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## **N-Channel Logic Level Power MOSFET 100 V, 12 A, 200 mΩ**

These are N-Channel enhancement mode silicon gate power field effect transistors specifically designed for use with logic level (5V) driving sources in applications such as programmable controllers, automotive switching and solenoid drivers. This performance is accomplished through a special gate oxide design which provides full rated conduction at gate biases in the 3V to 5V range, thereby facilitating true on-off power control directly from logic circuit supply voltages.

Formerly developmental type TA09526.

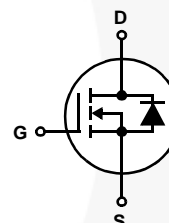
### **Ordering Information**

PART NUMBER	PACKAGE	BRAND
RFP12N10L	TO-220AB	F12N10L

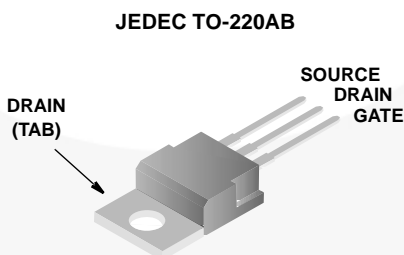
### **Features**

- 12A, 100V
- $r_{DS(ON)} = 0.200\Omega$
- Design Optimized for 5V Gate Drives
- Can be Driven Directly from QMOS, NMOS, TTL Circuits
- Compatible with Automotive Drive Requirements
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device
- Related Literature
  - TB334 "Guidelines for Soldering Surface Mount Components to PC Boards"

### **Symbol**



### **Packaging**



# RFP12N10L

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

	RFP12N10L	UNITS
Drain to Source Voltage (Note 1) . . . . .	$V_{DS}$	100 V
Drain to Gate Voltage ( $R_{GS} = 1\text{M}\Omega$ ) (Note 1) . . . . .	$V_{DGR}$	100 V
Continuous Drain Current . . . . .	$I_D$	12 A
Pulsed Drain Current (Note 3) . . . . .	$I_{DM}$	30 A
Gate to Source Voltage . . . . .	$V_{GS}$	$\pm 10$ V
Maximum Power Dissipation . . . . .	$P_D$	60 W
Above $T_C = 25^\circ\text{C}$ , Derate Linearly . . . . .		0.48 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:

1.  $T_J = 25^\circ\text{C}$  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	$V_{GS(TH)}$	$V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$ (Figure 7)	1	-	2	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 80\text{V}$	-	-	1	$\mu\text{A}$
		$V_{GS} = 0\text{V}$ $T_C = 125^\circ\text{C}$	-	-	50	$\mu\text{A}$
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS} = 10\text{V}$ , $V_{DS} = 0\text{V}$	-	-	100	nA
Drain to Source On Resistance (Note 2)	$r_{DS(ON)}$	$I_D = 12\text{A}$ , $V_{GS} = 5\text{V}$ (Figures 5, 6)	-	-	0.200	$\Omega$
Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$ (Figure 8)	-	-	900	pF
Output Capacitance	$C_{OSS}$		-	-	325	pF
Reverse-Transfer Capacitance	$C_{RSS}$		-	-	170	pF
Turn-On Delay Time	$t_{d(ON)}$	$I_D = 6\text{A}$ , $V_{DD} = 50\text{V}$ , $R_G = 6.25\Omega$ , $V_{GS} = 5\text{V}$ (Figures 9, 10, 11)	-	15	50	ns
Rise Time	$t_r$		-	70	150	ns
Turn-Off Delay Time	$t_{d(OFF)}$		-	100	130	ns
Fall Time	$t_f$		-	80	150	ns
Thermal Resistance Junction to Case	$R_{\theta JC}$	TO-220			2.083	$^\circ\text{C/W}$

## Source to Drain Diode Specifications

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Source to Drain Diode Voltage (Note 2)	$V_{SD}$	$I_{SD} = 6\text{A}$	-	-	1.4	V
Diode Reverse Recovery Time	$t_{rr}$	$I_{SD} = 4\text{A}$ , $dI_{SD}/dt = 50\text{A}/\mu\text{s}$	-	150	-	ns

### NOTES:

2. Pulsed: pulse duration = 80 $\mu\text{s}$  max, duty cycle = 2%.
3. Repetitive rating: pulse width limited by maximum junction temperature.

# Typical Performance Curves Unless Otherwise Specified

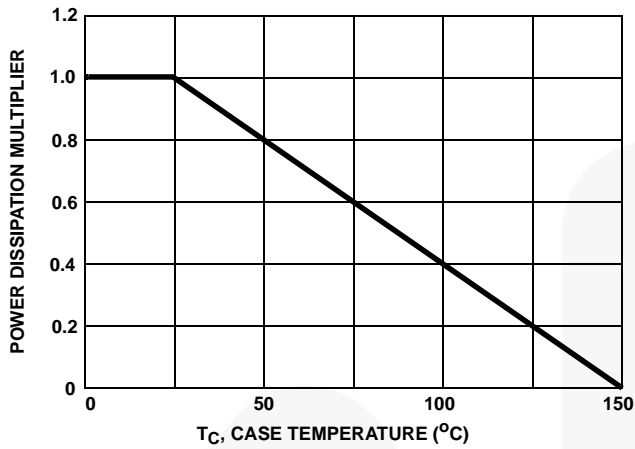


FIGURE 1. NORMALIZED POWER DISSIPATION vs CASE TEMPERATURE

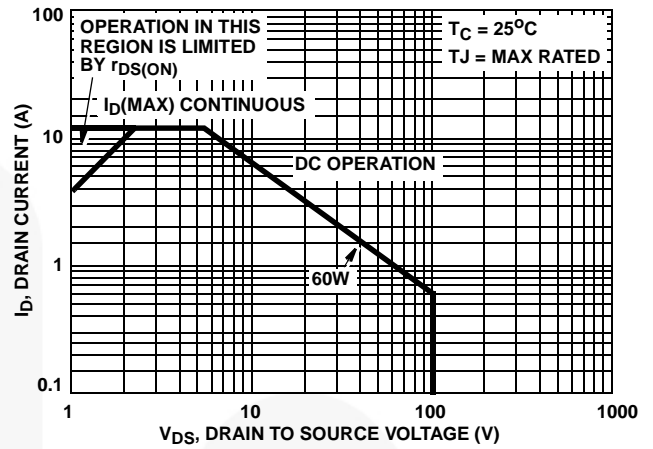


FIGURE 2. FORWARD BIAS OPERATING AREA

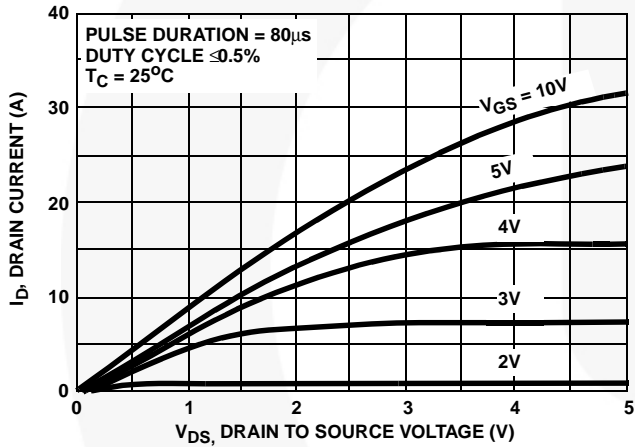


FIGURE 3. SATURATION CHARACTERISTICS

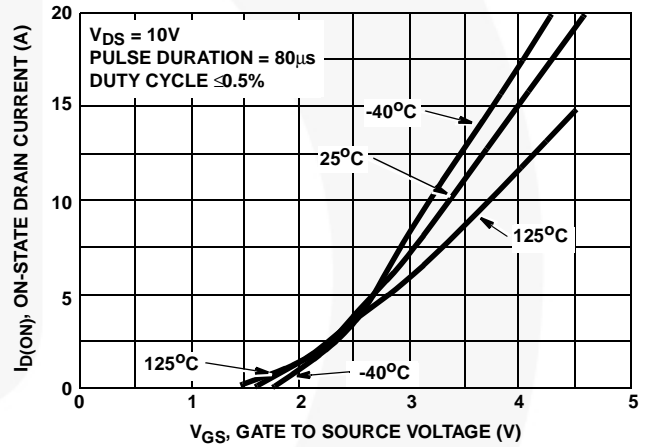


FIGURE 4. TRANSFER CHARACTERISTICS

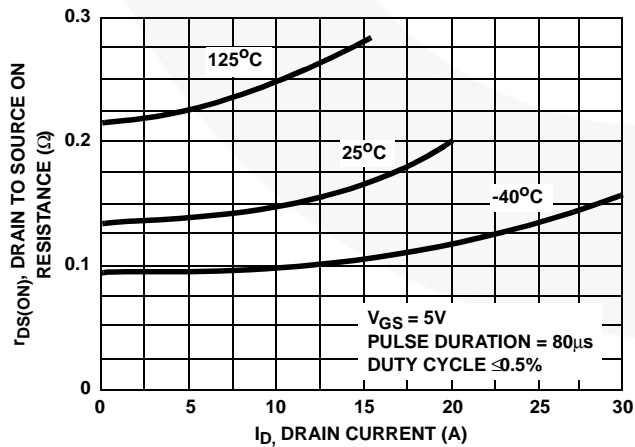


FIGURE 5. DRAIN TO SOURCE ON RESISTANCE vs DRAIN CURRENT

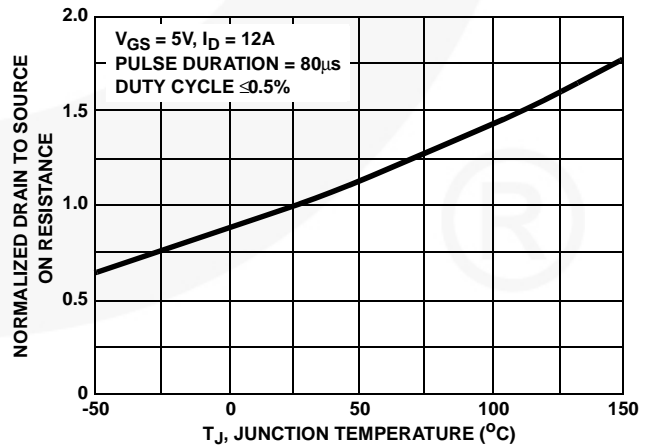


FIGURE 6. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs JUNCTION TEMPERATURE

# Typical Performance Curves Unless Otherwise Specified (Continued)

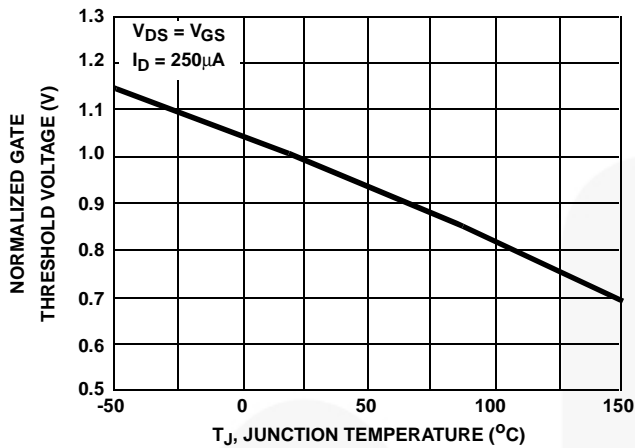


FIGURE 7. NORMALIZED GATE THRESHOLD VOLTAGE vs JUNCTION TEMPERATURE

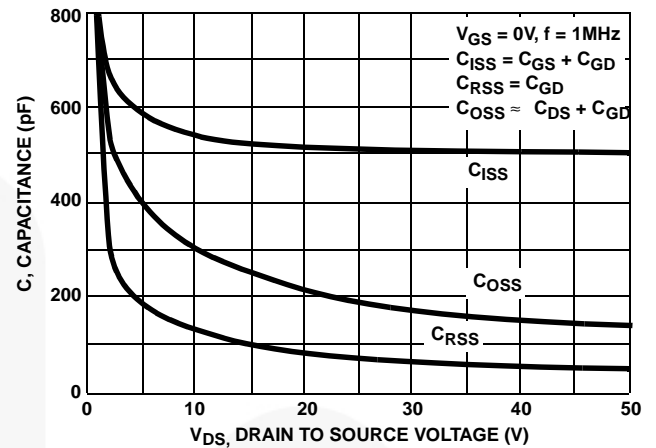
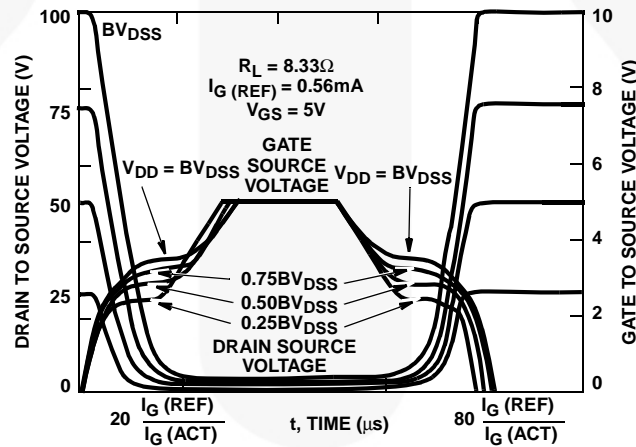


FIGURE 8. CAPACITANCE vs DRAIN TO SOURCE VOLTAGE



NOTE: Refer to Fairchild Applications Notes AN7254 and AN7260

FIGURE 9. NORMALIZED SWITCHING WAVEFORMS FOR CONSTANT GATE CURRENT

## Test Circuits and Waveforms

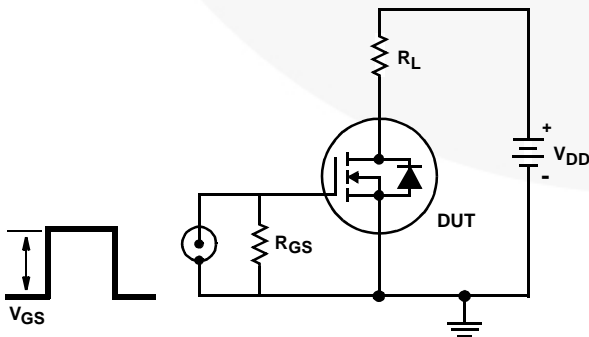


FIGURE 10. SWITCHING TIME TEST CIRCUIT

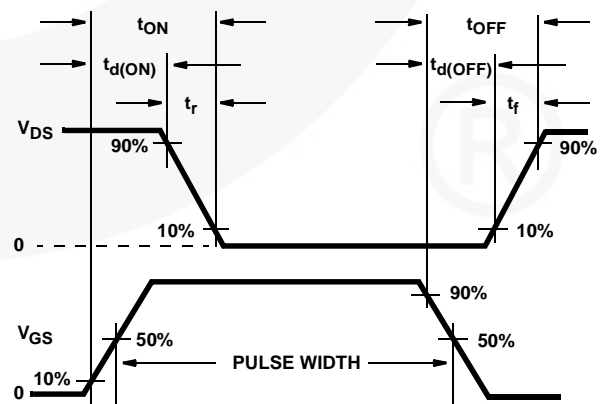


FIGURE 11. RESISTIVE SWITCHING WAVEFORMS

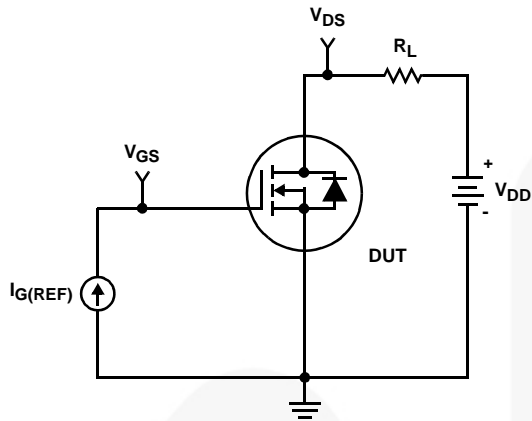
**Test Circuits and Waveforms** (Continued)

FIGURE 12. GATE CHARGE TEST CIRCUIT

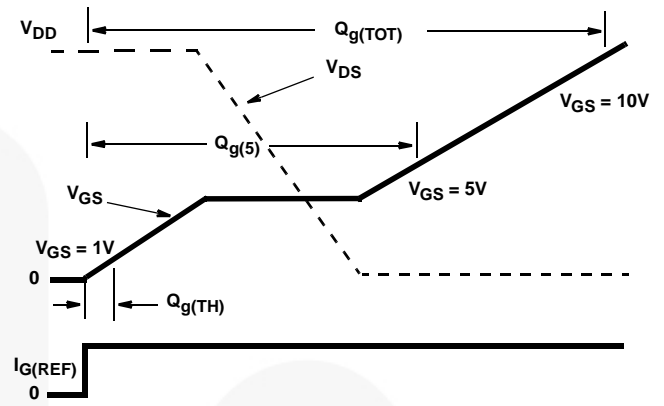




FIGURE 13. GATE CHARGE WAVEFORMS



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