



30V N-Channel MOSFETs

General Description

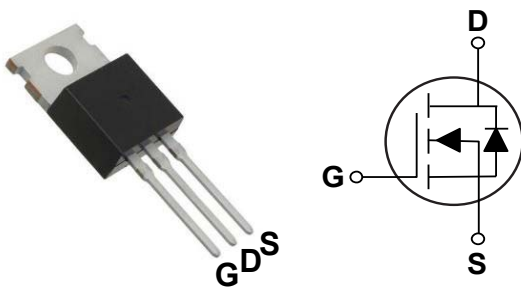
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

BV_{DSS}	$R_{DS(ON)}$	I_D
30 V	4 m Ω	140 A

Features

- $R_{DS(ON)} \leq 4m\Omega @ V_{GS}=10V$
- Improved dv/dt capability
- Fast switching
- Green Device Available

TO-220 Pin Configuration



Applications

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

Absolute Maximum Ratings $T_C=25^\circ\text{C}$ 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 ($T_C=25^\circ\text{C}$)	140	A
	Drain Current - Continuous ($T_C=100^\circ\text{C}$)	89	A
I_{DM}	Drain Current - Pulsed (NOTE 1)	560	A
EAS	Single Pulse Avalanche Energy (NOTE 2)	125	mJ
IAS	Single Pulse Avalanche Current (NOTE 2)	50	A
P_D	Power Dissipation ($T_C=25^\circ\text{C}$)	125	W
	Power Dissipation - Derate above 25°C	1	W/ $^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 175	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to 175	$^\circ\text{C}$
Marking Code		DP3904	

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	---	62	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	1	$^\circ\text{C}/\text{W}$

**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	$V_{GS}=0V, I_D=250\mu A$	30	---	---	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=30V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=24V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA

On Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$R_{DS(ON)}$	Static Drain-Source On-Resistance (NOTE 3)	$V_{GS}=10V, I_D=24A$	---	---	4	m Ω
		$V_{GS}=4.5V, I_D=12A$	---	---	6	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	1.6	2.5	V
gfs	Forward Transconductance	$V_{DS}=10V, I_D=10A$	---	16	---	S

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q_g	Total Gate Charge ($V_{GS}=4.5V$) (NOTE 3 & 4)	$V_{DS}=15V, V_{GS}=4.5V, I_D=24A$	---	24	---	nC
			---	47	---	
Q_{gs}	Gate-Source Charge	$V_{DS}=15V, V_{GS}=10V, I_D=24A$ (NOTE 3 & 4)	---	5.8	---	nC
Q_{gd}	Gate-Drain Charge		---	10	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=15V, V_{GS}=10V, R_G=3.3\Omega, I_D=15A$ (NOTE 3 & 4)	---	12.6	---	ns
T_r	Rise Time		---	19.5	---	
$T_{d(off)}$	Turn-Off Delay Time		---	42.8	---	
T_f	Fall Time		---	13.2	---	
C_{iss}	Input Capacitance	$V_{DS}=25V, V_{GS}=0V, F=1\text{MHz}$	---	2200	---	pF
C_{oss}	Output Capacitance		---	280	---	
C_{rss}	Reverse Transfer Capacitance		---	177	---	
Rg	Gate resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	---	2	---	Ω

Guaranteed Avalanche Energy

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy	$V_{DD}=25V, L=0.1\text{mH}, I_{AS}=24A$	31	---	---	mJ

Drain-Source Diode Characteristics and Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	$V_G=V_D=0V, \text{Force Current}$	---	---	140	A
I_{SM}	Pulsed Source Current (NOTE 3)		---	---	280	A
V_{SD}	Diode Forward Voltage (NOTE 3)	$V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$	---	---	1	V
t_{rr}	Reverse Recovery Time	$V_R=30V, I_S=10A,$	---	130	---	ns
Q_{rr}	Reverse Recovery Charge	$di/dt=100A/\mu s, T_J=25^\circ\text{C}$	---	240	---	nC

NOTES :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $V_{DD}=25V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=50A, R_G=25\Omega, \text{Starting } T_J=25^\circ\text{C}$.
3. The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
4. Essentially independent of operating temperature.



Characteristics Curves

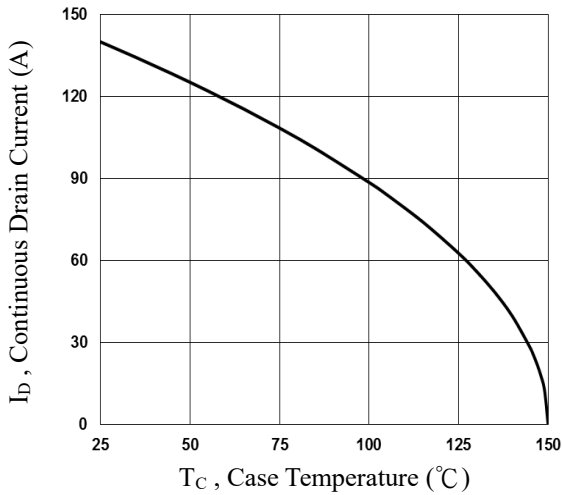


Fig.1 Continuous Drain Current vs. T_c

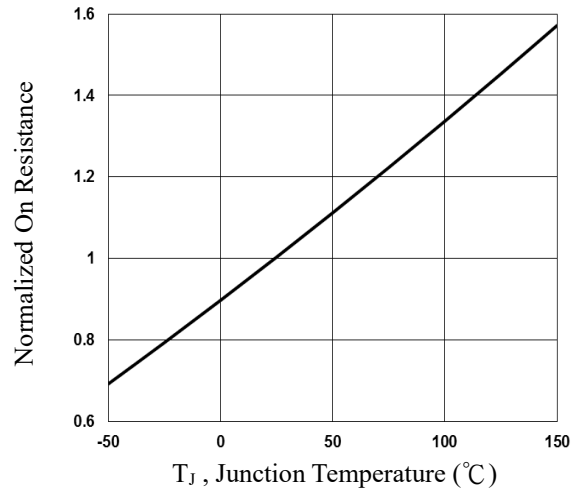


Fig.2 Normalized $R_{DS(on)}$ vs. T_j

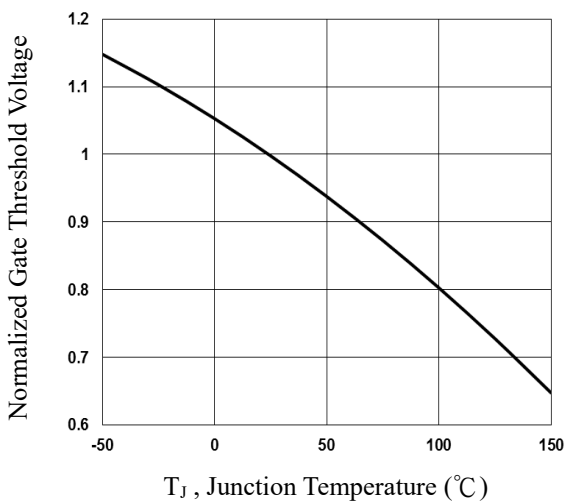


Fig.3 Normalized V_{th} vs. T_j

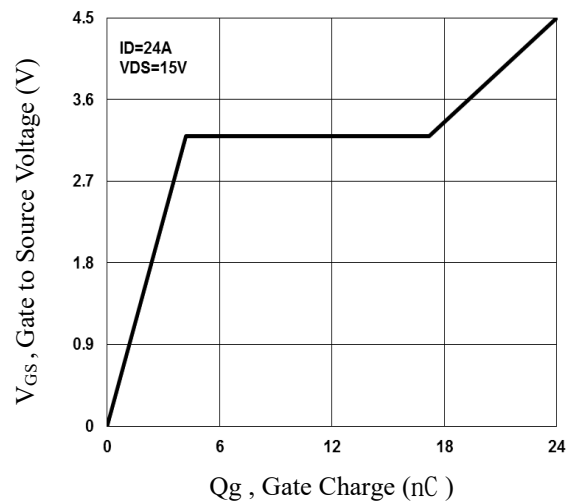


Fig.4 Gate Charge Waveform

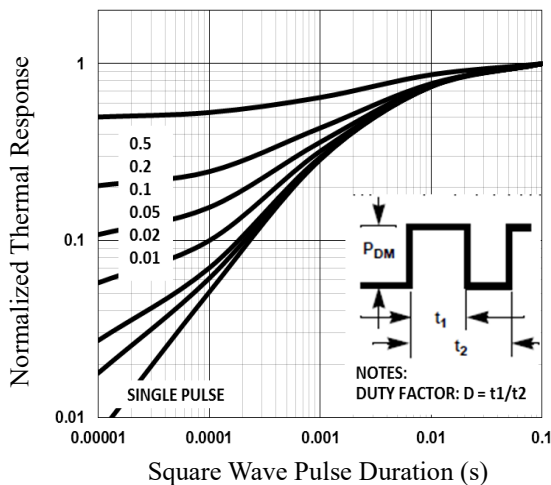


Fig.5 Normalized Transient Impedance

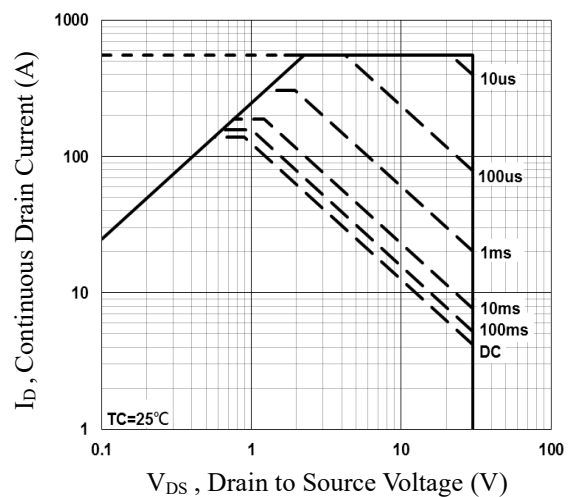


Fig.6 Maximum Safe Operation Area



Characteristics Curves

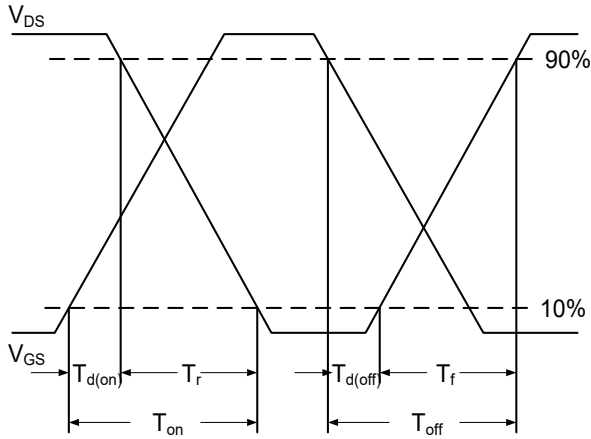
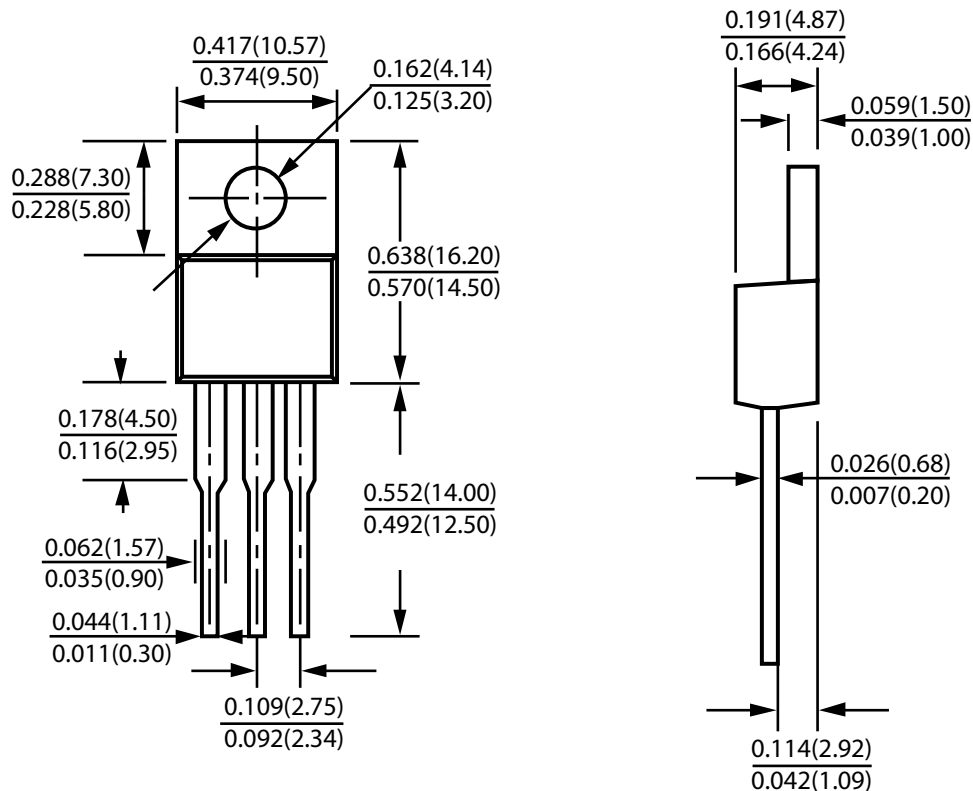


Fig.7 Switching Time Waveform

Package Outline Dimensions



TO-220

Dimensions in inches and (millimeters)



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