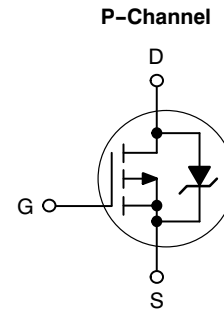


**Applications**

- Load Switches
- Notebook PC's
- Desktop PC's

**Features**

- $V_{DS}$  (V) = -30V
- $I_D$  = -11.4A ( $V_{GS}$  = -10V)
- $R_{DS(ON)}$  < 12m $\Omega$  ( $V_{GS}$  = -10V)
- $R_{DS(ON)}$  < 19m $\Omega$  ( $V_{GS}$  = -4.5V)
- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- SOP-8 Surface Mount Package Saves Board Space



**MAXIMUM RATINGS** ( $T_J$  = 25°C unless otherwise stated)

Rating	Symbol	Value	Unit	
Drain-to-Source Voltage	$V_{DSS}$	-30	V	
Gate-to-Source Voltage	$V_{GS}$	$\pm 20$	V	
Steady State	$I_D$	$T_A = 25^\circ C$	-8.9	A
		$T_A = 70^\circ C$	-7.1	
	$P_D$	$T_A = 25^\circ C$	1.52	W
	$I_D$	$T_A = 25^\circ C$	-6.6	A
		$T_A = 70^\circ C$	-5.3	
	$P_D$	$T_A = 25^\circ C$	0.84	W
	$I_D$	$T_A = 25^\circ C$	-11.4	A
		$T_A = 70^\circ C$	-9.3	
	$P_D$	$T_A = 25^\circ C$	2.5	W
	Pulsed Drain Current	$I_{DM}$	-46	A
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to +150	$^\circ C$
Source Current (Body Diode)	$I_S$	-2.1	A	
Single Pulse Drain-to-Source Avalanche Energy $T_J = 25^\circ C, V_{DD} = 30 V, V_{GS} = 10 V, I_L = 20 A_{pk}, L = 1.0 mH, R_G = 25 \Omega$	EAS	200	mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	$T_L$	260	$^\circ C$	

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Surface-mounted on FR4 board using 1 inch sq pad size, 1 oz Cu.
2. Surface-mounted on FR4 board using the minimum recommended pad size.

**THERMAL RESISTANCE RATINGS**

Rating	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	82	°C/W
Junction-to-Ambient – $t \leq 10$ s (Note 3)	$R_{\theta JA}$	50	
Junction-to-FOOT (Drain)	$R_{\theta JF}$	20	
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	148	

- Surface-mounted on FR4 board using 1 inch sq pad size, 1 oz Cu.
- Surface-mounted on FR4 board using the minimum recommended pad size.

**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)jk

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
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**OFF CHARACTERISTICS**

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			29		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = -24\text{ V}$			-1.0	$\mu\text{A}$
					-5.0	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA

**ON CHARACTERISTICS** (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$	-1.5		-2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			6.0		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -11.4\text{ A}$ $V_{GS} = -4.5\text{ V}, I_D = -9.1\text{ A}$		10	12	m $\Omega$
				15	19	
Forward Transconductance	$g_{FS}$	$V_{DS} = -1.5\text{ V}, I_D = -11.4\text{ A}$		30		S

**CHARGES, CAPACITANCES AND GATE RESISTANCE**

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = -24\text{ V}$		3100		pF
Output Capacitance	$C_{OSS}$			550		
Reverse Transfer Capacitance	$C_{RSS}$			370		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -15\text{ V}, I_D = -11.4\text{ A}$		29		nC
Threshold Gate Charge	$Q_{G(TH)}$			3.3		
Gate-to-Source Charge	$Q_{GS}$			10		
Gate-to-Drain Charge	$Q_{GD}$			13		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -10\text{ V}, V_{DS} = -15\text{ V}, I_D = -11.4\text{ A}$		55		nC
Gate Resistance	$R_G$			2.0	4.0	$\Omega$

**SWITCHING CHARACTERISTICS** (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -10\text{ V}, V_{DD} = -15\text{ V}, I_D = -1.0\text{ A}, R_G = 6.0\ \Omega$		18		ns
Rise Time	$t_r$			13		
Turn-Off Delay Time	$t_{d(OFF)}$			64		
Fall Time	$t_f$			36		

**DRAIN-TO-SOURCE CHARACTERISTICS**

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_D = -2.1\text{ A}$	$T_J = 25^\circ\text{C}$		-0.73	-1.0	V
			$T_J = 125^\circ\text{C}$		0.54		ns
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, d_{IS}/d_t = 100\text{ A}/\mu\text{s}, I_S = -2.1\text{ A}$		34			
Charge Time	$T_a$			18			
Discharge Time	$T_b$			16			
Reverse Recovery Time	$Q_{RR}$			30			

- Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Switching characteristics are independent of operating junction temperatures.

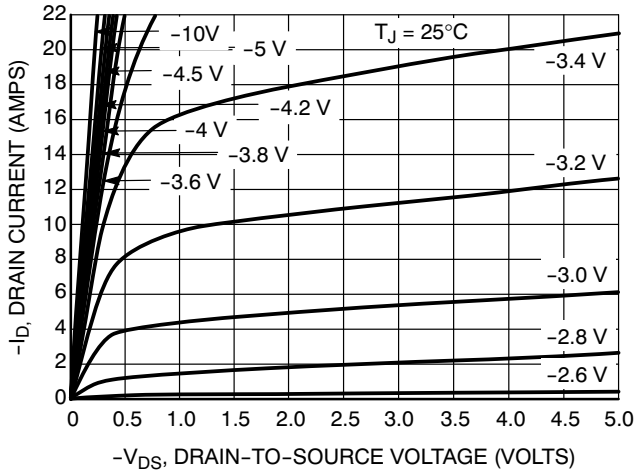


Figure 1. On-Region Characteristics

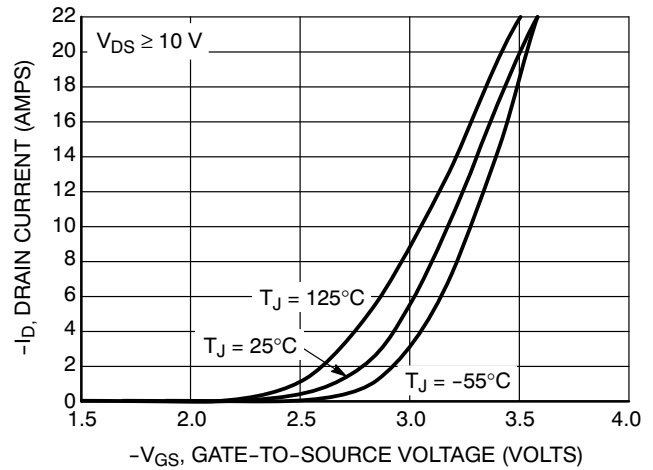


Figure 2. Transfer Characteristics

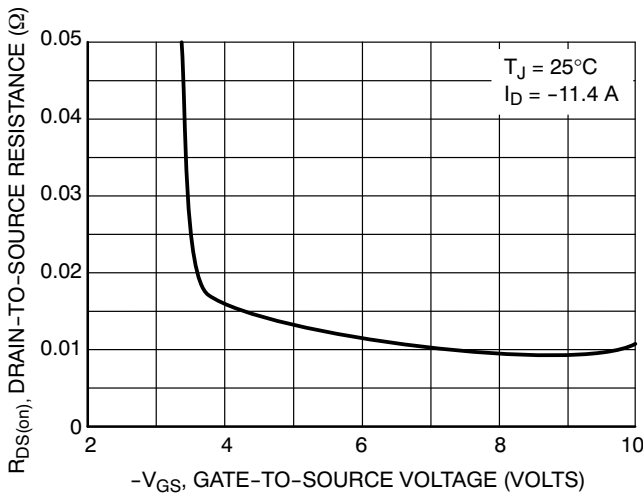


Figure 3. On-Resistance vs. Gate-to-Source Voltage

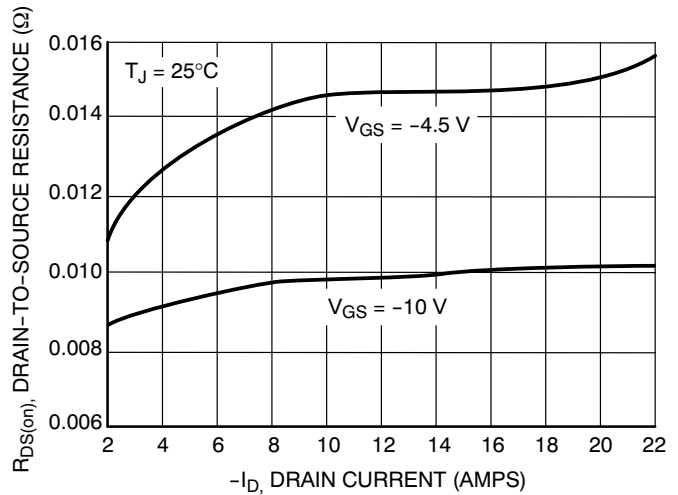


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

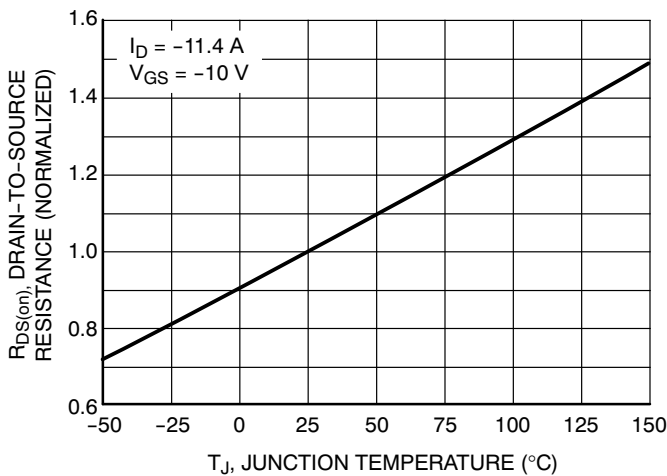


Figure 5. On-Resistance Variation with Temperature

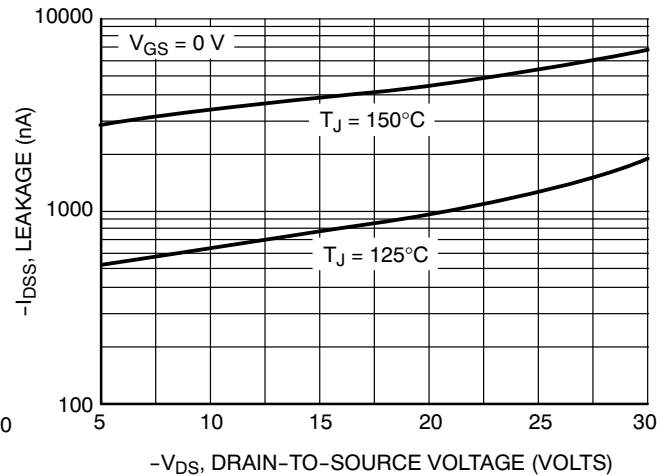


Figure 6. Drain-to-Source Leakage Current vs. Voltage

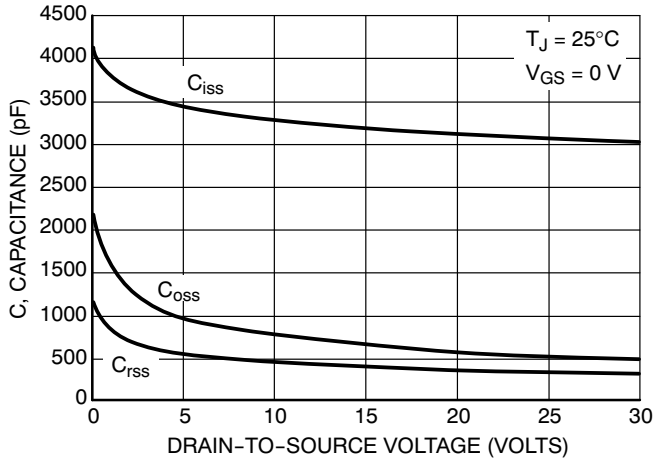


Figure 7. Capacitance Variation

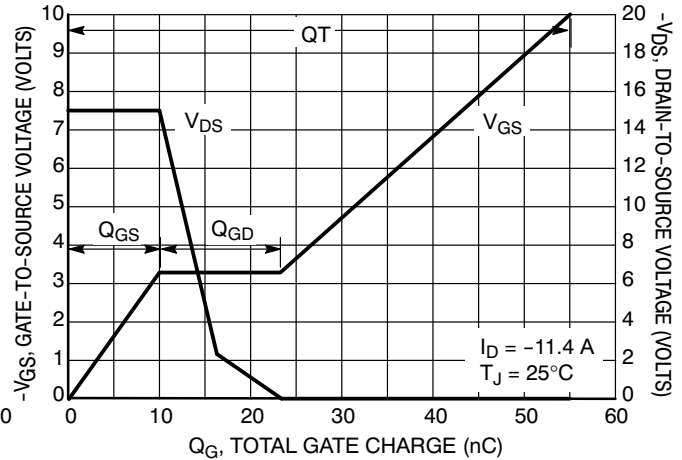


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

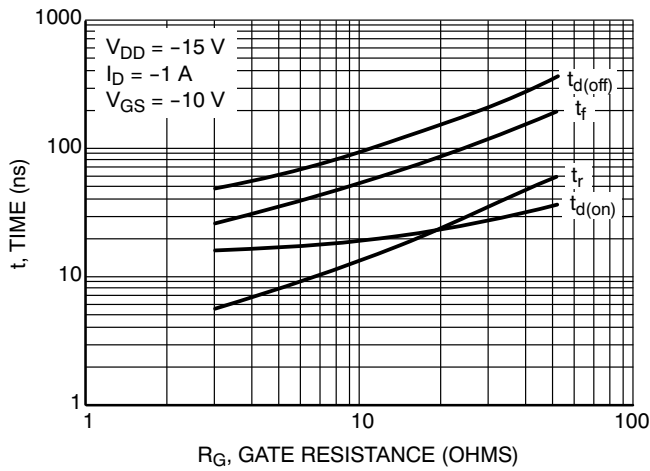


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

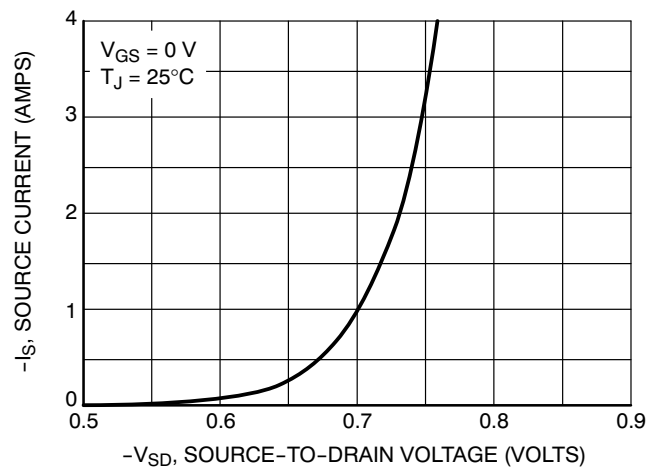


Figure 10. Diode Forward Voltage vs. Current

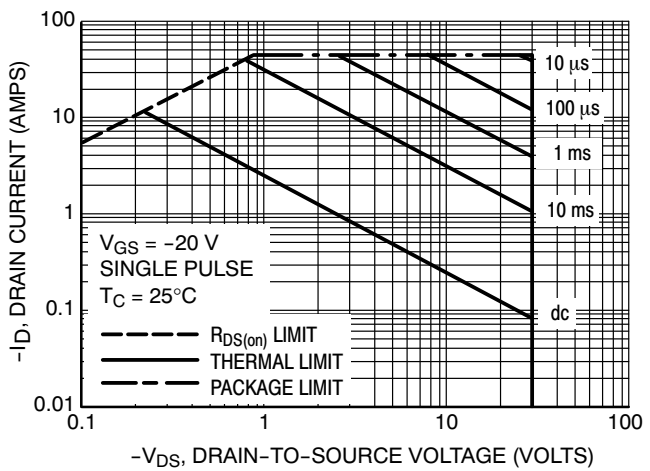


Figure 11. Maximum Rated Forward Biased Safe Operating Area

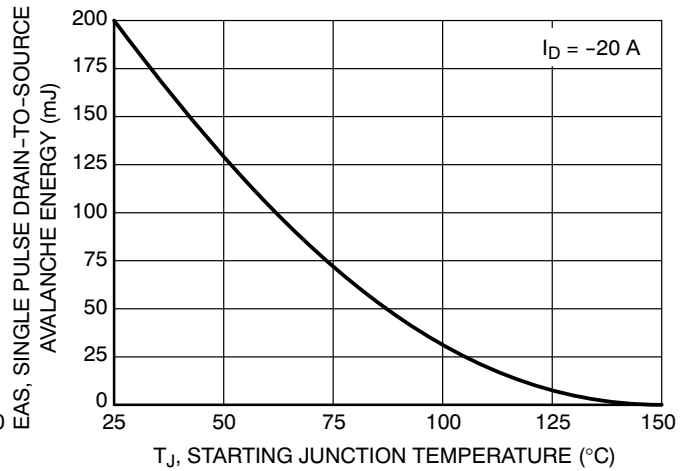
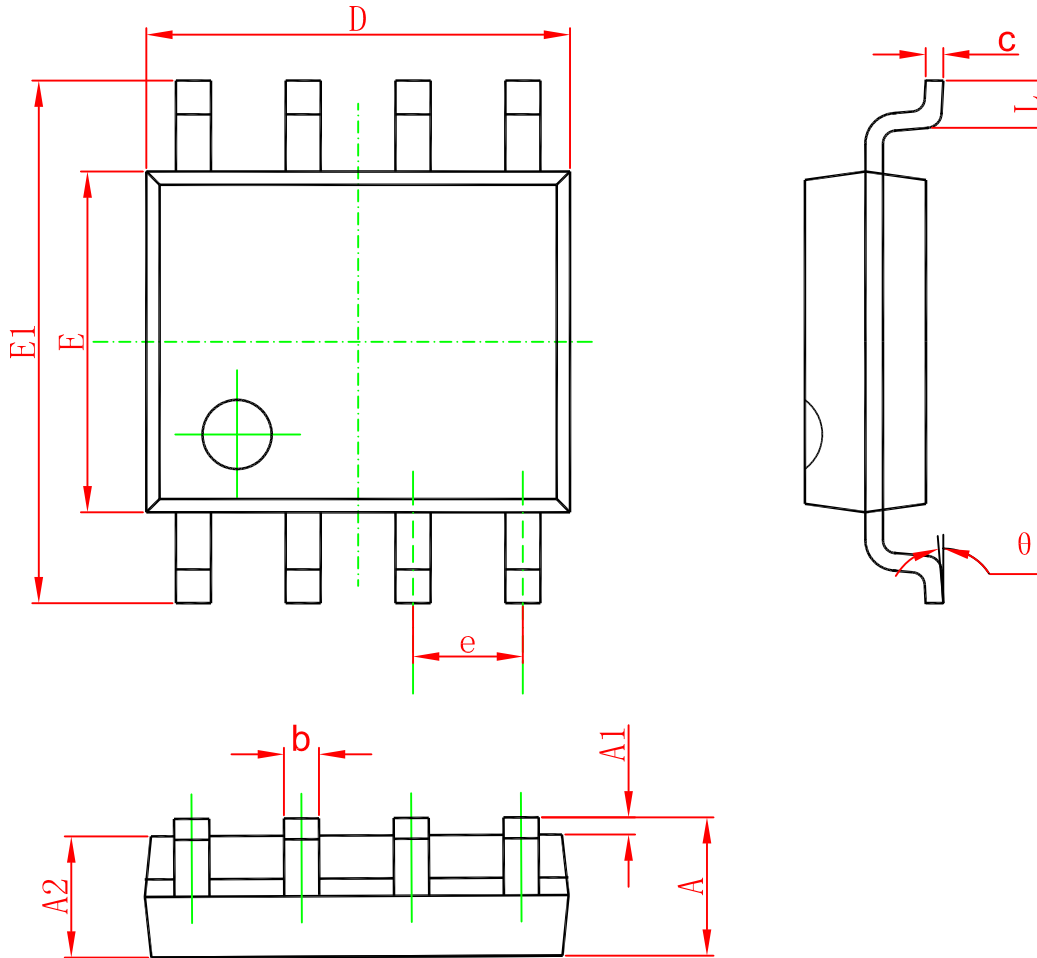


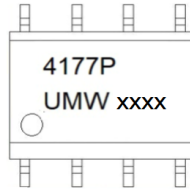
Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

Package Mechanical Data SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
theta	0°	8°	0°	8°

**Marking**



**Ordering information**

Order code	Package	Baseqty	Deliverymode
UMW NTMS4177PR	SOP-8	3000	Tape and reel

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