



650V N-Channel MOSFETs

General Description

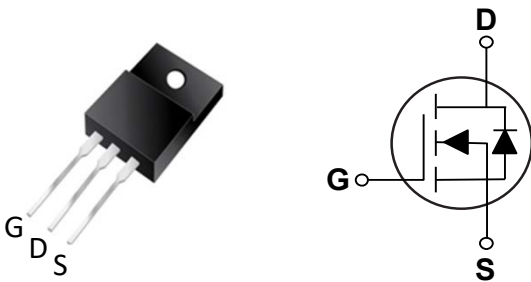
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

BV_{DSS}	$R_{DS(ON)}$	I_D
650 V	1.2 Ω	7 A

Features

- $R_{DS(ON)} \leq 1.2m\Omega @ V_{GS}=10V$
- Improved dv/dt Capability
- Fast Switching
- Green Device Available

TO-220F Pin Configuration



Applications

- Uninterruptible Power Supply(UPS)
- Power Factor Correction (PFC)

Absolute Maximum Ratings $T_C=25^\circ C$ unless otherwise noted

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	650	V
V_{GS}	Gate-Source Voltage	± 30	V
I_D	Drain Current – Continuous ($T_C=25^\circ C$)	7	A
I_{DM}	Drain Current – Pulsed (NOTE 1)	28	A
EAS	Single Pulse Avalanche Energy (NOTE 2)	247	mJ
P_D	Power Dissipation ($T_C=25^\circ C$)	32.9	W
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
Marking Code		NAB12H	

Thermal Characteristics

Symbol	Parameter	Rating	Unit
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	13.3	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction to Case	3.8	$^\circ C/W$



Electrical Characteristics (T_J=25°C, unless otherwise noted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	650	---	---	V
I _{DSS}	Drain-Source Leakage Current	V _{DS} =650V, V _{GS} =0V	---	---	1	uA
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±30V, V _{DS} =0V	---	---	±100	nA

On Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =3.5A	---	---	1.2	Ω
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	2.0	---	4.0	V

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q _g	Total Gate Charge	V _{DD} =520V, V _{GS} =10V, I _D =7A	---	22	---	nC
Q _{gs}	Gate-Source Charge		---	4.3	---	
Q _{gd}	Gate-Drain Charge		---	13	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =325V, R _G =25Ω, I _D =7A	---	12	---	nS
T _r	Rise Time		---	26	---	
T _{d(off)}	Turn-Off Delay Time		---	29	---	
T _f	Fall Time		---	27	---	
C _{iss}	Input Capacitance	V _{DS} =25V, V _{GS} =0V, F=1MHz	---	1000	---	pF
C _{oss}	Output Capacitance		---	101	---	
C _{riss}	Reverse Transfer Capacitance		---	1.5	---	

Drain-Source Diode Characteristics and Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Body Diode Current		---	---	7	A
I _{SM}	Pulsed Diode Forward Current		---	---	28	A
V _{SD}	Diode Forward Voltage	V _{GS} =0V, I _S =7A	---	---	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} =0V, I _S =7A,	---	389	---	nS
Q _{rr}	Reverse Recovery Charge	dI _F /dt=100A/us	---	2.04	---	uC

NOTES :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V_{DD}=50V, I_{AS}=4.5A, R_G=25Ω.
3. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
4. Essentially independent of operating temperature.



Characteristics Curves

FIG. 1- I_D vs. T_C

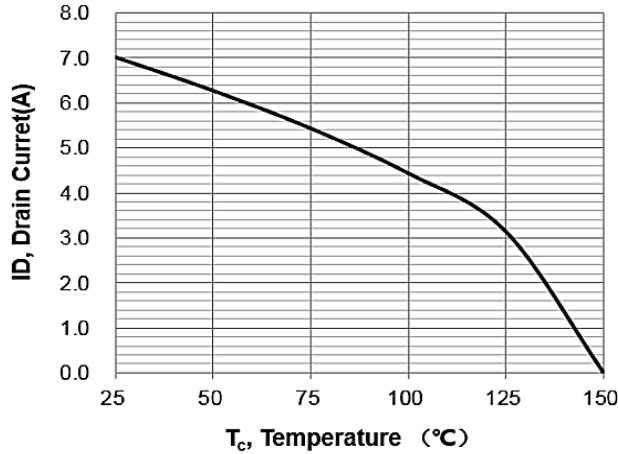


FIG. 2- Normalized BV_{DSS} vs. T_J

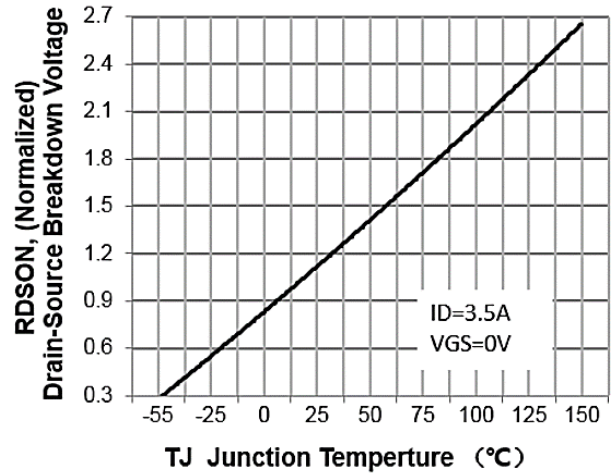


FIG. 3- $R_{DS(ON)}$ vs. I_D

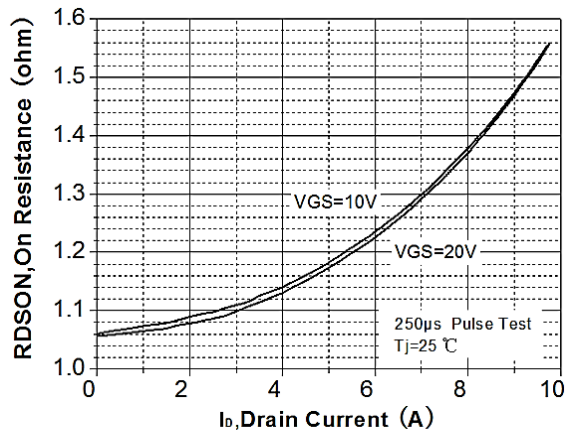


FIG. 4- Gate Charge Characteristics

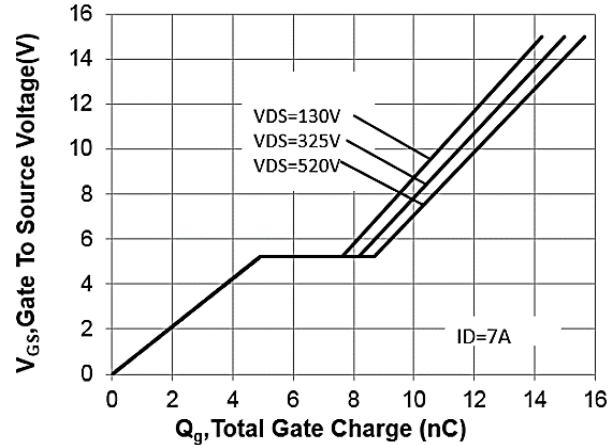


FIG. 5- Transient Thermal Response Curve

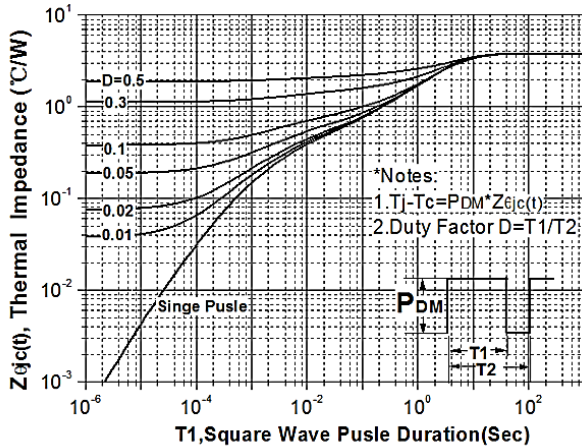
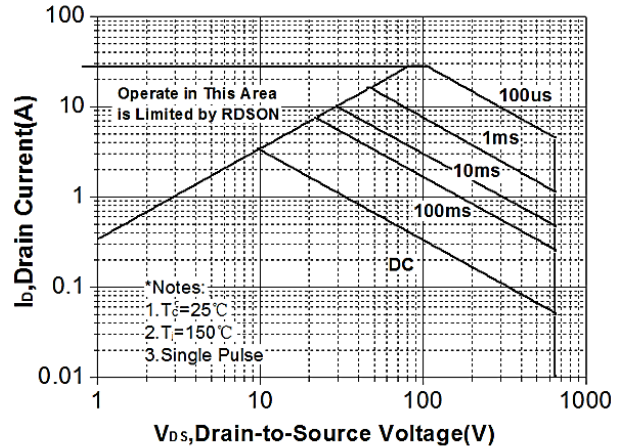
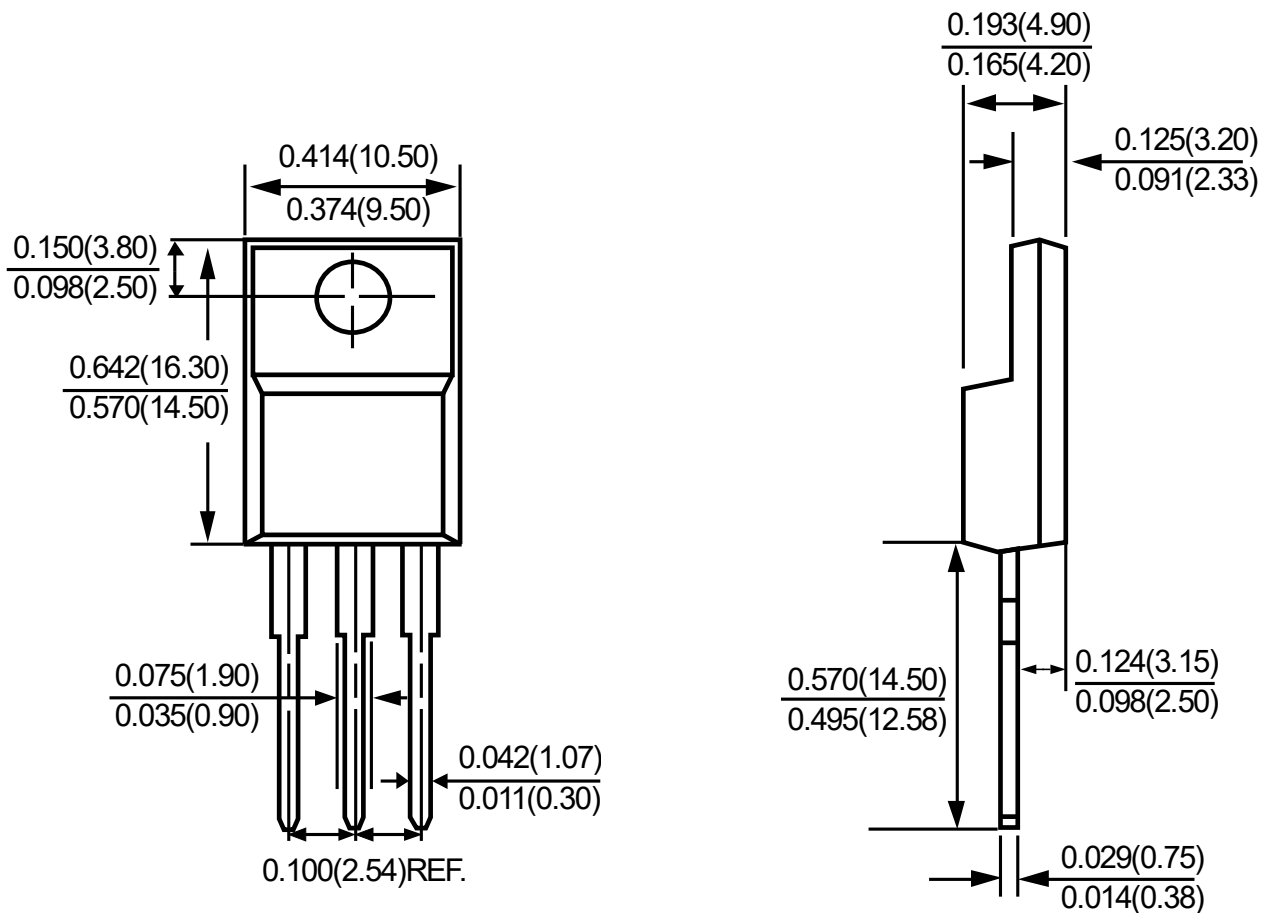


FIG. 6- Maximum Safe Operation Area





Package Outline Dimensions



TO-220F

Dimensions in inches and (millimeters)



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