UMW NDT456P

-30V P-Channel MOSFET

1.Description

Power SOT-223 P-Channel enhancement mode power field effect transistors especially tailored to minimize on state resistance and provide superior switching performance.

2.1Features

- $V_{DS\ (V)}$=-30V
- I_D=-7.5A
- $R_{DS(ON)}$<25mΩ(V_{GS}=-10V)
- $R_{DS(ON)}$<30mΩ(V_{GS}=-4.5V)

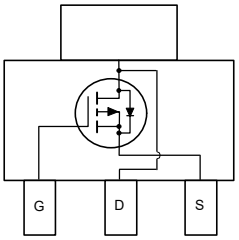
2.2Features

- High power and current handling capability in a widely used surface mount package.
- High density cell design for extremely low $R_{DS(ON)}$

3.Pinning information

Pin	Symbol	Description
1	G	GATE
2	D	DRAIN
3	S	SOURCE

SOT-223 top view



4.Absolute Maximum Ratings T_A= 25°C

Parameter		Symbol	Rating	Units
Drain-Source Voltage		V_{DSS}	-30	V
Gate-Source Voltage		V_{GSS}	±20	V
Drain Current - Continuous	(Note 1a)	I_D	-7.5	A
-Pulsed			±20	A
Power Dissipation for Single Operation	(Note 1a)	P_D	3	W
	(Note 1b)		1.3	W
	(Note 1c)		1.1	W
Storage Temperature Range		T_J, T_{STG}	-65 to 150	°C

5.Thermal Characteristics

Parameter		Symbol	Rating	Units
Thermal Resistance, Junction-to-Ambient	(Note 1a)	$R_{\theta JA}$	42	°C/W
Thermal Resistance, Junction-to-Case	(Note 1)	$R_{\theta JC}$	12	°C/W

6.Electrical Characteristic (T_A=25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	BV_{DSS}	I_D=250μA, V_{GS}=0V	-30			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-24V, V_{GS}=0V			-1	μA
		T_J=55°C			-10	μA
Gate - Body Leakage, Forward	I_{GSSF}	V_{GS}=20V, V_{DS}=0V			100	nA
Gate - Body Leakage, Reverse	I_{GSSR}	V_{GS}=-20V, V_{DS}=0V			-100	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=-250μA	-1	-1.5	-3	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-7.5A		15	25	mΩ
		V_{DS}=-4.5V, I_D=-6A		19	30	mΩ
On-State Drain Current	$I_{D(ON)}$	V_{GS}=-10V, V_{DS}=-5V	-20			A
		V_{GS}=-4.5V, V_{DS}=-5V	-10			A
Forward Transconductance	G_{fs}	V_{DS}=-10V, I_D=-7.5A		13		S
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=-15V, f=1MHz		1440		pF
Output Capacitance	C_{oss}			905		pF
Reverse Transfer Capacitance	C_{rss}			355		pF
Turn-On DelayTime	$t_{D(on)}$	V_{DD}=-15V, I_D=-7A V_{GEN}=-10V, R_{GEN}=12Ω		10	20	ns
Turn-On Rise Time	t_r			65	120	ns
Turn-Off DelayTime	$t_{D(off)}$			70	130	ns
Turn-Off Fall Time	t_f			70	130	ns
Total Gate Charge	Q_g	V_{GS}=-10V, V_{DS}=-10V I_D=-7.5A		47	67	nC
Gate-Source Charge	Q_{gs}			5		nC
Gate-Drain Charge	Q_{gd}			12		nC
Maximum Continuous Drain-Source Diode Forward Current	I_S				-2.5	A
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=-2.5A (Note 2)		-0.85	-1.2	V
Reverse Recovery Time	t_{rr}	V_{GS}=0V,I_F=-2.5A,dI_F/dt=100A/μs			140	ns

Notes:

1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while RθCA is defined by users.

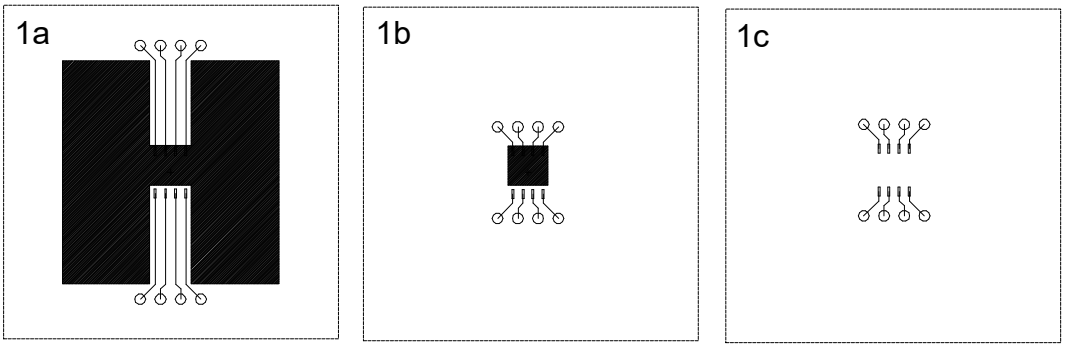
For general reference: Applications on 4.5"x5" FR-4 PCB under still air environment,typical $R_{\theta JA}$ is found to be:

$$P_D(t) = \frac{T_J - T_A}{R_{\theta JA(t)}} = \frac{T_J - T_A}{R_{\theta JC} + R_{\theta CA(t)}} = I_D^2(t) \times R_{DS(ON)@T_J}$$

a. 42°C/W when mounted on a 1 in^2 pad of 2oz copper.

b. 95°C/W when mounted on a 0.066in^2 pad of 2oz copper.

c. 110°C/W when mounted on a 0.00123 in^2 pad of 2oz copper.



Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%.

7.1Typical characteristic

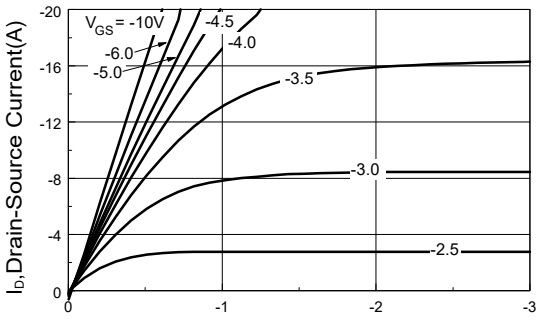


Figure 1: On-Region Characteristics

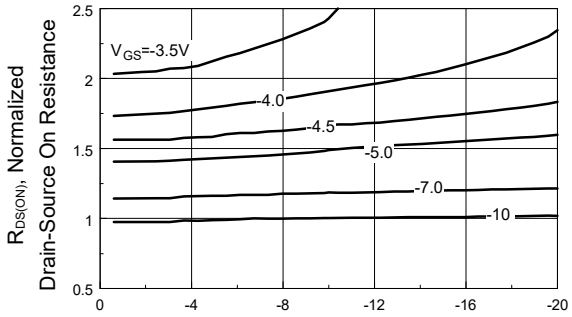


Figure 2: On-Resistance Variation with Gate Voltage and Drain Current

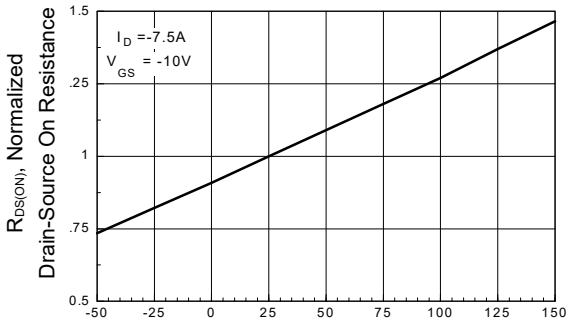


Figure 3: On-Resistance Variation with Temperature

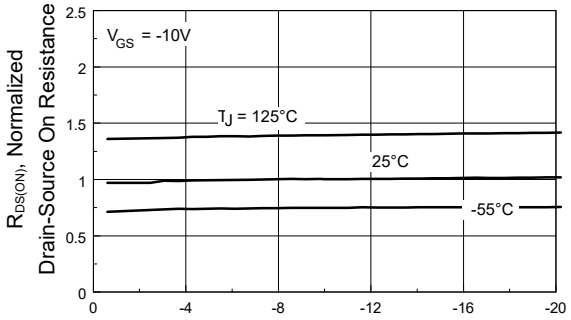


Figure 4: On-Resistance Variation with Drain Current and Temperature.

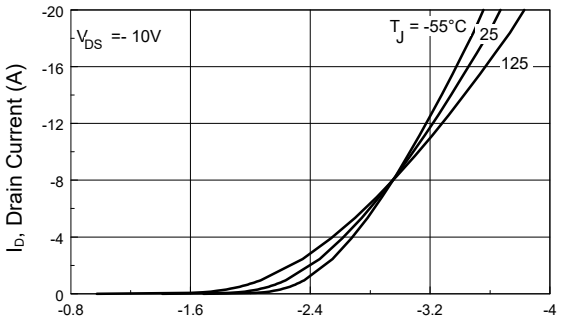


Figure 5: Transfer Characteristics

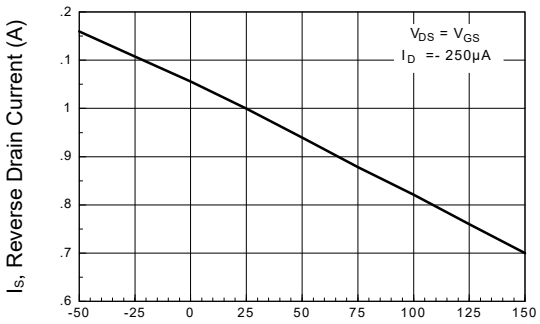
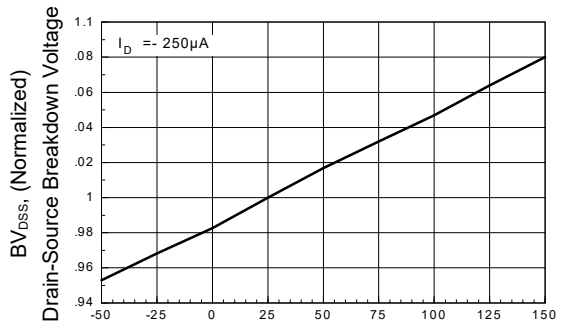


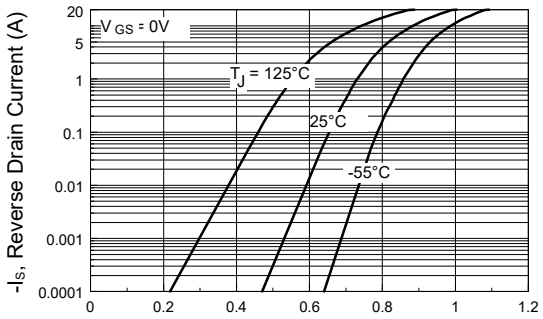
Figure 6: Gate Threshold Variation with Temperature.

7.2Typical characteristic



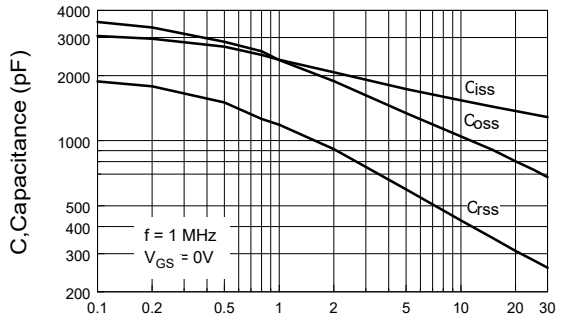
T_J,Junction Temperature (°C)

Figure 7: Breakdown Voltage Variation with Temperature



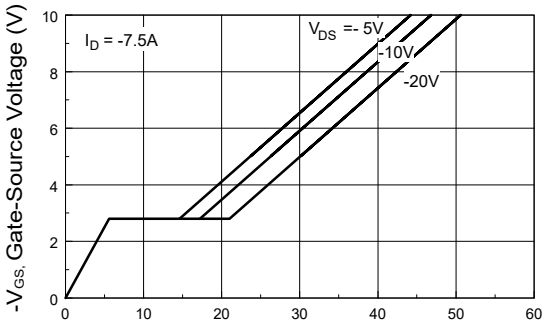
$-V_{SD}$,Body Diode Forward Voltage (V)

Figure 8: Body Diode Forward Voltage Variation with Current and Temperature



V_{DS}, Drain-source Voltage (V)

Figure 9: Capacitance Characteristics



Q_G, Total Gate Charge (nC)

Figure 10: Gate Charge Characteristics

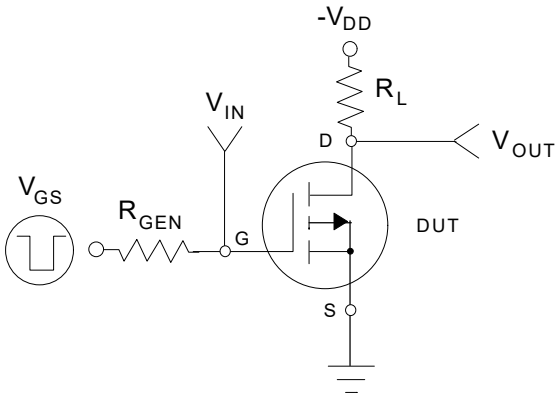


Figure 11: Switching Test Circuit

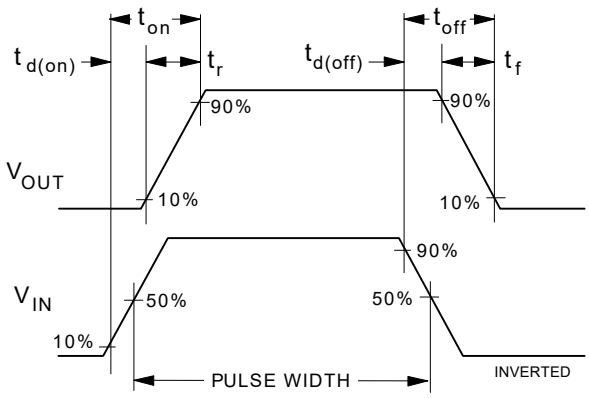


Figure 12: Switching Waveforms

7.3Typical characteristic

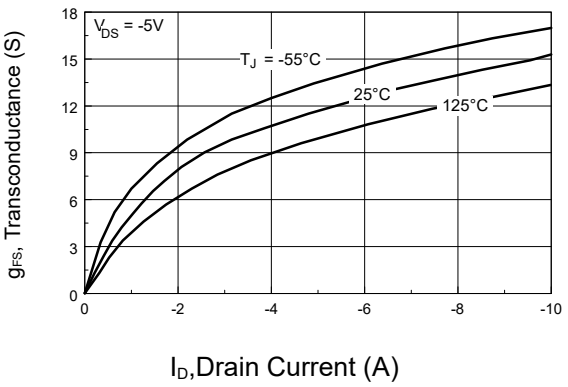


Figure 13: Transconductance Variation with Drain Current and Temperature

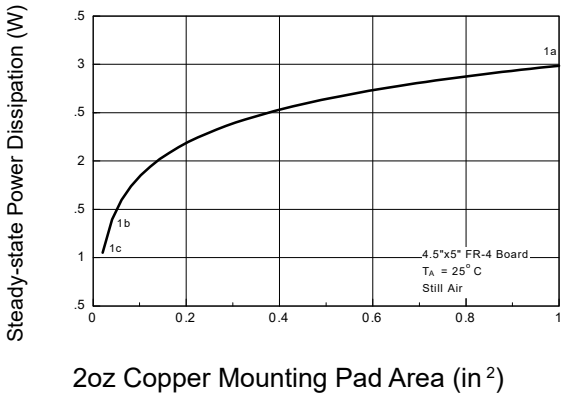


Figure 14: SOT-223 Maximum Steady- tate Power Dissipation versus CopperMounting Pad Area

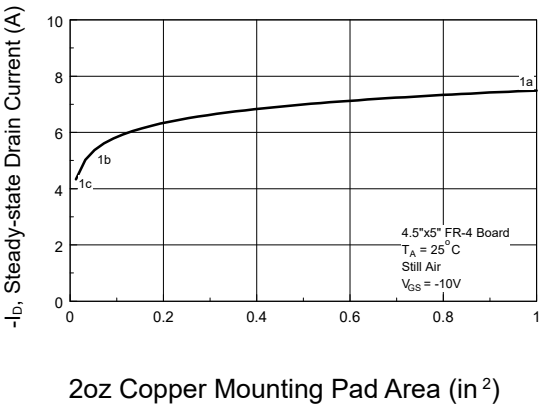


Figure 15:Maximum Steady-State Drain Current versus Copper Mounting PadArea

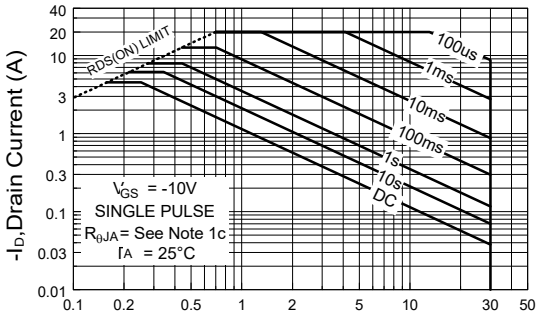


Figure 16: Maximum Safe Operating Area

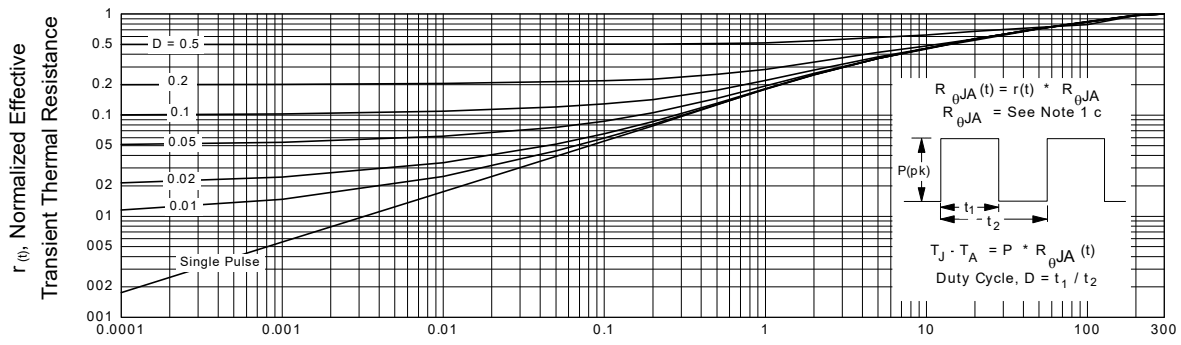
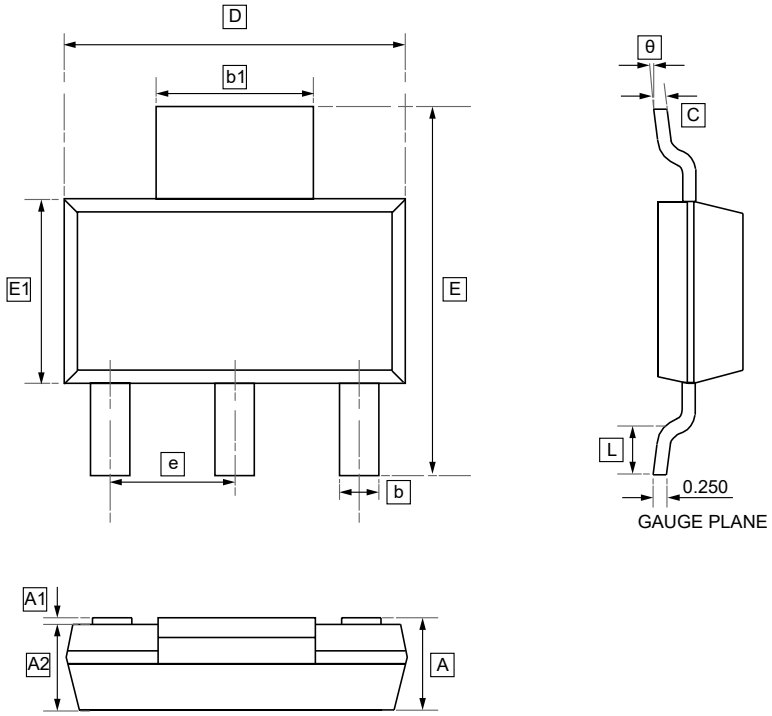


Figure 17: Transient Thermal Response Curve

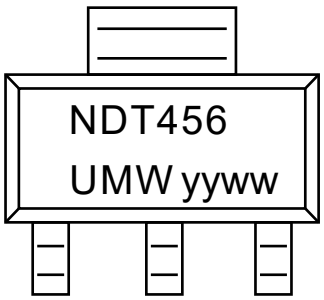
8.SOT-223 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	b1	c	D	E	E1	e	L	θ
Min	-	0.020	1.500	0.660	2.900	0.230	6.300	6.700	3.300	2.300	0.750	0°
Max	1.800	0.100	1.700	0.840	3.100	0.350	6.700	7.300	3.700	BSC	-	10°

9.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW NDT456P	SOT-223	2500	Tape and reel

10.Disclaimer

UMW reserves the right to make changes to all products, specifications. Customers should obtain the latest version of product documentation and verify the completeness and currency of the information before placing an order.

When applying our products, please do not exceed the maximum rated values, as this may affect the reliability of the entire system. Under certain conditions, any semiconductor product may experience faults or failures. Buyers are responsible for adhering to safety standards and implementing safety measures during system design, prototyping, and manufacturing when using our products to prevent potential failure risks that could lead to personal injury or property damage.

Unless explicitly stated in writing, UMW products are not intended for use in medical, life-saving, or life-sustaining applications, nor for any other applications where product failure could result in personal injury or death. If customers use or sell the product for such applications without explicit authorization, they assume all associated risks.

When reselling, applying, or exporting, please comply with export control laws and regulations of China, the United States, the United Kingdom, the European Union, and other relevant countries, regions, and international organizations.

This document and any actions by UMW do not grant any intellectual property rights, whether express or implied, by estoppel or otherwise. The product names and marks mentioned herein may be trademarks of their respective owners.