

## 2A, 60V, 0.160 Ohm, Logic Level, N-Channel Power MOSFET

The RFW2N06RLE N-Channel, logic level, ESD protected, power MOSFET is manufactured using the MegaFET process. This process, which uses feature sizes approaching those of LSI integrated circuits, gives optimum utilization of silicon, resulting in outstanding performance. The RFW2N06RLE was designed for use with logic level (5V) driving sources in applications such as programmable controllers, automotive switching, switching regulators, switching converters, motor and relay drivers and emitter switches for bipolar transistors. This performance is accomplished through a special gate oxide design which provides full rated conductance 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 TA9861.

## Ordering Information

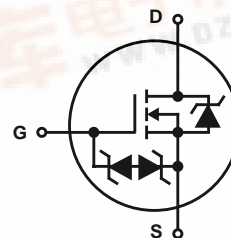
PART NUMBER	PACKAGE	BRAND
RFW2N06RLE	HEXDIP	RFW2N06RLE

NOTE: When ordering, use the entire part number.

## Features

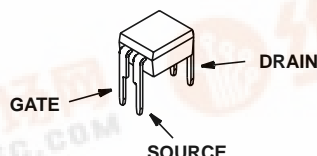
- 2A, 60V
- $r_{DS(on)} = 0.160\Omega$
- UIS Rating Curve (Single Pulse)
- Design Optimized For 5 Volt Gate Drive
- Can be Driven Directly from CMOS, NMOS, TTL Circuits
- Compatible with Automotive Drive Requirements
- SOA is Power Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device
- Electrostatic Discharge Protected
- Related Literature
  - TB334 "Guidelines for Soldering Surface Mount Components to PC Boards"

## Symbol



## Packaging

4 PIN HEXDIP



## RFW2N06RLE

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

	RFW2N06RLE	UNITS	
Drain to Source Breakdown Voltage (Note 1) . . . . .	$V_{DS}$	60	V
Drain to Gate Voltage ( $R_{GS} = 20k\Omega$ ) (Note 1) . . . . .	$V_{DGR}$	60	V
Continuous Drain Current . . . . .	$I_D$	2	A
Pulsed Drain Current (Note 3) . . . . .	$I_{DM}$	14	A
Gate to Source Voltage . . . . .	$V_{GS}$	-5 to 10	V
Maximum Power Dissipation (Figure 1) . . . . .	$P_D$	1.09	W
Linear Derating Factor (Figure 1) . . . . .		0.009	W/°C
Single Pulse Avalanche Energy Rating . . . . .	$E_{AS}$	Refer to UIS Curve	
Electrostatic Discharge Rating, MIL-STD-883, Catagory B(2). . . . .	$ESD$	2	KV
Operating and Storage Temperature . . . . .	$T_J, T_{STG}$	-55 to 150	°C
Maximum Temperature for Soldering			
Leads at 0.063in (1.6mm) from Case for 10s. . . . .	$T_L$	300	°C
Package Body for 10s, See Techbrief 334 . . . . .	$T_{pkg}$	260	°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 <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> = 0V		60	-	-	V
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250μA		1	-	2	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = Rated BV <sub>DSS</sub> , V <sub>GS</sub> = 0V		-	-	1	μA
		V <sub>DS</sub> = 0.8 x Rated BV <sub>DSS</sub> , V <sub>GS</sub> = 0V T <sub>C</sub> = 125°C		-	-	25	μA
Gate to Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =-5V to 10V		-	-	±100	nA
Drain to Source On Resistance (Note 2)	r <sub>DS(ON)</sub>	I <sub>D</sub> = 2A, V <sub>GS</sub> = 5V (Figure 8)		-	-	160	mΩ
		I <sub>D</sub> = 2A, V <sub>GS</sub> = 4.3V (Figure 8)		-	-	200	mΩ
Turn-On Time	t <sub>(ON)</sub>	V <sub>DD</sub> = 30V, I <sub>D</sub> = 2A, R <sub>L</sub> = 15Ω, V <sub>GS</sub> = 5V, R <sub>G</sub> = 25Ω (Figures 12, 13, 14)		-	-	100	ns
Turn-On Delay Time	t <sub>d(ON)</sub>			-	13	-	ns
Rise Time	t <sub>r</sub>			-	42	-	ns
Turn-Off Delay Time	t <sub>d(OFF)</sub>			-	95	-	ns
Fall Time	t <sub>f</sub>			-	45	-	ns
Turn-Off Time	t <sub>(OFF)</sub>				-	200	ns
Total Gate Charge	Q <sub>g(TOT)</sub>	V <sub>GS</sub> = 0 to 10V	V <sub>DD</sub> = 48V, I <sub>D</sub> = 2A, I <sub>G(REF)</sub> =0.5mA, R <sub>L</sub> = 24Ω (Figures 12, 15, 16)	-	20	30	nC
Gate Charge at 5V	Q <sub>g(5)</sub>	V <sub>GS</sub> = 0 to 5V		-	11	16	nC
Threshold Gate Charge	Q <sub>g(TH)</sub>	V <sub>GS</sub> = 0 to 1V		-	0.6	1.0	nC
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1MHz (Figure 11)		-	535	-	pF
Output Capacitance	C <sub>OSS</sub>			-	175	-	pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			-	32	-	pF
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>			-	-	115	°C/W

### Source to Drain Diode Specifications

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Source to Drain Diode Voltage (Note 2)	$V_{SD}$	$I_{SD} = 2\text{A}$	-	-	1.2	V
Reverse Recovery Time	$t_{rr}$	$I_{SD} = 2\text{A}$ , $dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	200	ns

#### NOTES:

2. Pulse test: width  $\leq 300\mu\text{s}$  duty cycle  $\leq 2\%$ .
3. Repetitive rating: pulse width limited by maximum junction temperature.

**Typical Performance Curves** Unless Otherwise Specified

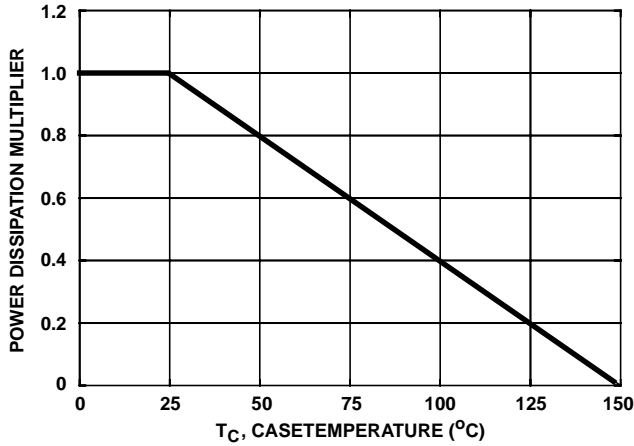


FIGURE 1. NORMALIZED POWER DISSIPATION vs CASE TEMPERATURE

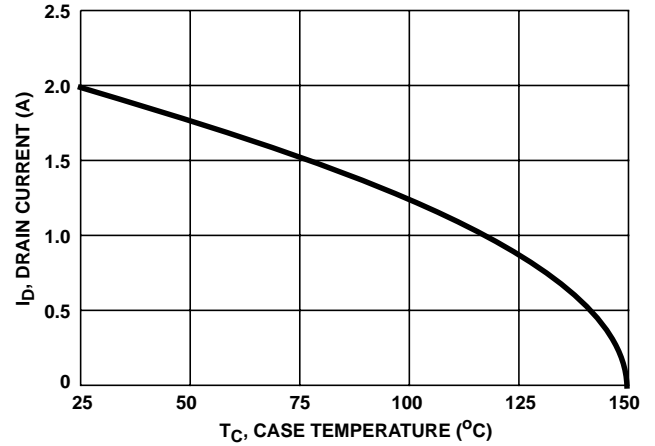


FIGURE 2. MAXIMUM CONTINUOUS DRAIN CURRENT vs CASE TEMPERATURE

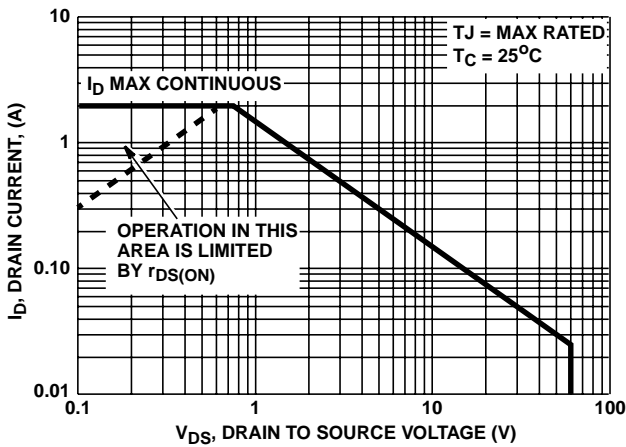


FIGURE 3. FORWARD BIAS SAFE OPERATING AREA

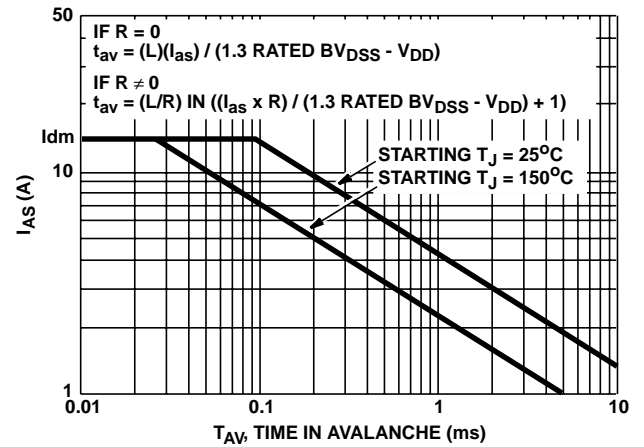


FIGURE 4. UNCLAMPED INDUCTIVE SWITCHING CAPABILITY

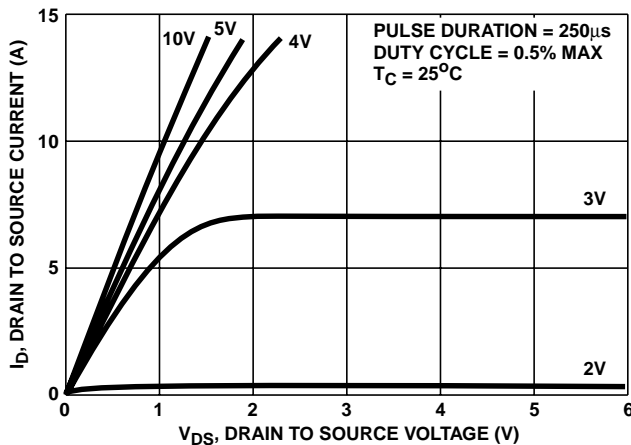


FIGURE 5. SATURATION CHARACTERISTICS

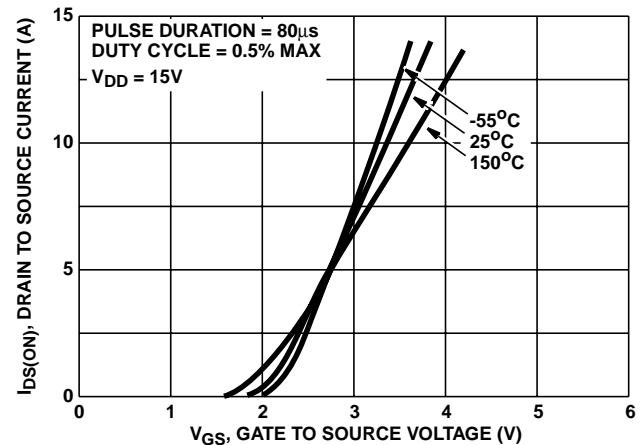


FIGURE 6. TRANSFER CHARACTERISTICS

**Typical Performance Curves** Unless Otherwise Specified (Continued)

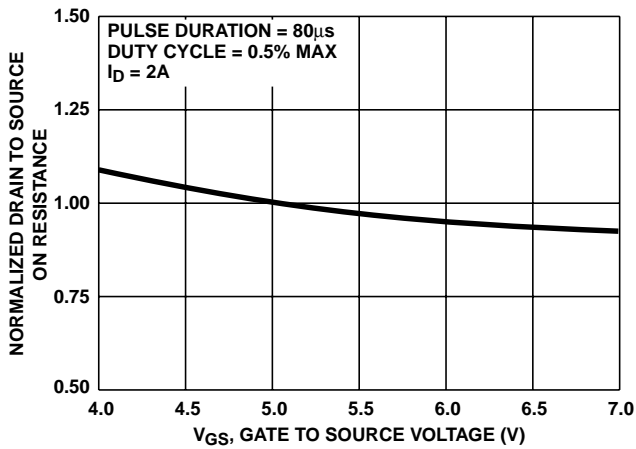


FIGURE 7. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs GATE VOLTAGE

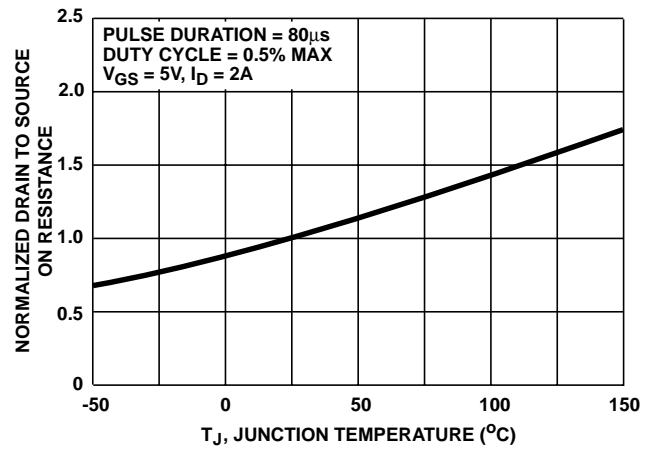


FIGURE 8. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs JUNCTION TEMPERATURE

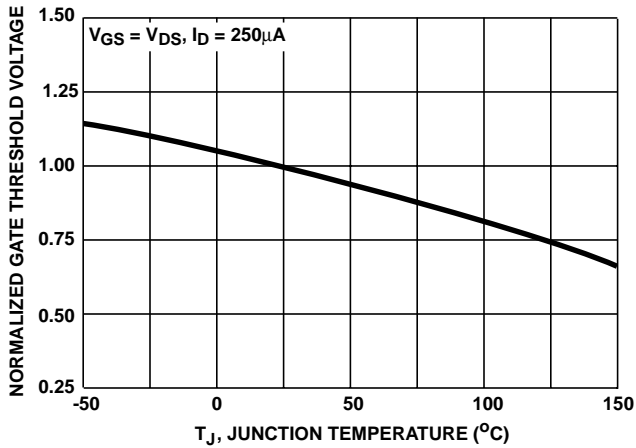


FIGURE 9. NORMALIZED GATE THRESHOLD VOLTAGE vs JUNCTION TEMPERATURE

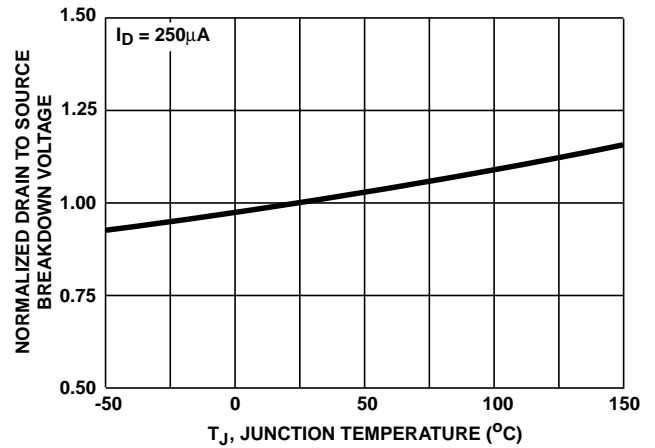


FIGURE 10. NORMALIZED DRAIN TO SOURCE BREAKDOWN VOLTAGE vs JUNCTION TEMPERATURE

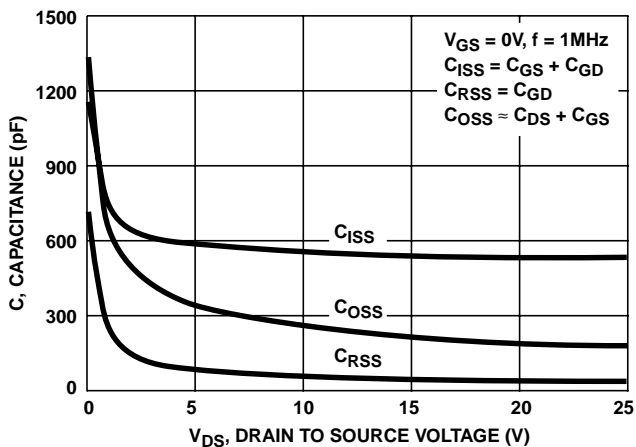
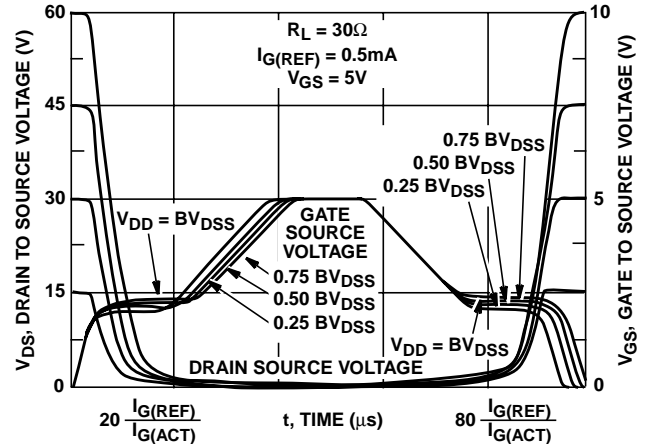


FIGURE 11. CAPACITANCE vs DRAIN TO SOURCE VOLTAGE



NOTE: Refer to Harris Application Notes AN7254 and AN7260.

FIGURE 12. NORMALIZED SWITCHING WAVEFORMS FOR CONSTANT GATE CURRENT

## Test Circuits and Waveforms

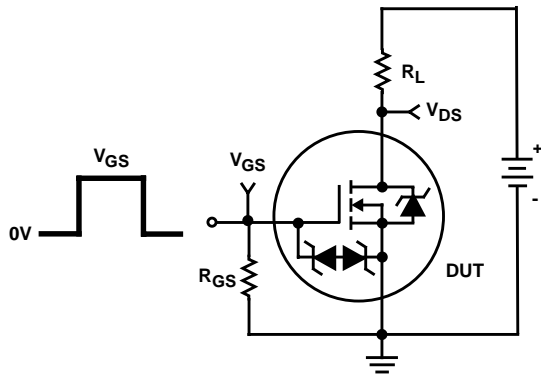


FIGURE 13. SWITCHING TIME TEST CIRCUIT

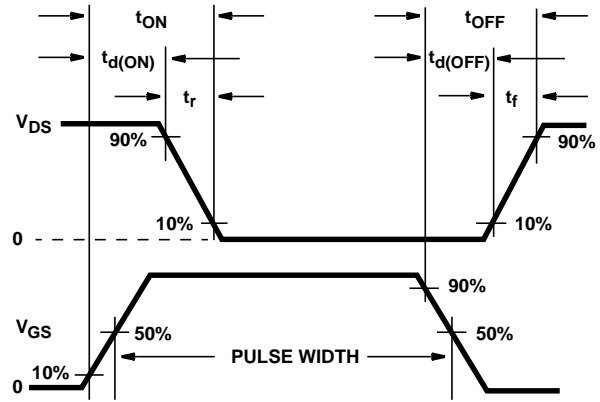


FIGURE 14. RESISTIVE SWITCHING WAVEFORMS

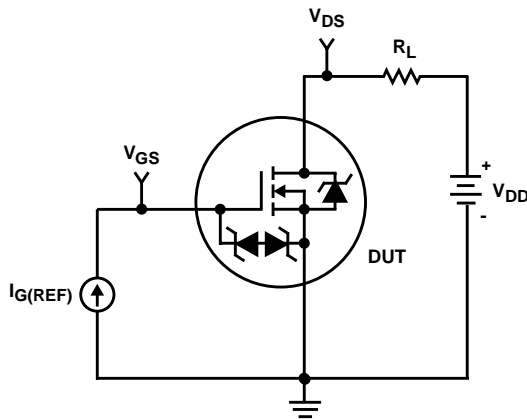


FIGURE 15. GATE CHARGE TEST CIRCUIT

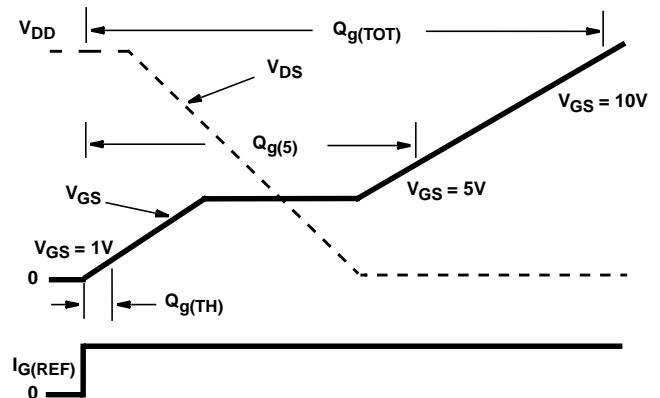


FIGURE 16. GATE CHARGE WAVEFORMS

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