MOTOROLA
SEMICONDUCTORS
P.O. BOX 20912 • PHOENIX, ARIZONA 85036

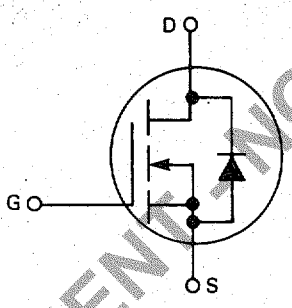
2N6659 MPF6659
2N6660 MPF6660
2N6661 MPF6661

N-CHANNEL ENHANCEMENT-MODE TMOS POWER FIELD-EFFECT TRANSISTOR

These TMOS Power FETs are designed for high-current, high-speed power switching applications such as switching power supplies, CMOS logic, microprocessor or TTL-to-high current interface and line drivers.

- Fast Switching Speed — $t_{on} = t_{off} = 5.0$ ns Max
- Low On-Resistance — 1.5 Ohm Typ — 2N6659/MPF6659
  2.0 Ohm Typ — 2N6660/2N6661
  — MPF6660/MPF6661
- Low Drive Requirement, $V_{GS(th)} = 2.0$ V Max
- Inherent Current Sharing Capability Permits Easy Paralleling of Many Devices

TMOS™

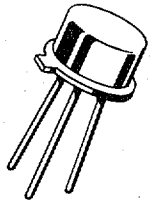


2.0 AMPERE

N-CHANNEL TMOS POWER FET

35, 60, 90 VOLTS

2N6659
2N6660
2N6661



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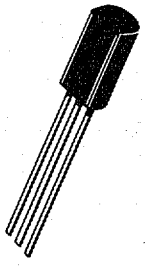
MPF6659
MPF6660
MPF6661



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MAXIMUM RATINGS

Rating	Symbol	2N6659 MPF6659	2N6660 MPF6660	2N6661 MPF6661	Unit
Drain-Source Voltage	V_{DSS}	35	60	90	Vdc
Drain-Gate Voltage	V_{DGO}	35	60	90	Vdc
Gate-Source Voltage	V_{GS}	± 30			Vdc
Drain Current — Continuous (1)	I_D	2.0			Adc
Pulsed (2)	I_{DM}	3.0			
		2N6659 2N6660 2N6661		MPF6659 MPF6660 MPF6661	
Total Power Dissipation @ $T_C = 25°C$	P_D	6.25		2.5	Watts
Derate above 25°C		50		20	mW/°C
Total Power Dissipation @ $T_A = 25°C$	P_D	—		1.0	Watts
Derate above 25°C		—		8.0	mW/°C
Operating and Storage Temperature Range	T_J, T_{stg}	−55 to +150			°C

(1) The Power Dissipation of the package may result in a lower continuous drain current.
(2) Pulse Width ≤ 300 μs Duty Cycle ≤ 2.0%

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

Characteristics		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage (V_{GS} = 0, I_D = 10 μA)	2N6659, MPF6659	$V_{(BR)DSS}$	35	—	—	Vdc
	2N6660, MPF6660		60	—	—	
	2N6661, MPF6661		90	—	—	
Zero Gate Voltage Drain Current (V_{DS} = Maximum Rating, V_{GS} = 0)		I_{DSS}	—	—	10	μAdc
Gate-Body Leakage Current (V_{GS} = 15 V, V_{DS} = 0)		I_{GSS}	—	—	100	nAdc
ON CHARACTERISTICS*						
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 1.0 mA)		$V_{GS(th)}$	0.8	1.4	2.0	Vdc
Drain-Source On-Voltage		$V_{DS(on)}$				Vdc
(V_{GS} = 10 V, I_D = 1.0 A)	2N6659, MPF6659		—	—	1.8	
	2N6660, MPF6660		—	—	3.0	
	2N6661, MPF6661		—	—	4.0	
(V_{GS} = 5.0 V, I_D = 0.3 A)	2N6659, MPF6659		—	0.8	1.5	
	2N6660, MPF6660		—	0.9	1.5	
	2N6661, MPF6661		—	0.9	1.6	
Static Drain-Source On-Resistance		$r_{DS(on)}$				Ohms
(V_{GS} = 10 Vdc, I_D = 1.0 Adc)	2N6659, MPF6659		—	—	1.8	
	2N6660, MPF6660		—	—	3.0	
	2N6661, MPF6661		—	—	4.0	
On-State Drain Current (V_{DS} = 25 V, V_{GS} = 10 V)		$I_{D(on)}$	1.0	2.0	—	Amps
Forward Transconductance (V_{DS} = 25 V, I_D = 0.5 A)		g_{fs}	170	—	—	mmhos
DYNAMIC CHARACTERISTICS						
Input Capacitance (V_{DS} = 25 V, V_{GS} = 0, f = 1.0 MHz)		C_{iss}	—	30	50	pF
Output Capacitance (V_{DS} = 25 V, V_{GS} = 0, f = 1.0 MHz)		C_{oss}	—	20	40	pF
Reverse Transfer Capacitance (V_{DS} = 25 V, V_{GS} = 0, f = 1.0 MHz)		C_{rss}	—	3.6	10	pF
SWITCHING CHARACTERISTICS*						
Turn-On Time (See Figure 1)		t_{on}	—	—	5.0	ns
Turn-Off Time (See Figure 1)		t_{off}	—	—	5.0	ns
Rise Time		t_r	—	—	5.0	ns
Fall Time		t_f	—	—	5.0	ns

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

RESISTIVE SWITCHING

FIGURE 1 — SWITCHING TEST CIRCUIT

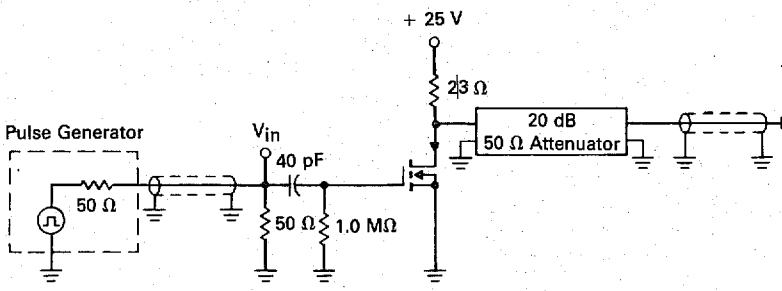


FIGURE 2 — SWITCHING WAVEFORMS

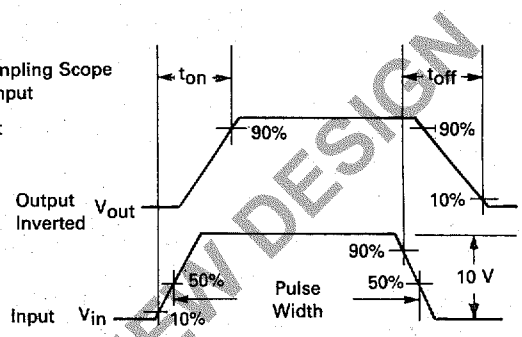


FIGURE 3 — $V_{GS(th)}$ NORMALIZED versus TEMPERATURE

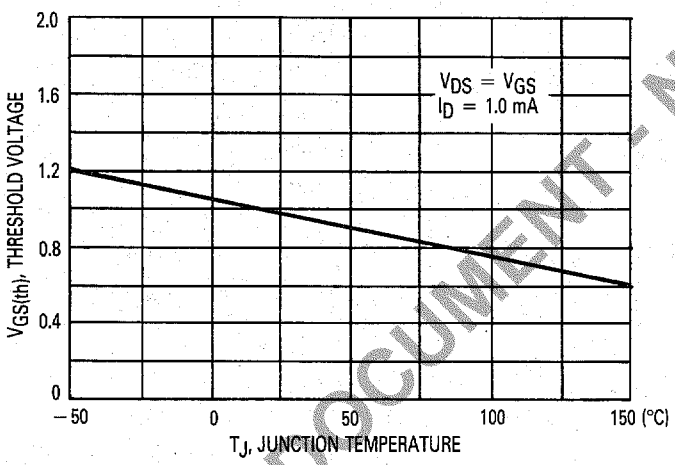


FIGURE 4 — ON-REGION CHARACTERISTICS

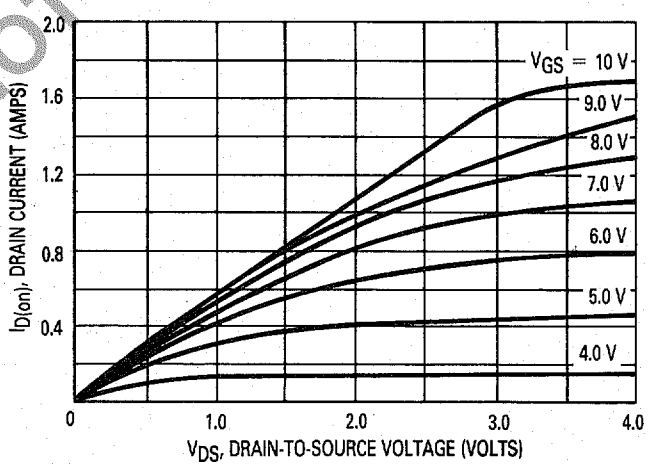


FIGURE 5 — OUTPUT CHARACTERISTICS

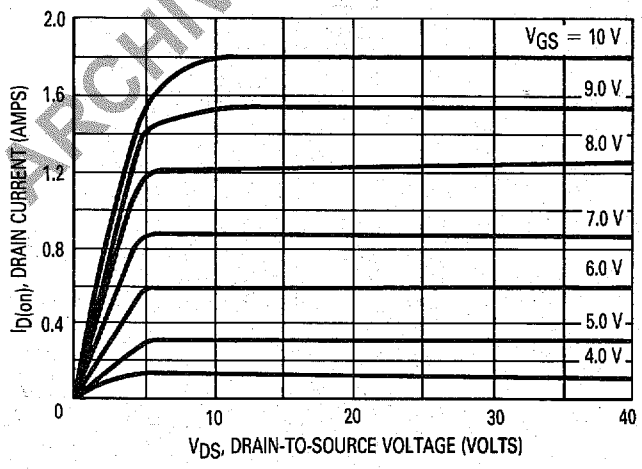


FIGURE 6 — CAPACITANCE versus DRAIN-TO-SOURCE VOLTAGE

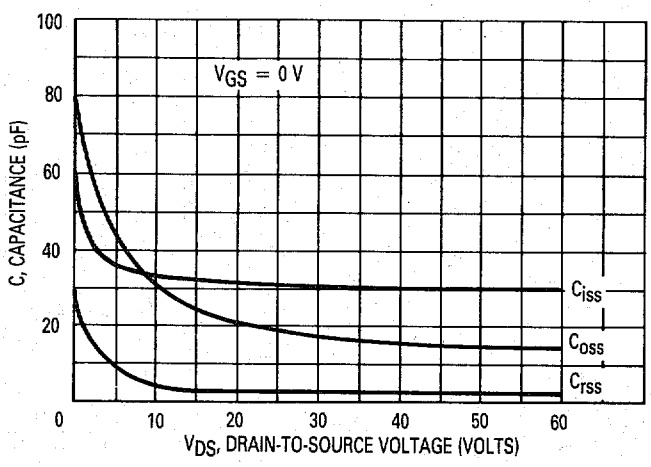
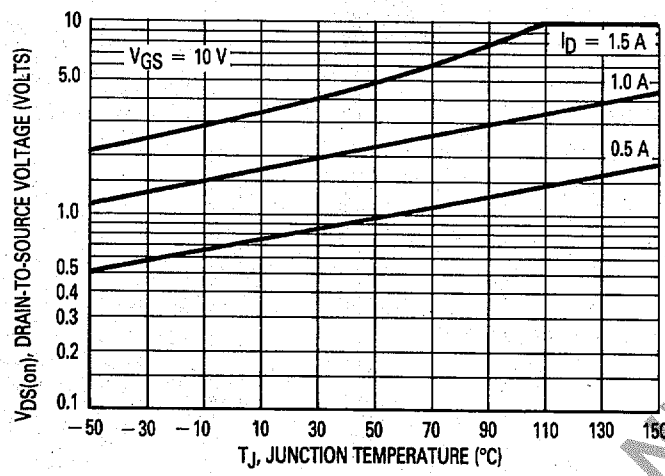
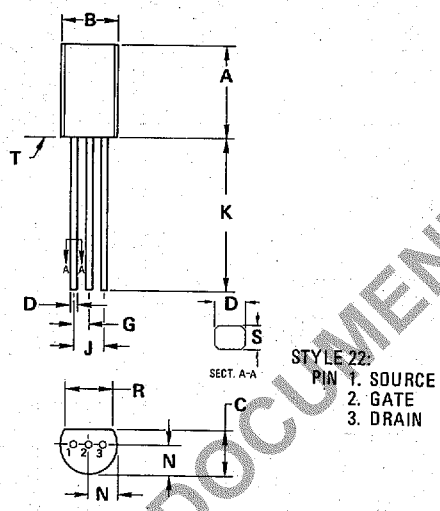


FIGURE 7 — ON-VOLTAGE versus TEMPERATURE



OUTLINE DIMENSIONS



NOTES:
1. DIMENSIONS -A- AND -B- ARE DATUMS.
2. -T- IS SEATING PLANE.
3. POSITIONAL TOLERANCE FOR LEADS:
   ⌖ | Ø 0.10 (0.004) Ⓜ | T | A Ⓜ | B Ⓜ
4. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	7.37	7.87	0.290	0.310
B	4.44	5.21	0.175	0.205
C	3.18	4.19	0.125	0.165
D	0.46	0.61	0.018	0.024
G	1.27 BSC		0.050 BSC	
J	2.54 BSC		0.100 BSC	
K	12.70	–	0.500	–
N	2.03	2.92	0.080	0.115
R	3.43	–	0.135	–
S	0.46	0.61	0.018	0.024

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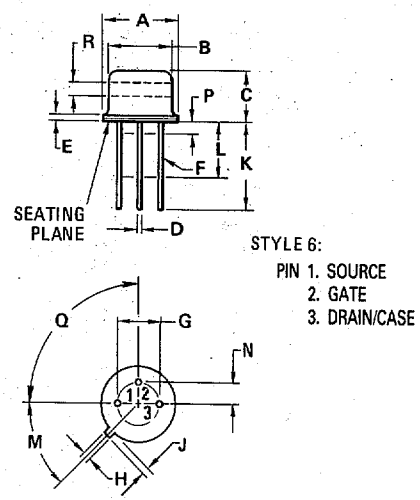

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	8.89	9.40	0.350	0.370
B	8.00	8.51	0.315	0.335
C	6.10	6.60	0.240	0.260
D	0.406	0.533	0.016	0.021
E	0.229	3.18	0.009	0.125
F	0.406	0.483	0.016	0.019
G	4.83	5.33	0.190	0.210
H	0.711	0.864	0.028	0.034
J	0.737	1.02	0.029	0.040
K	12.70	–	0.500	–
L	6.35	–	0.250	–
M	45° NOM		45° NOM	
P	–	1.27	–	0.050
Q	90° NOM		90° NOM	
R	2.54	–	0.100	–

All JEDEC dimensions and notes apply.

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