

**5.6A, 100V, 0.600 Ohm, P-Channel Power MOSFETs**

These advanced power MOSFETs are designed, tested, and guaranteed to withstand a specific level of energy in the avalanche breakdown mode of operation. They are P-Channel enhancement mode silicon gate power field effect transistors designed for applications such as switching regulators, switching convertors, motor drivers, relay drivers, and drivers for high power bipolar switching transistors requiring high speed and low gate-drive power. They can be operated directly from integrated circuits.

Formerly developmental type TA17501.

**Ordering Information**

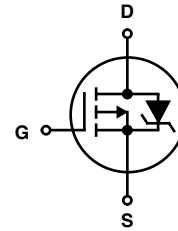
PART NUMBER	PACKAGE	BRAND
IRFR9120	TO-252AA	IF9120
IRFU9120	TO-251AA	IF9120

NOTE: When ordering use the entire part number. Add the suffix 9A to obtain the TO-252AA variant in tape and reel, e.g., IRFR91209A.

**Features**

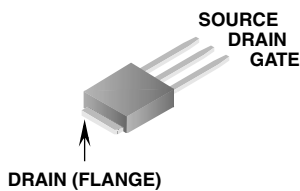
- 5.6A, 100V
- $r_{DS(ON)} = 0.600\Omega$
- Temperature Compensating PSPICE™ Model
- Peak Current vs Pulse Width Curve
- UIS Rating Curve
- Related Literature
  - TB334 "Guidelines for Soldering Surface Mount Components to PC Boards"

**Symbol**

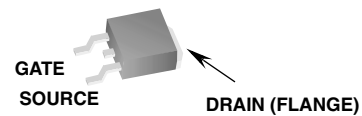


**Packaging**

**JEDEC TO-251AA**



**JEDEC TO-252AA**



# IRFR9120, IRFU9120

## Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ , Unless Otherwise Specified

	IRFR9120, IRFU9120	UNITS
Drain to Source Voltage (Note 1) . . . . .	$V_{DSS}$	-100 V
Drain to Gate Voltage ( $R_{GS} = 20k\Omega$ ) (Note 1) . . . . .	$V_{DGR}$	-100 V
Gate to Source Voltage . . . . .	$V_{GS}$	$\pm 20$ V
Continuous Drain Current . . . . .	$I_D$	5.6 A
Pulsed Drain Current (Note 3) . . . . .	$I_{DM}$	Refer to Peak Current Curve
Single Pulse Avalanche Rating . . . . .	$E_{AS}$	Refer to UIS Curve
Power Dissipation . . . . .	$P_D$	42 W
Linear Derating Factor . . . . .		0.33 W/ $^\circ\text{C}$
Operating and Storage Temperature . . . . .	$T_J, T_{STG}$	-55 to 150 $^\circ\text{C}$
Maximum Temperature for Soldering		
Leads at 0.063in (1.6mm) from Case for 10s . . . . .	$T_L$	300 $^\circ\text{C}$
Package Body for 10s, See Techbrief 334 . . . . .	$T_{pkg}$	260 $^\circ\text{C}$

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

**NOTE:**

- $T_J = 25^\circ\text{C}$  to  $125^\circ\text{C}$ .

## Electrical Specifications $T_C = 25^\circ\text{C}$ , Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Drain to Source Breakdown Voltage	$BV_{DSS}$	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	-100	-	-	V
Gate to Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	-2.0	-	-4.0	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = \text{Rated } BV_{DSS}, V_{GS} = 0\text{V}$	-	-	-25	$\mu\text{A}$
		$V_{DS} = 0.8 \times \text{Rated } BV_{DSS}, V_{GS} = 0\text{V}, T_C = 150^\circ\text{C}$	-	-	-250	$\mu\text{A}$
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	nA
Drain to Source on Resistance (Note 2)	$r_{DS(ON)}$	$I_D = 3.4\text{A}, V_{GS} = -10\text{V}$ , (Figure 9)	-	-	0.600	$\Omega$
Turn-On Time	$t_{ON}$	$V_{DD} = -50\text{V}, I_D = 6.8\text{A}, R_L = 7.1\Omega,$ $V_{GS} = -10\text{V}, R_{GS} = 18\Omega$ (Figures 13, 16, 17)	-	-	60	ns
Turn-On Delay Time	$t_{d(ON)}$		-	9.6	-	ns
Rise Time	$t_r$		-	29	-	ns
Turn-Off Delay Time	$t_{d(OFF)}$		-	21	-	ns
Fall Time	$t_f$		-	25	-	ns
Turn-Off Time	$t_{OFF}$		-	-	60	ns
Total Gate Charge	$Q_g$		$V_{GS} = 0\text{V to } -10\text{V}$ $V_{DD} = -80\text{V},$ $I_D = 5.6\text{A},$ $R_L = 14.3\Omega$ $I_{G(REF)} = 1.0\text{mA}$	-	-	18
Gate to Drain Charge	$Q_{gd}$	-		-	9	nC
Gate to Source Charge	$Q_{gs}$	-		-	3	nC
Input Capacitance	$C_{ISS}$	$V_{DS} = -25\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	-	485	-	pF
Output Capacitance	$C_{OSS}$		-	170	-	pF
Reverse Transfer Capacitance	$C_{RSS}$		-	45	-	pF
Thermal Resistance Junction to Case	$R_{\theta JC}$		-	-	3.00	$^\circ\text{C/W}$
Thermal Resistance Junction to Ambient	$R_{\theta JA}$		-	-	100	$^\circ\text{C/W}$

## Source to Drain Diode Ratings and Specifications

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Source to Drain Diode Voltage (Note 2)	$V_{SD}$	$I_{SD} = -5.6\text{A}$	-	-	-6.3	V
Reverse Recovery Time	$t_{rr}$	$I_{SD} = -6.8\text{A}, dI_{SD}/dt = -100\text{A}/\mu\text{s}$	-	130	150	ns
Reverse Recovery Charge	$Q_{RR}$		-	0.70	1.4	$\mu\text{C}$

**NOTES:**

- Pulse test: pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Repetitive rating: pulse width limited by maximum junction temperature. See Transient Thermal Impedance curve (Figure 3)

Typical Performance Curves Unless Otherwise Specified

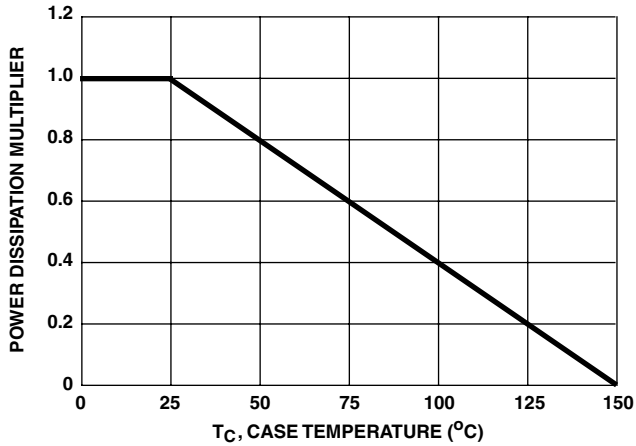


FIGURE 1. NORMALIZED POWER DISSIPATION vs CASE TEMPERATURE

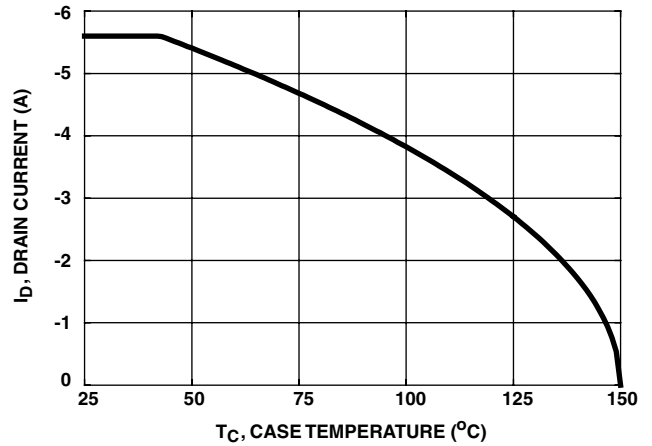


FIGURE 2. MAXIMUM CONTINUOUS DRAIN CURRENT vs CASE TEMPERATURE

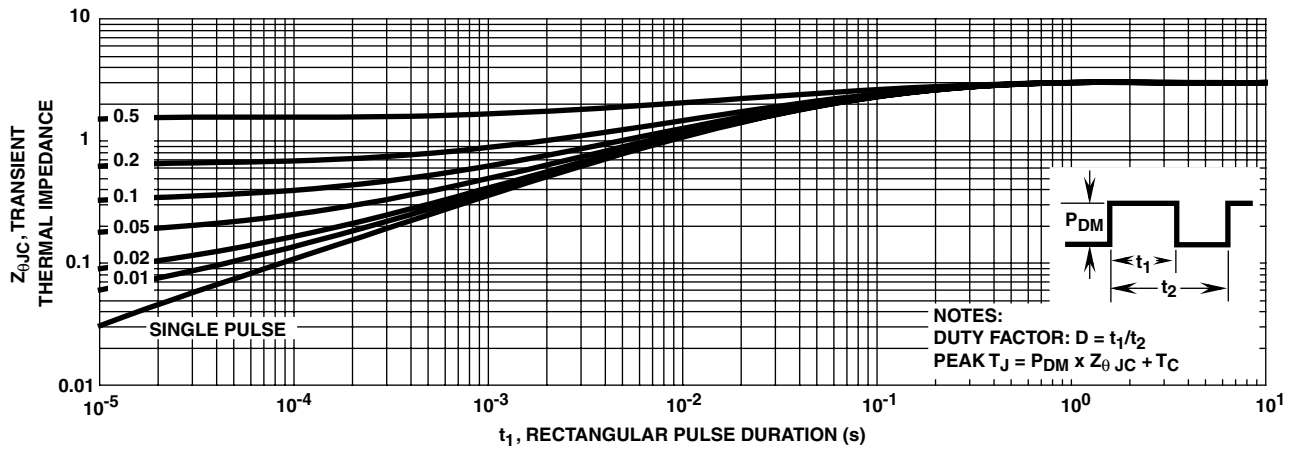


FIGURE 3. MAXIMUM TRANSIENT THERMAL IMPEDANCE

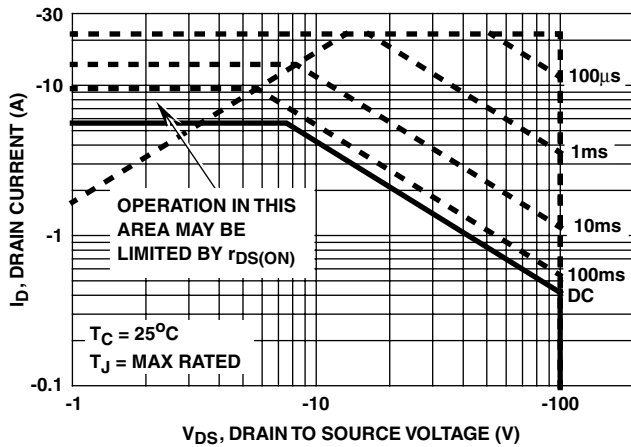


FIGURE 4. FORWARD BIAS SAFE OPERATING AREA

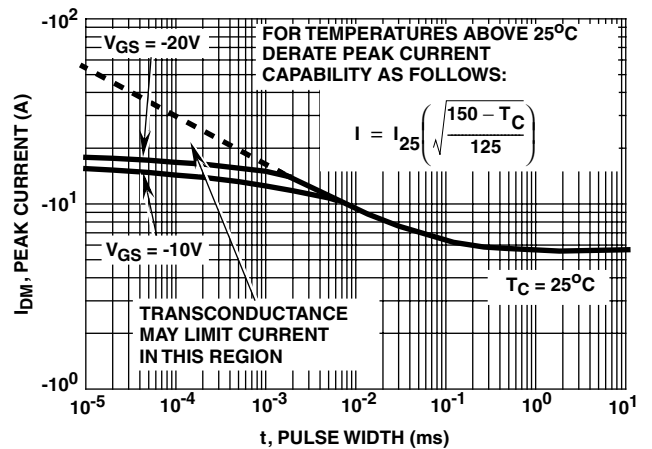


FIGURE 5. PEAK CURRENT CAPABILITY

Typical Performance Curves Unless Otherwise Specified (Continued)

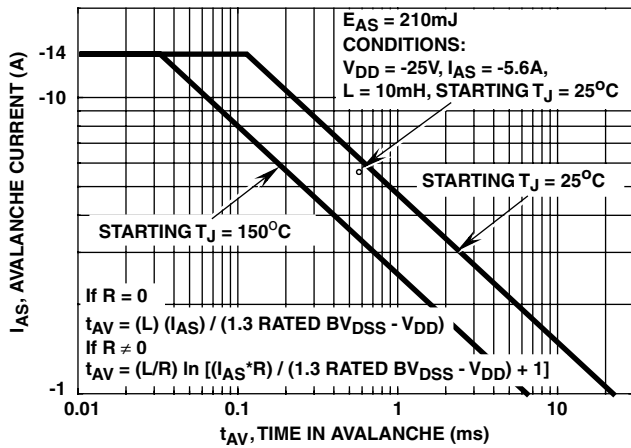


FIGURE 6. UNCLAMPED INDUCTIVE SWITCHING

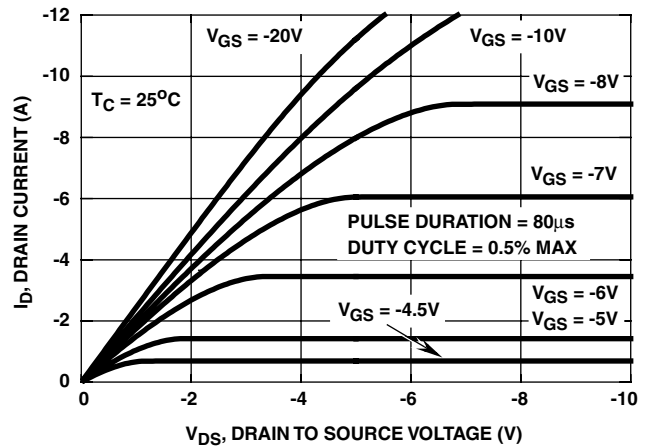


FIGURE 7. SATURATION CHARACTERISTICS

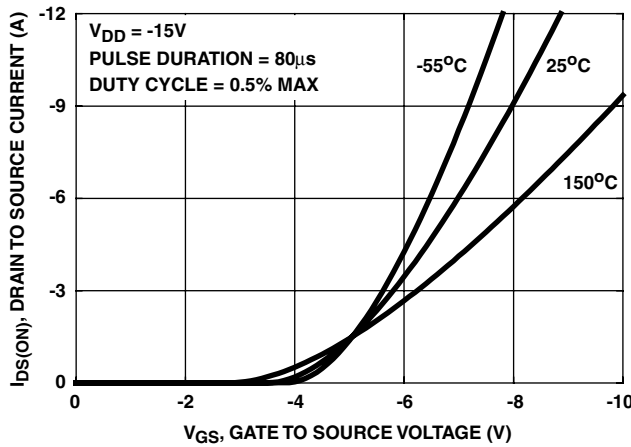


FIGURE 8. TRANSFER CHARACTERISTICS

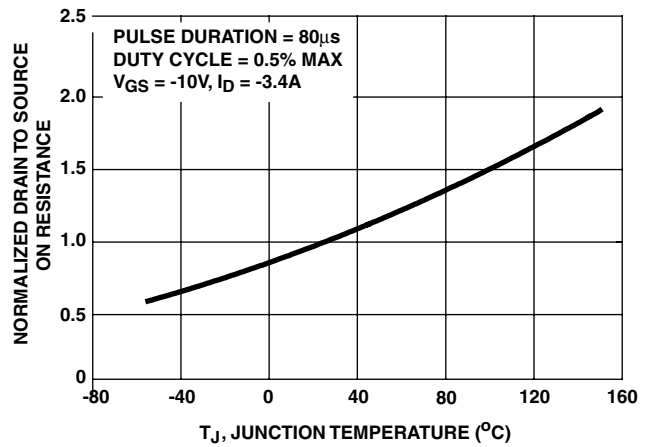


FIGURE 9. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs JUNCTION TEMPERATURE

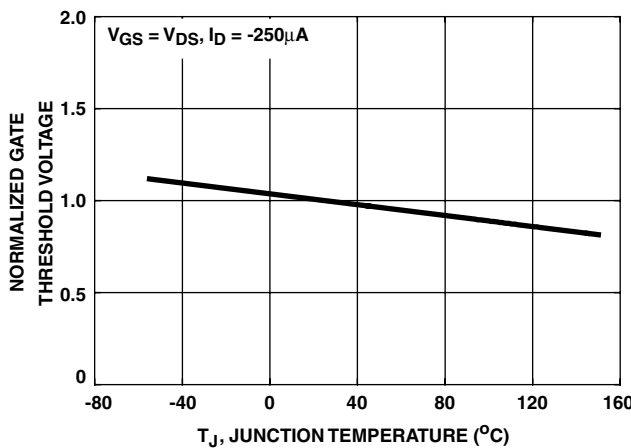


FIGURE 10. NORMALIZED GATE THRESHOLD VOLTAGE vs TEMPERATURE

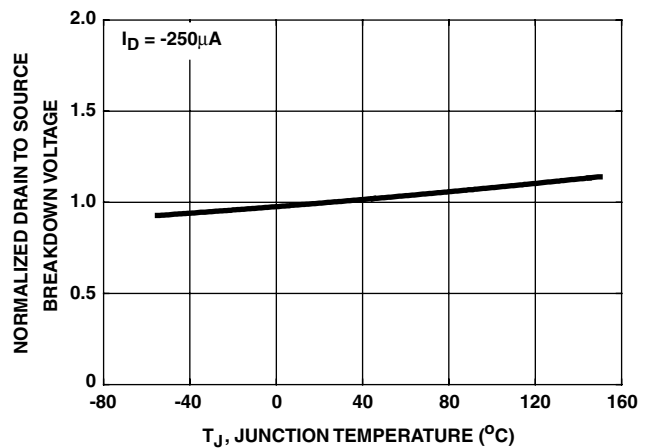


FIGURE 11. NORMALIZED DRAIN TO SOURCE BREAKDOWN VOLTAGE vs JUNCTION TEMPERATURE

Typical Performance Curves Unless Otherwise Specified (Continued)

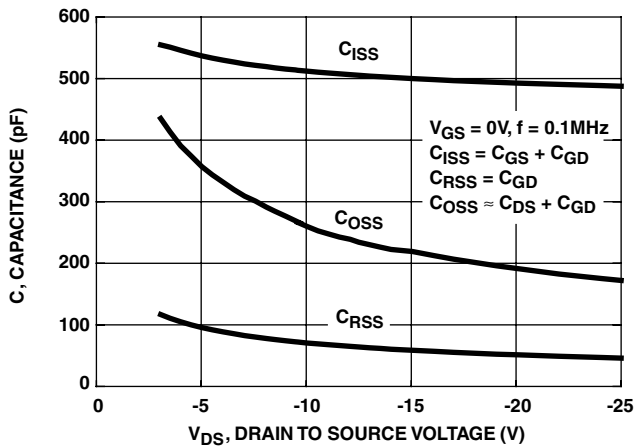
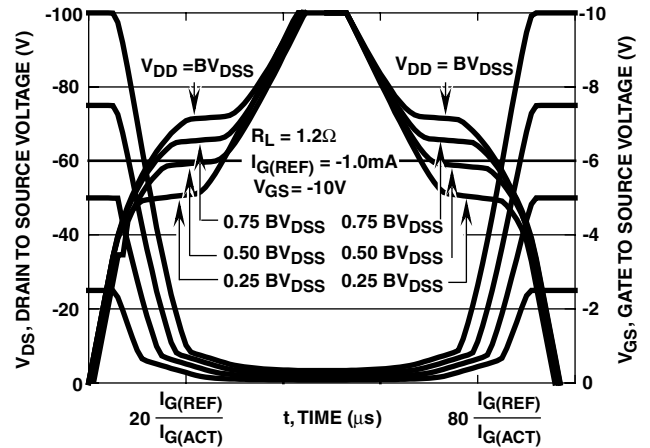


FIGURE 12. CAPACITANCE vs DRAIN TO SOURCE VOLTAGE



NOTE: Refer to Fairchild Application Notes AN7254 and AN7260.

FIGURE 13. NORMALIZED SWITCHING WAVEFORMS FOR CONSTANT GATE CURRENT

Test Circuits and Waveforms

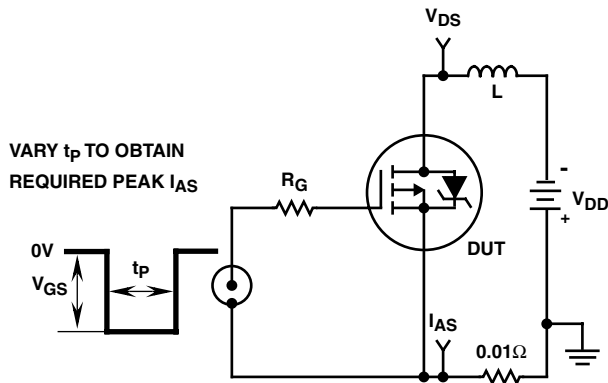


FIGURE 14. UNCLAMPED ENERGY TEST CIRCUIT

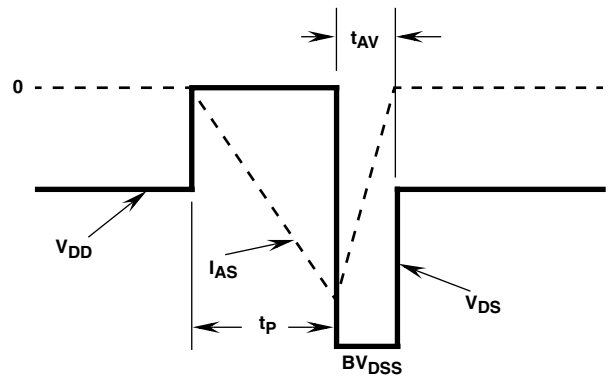


FIGURE 15. UNCLAMPED ENERGY WAVEFORMS

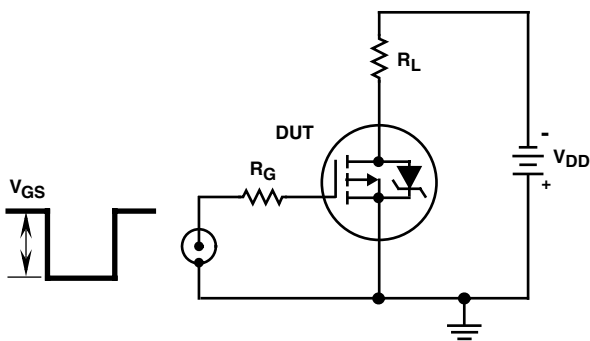


FIGURE 16. RESISTIVE SWITCHING TEST CIRCUIT

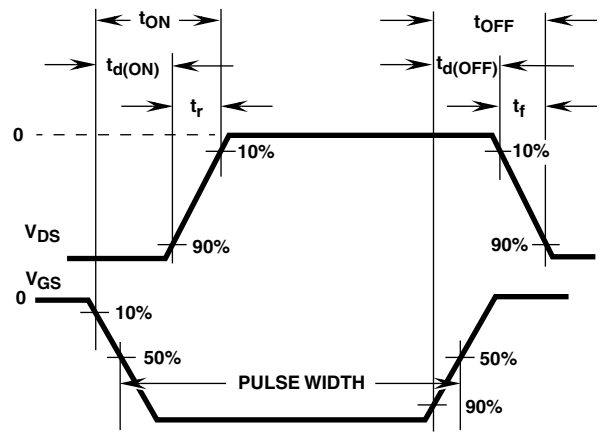


FIGURE 17. RESISTIVE SWITCHING WAVEFORMS



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