

General Description

These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

Features

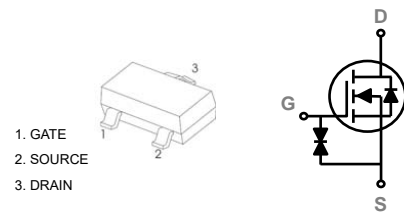
20V,800mA, $R_{DS(ON)}=200m\Omega@V_{GS} = 4.5V$
Improved dv/dt capability
Fast switching
ESD protected up to 2KV
Green Device Available

Application

Notebook
Load Switch
Battery Protection
Hand-held Instruments

V_{DSS} 20 V
 I_D 800 mA
 $R_{DS(ON)}$ 200 m Ω

NA1J2



MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	20	V
V_{GS}	Gate-Source Voltage	± 10	V
I_D	Drain Current – Continuous ($T_A=25^\circ\text{C}$)	800	mA
	Drain Current – Continuous ($T_A=70^\circ\text{C}$)	640	mA
I_{DM}	Drain Current – Pulsed ¹	3.2	A
P_D	Power Dissipation ($T_A=25^\circ\text{C}$)	312	mW
	Power Dissipation – Derate above 25°C	2.5	mW/ $^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	400	$^\circ\text{C/W}$

Electrical Characteristics $T_A=25^\circ\text{C}$ unless otherwise specified

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	20	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to $25^\circ\text{C}, I_D=1\text{mA}$	---	-0.01	---	$\text{V}/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=20V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=16V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 10V, V_{DS}=0V$	---	---	± 10	μA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=4.5V, I_D=0.5A$	---	200	270	m Ω
		$V_{GS}=2.5V, I_D=0.4A$	---	235	380	
		$V_{GS}=1.8V, I_D=0.2A$	---	295	550	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	0.3	0.6	1.0	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	3	---	$\text{mV}/^\circ\text{C}$

Dynamic and switching Characteristics

Q_g	Total Gate Charge ^{2,3}	$V_{DS}=10V, V_{GS}=4.5V, I_D=0.5A$	---	1	---	nC
Q_{gs}	Gate-Source Charge ^{2,3}		---	0.26	---	
Q_{gd}	Gate-Drain Charge ^{2,3}		---	0.2	---	
$T_{d(on)}$	Turn-On Delay Time ^{2,3}	$V_{DD}=10V, V_{GS}=4.5V, R_G=10\Omega, I_D=0.5A$	---	5	---	ns
T_r	Rise Time ^{2,3}		---	3.5	---	
$T_{d(off)}$	Turn-Off Delay Time ^{2,3}		---	14	---	
T_f	Fall Time ^{2,3}		---	6	---	
C_{iss}	Input Capacitance	$V_{DS}=10V, V_{GS}=0V, F=1\text{MHz}$	---	38.2	---	pF
C_{oss}	Output Capacitance		---	14.4	---	
C_{rss}	Reverse Transfer Capacitance		---	6	---	

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	$V_G=V_D=0V, \text{Force Current}$	---	---	0.8	A
I_{SM}	Pulsed Source Current		---	---	1.6	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V, I_S=0.2A, T_J=25^\circ\text{C}$	---	---	1.2	V

Note :

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

RATING AND CHARACTERISTIC CURVES

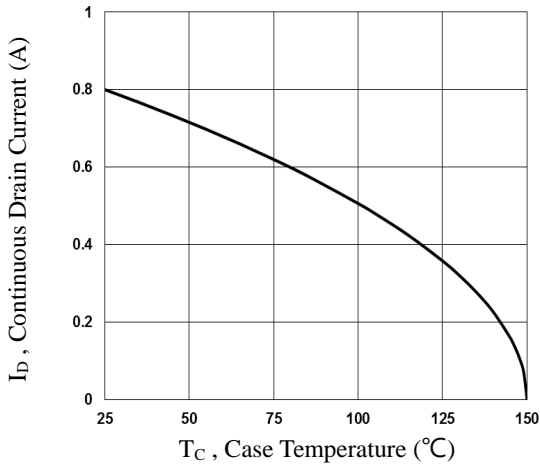


Fig.1 Continuous Drain Current vs. T_c

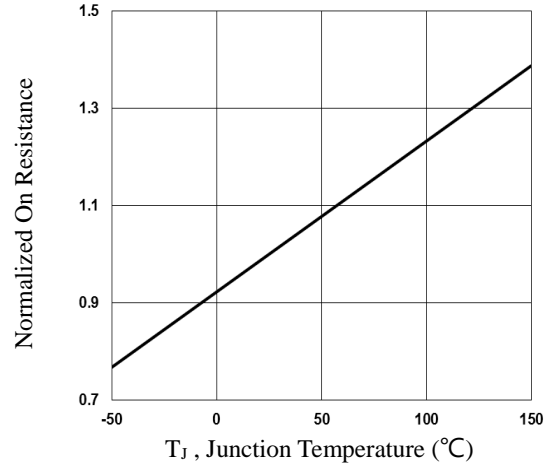


Fig.2 Normalized $R_{DS(on)}$ vs. T_j

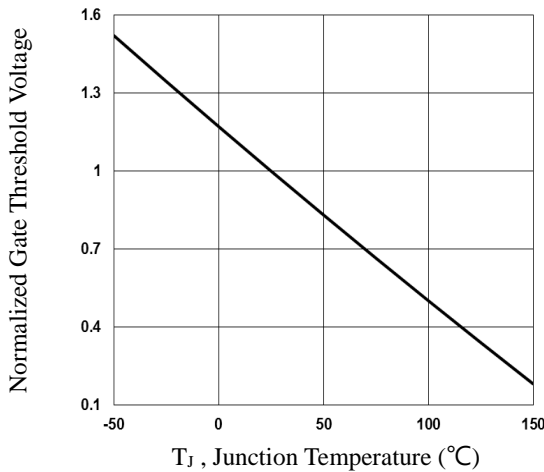


Fig.3 Normalized V_{th} vs. T_j

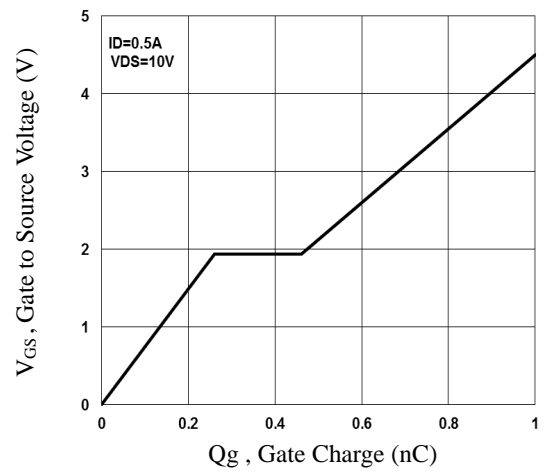


Fig.4 Gate Charge Waveform

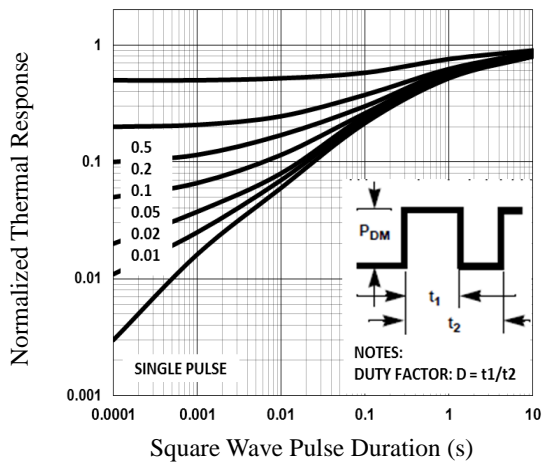


Fig.5 Normalized Transient Response

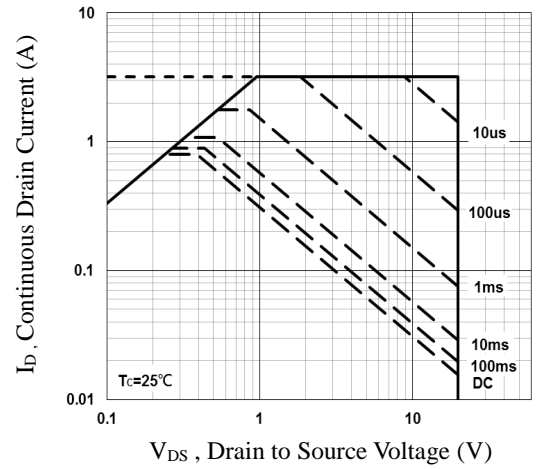


Fig.6 Maximum Safe Operation Area

RATING AND CHARACTERISTIC CURVES

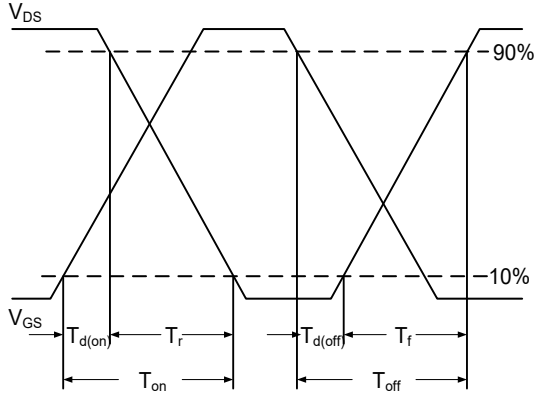


Fig.7 Switching Time Waveform

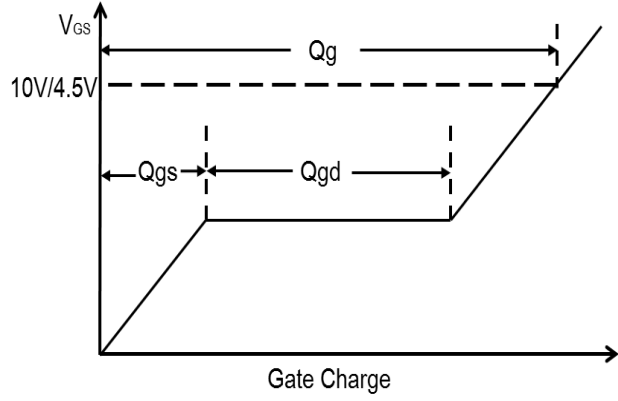


Fig.8 Gate Charge Waveform

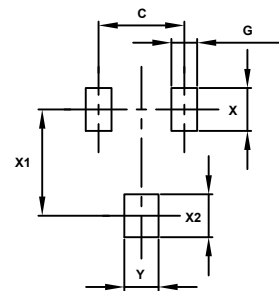
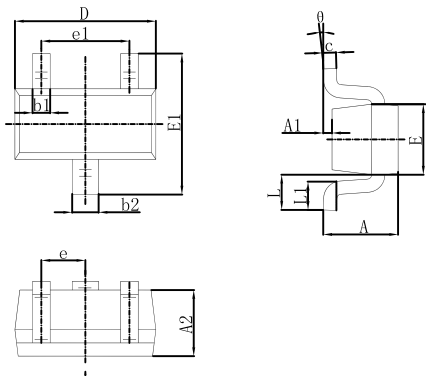
Soldering parameters

Reflow Condition		Pb-Free assembly (see as below)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150 °C
	-Temperature Max ($T_{s(max)}$)	+200 °C
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3 °C/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3 °C/sec. Max
Reflow	-Temperature (T_L) (Liquid us)	+217 °C
	-Temperature (t_L)	60-150 secs.
Peak Temp (T_P)		+260(+0/-5) °C
Time within 5 °C of actual Peak Temp (t_p)		30 secs. Max
Ramp-down Rate		6 °C/sec. Max
Time 25 °C to Peak Temp (T_P)		8 min. Max
Do not exceed		+260 °C



Package Dimensions & Suggested Pad Layout

SOT-523

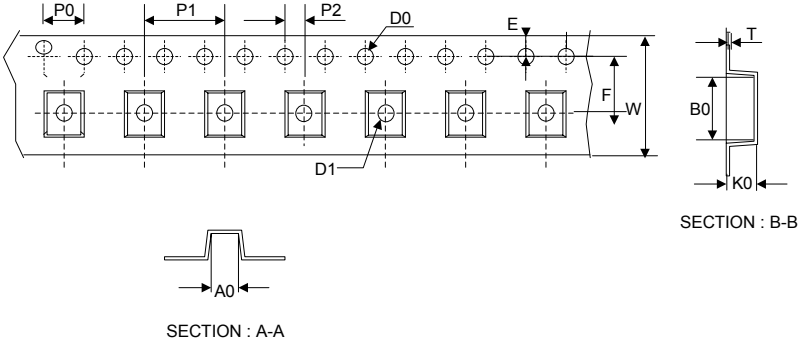
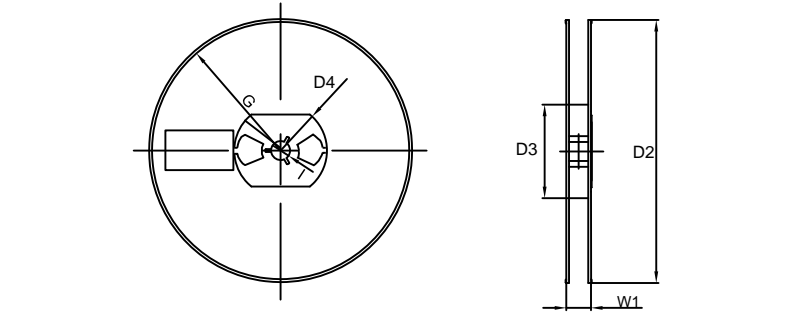


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.900	0.028	0.035
A1	0.000	0.100	0.000	0.004
A2	0.700	0.800	0.028	0.031
b1	0.150	0.250	0.006	0.010
b2	0.250	0.350	0.010	0.014
c	0.100	0.200	0.004	0.008
D	1.500	1.700	0.059	0.067
E	0.700	0.900	0.028	0.035
E1	1.450	1.750	0.057	0.069
e	0.500 TYP.		0.020 TYP.	
e1	0.900	1.100	0.035	0.043
L	0.400 REF.		0.016 REF.	
L1	0.260	0.460	0.010	0.018
theta	0°	8°	0°	8°

Dimensions	Value (in mm)
C	1.00
G	0.45
X	0.70
X1	1.40
X2	0.70
Y	0.60

Dimensions in inches and (millimeters)

Tape & reel specification

Tape	Symbol	Dimension (mm)	
	P0	4.00±0.20	
	P1	4.00±0.20	
	P2	2.00±0.20	
	D0	1.55±0.20	
	D1	0.65±0.20	
	E	1.55±0.25	
	F	3.60±0.20	
	W	8.00±0.20	
	A0	2.10±0.20	
	B0	2.20±0.20	
	K0	1.10±0.20	
	T	0.20±0.20	
	<p>7" Reel</p> 	D2	177.0±5.0
		D3	55Min.
		D4	R24.6±2.0
G		R82.0±2.0	
I		13.0±2.0	
W1		10.20±3.0	
Quantity: 3000PCS			