

20V P-Channel Enhancement Mode MOSFET

Description

The NP3401 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 load switch or in PWM applications.

General Features

- ◆ $V_{DS} = -30V$, $I_D = -4A$
 $R_{DS(ON)}(Typ.) = 53m\Omega$ @ $V_{GS} = -4.5V$
 $R_{DS(ON)}(Typ.) = 73m\Omega$ @ $V_{GS} = -2.5V$
- ◆ High power and current handling capability
- ◆ Lead free product is acquired
- ◆ Surface mount package

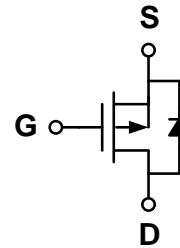
Application

- ◆ PWM applications
- ◆ Load switch

Package

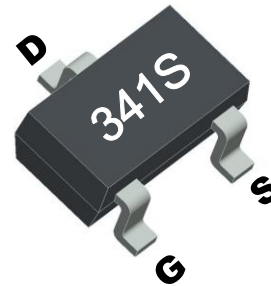
- ◆ SOT-23

Schematic diagram



Marking and pin assignment

SOT-23
(TOP VIEW)



Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP3401VR	-55°C to +150°C	SOT-23	3000

Absolute Maximum Ratings (TA=25°C unless otherwise noted)

parameter	symbol	limit	unit
Drain-source voltage	V_{DS}	-30	V
Gate-source voltage	V_{GS}	±12	V
Drain current-continuous ^a @Tj=125°C -pulse ^b	I_D	-4	A
	I_{DM}	-28	A
Drain-source Diode forward current	I_S	-1.25	A
Maximum power dissipation	P_D	1	W
Operating junction Temperature range	T_j	-55—150	°C

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-30	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	μA
Gate-body leakage	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 12V$	-	-	± 100	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.5	-0.83	-1.3	V
Drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=-4.5V, I_D=-3A$	-	53	65	m Ω
		$V_{GS}=-2.5V, I_D=-2A$	-	73	85	
Forward transconductance	g_{fs}	$V_{GS}=-5V, I_D=-4A$	-	5	-	S
Dynamic Characteristics						
Input capacitance	C_{ISS}	$V_{DS}=-10V, V_{GS}=0V$ $f=1.0MHz$	-	880	-	pF
Output capacitance	C_{OSS}		-	105	-	
Reverse transfer capacitance	C_{RSS}		-	65	-	
Switching Characteristics						
Turn-on delay time	$t_{D(ON)}$	$V_{DD}=-15V$ $I_D=-4A$ $V_{GEN}=-10V$ $R_L=10ohm$ $R_{GEN}=6ohm$	-	7	-	ns
Rise time	t_r		-	3	-	
Turn-off delay time	$t_{D(OFF)}$		-	30	-	
Fall time	t_f		-	12	-	
Total gate charge	Q_g	$V_{DS}=-15V, I_D=-4A$ $V_{GS}=-4.5V$	-	8.5	-	nC
Gate-source charge	Q_{gs}		-	1.8	-	
Gate-drain charge	Q_{gd}		-	2.7	-	
DRAIN-SOURCE DIODE CHARACTERISTICS						
Diode forward voltage	V_{SD}	$V_{GS}=0V, I_s=-4A$	-	-0.81	-1.2	V

Notes:

- surface mounted on FR4 board, $t \leq 10sec$
- pulse test: pulse width $\leq 300\mu s$, duty $\leq 2\%$
- guaranteed by design, not subject to production testing

Thermal Characteristics

Thermal Resistance junction-to ambient	Rth JA	100	$^{\circ}C/W$
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Typical Performance Characteristics

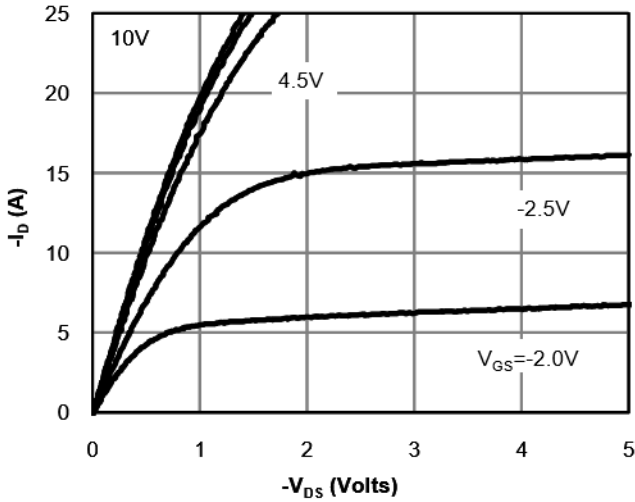


Fig 1: On-Region Characteristics (Note E)

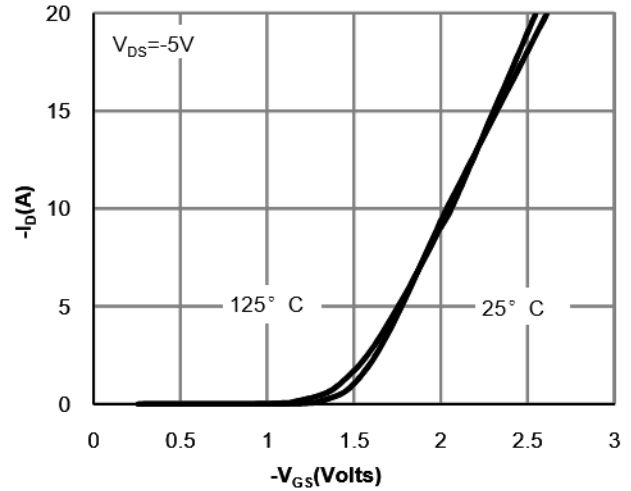


Figure 2: Transfer Characteristics (Note E)

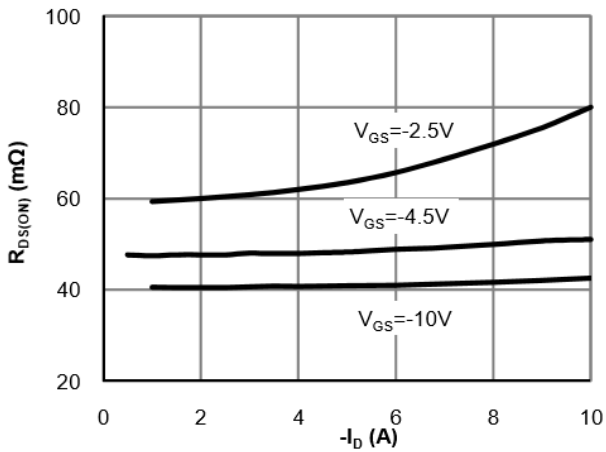


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

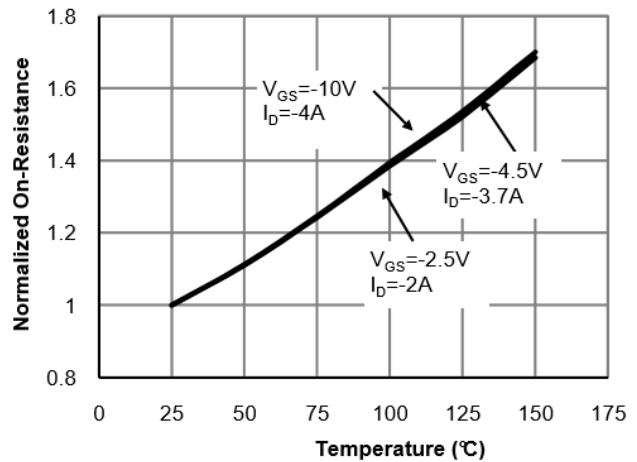


Figure 4: On-Resistance vs. Junction Temperature (Note E)

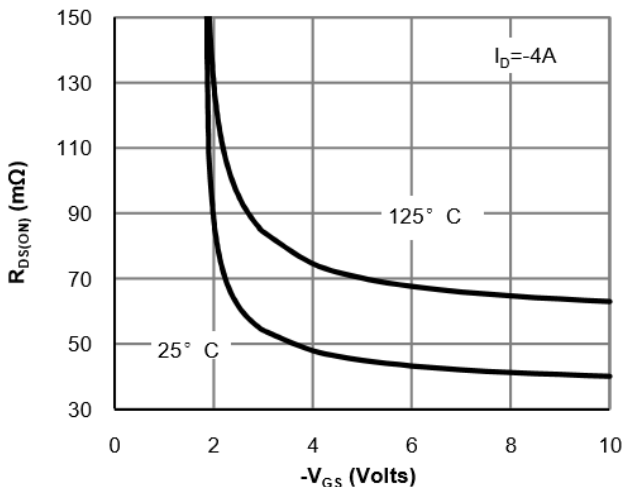


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

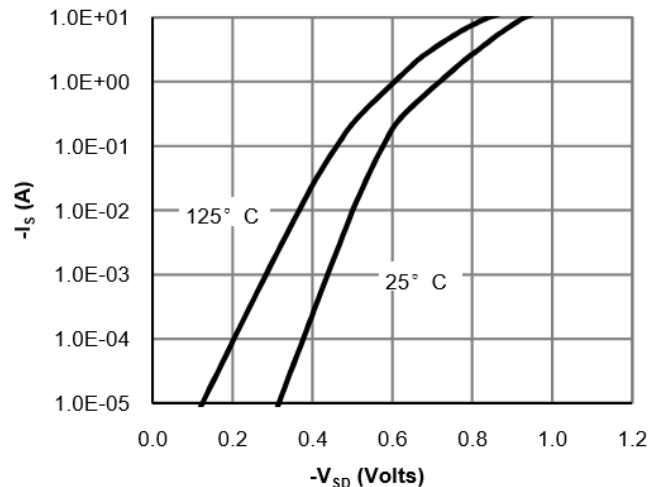


Figure 6: Body-Diode Characteristics (Note E)

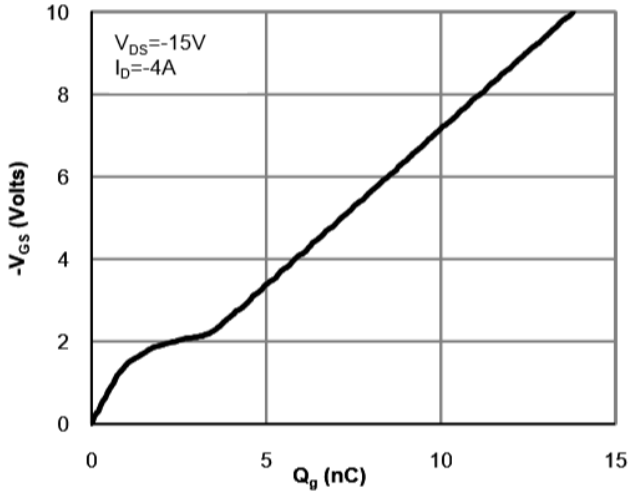


Figure 7: Gate-Charge Characteristics

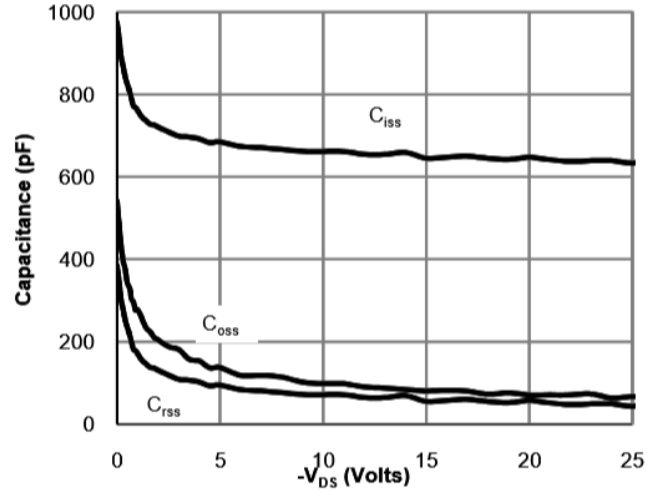


Figure 8: Capacitance Characteristics

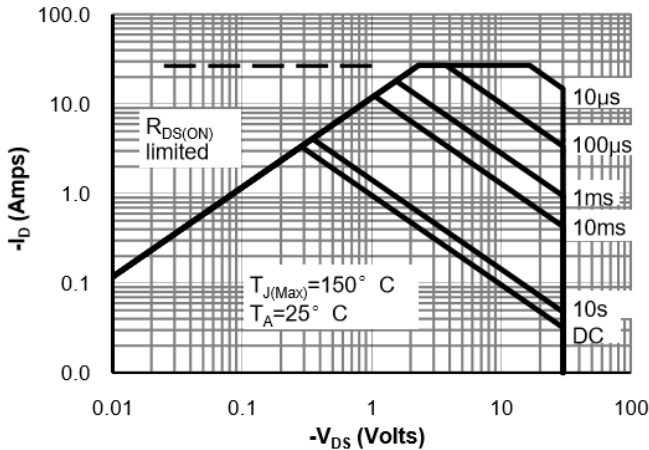


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

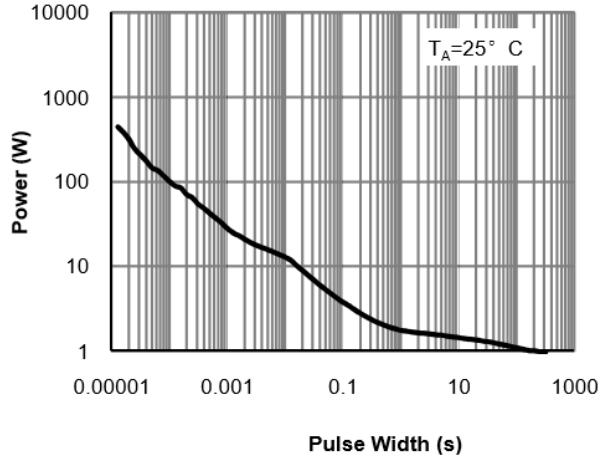


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

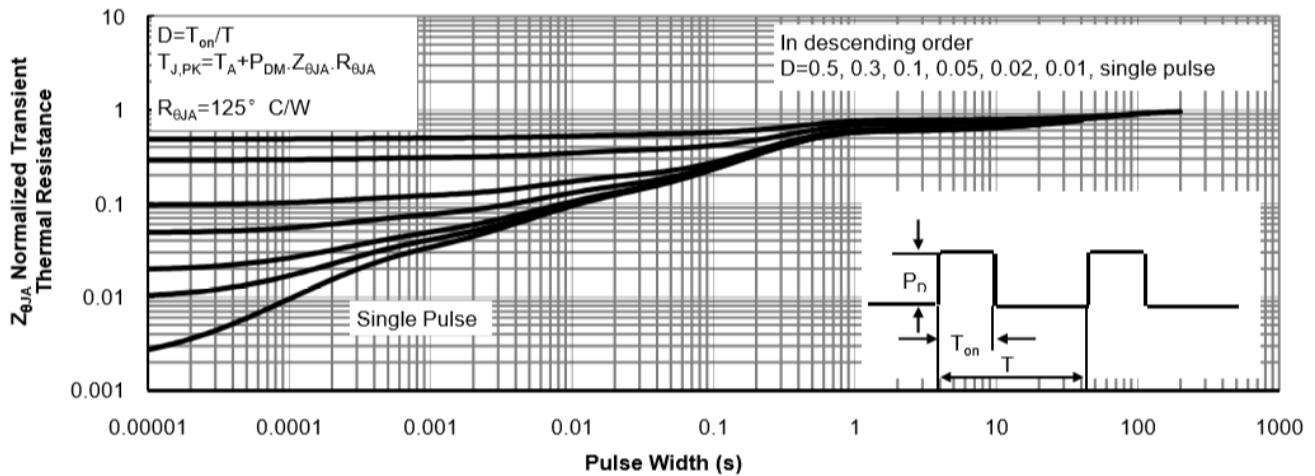
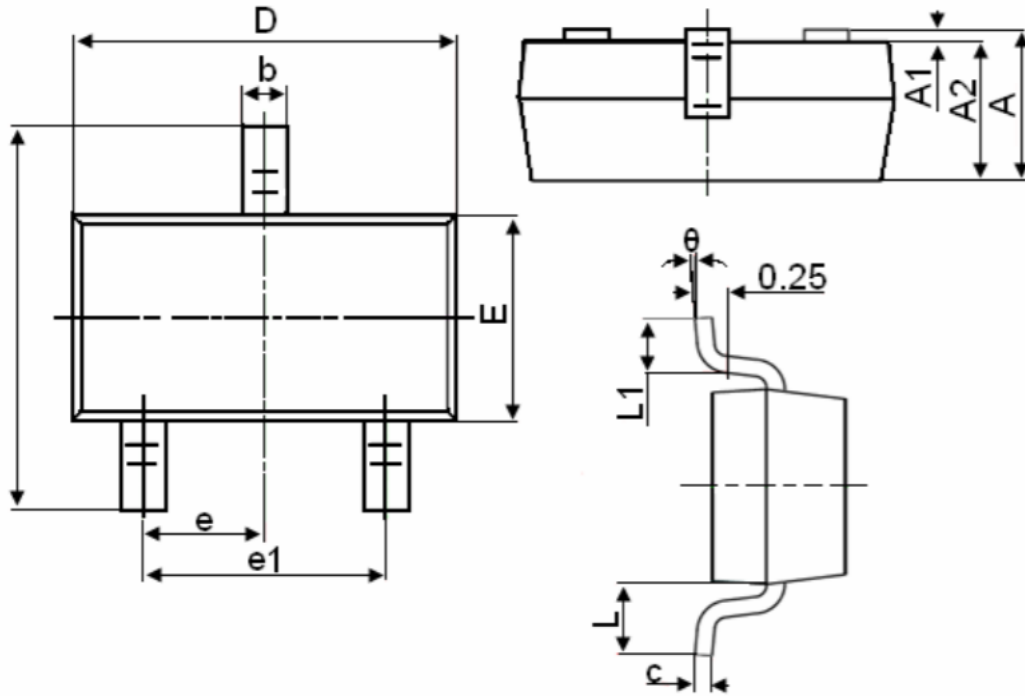


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Package Information

- SOT-23



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°