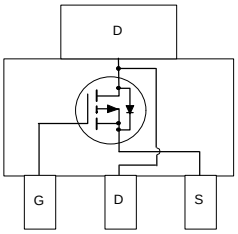
-30 V P-Channel MOSFET

General Description

Power SOT-223 P-Channel enhancement mode power field effect transistors especially tailored to minimize on-state resistance and provide superior switching performance. These devices are particularly suited for low voltage applications such as notebook computer power management and DC motor control.



Features

- V_{DS}(V) =-30V
- I_D =-5A (V_{GS}= -10V)
- $R_{DS(ON)}$ <65mΩ (V_{GS} =-10V)
- $R_{DS(ON)}$ <100mΩ (V_{GS} =-4.5V)
- High density cell design for extremely low $R_{DS(ON)}$
- High power and current handling capability in a widely used surface mount package.

Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter		NDT452AP	Units
V_{DSS}	Drain-Source Voltage		-30	V
V_{GSS}	Gate-Source Voltage		±20	V
I_D	Drain Current - Continuous	(Note 1a)	-5	A
	- Pulsed		- 15	
P_D	Maximum Power Dissipation	(Note 1a)	3	W
		(Note 1b)	1.3	
		(Note 1c)	1.1	
T_J,T_{STG}	Operating and Storage Temperature Range		-65 to 150	°C

THERMAL CHARACTERISTICS

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

Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = -250 µA	-30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -24 V, V_{GS} = 0 V			-1	µA
		T_J = 55°C			-10	µA
I_{GSSF}	Gate - Body Leakage, Forward	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate - Body Leakage, Reverse	V_{GS} = -20 V, V_{DS} = 0 V			-100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250 µA	-1	-1.6	-2.8	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = -10 V, I_D = -5.0 A		52	65	mΩ
		V_{GS} = -4.5 V, I_D = -4.3 A		85	100	
$I_{D(on)}$	On-State Drain Current	V_{GS} = -10 V, V_{DS} = -5 V	-15			A
		V_{GS} = -4.5 V, V_{DS} = -5 V	-5			
g_{FS}	Forward Transconductance	V_{DS} = -10 V, I_D = -5.0 A		7		S
C_{iss}	Input Capacitance	V_{DS} = -15 V, V_{GS} = 0 V, f = 1.0 MHz		690		pF
C_{oss}	Output Capacitance			430		pF
C_{rss}	Reverse Transfer Capacitance			160		pF
$t_{D(on)}$	Turn - On Delay Time	V_{DD} = -10 V, I_D = -1 A, V_{GEN} = -10 V, R_{GEN} = 6 Ω		9	20	ns
t_r	Turn - On Rise Time			20	30	ns
$t_{D(off)}$	Turn - Off Delay Time			40	50	ns
t_f	Turn - Off Fall Time			19	40	ns
Q_g	Total Gate Charge	V_{DS} = -10 V, I_D = -5.0 A, V_{GS} = -10 V		22	30	nC
Q_{gs}	Gate-Source Charge			3.2		nC
Q_{gd}	Gate-Drain Charge			5.2		nC
I_S	Maximum Continuous Drain-Source Diode Forward Current				-2.5	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = -2.5 A (Note 2)		-0.85	-1.2	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_F = -2.5 A, dI_F/dt = 100 A/µs			100	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 $R_{\theta CA}$ is determined by the user's board design.

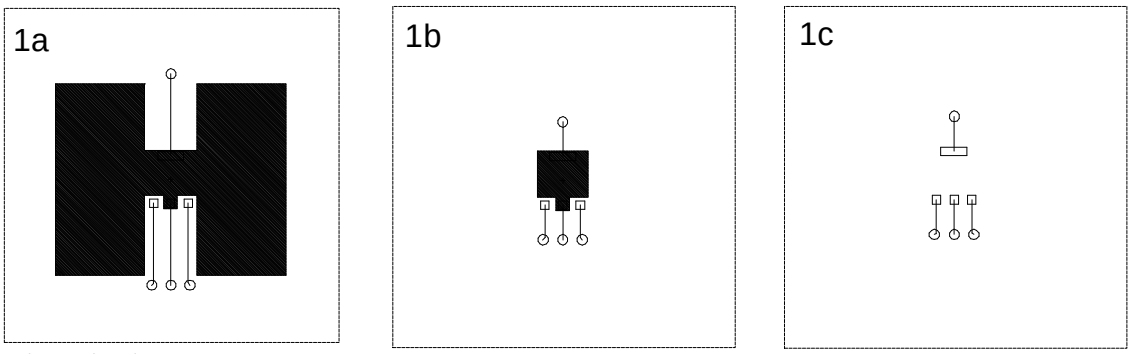
$$P_D(t) = \frac{T_J - T_A}{R_{\theta JA}(t)} = \frac{T_J - T_A}{R_{\theta JC} + R_{\theta CA}(t)} = I_D^2(t) \times R_{DS(ON)@T_J}$$

Typical $R_{\theta JA}$ using the board layouts shown below on 4.5"x5" FR-4 PCB in a still air environment:

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

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

c. 110°C/W when mounted on a 0.0123 in^2 pad of 2oz copper.



Scale 1 : 1 on letter size paper

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

Typical Electrical Characteristics

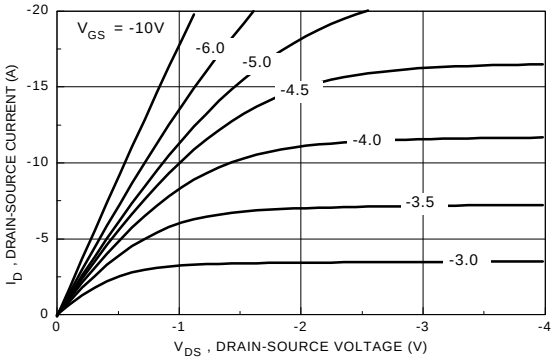


Figure 1. On-Region Characteristics.

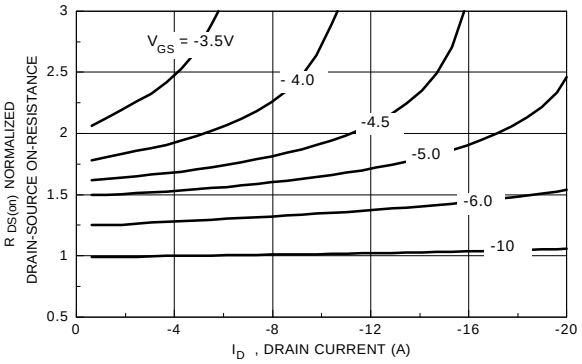


Figure 2. On-Resistance Variation with Gate Voltage and Drain Current.

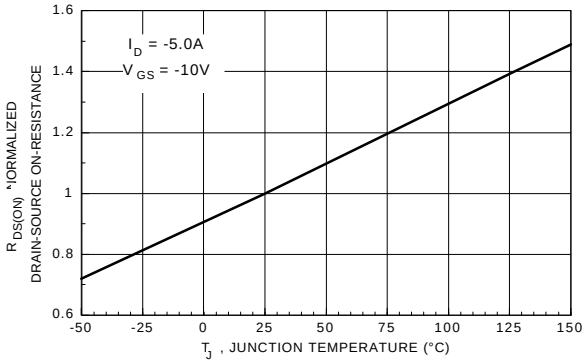


Figure 3. On-Resistance Variation with Temperature.

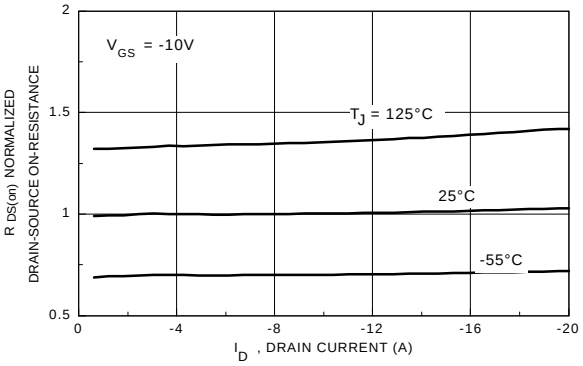


Figure 4. On-Resistance Variation with Drain Current and Temperature.

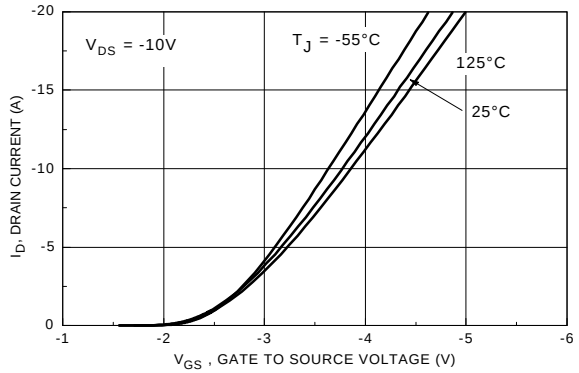


Figure 5. Transfer Characteristics.

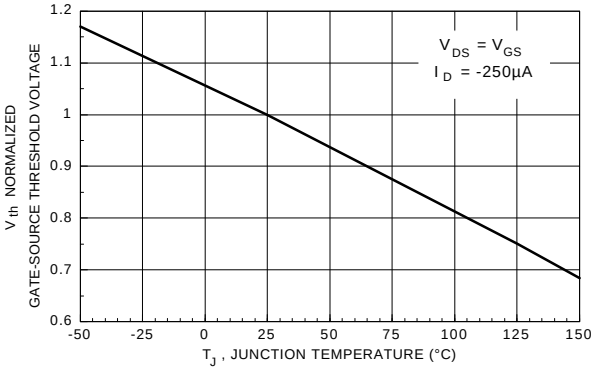


Figure 6. Gate Threshold Variation with Temperature.

Typical Electrical Characteristics

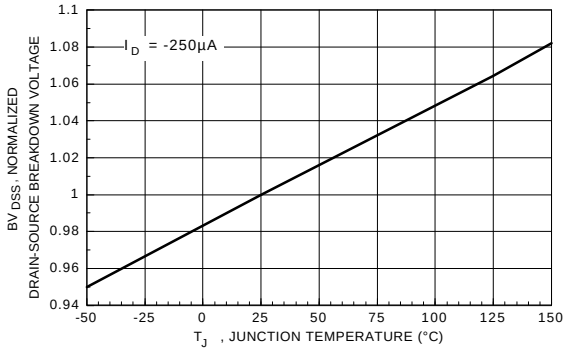


Figure 7. Breakdown Voltage Variation with Temperature.

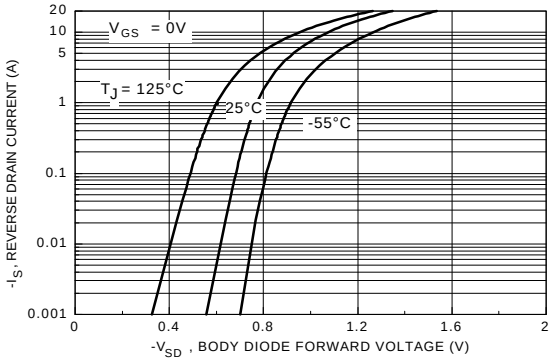


Figure 8. Body Diode Forward Voltage Variation with Current and Temperature.

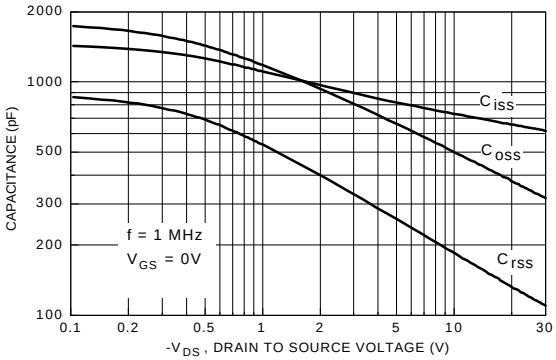


Figure 9. Capacitance Characteristics.

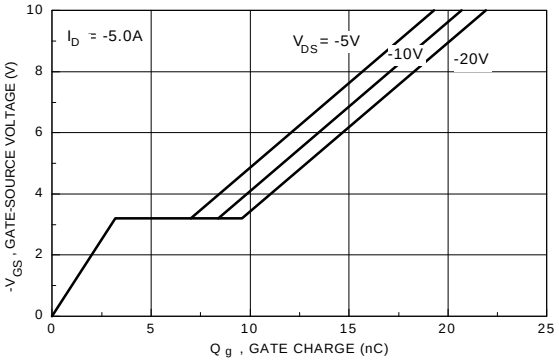


Figure 10. Gate Charge Characteristics.

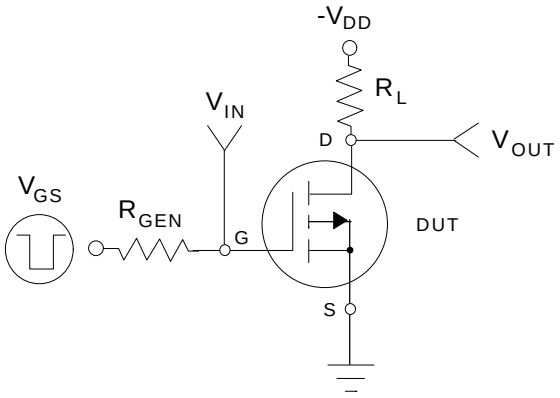


Figure 11. Switching Test Circuit.

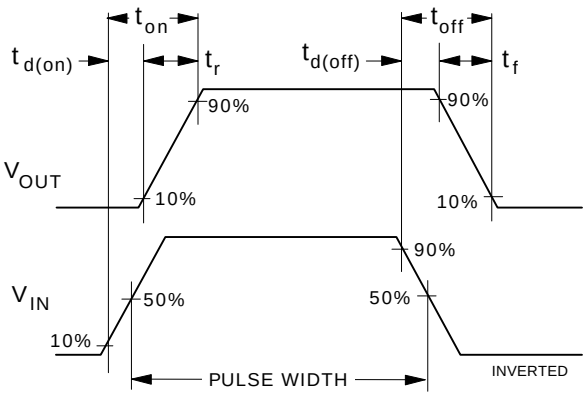


Figure 12. Switching Waveforms.

Typical Thermal Characteristics

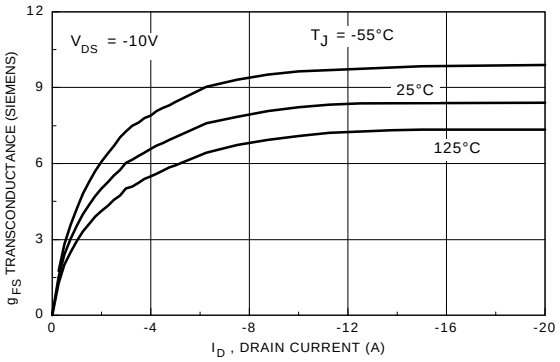


Figure 13. Transconductance Variation with Drain Current and Temperature.

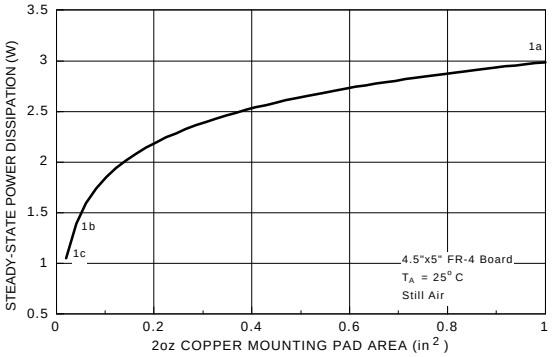


Figure 14. SOT-223 Maximum Steady- tate Power Dissipation versus Copper Mounting Pad Area.

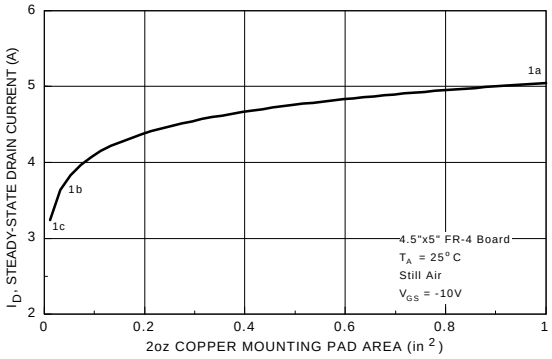


Figure 15. Maximum Steady-State Drain Current versus Copper Mounting Pad Area.

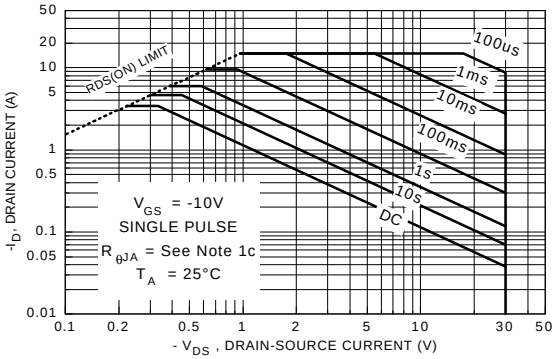


Figure 16. Maximum Safe Operating Area.

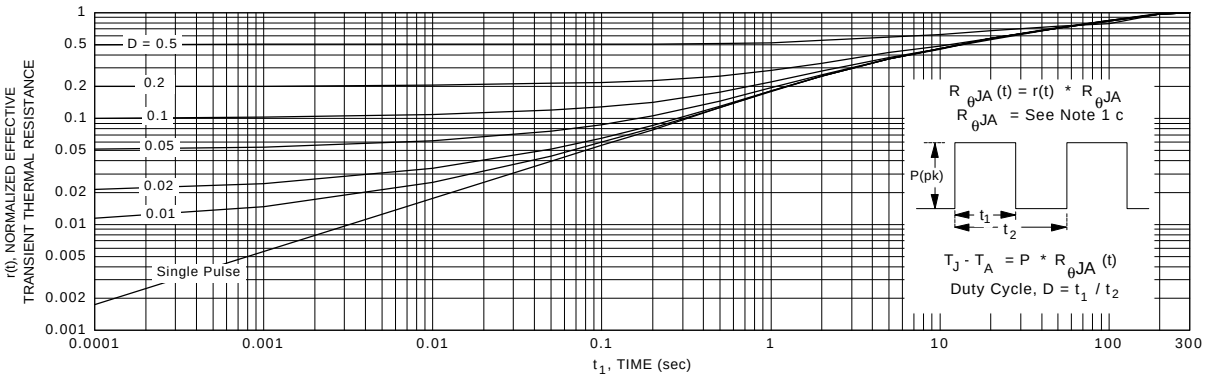
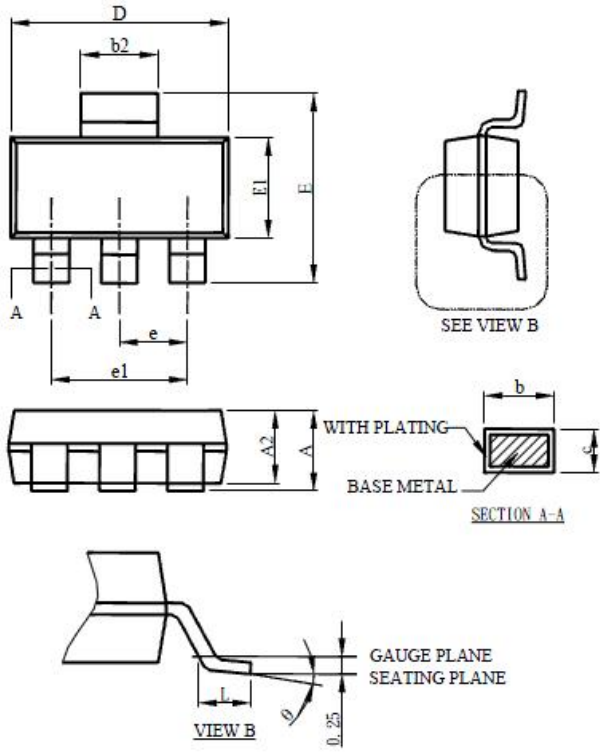


Figure 17. Transient Thermal Response Curve.

Note: Thermal characterization performed using the conditions described in note 1c. Transient thermal response will change depending on the circuit board design.

Package Demensions

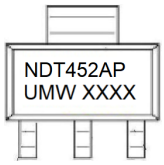
SOT-223



SYMBOL	SOT-223	
	MILLIMETERS	
	MIN.	MAX.
A		1.80
A1	0.02	0.10
A2	1.55	1.65
b	0.66	0.84
b2	2.90	3.10
c	0.23	0.33
D	6.30	6.70
E	6.70	7.30
E1	3.30	3.70
e	2.30 BSC	
e1	4.60 BSC	
L	0.90	
θ	0°	8°

Note:
1.Refer to JEDEC TO-261AA.
2.Dimension D and E1 are determined at the outermost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs, and interlead flash, but including any mismatch between the top and bottom of the plastic body.
3.Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW NDT452AP	SOT-223	2500	Tape and reel