3N169 (SILICON)
3N170
3N171

SILICON N-CHANNEL
MOS FIELD-EFFECT TRANSISTORS

Enhancement Mode transistors designed for low-power switching applications.

- Low Switching Voltages – $V_{GS(th)} \leq 3.0$ Vdc
- Fast Switching Times – $t_r \leq 10$ ns
- Low Drain-Source Resistance $r_{ds(on)} = 200$ Ohms (Max)
- Low Reverse Transfer Capacitance $C_{rss} = 1.3$ pF (Max)
- Manufactured Using the New Silicon Nitride Process Resulting in a Stable $V_{GS(th)}$ and Gate Oxide Breakdown Protection to Typical Transients of ±150 Volts Peak

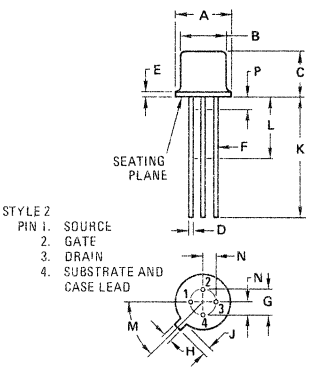
MOS FIELD-EFFECT TRANSISTORS

N-CHANNEL

MAXIMUM RATINGS ($T_A = 25^oC$ unless otherwise noted)

Rating	Symbol	Value	Unit
*Drain-Source Voltage	V_{DS}	25	Vdc
*Drain-Gate Voltage	V_{DG}	±35	Vdc
*Gate-Source Voltage	V_{GS}	±35	Vdc
*Drain Current	I_D	30	mAdc
Power Dissipation @ $T_A = 25^oC$ Derate above 25^oC	P_D	300 1.7	mW mW/^oC
*Power Dissipation @ $T_C = 25^oC$ *Derate above 25^oC	P_D	800 4.56	mW mW/^oC
Operating Junction Temperature	T_J	175	^oC
*Storage Temperature Range	T_{stg}	-65 to +200	^oC

*Indicates JEDEC Registered Data.



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	5.31	5.84	0.209	0.230
B	4.52	4.95	0.178	0.195
C	4.32	5.33	0.170	0.210
D	0.41	0.53	0.016	0.021
E	–	0.76	–	0.030
F	0.41	0.48	0.016	0.019
G	2.54 BSC		0.100 BSC	
H	0.91	1.17	0.036	0.046
J	0.71	1.22	0.028	0.048
K	12.70	–	0.500	–
L	6.35	–	0.250	–
M	45° BSC		45° BSC	
N	1.27 BSC		0.050 BSC	
P	–	1.27	–	0.050

ALL JEDEC dimensions and notes apply

CASE 20-03
TO-72

HANDLING PRECAUTIONS:

MOS field-effect transistors have extremely high input resistance. They can be damaged by the accumulation of excess static charge. Avoid possible damage to the devices while handling, testing, or in actual operation, by following the procedures outlined below:

1. To avoid the build-up of static charge, the leads of the devices should remain shorted together with a metal ring except when being tested or used.
2. Avoid unnecessary handling. Pick up devices by the case instead of the leads.
3. Do not insert or remove devices from circuits with the power on because transient voltages may cause permanent damage to the devices.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Substrate connected to source.

Characteristic		Figure No.	Symbol	Min	Max	Unit
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage (I_D = 10 μAdc, V_{GS} = 0)		–	$V_{(BR)DSS}$	25	–	Vdc
*Gate Leakage Current		–	I_{GSS}			pAdc
(V_{GS} = -35 Vdc, V_{DS} = 0)				–	10	
(V_{GS} = -35 Vdc, V_{DS} = 0, T_A = 125°C)				–	100	
*Zero-Gate-Voltage Drain Current		–	I_{DSS}			nAdc
(V_{DS} = 10 Vdc, V_{GS} = 0)				–	10	
(V_{DS} = 10 Vdc, V_{GS} = 0, T_A = 125°C)				–	1.0	μAdc
***ON CHARACTERISTICS**						
Gate-Source Threshold Voltage (V_{DS} = 10 Vdc, I_D = 10 μAdc)	3N169	–	$V_{GS(th)}$	0.5	1.5	Vdc
	3N170			1.0	2.0	
	3N171			1.5	3.0	
"ON" Drain Current (V_{GS} = 10 Vdc, V_{DS} = 10 Vdc)		3	$I_{D(on)}$	10	–	mAdc
Drain-Source "ON" Voltage (I_D = 10 mAdc, V_{GS} = 10 Vdc)		–	$V_{DS(on)}$	–	2.0	Vdc
SMALL SIGNAL CHARACTERISTICS						
*Drain-Source Resistance (V_{GS} = 10 Vdc, I_D = 0, f = 1.0 kHz)		4	$r_{ds(on)}$	–	200	Ohms
Forward Transfer Admittance (V_{DS} = 10 Vdc, I_D = 2.0 mAdc, f = 1.0 kHz)		1	$\|y_{fs}\|$	1000	–	μmhos
*Reverse Transfer Capacitance (V_{DS} = 0, V_{GS} = 0, f = 1.0 MHz)		2	C_{rss}	–	1.3	pF
*Input Capacitance (V_{DS} = 10 Vdc, V_{GS} = 0, f = 1.0 MHz)		2	C_{iss}	–	5.0	pF
*Drain-Substrate Capacitance ($V_{D(SUB)}$ = 10 Vdc, f = 1.0 MHz)		–	$C_{d(sub)}$	–	5.0	pF
***SWITCHING CHARACTERISTICS**						
Turn-On Delay Time	(V_{DD} = 10 Vdc, $I_{D(on)}$ = 10 mAdc, $V_{GS(on)}$ = 10 Vdc, $V_{GS(off)}$ = 0, R_G' = 50 Ohms)	6,10	$t_{d(on)}$	–	3.0	ns
Rise Time		7,10	t_r	–	10	ns
Turn-Off Delay Time		8,10	$t_{d(off)}$	–	3.0	ns
Fall Time		9,10	t_f	–	15	ns

*Indicates JEDEC Registered Data.

FIGURE 1 – FORWARD TRANSFER ADMITTANCE

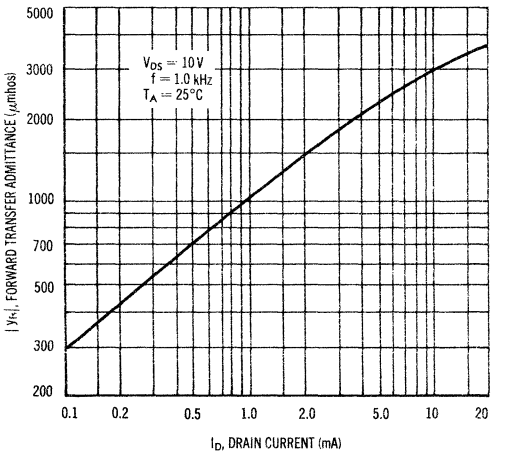


FIGURE 2 – CAPACITANCE

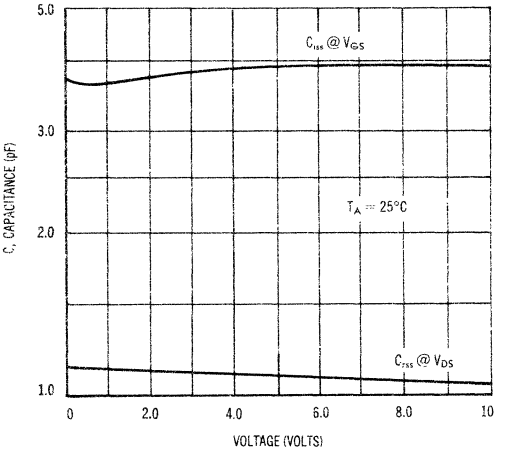


FIGURE 3 – TRANSFER CHARACTERISTICS

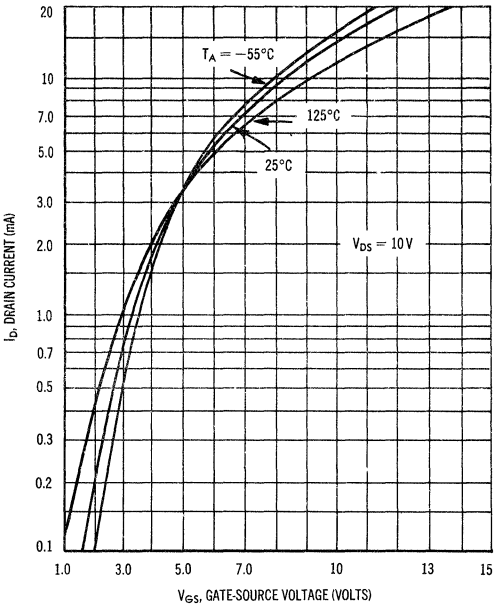


FIGURE 4 – DRAIN-SOURCE "ON" RESISTANCE

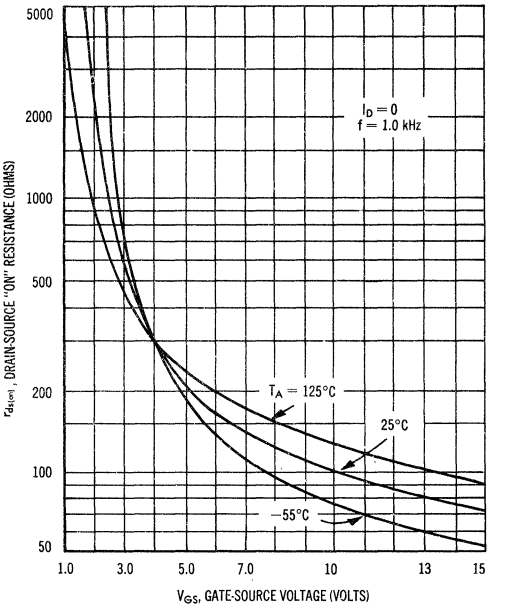
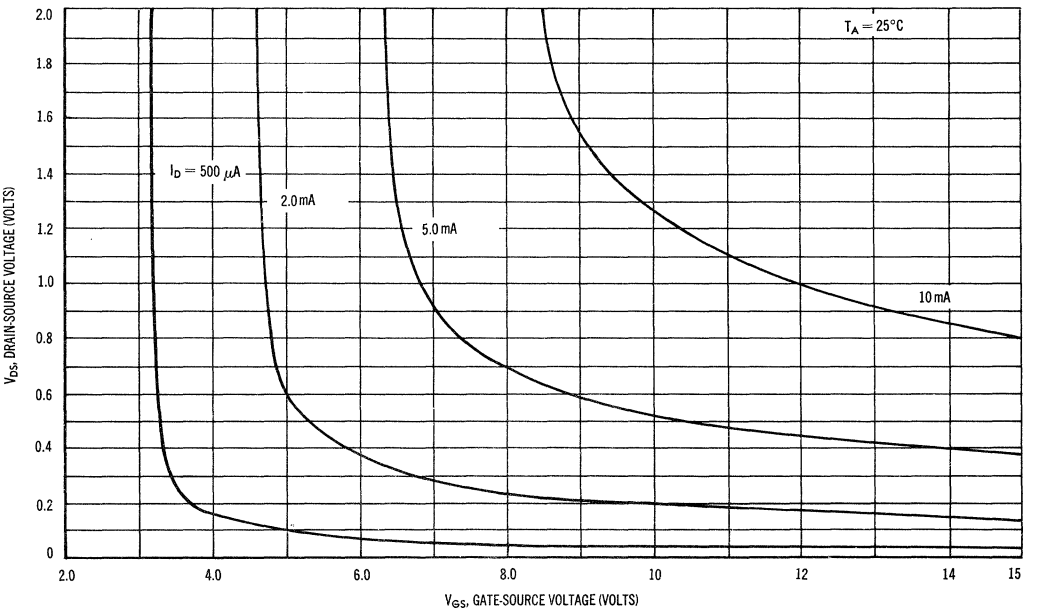


FIGURE 5 – "ON" DRAIN-SOURCE VOLTAGE



TYPICAL SWITCHING CHARACTERISTICS
$T_A = 25^oC$

FIGURE 6 – TURN-ON DELAY TIME

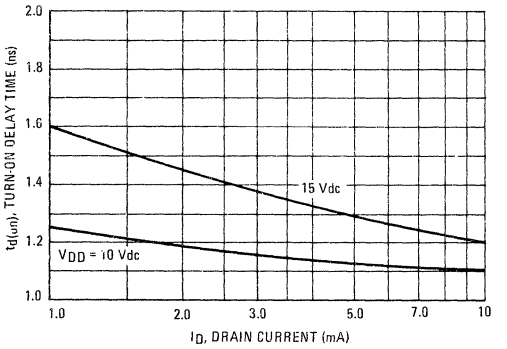


FIGURE 7 – RISE TIME

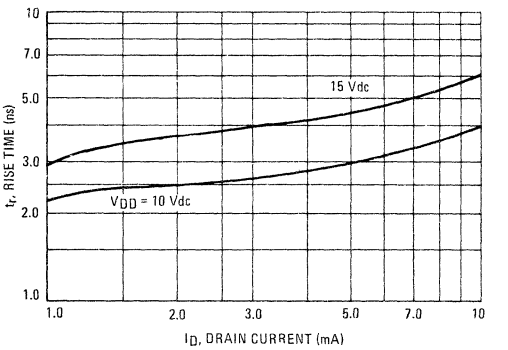


FIGURE 8 – TURN-OFF DELAY TIME

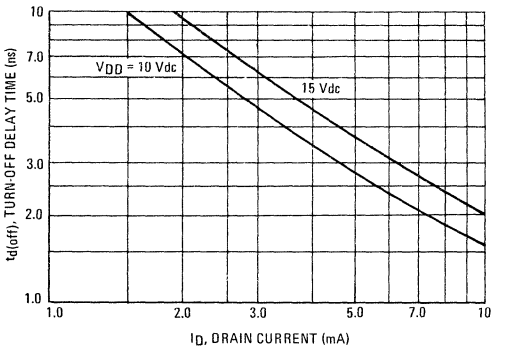


FIGURE 9 – FALL TIME

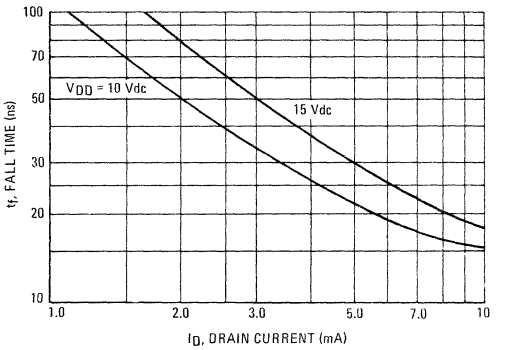


FIGURE 10 – SWITCHING TIME TEST CIRCUIT