



# 60V N-Channel MOSFETs

## General Description

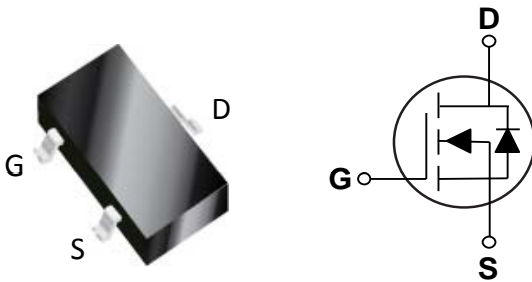
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

$BV_{DSS}$	$R_{DS(ON)}$	$I_D$
60 V	75 mΩ	3.2 A

## Features

- $R_{DS(ON)} \leq 75m\Omega @ V_{GS}=10V$
- Improved dv/dt capability
- Fast switching
- Green Device Available

SOT-23S Pin Configuration



## Applications

- Motor Drive
- Power Tools
- LED Lighting

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

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	60	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current - Continuous ( $T_c=25^\circ\text{C}$ )	3.2	A
	Drain Current - Continuous ( $T_c=100^\circ\text{C}$ )	2	A
$I_{DM}$	Drain Current - Pulsed (NOTE 1)	12.8	A
$P_D$	Power Dissipation ( $T_c=25^\circ\text{C}$ )	1.56	W
	Power Dissipation - Derate above $25^\circ\text{C}$	0.012	W/ $^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-50 to 150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-50 to 150	$^\circ\text{C}$
Marking Code		N	

## Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	---	80	$^\circ\text{C}/\text{W}$

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60	---	---	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=60V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	$\mu A$
		$V_{DS}=48V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	10	$\mu A$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA

**On Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=3A$	---	60	75	m $\Omega$
		$V_{GS}=4.5V, I_D=1.5A$	---	70	90	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	1.8	2.5	V
gfs	Forward Transconductance	$V_{DS}=10V, I_D=3A$	---	7	---	S

**Dynamic and switching Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$Q_g$	Total Gate Charge	$V_{DS}=48V, V_{GS}=10V, I_D=3A$ (NOTE 2、3)	---	9.3	14	nC
$Q_{gs}$	Gate-Source Charge		---	2.1	4	
$Q_{gd}$	Gate-Drain Charge		---	1.8	4	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=30V, V_{GS}=10V, R_G=3.3\Omega$ , $I_D=1A$ (NOTE 2、3)	---	2.9	6	nS
$T_r$	Rise Time		---	9.5	18	
$T_{d(off)}$	Turn-Off Delay Time		---	18.4	35	
$T_f$	Fall Time		---	5.3	10	
$C_{iss}$	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, F=1\text{MHz}$	---	500	725	pF
$C_{oss}$	Output Capacitance		---	45	65	
$C_{riss}$	Reverse Transfer Capacitance		---	16	30	
$R_g$	Gate resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	---	2	4	$\Omega$

**Drain-Source Diode Characteristics and Ratings**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current	$V_G=V_D=0V$ , Force Current	---	---	3.2	A
$I_{SM}$	Pulsed Source Current		---	---	6.4	A
$V_{SD}$	Diode Forward Voltage	$V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$	---	---	1	V
$t_{rr}$	Reverse Recovery Time (NOTE 2)	$V_{GS}=30V, I_S=1A$ ,	---	23.2	---	nS
$Q_{rr}$	Reverse Recovery Charge (NOTE 2)	$di/dt=100A/\mu s, T_J=25^\circ\text{C}$	---	14.3	---	nC

## NOTES :

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



Characteristics Curves

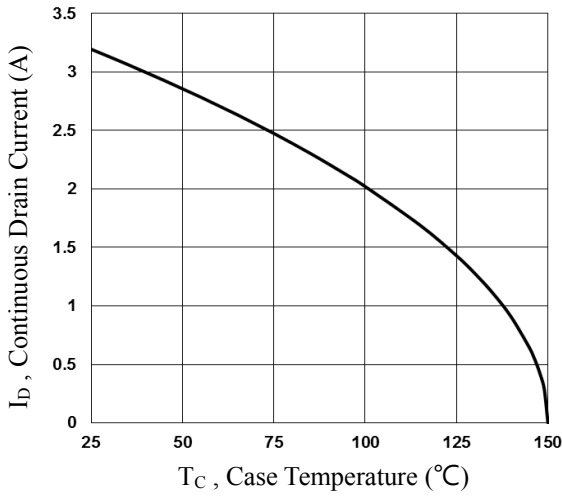


Fig.1 Continuous Drain Current vs.  $T_C$

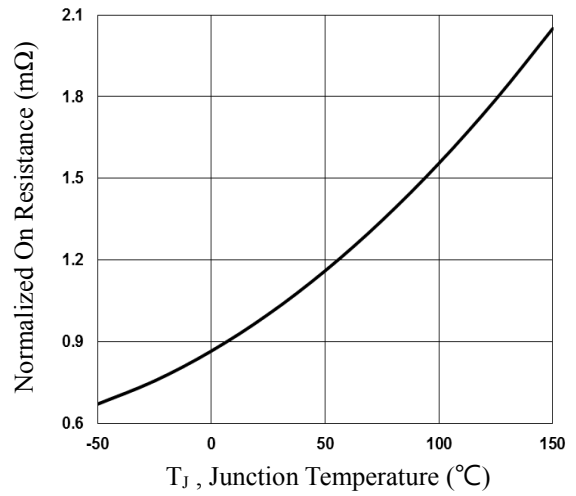


Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$

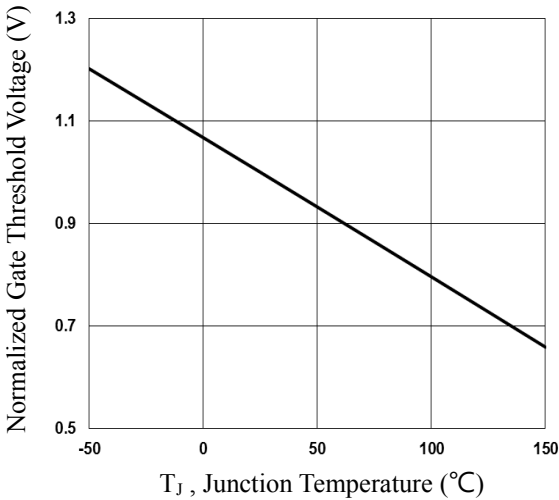


Fig.3 Normalized  $V_{th}$  vs.  $T_J$

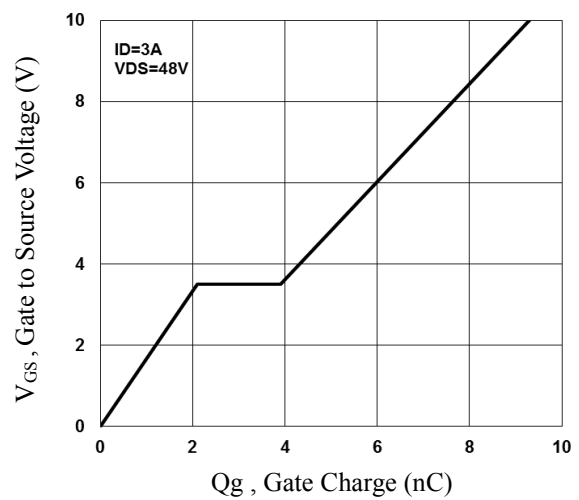


Fig.4 Gate Charge Waveform

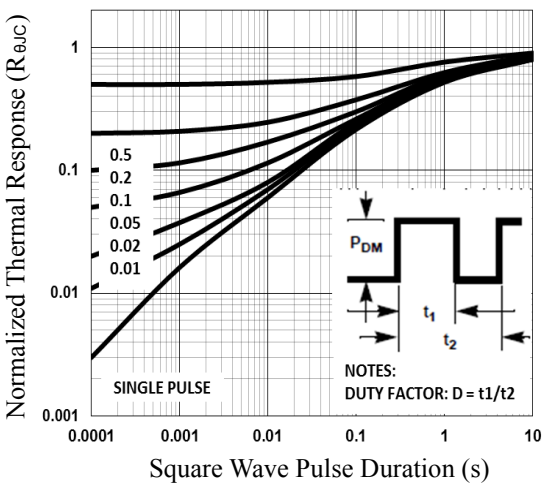


Fig.5 Normalized Transient Response

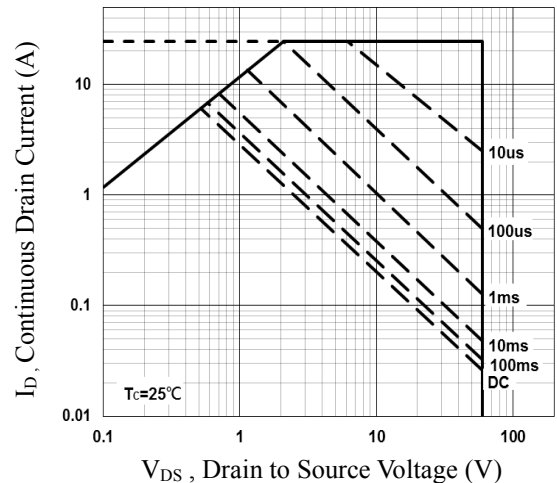


Fig.6 Maximum Safe Operation Area



Characteristics Curves

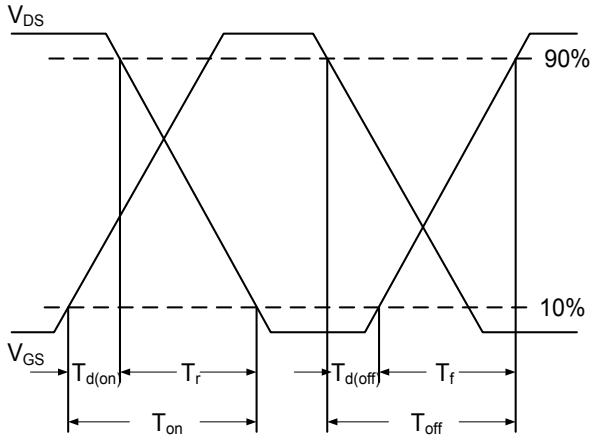


Fig.7 Switching Time Waveform

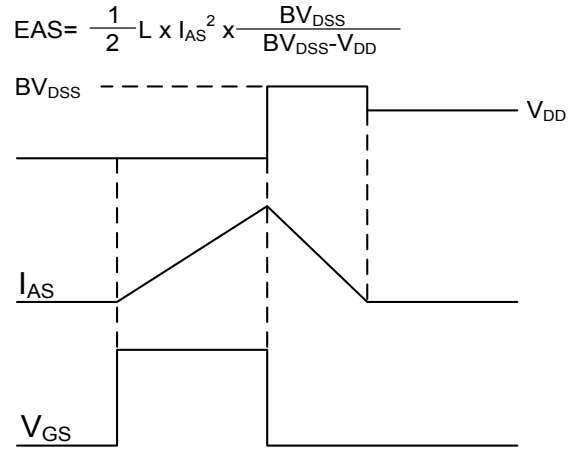
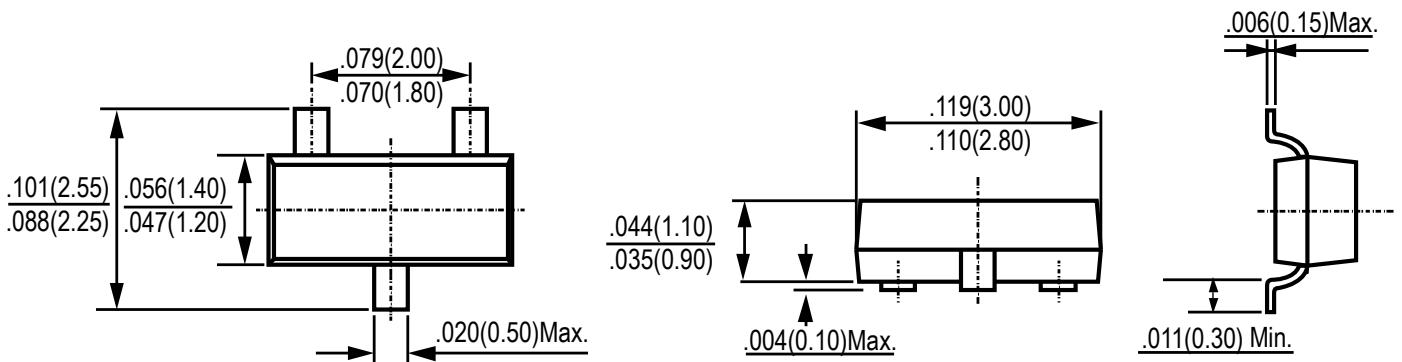


Fig.8 EAS Waveform

Package Outline Dimensions



SOT-23S

Dimensions in inches and (millimeters)



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