N-CHANNEL FETS

Silicon symmetrical n-channel depletion type junction field-effect transistors in TO-18 metal envelopes with the gate connected to the case. The transistors are intended for low power, chopper or switching, application in industrial service.

QUICK REFERENCE DATA

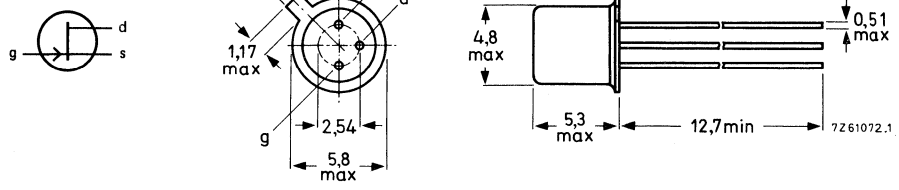
Drain-source voltage	$\pm V_{DS}$	max.	40		V
Total power dissipation up to T_{case} = 25 °C	P_{tot}	max.	1,8		W
			2N4391	**2N4392**	**2N4393**
Drain current					
V_{DS} = 20 V; V_{GS} = 0	I_{DSS}	>	50	25	5 mA
Gate-source cut-off voltage		>	4,0	2,0	0,5 V
I_D = 1 nA; V_{DS} = 20 V	$-V_{(P)GS}$	<	10	5,0	3,0 V
Drain-source resistance (on) at f = 1 kHz					
I_D = 1 mA; V_{GS} = 0	$r_{ds\ on}$	<	30	60	100 Ω
Feedback capacitance at f = 1 MHz					
V_{DS} = 0; $-V_{GS}$ = 12 V **2N4391**					
V_{DS} = 0; $-V_{GS}$ = 7 V **2N4392**	C_{rs}	<	3,5	3,5	3,5 pF
V_{DS} = 0; $-V_{GS}$ = 5 V **2N4393**					
Turn-off time					
V_{DD} = 10 V; V_{GS} = 0					
I_D = 12 mA; $-V_{GSM}$ = 12 V	t_{off}	<	20	–	– ns
I_D = 6,0 mA; $-V_{GSM}$ = 7 V	t_{off}	<	–	35	– ns
I_D = 3,0 mA; $-V_{GSM}$ = 5 V	t_{off}	<	–	–	50 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-18.

Gate connected to case



Accessories: 56246 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	$\pm V_{DS}$	max.	40	V
Drain-gate voltage (open source)	V_{DGO}	max.	40	V
Gate-source voltage	$-V_{GSO}$	max.	40	V
Gate current (d.c.)	I_G	max.	50	mA
Total power dissipation up to T_{case} = 25 °C	P_{tot}	max.	1.8	W
Storage temperature	T_{stg}	−65 to	200	°C
Junction temperature	T_j	max.	200	°C
→ From junction to case in free air	$R_{th\ j\text{-}c}$	=	0.1	K/mW

CHARACTERISTICS T_{amb} = 25 °C unless otherwise specified

Gate cut-off current

$-V_{GS}$ = 20 V; V_{DS} = 0	$-I_{GSS}$ <	0.1	nA
$-V_{GS}$ = 20 V; V_{DS} = 0; T_{amb} = 150 °C	$-I_{GSS}$ <	0.2	μA

Drain cut-off current

		2N4391	2N4392	2N4393	
V_{DS} = 20 V; $-V_{GS}$ = 12 V	I_{DSX} <	0.1	–	–	nA
V_{DS} = 20 V; $-V_{GS}$ = 7 V	I_{DSX} <	–	0.1	–	nA
V_{DS} = 20 V; $-V_{GS}$ = 5 V	I_{DSX} <	–	–	0.1	nA
V_{DS} = 20 V; $-V_{GS}$ = 12 V; T_{amb} = 150 °C	I_{DSX} <	0.2	–	–	μA
V_{DS} = 20 V; $-V_{GS}$ = 7 V; T_{amb} = 150 °C	I_{DSX} <	–	0.2	–	μA
V_{DS} = 20 V; $-V_{GS}$ = 5 V; T_{amb} = 150 °C	I_{DSX} <	–	–	0.2	μA

CHARACTERISTICS (continued) $T_{amb} = 25\,^{o}C$ unless otherwise specified

			2N4391	2N4392	2N4393	
Drain currents [1]						
$V_{DS} = 20$ V; $V_{GS} = 0$	I_{DSS}	>	50	–	–	mA
		<	150	–	–	mA
$V_{DS} = 20$ V; $V_{GS} = 0$	I_{DSS}	>	–	25	–	mA
		<	–	75	–	mA
$V_{DS} = 20$ V; $V_{GS} = 0$	I_{DSS}	>	–	–	5	mA
		<	–	–	30	mA
Gate-source breakdown voltage						
$-I_G = 1$ µA; $V_{DS} = 0$	$-V_{(BR)GSS}$	>	40	40	40	V
Gate-source voltage						
$I_G = 1$ mA; $V_{DS} = 0$	V_{GSon}	<	1.0	1.0	1.0	V
Gate-source cut-off voltage						
$I_D = 1$ nA; $V_{DS} = 20$ V	$-V_{(P)GS}$	>	4.0	2.0	0.5	V
		<	10	5.0	3.0	V
Drain-source voltage (on)						
$I_D = 12$ mA; $V_{GS} = 0$	V_{DSon}	<	0.4	–	–	V
$I_D = 6.0$ mA; $V_{GS} = 0$	V_{DSon}	<	–	0.4	–	V
$I_D = 3.0$ mA; $V_{GS} = 0$	V_{DSon}	<	–	–	0.4	V
Drain-source resistance (on)						
$I_D = 1$ mA; $V_{GS} = 0$	r_{DSon}	<	30	60	100	Ω
Drain-source resistance (on) at f = 1 kHz						
$I_D = 0$; $V_{GS} = 0$	r_{dson}	<	30	60	100	Ω
y parameters at f = 1 MHz (common source)						
Input capacitance						
$V_{DS} = 20$ V; $V_{GS} = 0$	C_{is}	<	14	14	14	pF
Feedback capacitance						
$-V_{GS} = 12$ V; $V_{DS} = 0$	$-C_{rs}$	<	3.5	–	–	pF
$-V_{GS} = 7$ V; $V_{DS} = 0$	$-C_{rs}$	<	–	3.5	–	pF
$-V_{GS} = 5$ V; $V_{DS} = 0$	$-C_{rs}$	<	–	–	3.5	pF

[1]) measured under pulsed conditions: $t_p = 100$ µs; $\delta = 0.01$

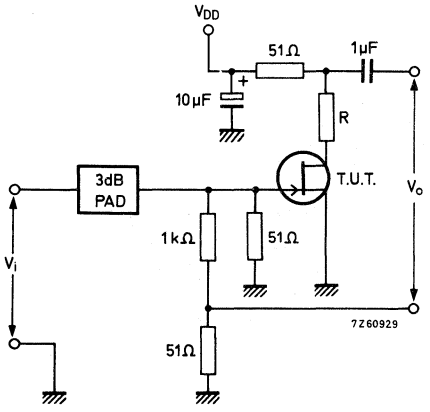
CHARACTERISTICS (continued) $T_{amb} = 25\,^{o}C$ unless otherwise specified

Switching times

$V_{DD} = 10\,V$; $V_{GS} = 0$

			2N4391	2N4392	2N4393	
	I_D	=	12	6.0	3.0	mA
	$-V_{GSM}$	=	12	7	5	V
Rise time	t_r	<	5	5	5	ns
Turn on time	t_{on}	<	15	15	15	ns
Fall time	t_f	<	15	20	30	ns
Turn off time	t_{off}	<	20	35	50	ns

Test circuit:



$$R = \frac{9.6}{I_D} - 51\,\Omega$$

Pulse generator:

t_r	<	0.5	ns
t_f	<	0.5	ns
t_p	=	100	μs
δ	=	0.01	

Oscilloscope:

R_i	=	50	Ω