



Description

The NDS352AP uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.



SOT-23

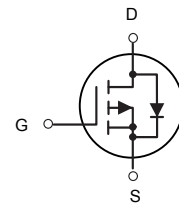
General Features

$V_{DS} = -30V, I_D = -4.1A$

$R_{DS(ON)} < 56m\Omega @ V_{GS}=10V$

Application

- High power and current handing capability
- Lead free product is acquired
- Surface mount package
- PWM applications
- Load switch
- Power management



P-Channel MOSFET

Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
NDS352AP	SOT-23	HXY MOSFET	3000

Absolute Maximum Ratings ($T_A=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Limit	Unit
V_{DS}	Drain-Source Voltage	-30	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current-Continuous	-4.1	A
I_{DM}	Drain Current-Pulsed ^(Note 1)	-13	A
P_D	Maximum Power Dissipation	1.32	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient ^(Note 2)	125	$^\circ C/W$



Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	-30	---	---	V
ΔBV _{DSS} /ΔT _J	BVDSS Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	-0.02	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =-10V, I _D =-3A	---	48	56	mΩ
		V _{GS} =-4.5V, I _D =-1.5A	---	78	90	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-1.2	-1.5	-2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	4.32	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-24V, V _{GS} =0V, T _J =25°C	---	---	-1	uA
		V _{DS} =-24V, V _{GS} =0V, T _J =55°C	---	---	-5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V, I _D =-3A	---	4.8	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	24	48	Ω
Q _g	Total Gate Charge (-4.5V)	V _{DS} =-20V, V _{GS} =-4.5V, I _D =-3A	---	5.22	7.3	nC
Q _{gs}	Gate-Source Charge		---	1.25	1.8	
Q _{gd}	Gate-Drain Charge		---	2.3	3.2	
T _{d(on)}	Turn-On Delay Time	V _{DD} =-15V, V _{GS} =-10V, R _G =3.3Ω I _D =-1A	---	18.4	37	ns
T _r	Rise Time		---	11.4	21	
T _{d(off)}	Turn-Off Delay Time		---	39.4	79	
T _f	Fall Time		---	5.2	10.4	
C _{iss}	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, f=1MHz	---	463	650	pF
C _{oss}	Output Capacitance		---	82	115	
C _{rss}	Reverse Transfer Capacitance		---	68	95	
I _s	Continuous Source Current ^{1,4}	V _G =V _D =0V, Force Current	---	---	-3.2	A
I _{SM}	Pulsed Source Current ^{2,4}		---	---	-13	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1	V

Note :

- 1.The data tested by surface mounted on a 1 inch²FR-4 board with 2OZ copper.
- 2.The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- 3.The power dissipation is limited by 150°C junction temperature
- 4.The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.



Typical Characteristics



Fig.1 Typical Output Characteristics

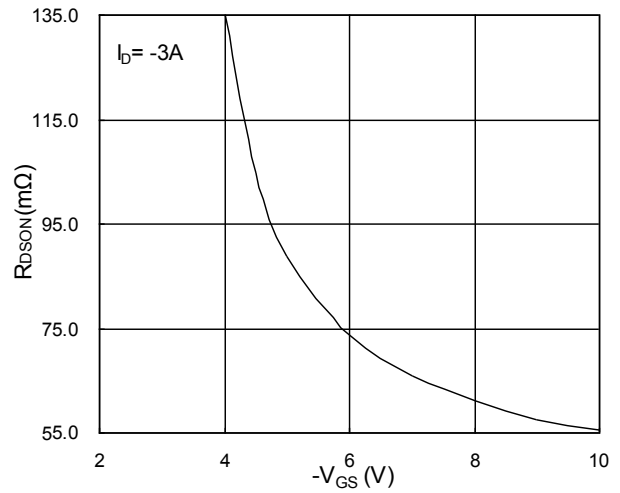


Fig.2 On-Resistance vs. G-S Voltage

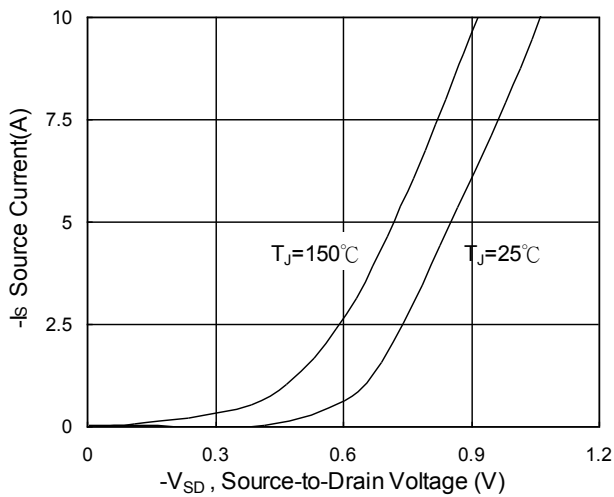


Fig.3 Source Drain Forward Characteristics

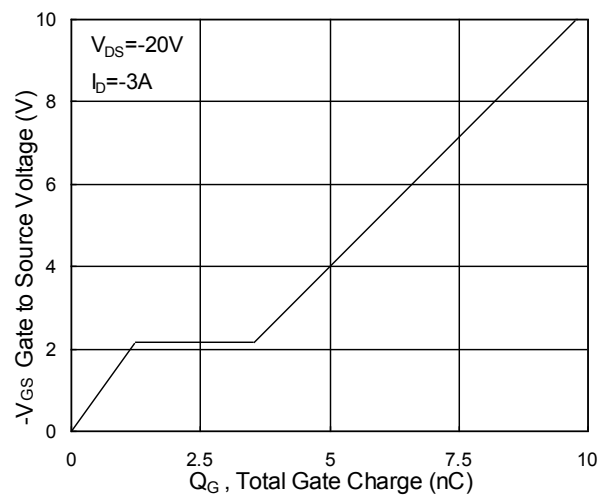


Fig.4 Gate-Charge Characteristics

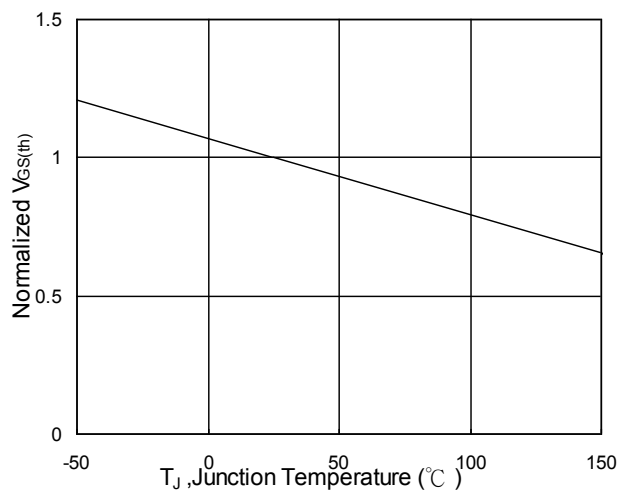


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

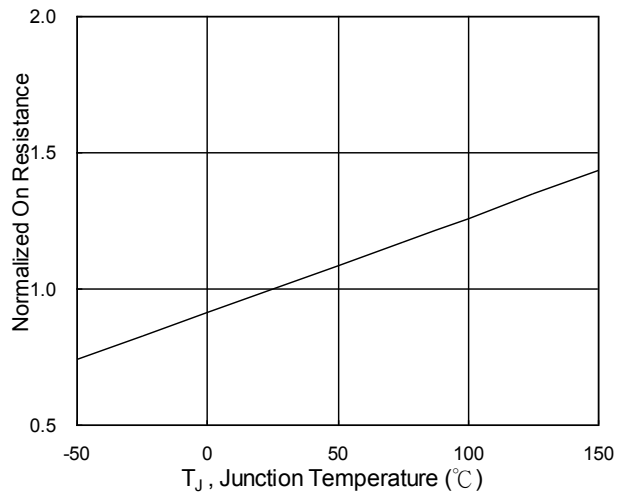


Fig.6 Normalized $R_{DS(on)}$ vs. T_J



Fig.7 Capacitance

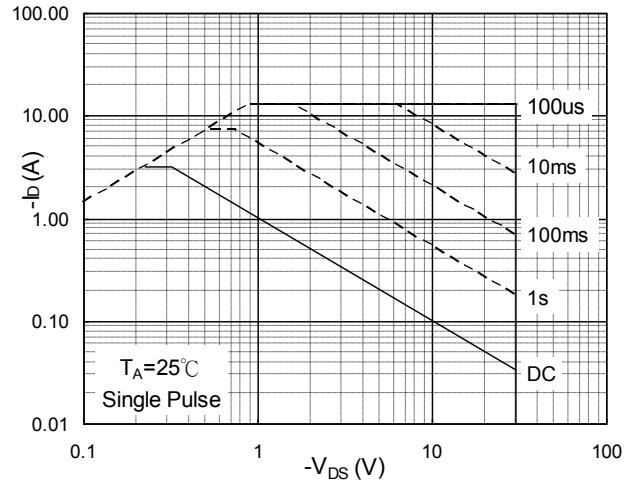


Fig.8 Safe Operating Area

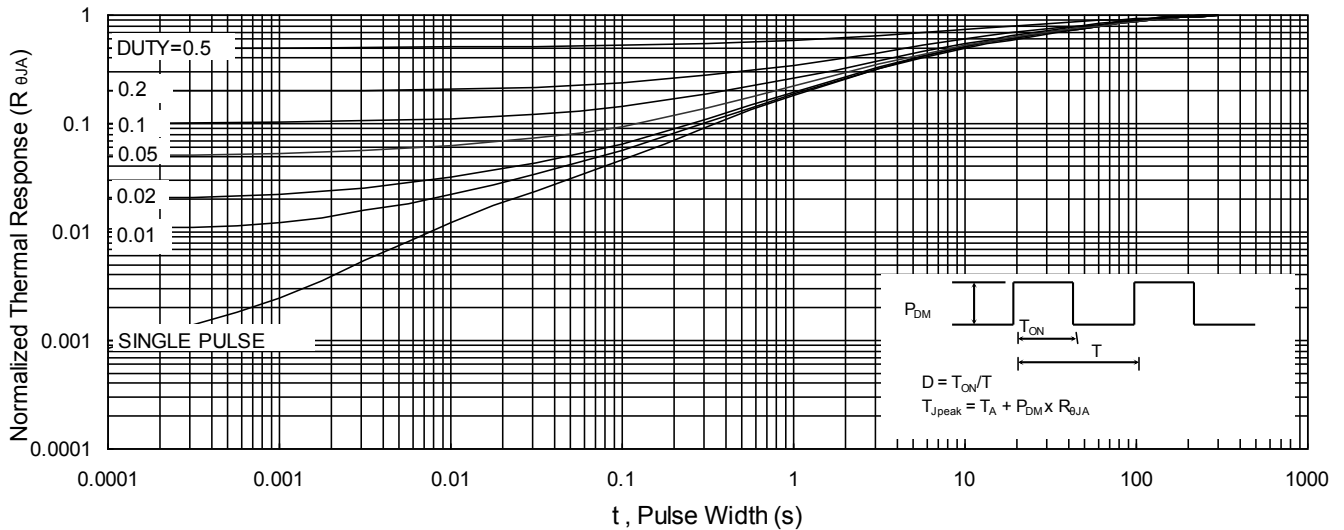


Fig.9 Normalized Maximum Transient Thermal Impedance



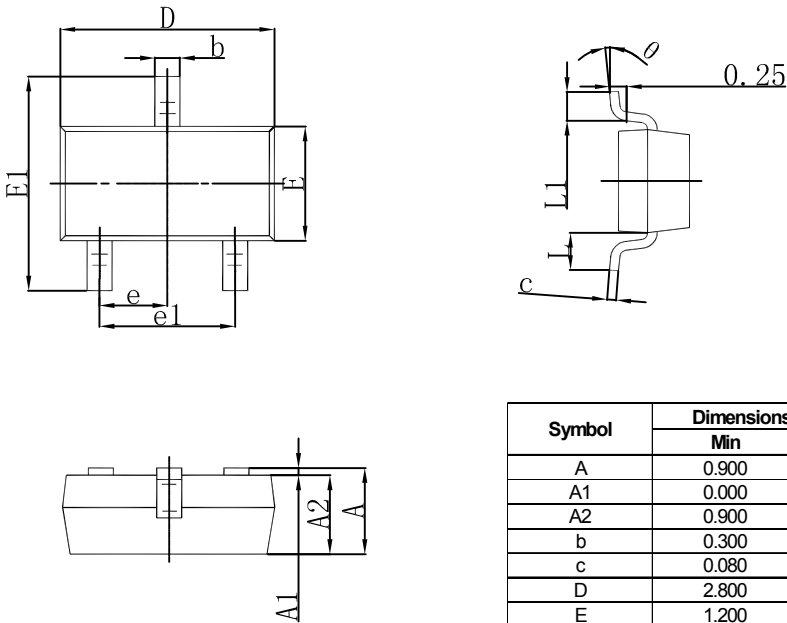
Fig.10 Switching Time Waveform



Fig.11 Gate Charge Waveform



SOT-23 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

SOT-23 Suggested Pad Layout



- Note:
1. Controlling dimension: in millimeters.
 2. General tolerance: $\pm 0.05\text{mm}$.
 3. The pad layout is for reference purposes only.



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