



## 600V N-Channel MOSFETs

### General Description

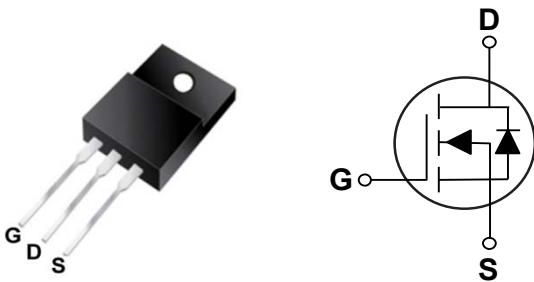
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

$BV_{DSS}$	$R_{DS(ON)}$	$I_D$
600 V	380 m $\Omega$	9.1 A

### Features

- $R_{DS(ON)} \leq 380m\Omega @ V_{GS}=10V$
- Improved dv/dt Capability
- Fast Switching
- Green Device Available

TO-220F Pin Configuration



### Applications

- LED Power Supply
- Electronic Ballast
- High Frequency Switching Mode Power Supply

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

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	600	V
$V_{GS}$	Gate-Source Voltage	$\pm 30$	V
$I_D$	Drain Current – Continuous ( $T_C=25^\circ\text{C}$ )	9.1	A
$I_{DM}$	Drain Current – Pulsed (NOTE 1)	33	A
EAS	Single Pulse Avalanche Energy (NOTE 2)	280	mJ
$P_D$	Power Dissipation ( $T_C=25^\circ\text{C}$ )	32	W
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
Marking Code		NAA380	

### Thermal Characteristics

Symbol	Parameter	Rating	Unit
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	80	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	3.92	$^\circ\text{C/W}$

**Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)****Off Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	600	---	---	V
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V	---	---	10	uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V	---	---	±100	nA

**On Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =7A	---	---	380	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	2.5	---	4.0	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =20V, I <sub>D</sub> =7A	---	8.1	---	S

**Dynamic and switching Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =520V, V <sub>GS</sub> =10V, I <sub>D</sub> =11A (NOTE 3、4)	---	25	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	6	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	8.7	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =380V, R <sub>G</sub> =6.8Ω, I <sub>D</sub> =5.5A, V <sub>GS</sub> =10V (NOTE 3、4)	---	9	---	nS
T <sub>r</sub>	Rise Time		---	4	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	41	---	
T <sub>f</sub>	Fall Time		---	4.6	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =50V, V <sub>GS</sub> =0V, F=1MHz	---	1035	---	pF
C <sub>oss</sub>	Output Capacitance		---	89	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	4.5	---	
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, F=1MHz	---	2.1	---	Ω

**Drain-Source Diode Characteristics and Ratings**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Body Diode Current		---	---	9.1	A
I <sub>SM</sub>	Pulsed Diode Forward Current		---	---	29	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =9A	---	---	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> =0V, I <sub>F</sub> =I <sub>S</sub> , dI <sub>F</sub> /dt=100A/us	---	247	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge		---	2.4	---	uC

**NOTES :**

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V<sub>GS</sub>=10V, V<sub>DD</sub>=50V, R<sub>G</sub>=25Ω.
3. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
4. Essentially independent of operating temperature.



### Characteristics Curves

FIG. 1- Power Dissipation

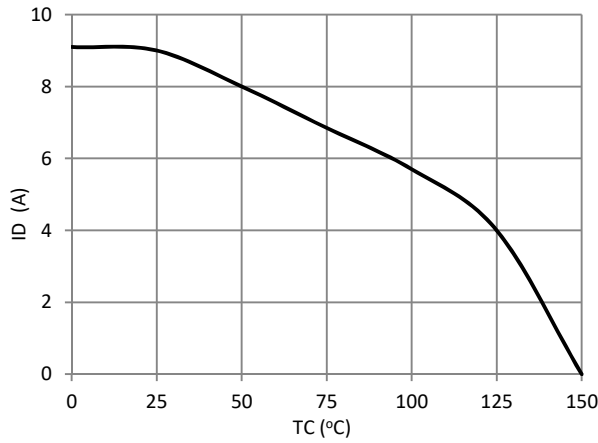


FIG. 2-  $BV_{DSS}$  (Normalized) vs.  $T_J$

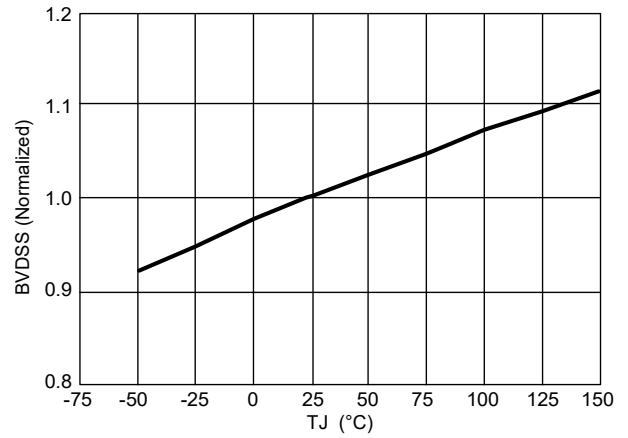


FIG. 3-  $R_{DS(ON)}$  vs.  $I_D$

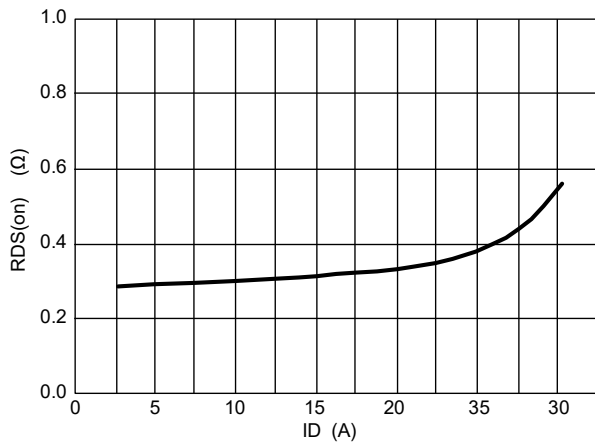


FIG. 4- Gate Charge Characteristics

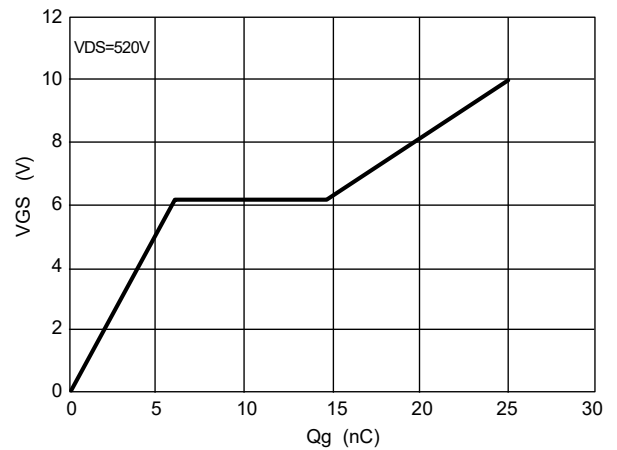


FIG. 5- Safe Operation Area

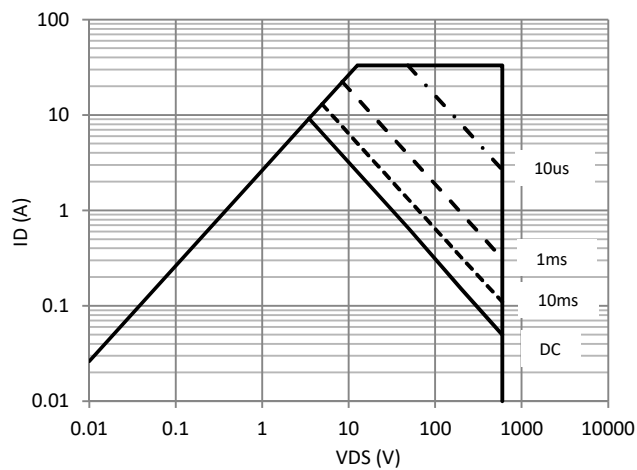
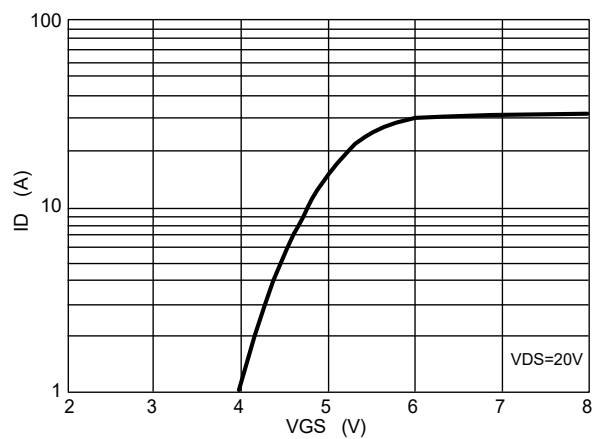


FIG. 6- Transfer Characteristics





**Characteristics Curves**

FIG. 7- Switching Time Waveform

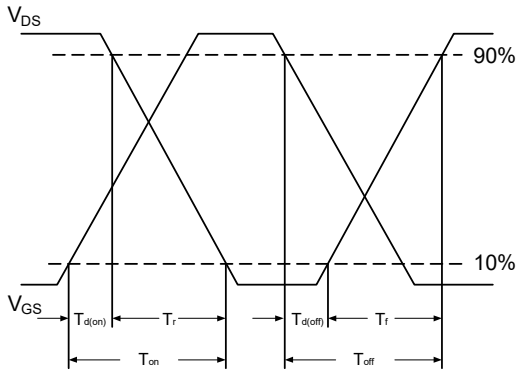
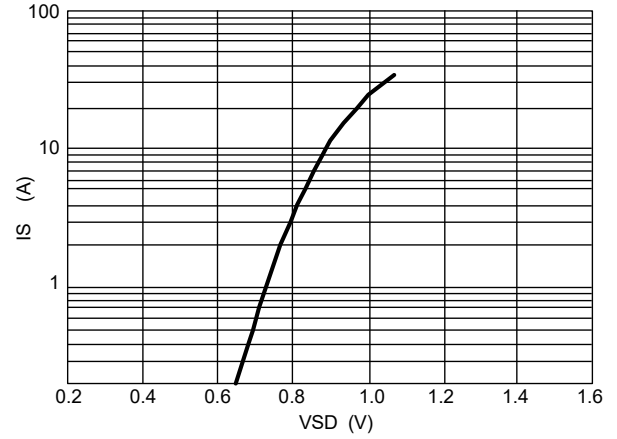
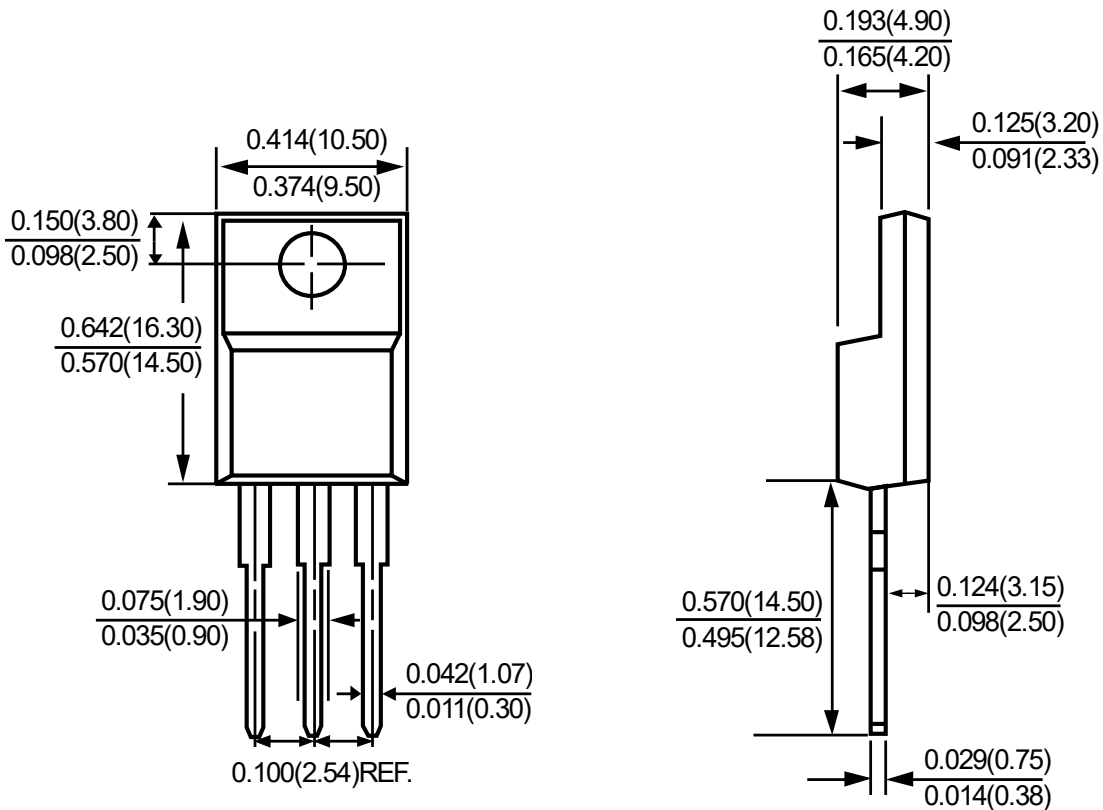


FIG. 8- Diode Forward Characteristics



**Package Outline Dimensions**



**TO-220F**

Dimensions in inches and (millimeters)



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