MOTOROLA

2N5638
2N5639
2N5640

N-CHANNEL JUNCTION FIELD-EFFECT TRANSISTORS

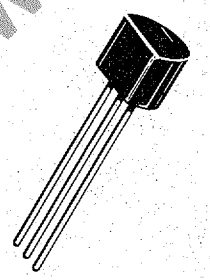
. . . depletion mode (Type A) Junction Field-Effect Transistors designed for chopper and high-speed switching applications.

- Low Drain-Source "ON" Resistance —
  $r_{ds(on)}$ = 30 Ohms (2N5638)
  60 Ohms (2N5639)
  100 Ohms (2N5640)
- Low Reverse Transfer Capacitance —
  C_{rss} = 4.0 pF (Max) @ f = 1.0 MHz
- Fast Switching Characteristics —
  t_r = 5.0 ns (Max) (2N5638)

N-CHANNEL
JUNCTION
FIELD-EFFECT
TRANSISTORS

TYPE A

JUNE 1969 — DS 5319



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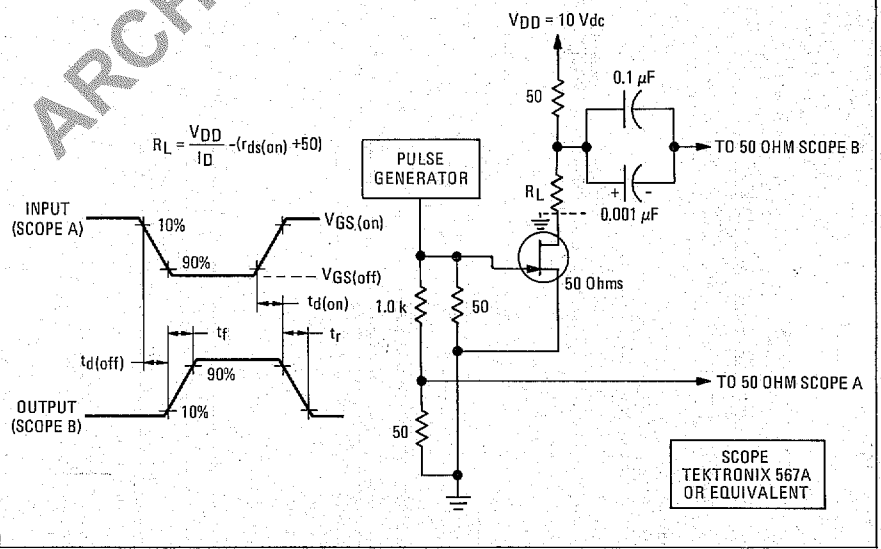
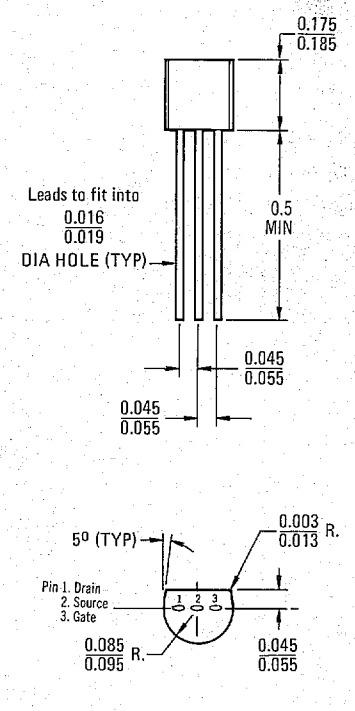
MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	30	Vdc
*Drain-Gate Voltage	V_{DG}	30	Vdc
*Reverse Gate-Source Voltage	V_{GSR}	30	Vdc
*Forward Gate Current	I_{GF}	10	mAdc
*Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	310 2.82	mW mW/°C
*Storage Temperature Range	T_{stg}	-65 to +150	°C
Operating Junction Temperature Range	T_J	-65 to +135	°C

*Indicates JEDEC Registered Data.

FIGURE 1 — SWITCHING TIMES TEST CIRCUIT





Case 29 (5)
(TO-92)

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Gate-Source Breakdown Voltage (I_G = 10 μAdc, V_{DS} = 0)		$V_{(BR)GSS}$	30	–	Vdc
Gate Reverse Current		I_{GSS}			
(V_{GS} = -15 Vdc, V_{DS} = 0)			–	1.0	nAdc
(V_{GS} = -15 Vdc, V_{DS} = 0, T_A = 100°C)			–	1.0	μAdc
Drain Cutoff Current		$I_{D(off)}$			
(V_{DS} = 15 Vdc, V_{GS} = -12 Vdc)	2N5638		–	1.0	μAdc
(V_{DS} = 15 Vdc, V_{GS} = -8.0 Vdc)	2N5639		–	1.0	
(V_{DS} = 15 Vdc, V_{GS} = -6.0 Vdc)	2N5640		–	1.0	
(V_{DS} = 15 Vdc, V_{GS} = -12 Vdc, T_A = 100°C)	2N5638		–	1.0	μAdc
(V_{DS} = 15 Vdc, V_{GS} = -8.0 Vdc, T_A = 100°C)	2N5639		–	1.0	
(V_{DS} = 15 Vdc, V_{GS} = -6.0 Vdc, T_A = 100°C)	2N5640		–	1.0	
ON CHARACTERISTICS					
Zero-Gate Voltage Drain Current (Note 1)		I_{DSS}			mAdc
(V_{DS} = 20 Vdc, V_{GS} = 0)	2N5638		50	–	
	2N5639		25	–	
	2N5640		5.0	–	
Drain-Source "ON" Voltage		$V_{DS(on)}$			Vdc
(I_D = 12 mAdc, V_{GS} = 0)	2N5638		–	0.5	
(I_D = 6.0 mAdc, V_{GS} = 0)	2N5639		–	0.5	
(I_D = 3.0 mAdc, V_{GS} = 0)	2N5640		–	0.5	
Static Drain-Source "ON" Resistance		$r_{DS(on)}$			Ohms
(I_D = 1.0 mAdc, V_{GS} = 0)	2N5638		–	30	
	2N5639		–	60	
	2N5640		–	100	
SMALL-SIGNAL CHARACTERISTICS					
Static Drain-Source "ON" Resistance		$r_{ds(on)}$			Ohms
(V_{GS} = 0, I_D = 0, f = 1.0 kHz)	2N5638		–	30	
	2N5639		–	60	
	2N5640		–	100	
Input Capacitance (V_{DS} = 0, V_{GS} = -12 Vdc, f = 1.0 MHz)		C_{iss}	–	10	pF
Reverse Transfer Capacitance (V_{DS} = 0, V_{GS} = -12 Vdc, f = 1.0 MHz)		C_{rss}	–	4.0	pF
SWITCHING CHARACTERISTICS (Figure 1)					
Turn-On Delay Time	V_{DD} = 10 Vdc, $V_{GS(on)}$ = 0, $V_{GS(off)}$ = -10 Vdc, R_G' = 50 ohms				
	$I_{D(on)}$ = 12 mAdc	2N5638	$t_{d(on)}$	–	4.0	ns
	6.0 mAdc	2N5639		–	6.0	
	3.0 mAdc	2N5640		–	8.0	
Rise Time	$I_{D(on)}$ = 12 mAdc	2N5638	t_r	–	5.0	ns
	6.0 mAdc	2N5639		–	8.0	
	3.0 mAdc	2N5640		–	10	
Turn-Off Delay Time	$I_{D(on)}$ = 12 mAdc	2N5638	$t_{d(off)}$	–	5.0	ns
	6.0 mAdc	2N5639		–	10	
	3.0 mAdc	2N5640		–	15	
Fall Time	$I_{D(on)}$ = 12 mAdc	2N5638	t_f	–	10	ns
	6.0 mAdc	2N5639		–	20	
	3.0 mAdc	2N5640		–	30	

*Indicates JEDEC Registered Data.

Note 1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 3.0%.

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DS 5319