MOSPEC

30V N-Channel MOSFETs
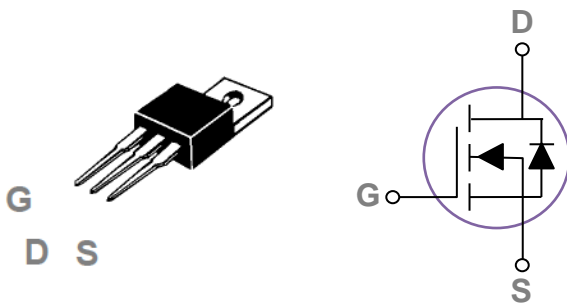
176N30A

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.

BVDSS	RDSON	ID
30V	3mΩ	176A

Features

- *30V, 176A, RDS(ON) =3mΩ@VGS = 10V*
- *Improved dv/dt capability*
- *Fast switching*
- *100% EAS Guaranteed*
- *Green Device Available*

Applications

- *MB / VGA / Vcore*
- *POL Applications*
- *SMPS 2nd SR*

TO220 Pin Configuration

Absolute Maximum Ratings Tc=25℃ unless otherwise noted

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	30	V
V_{GS}	Gate-Source Voltage	±20	V
I_D	Drain Current – Continuous (T_C=25℃)	176	A
	Drain Current – Continuous (T_C=100℃)	111	A
I_{DM}	Drain Current – Pulsed[1]	704	A
EAS	Single Pulse Avalanche Energy[2]	180	mJ
IAS	Single Pulse Avalanche Current[2]	60	A
P_D	Power Dissipation (T_C=25℃)	168	W
	Power Dissipation – Derate above 25℃	1.34	W/℃
T_{STG}	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	62	℃/W
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	0.74	℃/W

Electrical Characteristics (T$_J$=25 ℃, unless otherwise noted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV$_{DSS}$	Drain-Source Breakdown Voltage	V$_{GS}$=0V , I$_D$=250uA	30	---	---	V
△BV$_{DSS}$/△T$_J$	BV$_{DSS}$ Temperature Coefficient	Reference to 25℃ , I$_D$=1mA	---	0.03	---	V/℃
I$_{DSS}$	Drain-Source Leakage Current	V$_{DS}$=30V , V$_{GS}$=0V , T$_J$=25℃	---	---	1	uA
		V$_{DS}$=24V , V$_{GS}$=0V , T$_J$=125℃	---	---	10	uA
I$_{GSS}$	Gate-Source Leakage Current	V$_{GS}$=±20V , V$_{DS}$=0V	---	---	±100	nA

On Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R$_{DS(ON)}$	Static Drain-Source On-Resistance[3]	V$_{GS}$=10V , I$_D$=30A	---	2.4	3	mΩ
		V$_{GS}$=4.5V , I$_D$=15A	---	3.2	4	mΩ
V$_{GS(th)}$	Gate Threshold Voltage	V$_{GS}$=V$_{DS}$, I$_D$ =250uA	1.2	1.6	2.5	V
△V$_{GS(th)}$	V$_{GS(th)}$ Temperature Coefficient		---	-5	---	mV/℃
gfs	Forward Transconductance	V$_{DS}$=10V , I$_D$=2A	---	16	---	S

Dynamic Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q$_g$	Total Gate Charge[3,4]	V$_{DS}$=15V , V$_{GS}$=4.5V , I$_D$=24A	---	40	75	nC
		V$_{DS}$=15V , V$_{GS}$=10V , I$_D$=24A	---	82	160	
Q$_{gs}$	Gate-Source Charge[3,4]		---	12	24	
Q$_{gd}$	Gate-Drain Charge[3,4]		---	17	35	
T$_{d(on)}$	Turn-On Delay Time[3,4]	V$_{DD}$=15V , V$_{GS}$=10V , R$_G$=1Ω I$_D$=1A	---	20	40	ns
T$_r$	Rise Time[3,4]		---	32	60	
T$_{d(off)}$	Turn-Off Delay Time[3,4]		---	75	130	
T$_f$	Fall Time[3,4]		---	28	55	
C$_{iss}$	Input Capacitance	V$_{DS}$=25V , V$_{GS}$=0V , F=1MHz	---	4800	8000	pF
C$_{oss}$	Output Capacitance		---	735	1300	
C$_{rss}$	Reverse Transfer Capacitance		---	420	800	
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, F=1MHz	---	1.6	3.5	Ω

Drain-Source Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I$_S$	Continuous Source Current	V$_G$=V$_D$=0V , Force Current	---	---	176	A
I$_{SM}$	Pulsed Source Current[3]		---	---	352	A
V$_{SD}$	Diode Forward Voltage[3]	V$_{GS}$=0V , I$_S$=1A , T$_J$=25℃	---	---	1	V
t$_{rr}$	Reverse Recovery Time	V$_R$=30V, I$_S$=10A	---	140	---	ns
Q$_{rr}$	Reverse Recovery Charge	di/dt=100A/µs, T$_J$=25℃	---	300	---	nC

Note :
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V$_{DD}$=25V,V$_{GS}$=10V,L=0.1mH,I$_{AS}$=60A.,R$_G$=25Ω,Starting T$_J$=25℃.
3. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
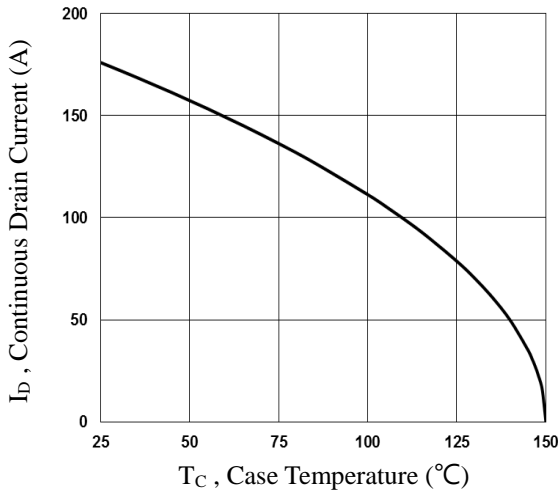4. Essentially independent of operating temperature.
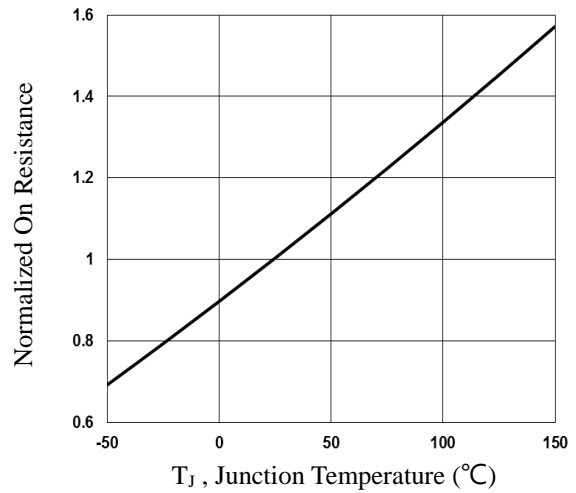
Fig.1   Continuous Drain Current vs. Tc
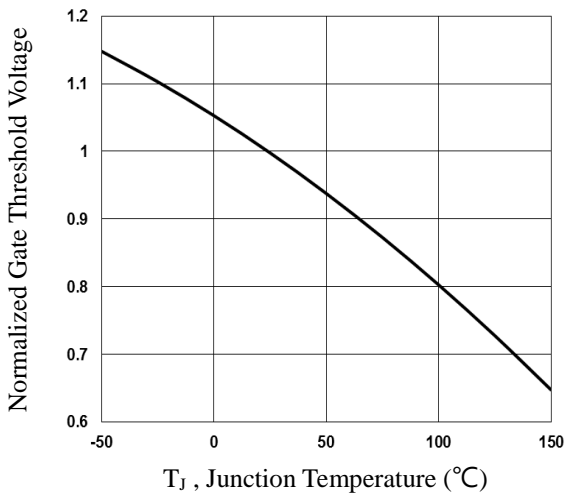
Fig.2   Normalized RDSON vs. TJ

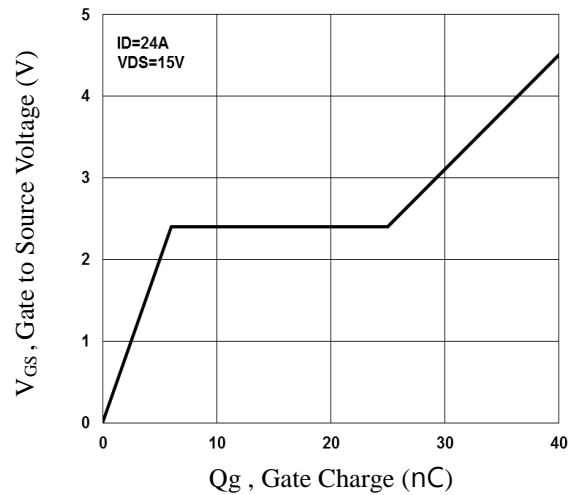Fig.3   Normalized Vth vs. TJ

Fig.4   Gate Charge Waveform
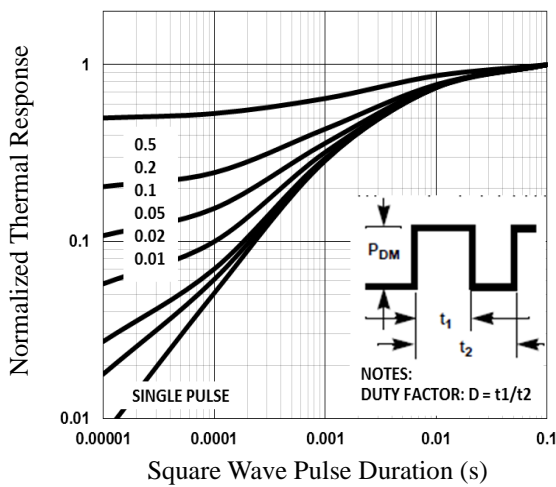
Fig.5   Normalized Transient Impedance
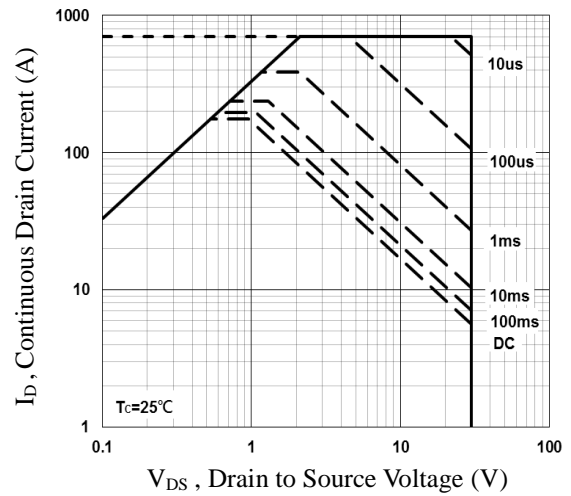
Fig.6   Maximum Safe Operation Area

$$EAS = \frac{1}{2}L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS}-V_{DD}}$$
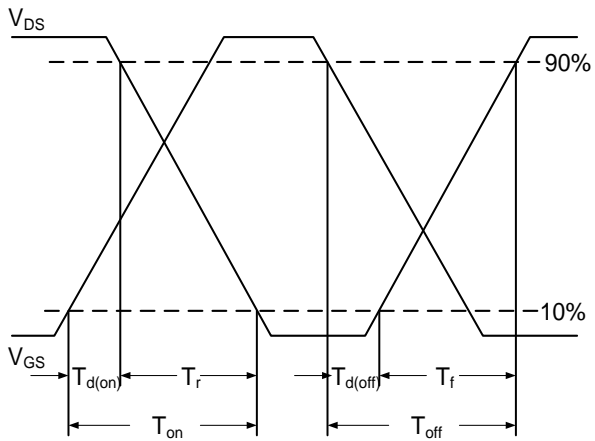
Fig.7   Switching Time Waveform
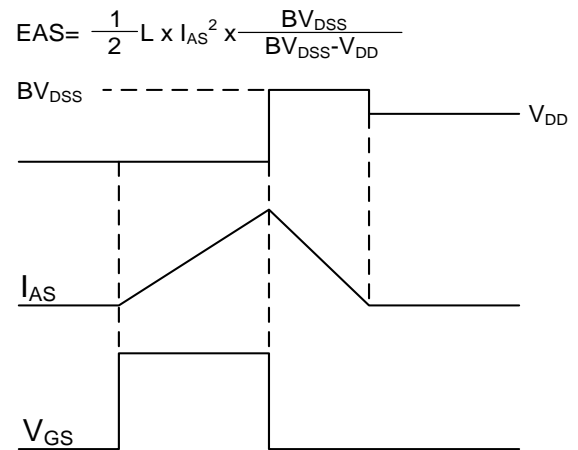
Fig.8   EAS Waveform

TO220 PACKAGE INFORMATION
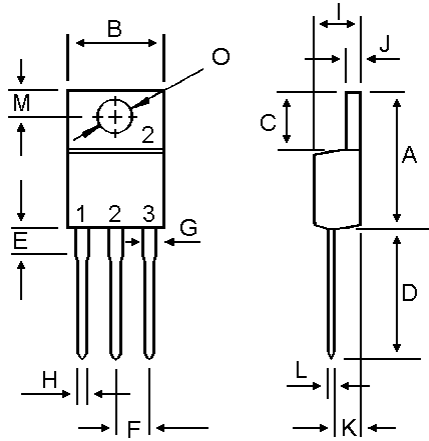
DIM	MILLIMETERS	
	MIN	MAX
A	14.68	16.00
B	9.78	10.42
C	5.02	6.60
D	13.00	14.62
E	3.10	4.19
F	2.41	2.67
G	1.10	1.67
H	0.69	1.01
I	4.22	4.98
J	1.14	1.40
K	2.20	3.30
L	0.28	0.61
M	2.48	3.00
O	3.50	4.00

Notice