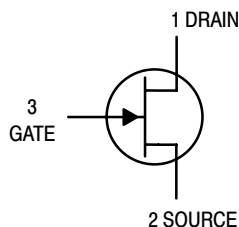


JFETs Switching

N-Channel – Depletion



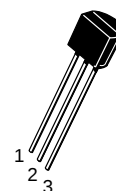
MPF4392

MPF4393

ON Semiconductors Preferred Devices

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain–Source Voltage	V_{DS}	30	Vdc
Drain–Gate Voltage	V_{DG}	30	Vdc
Gate–Source Voltage	V_{GS}	30	Vdc
Forward Gate Current	$I_{G(f)}$	50	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	350 2.8	mW mW/ $^\circ\text{C}$
Operating and Storage Channel Temperature Range	T_{channel} , T_{stg}	–65 to +150	$^\circ\text{C}$



CASE 29–11, STYLE 5
TO–92 (TO–226AA)

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Gate–Source Breakdown Voltage ($I_G = 1.0 \mu\text{Adc}$, $V_{DS} = 0$)	$V_{(BR)GSS}$	30	–	–	Vdc
Gate Reverse Current ($V_{GS} = 15 \text{ Vdc}$, $V_{DS} = 0$) ($V_{GS} = 15 \text{ Vdc}$, $V_{DS} = 0$, $T_A = 100^\circ\text{C}$)	I_{GSS}	– –	– –	1.0 0.2	nAdc μAdc
Drain–Cutoff Current ($V_{DS} = 15 \text{ Vdc}$, $V_{GS} = 12 \text{ Vdc}$) ($V_{DS} = 15 \text{ Vdc}$, $V_{GS} = 12 \text{ Vdc}$, $T_A = 100^\circ\text{C}$)	$I_{D(off)}$	– –	– –	1.0 0.1	nAdc μAdc
Gate Source Voltage ($V_{DS} = 15 \text{ Vdc}$, $I_D = 10 \text{ nAdc}$)	V_{GS}	–2.0 –0.5	– –	–5.0 –3.0	Vdc

ON CHARACTERISTICS

Zero–Gate–Voltage Drain Current ⁽¹⁾ ($V_{DS} = 15 \text{ Vdc}$, $V_{GS} = 0$)	I_{DSS}	25 5.0	– –	75 30	mAdc
Drain–Source On–Voltage ($I_D = 6.0 \text{ mAdc}$, $V_{GS} = 0$) ($I_D = 3.0 \text{ mAdc}$, $V_{GS} = 0$)	$V_{DS(on)}$	– –	– –	0.4 0.4	Vdc
Static Drain–Source On Resistance ($I_D = 1.0 \text{ mAdc}$, $V_{GS} = 0$)	$r_{DS(on)}$	– –	– –	60 100	Ω

SMALL–SIGNAL CHARACTERISTICS

Forward Transfer Admittance ($V_{DS} = 15 \text{ Vdc}$, $I_D = 25 \text{ mAdc}$, $f = 1.0 \text{ kHz}$) ($V_{DS} = 15 \text{ Vdc}$, $I_D = 5.0 \text{ mAdc}$, $f = 1.0 \text{ kHz}$)	$ y_{fs} $	– –	17 12	– –	mmhos
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1. Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 3.0\%$.

Preferred devices are ON Semiconductor recommended choices for future use and best overall value.

MPF4392 MPF4393

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Typ	Max	Unit
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SMALL-SIGNAL CHARACTERISTICS (continued)

Drain-Source "ON" Resistance ($V_{GS} = 0$, $I_D = 0$, $f = 1.0$ kHz)	MPF4392 MPF4393	$r_{ds(on)}$	— —	— —	60 100	Ω
Input Capacitance ($V_{GS} = 15$ Vdc, $V_{DS} = 0$, $f = 1.0$ MHz)		C_{iss}	—	6.0	10	pF
Reverse Transfer Capacitance ($V_{GS} = 12$ Vdc, $V_{DS} = 0$, $f = 1.0$ MHz) ($V_{DS} = 15$ Vdc, $I_D = 10$ mAdc, $f = 1.0$ MHz)		C_{rss}	— —	2.5 3.2	3.5 —	pF

SWITCHING CHARACTERISTICS

Rise Time (See Figure 2) ($I_{D(on)} = 6.0$ mAdc) ($I_{D(on)} = 3.0$ mAdc)	MPF4392 MPF4393	t_r	— —	2.0 2.5	5.0 5.0	ns
Fall Time (See Figure 4) ($V_{GS(off)} = 7.0$ Vdc) ($V_{GS(off)} = 5.0$ Vdc)	MPF4392 MPF4393	t_f	— —	15 29	20 35	ns
Turn-On Time (See Figures 1 and 2) ($I_{D(on)} = 6.0$ mAdc) ($I_{D(on)} = 3.0$ mAdc)	MPF4392 MPF4393	t_{on}	— —	4.0 6.5	15 15	ns
Turn-Off Time (See Figures 3 and 4) ($V_{GS(off)} = 7.0$ Vdc) ($V_{GS(off)} = 5.0$ Vdc)	MPF4392 MPF4393	t_{off}	— —	20 37	35 55	ns

TYPICAL SWITCHING CHARACTERISTICS

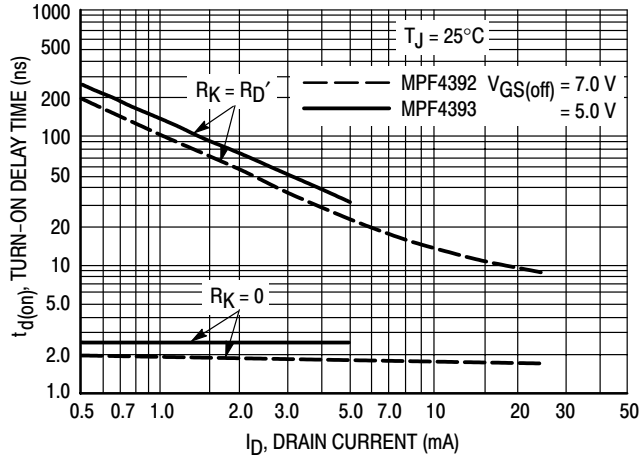


Figure 1. Turn-On Delay Time

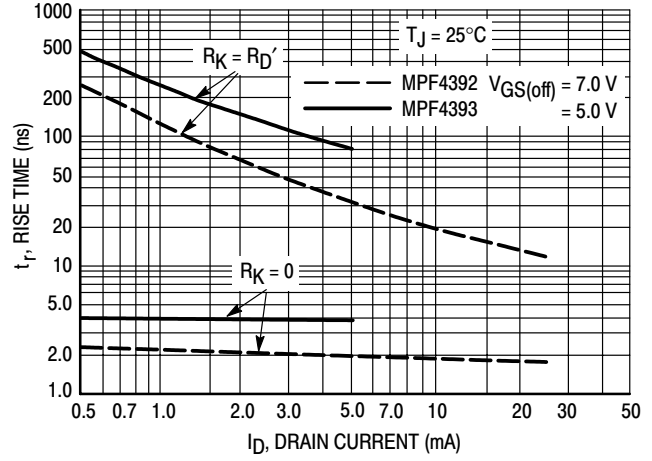


Figure 2. Rise Time

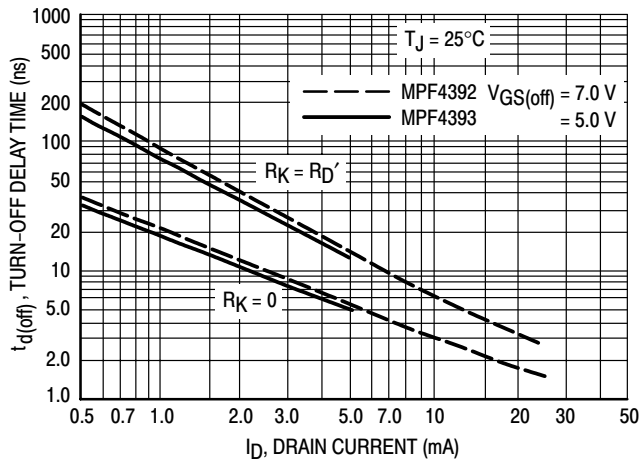


Figure 3. Turn-Off Delay Time

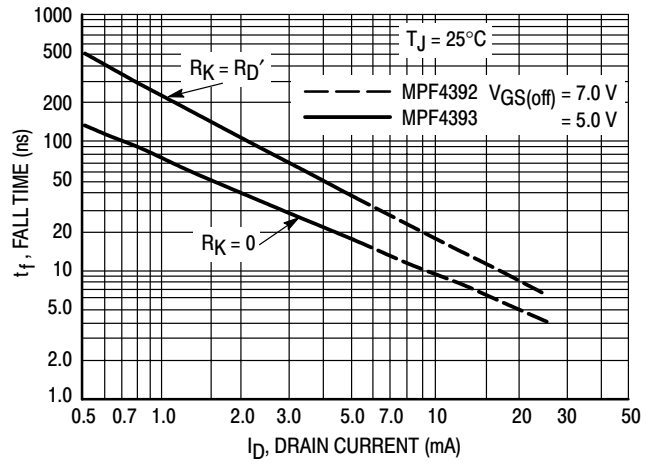


Figure 4. Fall Time

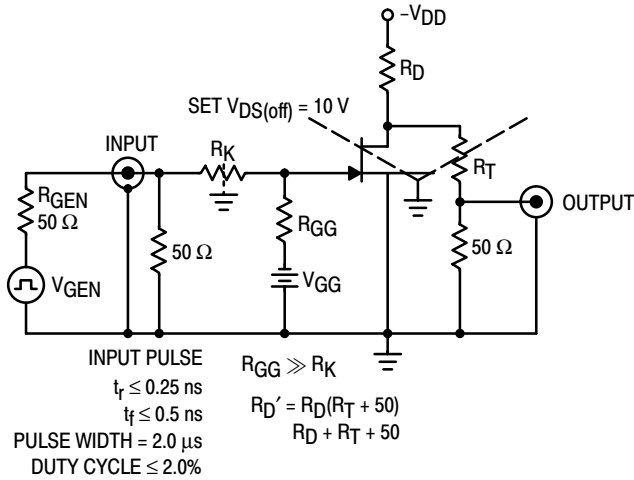


Figure 5. Switching Time Test Circuit

NOTE 1

The switching characteristics shown above were measured using a test circuit similar to Figure 5. At the beginning of the switching interval, the gate voltage is at Gate Supply Voltage ($-V_{GG}$). The Drain-Source Voltage (V_{DS}) is slightly lower than Drain Supply Voltage (V_{DD}) due to the voltage divider. Thus Reverse Transfer Capacitance (C_{RSS}) or Gate-Drain Capacitance (C_{gd}) is charged to $V_{GG} + V_{DS}$.

During the turn-on interval, Gate-Source Capacitance (C_{gs}) discharges through the series combination of R_{GEN} and R_K . C_{gd} must discharge to $V_{DS(on)}$ through R_G and R_K in series with the parallel combination of effective load impedance (R'_D) and Drain-Source Resistance (r_{ds}). During the turn-off, this charge flow is reversed.

Predicting turn-on time is somewhat difficult as the channel resistance r_{ds} is a function of the gate-source voltage. While C_{gs} discharges, V_{GS} approaches zero and r_{ds} decreases. Since C_{gd} discharges through r_{ds} , turn-on time is non-linear. During turn-off, the situation is reversed with r_{ds} increasing as C_{gd} charges.

The above switching curves show two impedance conditions: 1) R_K is equal to R_D' which simulates the switching behavior of cascaded stages where the driving source impedance is normally the load impedance of the previous stage, and 2) $R_K = 0$ (low impedance) the driving source impedance is that of the generator.

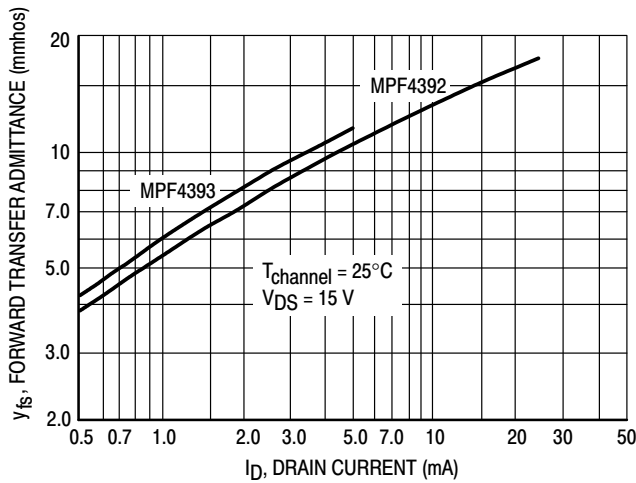


Figure 6. Typical Forward Transfer Admittance

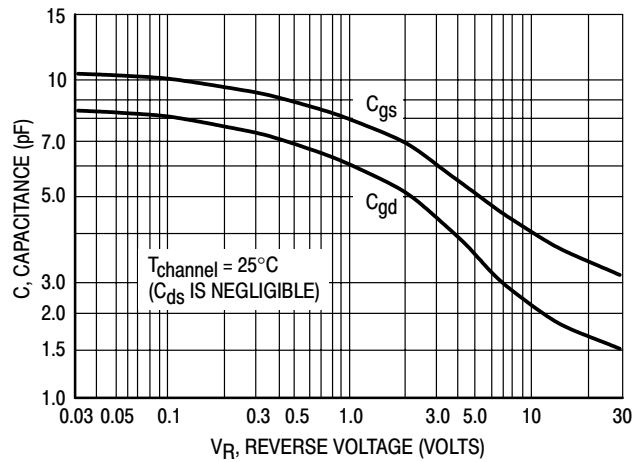


Figure 7. Typical Capacitance

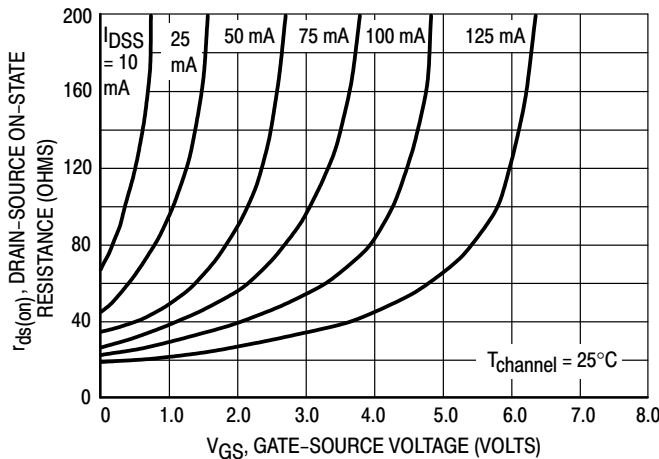


Figure 8. Effect of Gate-Source Voltage On Drain-Source Resistance

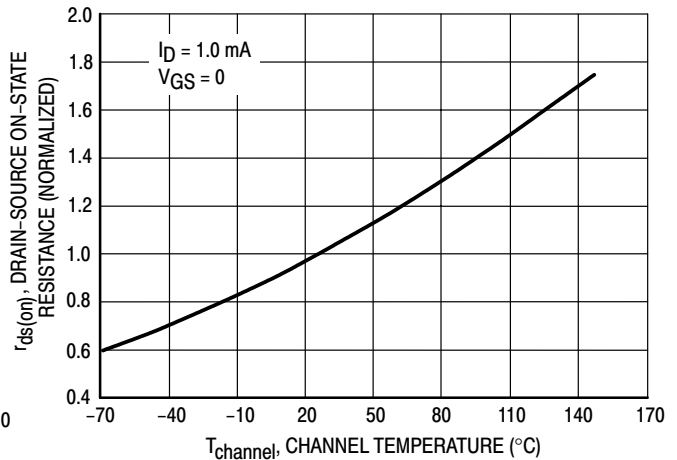


Figure 9. Effect of Temperature On Drain-Source On-State Resistance

MPF4392 MPF4393

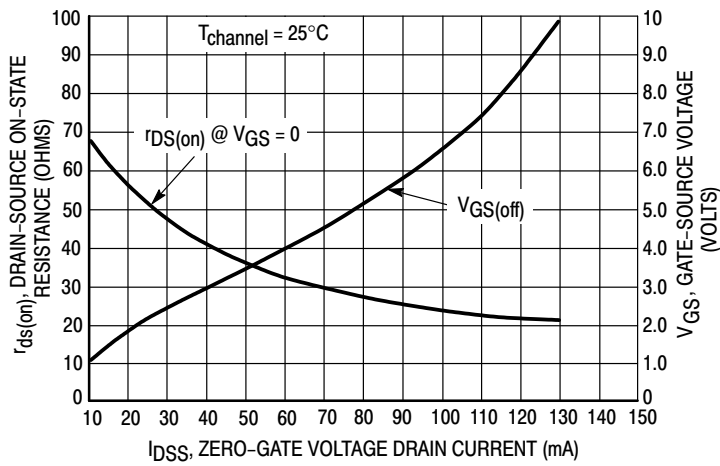


Figure 10. Effect of I_{DSS} On Drain-Source Resistance and Gate-Source Voltage

NOTE 2

The Zero-Gate-Voltage Drain Current (I_{DSS}), is the principle determinant of other J-FET characteristics. Figure 10 shows the relationship of Gate-Source Off Voltage ($V_{GS(off)}$) and Drain-Source On Resistance ($r_{DS(on)}$) to I_{DSS} . Most of the devices will be within $\pm 10\%$ of the values shown in Figure 10. This data will be useful in predicting the characteristic variations for a given part number.

For example:

Unknown

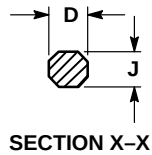
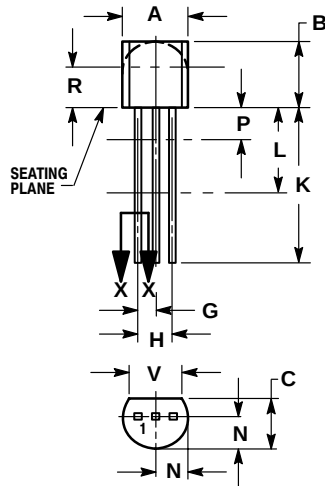
$r_{DS(on)}$ and V_{GS} range for an MPF4392

The electrical characteristics table indicates that an MPF4392 has an I_{DSS} range of 25 to 75 mA. Figure 10 shows $r_{DS(on)} = 52$ Ohms for $I_{DSS} = 25$ mA and 30 Ohms for $I_{DSS} = 75$ mA. The corresponding V_{GS} values are 2.2 volts and 4.8 volts.

MPF4392 MPF4393

PACKAGE DIMENSIONS

TO-92 (TO-226)
CASE 29-11
ISSUE AL



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---

Notes

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