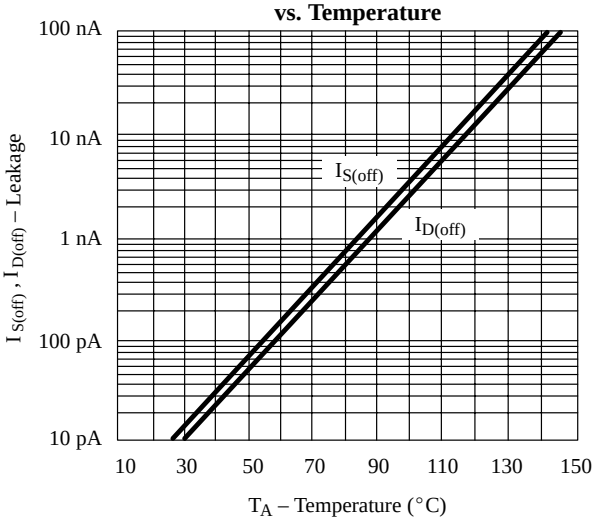


Typical Characteristics (Cont'd)

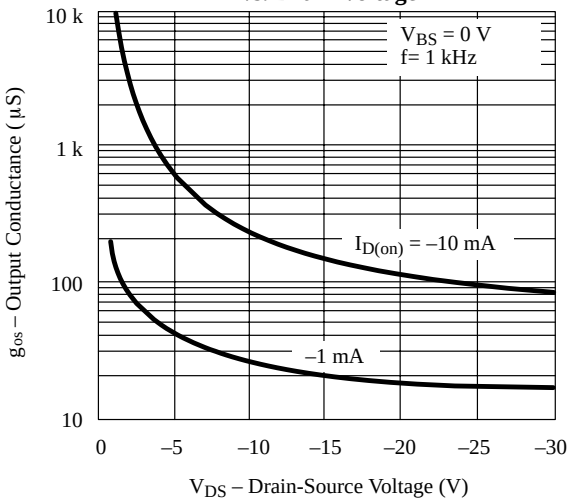
Capacitance vs. Gate-Source Voltage



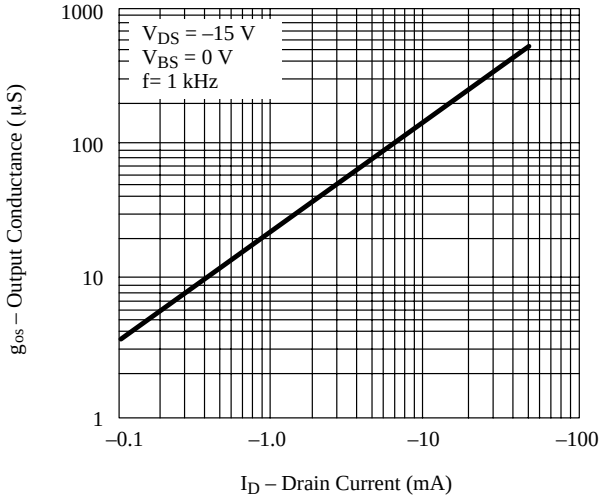
Drain-Source Leakage Current vs. Temperature



Common-Source Output Conductance vs. Drain Voltage



Common-Source Output Conductance vs. Drain Current



Switching Time Test Circuit