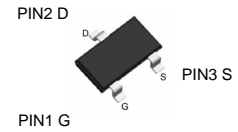


Description

The 4N10 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



SOT23-3L

General Features

$V_{DS} = 100V$ $I_D = 3.8A$

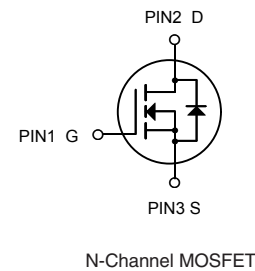
$R_{DS(ON)} < 240m\Omega$ @ $V_{GS}=10V$

Applicatio

Battery protection

Load switch

Uninterruptible power supply



Absolute Maximum Ratings $T_c=25^\circ C$ unless otherwise noted

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	100	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current – Continuous ($T_c=25^\circ C$)	3.8	A
	Drain Current – Continuous ($T_c=100^\circ C$)	2	A
I_{DM}	Drain Current – Pulsed ¹	8	A
P_D	Power Dissipation ($T_c=25^\circ C$)	3.76	W
	Power Dissipation – Derate above $25^\circ C$	0.5	W/ $^\circ C$
T_{STG}	Storage Temperature Range	-50 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-50 to 150	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	70	$^{\circ}C/W$
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	30	$^{\circ}C/W$

Electrical Characteristics ($T_J=25^{\circ}C$, unless otherwise noted) Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	100	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to $25^{\circ}C, I_D=1mA$	---	0.09	---	$V/^{\circ}C$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=100V, V_{GS}=0V, T_J=25^{\circ}C$	---	---	1	μA
		$V_{DS}=80V, V_{GS}=0V, T_J=125^{\circ}C$	---	---	10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=1A$	---	210	240	$m\Omega$
		$V_{GS}=4.5V, I_D=0.5A$	---	240	280	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.0	1.9	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-5	---	$mV/^{\circ}C$
g_{fs}	Forward Transconductance	$V_{DS}=10V, I_D=2A$	---	2.3	---	S
Q_g	Total Gate Charge ^{2, 3}	$V_{DS}=50V, V_{GS}=10V, I_D=1A$	---	9	18	nC
Q_{gs}	Gate-Source Charge ^{2, 3}		---	2.3	4.6	
Q_{gd}	Gate-Drain Charge ^{2, 3}		---	1.1	2.5	
$T_{d(on)}$	Turn-On Delay Time ^{2, 3}	$V_{DD}=50V, V_{GS}=10V, R_G=3.3, I_D=1A$	---	5.2	10	ns
T_r	Rise Time ^{2, 3}		---	6.8	12	
$T_{d(off)}$	Turn-Off Delay Time ^{2, 3}		---	14.5	28	
T_f	Fall Time ^{2, 3}		---	2.1	5	
C_{iss}	Input Capacitance	$V_{DS}=25V, V_{GS}=0V, F=1MHz$	---	152	200	pF
C_{oss}	Output Capacitance		---	17	20	
C_{rss}	Reverse Transfer Capacitance		---	10	15	
R_g	Gate resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$	---	2.8	5.6	

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	$V_G=V_D=0V$, Force Current	---	---	4	A
I_{SM}	Pulsed Source Current		---	---	8	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V$, $I_S=1A$, $T_J=25^\circ C$	---	---	1	V
t_{rr}	Reverse Recovery Time ²	$I_S=1A$, $dI/dt=100A/\mu s$ $T_J=25^\circ C$	---	---	---	ns
Q_{rr}	Reverse Recovery Charge ²		---	---	---	nC

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
23. . Essentially independent of operating temperature. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

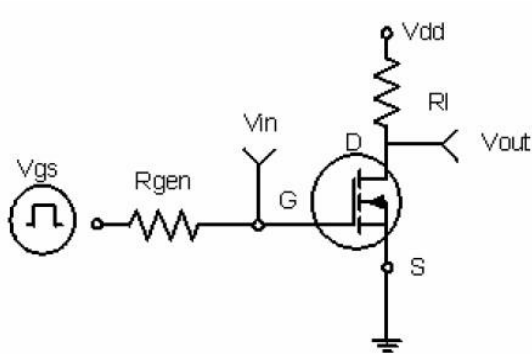
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS


Figure 1: Switching Test Circuit

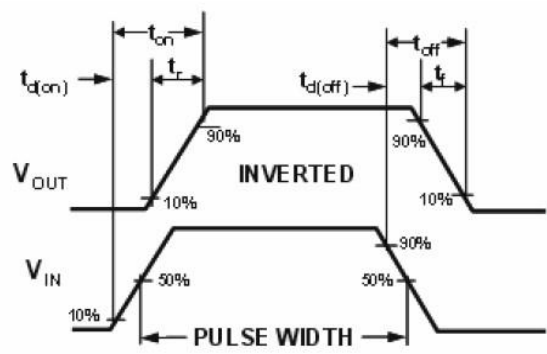
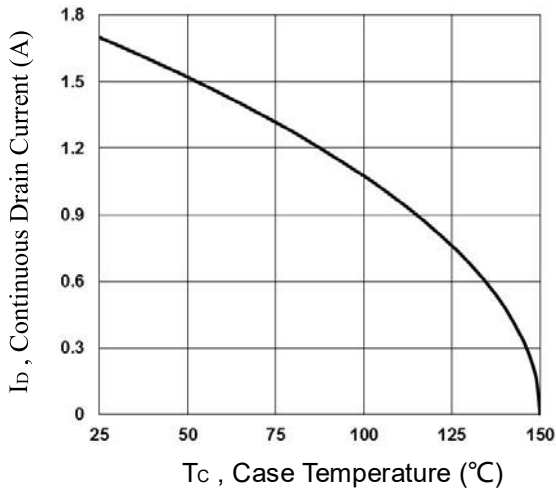
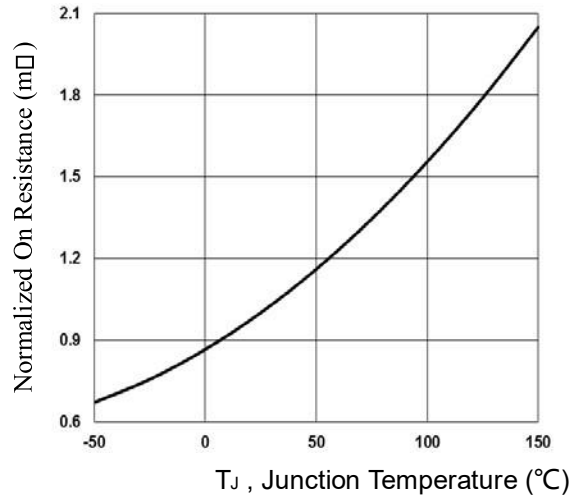
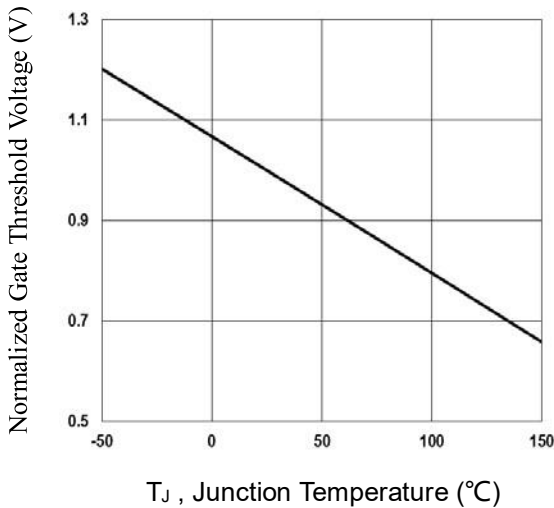
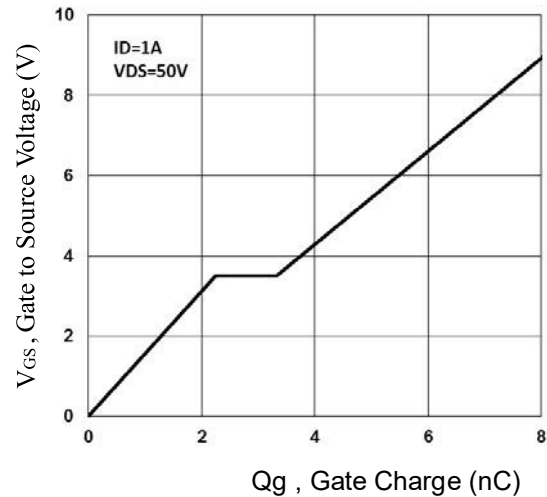
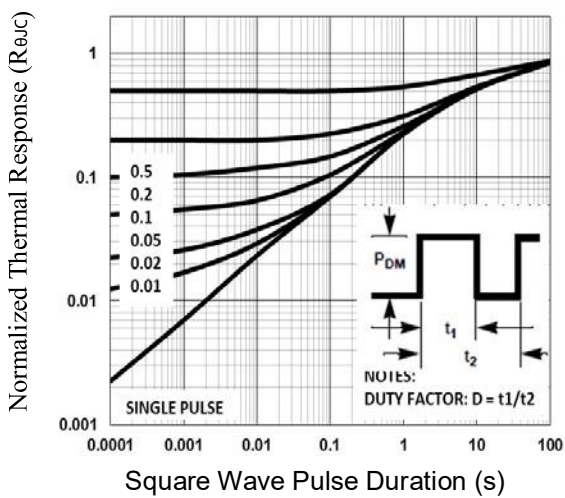
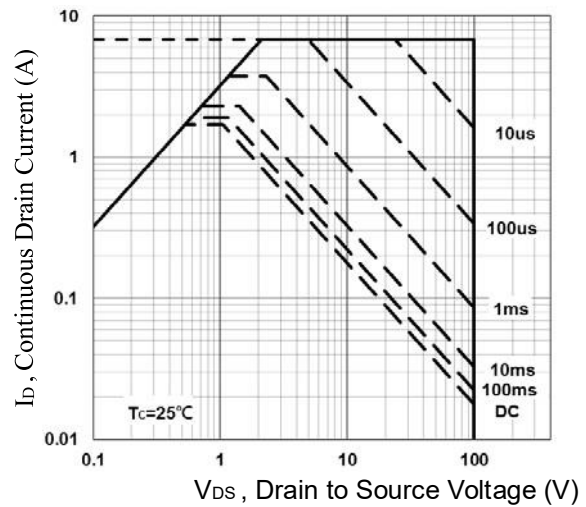
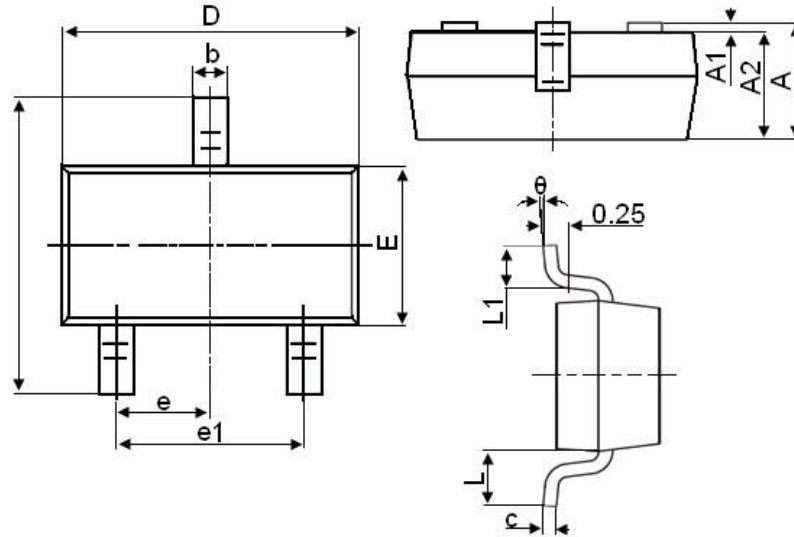


Figure 2: Switching Waveforms


Fig.1 Continuous Drain Current vs. T_c

Fig.2 Normalized RDSON vs. T_J

Fig.3 Normalized V_{th} vs. T_J

Fig.4 Gate Charge Waveform

Fig.5 Normalized Transient Impedance

Fig.6 Maximum Safe Operation Area

SOT23-3L Package Information


Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	1.050	1.250
A1	0.000	0.100
A2	1.050	1.150
b	0.300	0.500
c	0.100	0.200
D	2.800	3.000
E	1.500	1.700
E1	2.650	2.950
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.600
θ	0°	8°