



650 V E-mode GaN Transistor

General Description

The NKGNAB190 is an enhancement mode GaN-on-Silicon power transistor.

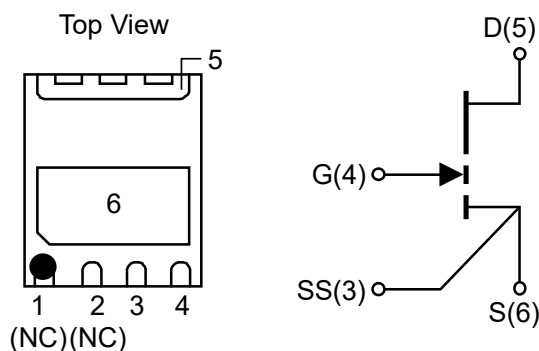
The properties of GaN allow for high current, high voltage breakdown and high switching frequency.

BV_{DSS}	$R_{DS(ON)}$	I_D
650 V	190 mΩ	11 A

Features

- $R_{DS(ON)} \leq 190m\Omega @ V_{GS}=6V$
- High Switching Frequency (> 1 MHz)
- Fast Switching
- Reverse Conduction Capability
- Zero Reverse Recovery Loss

DFN5X6A Pin Configuration



Applications

- Power Adapters
- LED Lighting Drivers
- Fast Battery Charging
- Power Factor Correction
- Appliance Motor Drives
- Wireless Power Transfer
- Industrial Power Supplies

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	-10 to +7	V
I_D	Drain Current - Continuous ($T_C=25^\circ C$)	11	A
	Drain Current - Continuous ($T_C=100^\circ C$)	7.2	A
I_{DM}	Drain Current - Pulsed (Pulse width 10 μs , $V_{GS}=6 V$) (NOTE 1)	19	A
T_J	Operating Junction Temperature Range	-50 to 150	$^\circ C$
T_{STG}	Storage Temperature Range	-50 to 150	$^\circ C$
Marking Code		GNAB190	

Thermal Characteristics

Symbol	Parameter	Typ.	Max	Unit
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	36.5	---	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction to Case — Bottom Side	1.4	---	$^\circ C/W$



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Electrical Characteristics (Typical values at $T_J=25^{\circ}\text{C}$, $V_{GS}=6\text{V}$ unless otherwise noted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{(BL)DSS}$	Drain-to-Source Blocking Voltage	$V_{GS}=0\text{V}$, $I_{DSS}\leq 18\mu\text{A}$	650	---	---	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=650\text{V}$, $V_{GS}=0\text{V}$, $T_J=25^{\circ}\text{C}$	---	---	18	μA
		$V_{DS}=650\text{V}$, $V_{GS}=0\text{V}$, $T_J=150^{\circ}\text{C}$	---	143	---	μA
I_{GSS}	Gate-Source Current	$V_{GS}=6\text{V}$, $V_{DS}=0\text{V}$	---	57	---	μA

On Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=6\text{V}$, $I_D=3.2\text{A}$, $T_J=25^{\circ}\text{C}$	---	150	190	m Ω
		$V_{GS}=6\text{V}$, $I_D=3.2\text{A}$, $T_J=150^{\circ}\text{C}$	---	380	---	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=2.4\text{mA}$	1.1	1.7	2.6	V

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q_g	Total Gate Charge	$V_{DS}=400\text{V}$, $V_{GS}=0$ to 6V	---	2.2	---	nC
Q_{gs}	Gate-Source Charge		---	0.7	---	
Q_{gd}	Gate-Drain Charge		---	0.7	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=400\text{V}$, $V_{GS}=0-6\text{V}$, $I_D=6\text{A}$, $R_{G(on)}=15\Omega$, $R_{G(off)}=2\Omega$, $L=300\mu\text{H}$, $L_P=9\text{nH}$ (NOTE 2)	---	5	---	nS
T_r	Rise Time		---	5	---	
$T_{d(off)}$	Turn-Off Delay Time		---	8	---	
T_f	Fall Time		---	10	---	
C_{iss}	Input Capacitance	$V_{DS}=400\text{V}$, $V_{GS}=0\text{V}$, $F=100\text{kHz}$	---	70	---	pF
C_{oss}	Output Capacitance		---	20	---	
C_{rss}	Reverse Transfer Capacitance		---	0.4	---	
R_g	Gate Resistance	$F=5\text{MHz}$	---	1.4	---	Ω

NOTES :

1. Defined by product design and characterization. Value is not tested to full current in production.
2. L_P = parasitic inductance.



Characteristics Curves

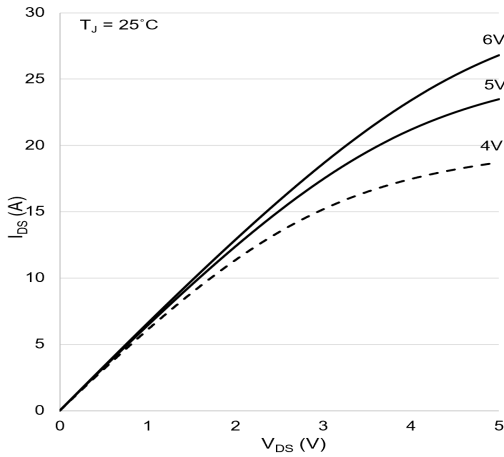


Fig 1 : Typical I_{DS} vs. V_{DS} @ $T_J = 25\text{ }^\circ\text{C}$

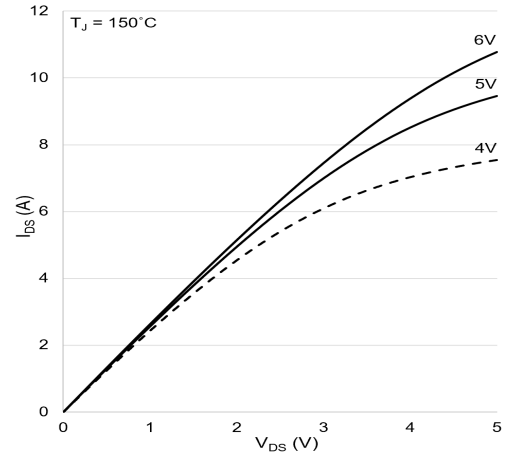


Fig 2 : Typical I_{DS} vs. V_{DS} @ $T_J = 150\text{ }^\circ\text{C}$

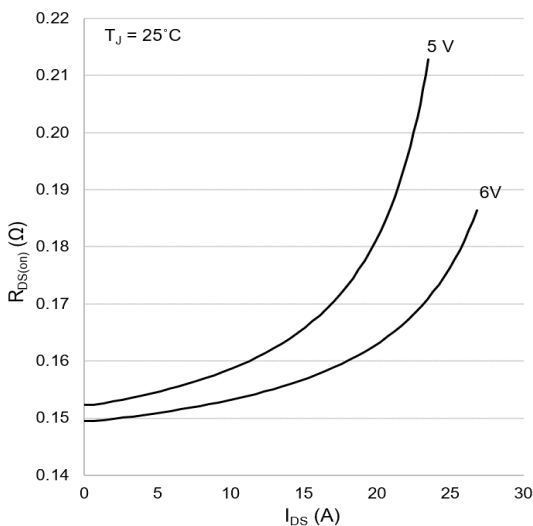


Fig 3 : $R_{DS(on)}$ vs. I_{DS} at $T_J = 25\text{ }^\circ\text{C}$

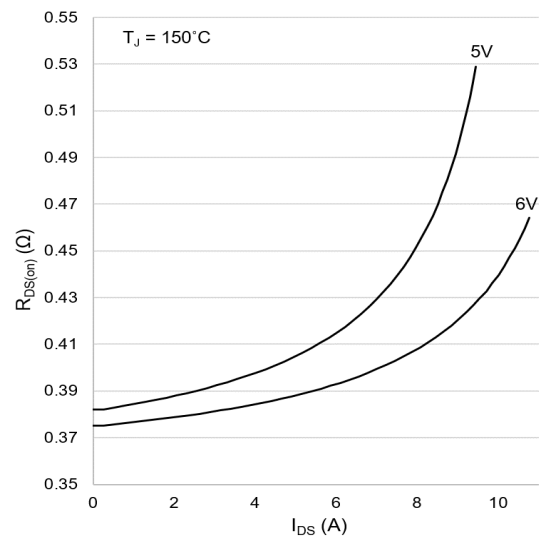


Fig 4 : $R_{DS(on)}$ vs. I_{DS} at $T_J = 150\text{ }^\circ\text{C}$

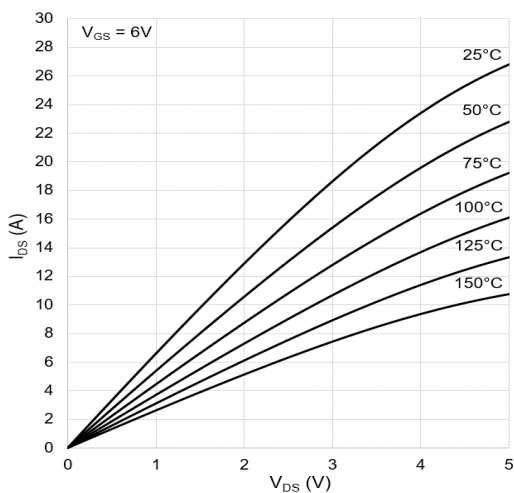


Fig 5 : Typical I_{DS} vs. V_{DS} @ $V_{GS} = 6\text{ V}$

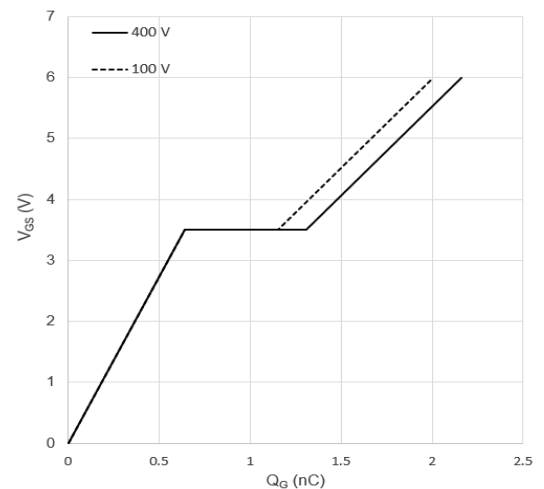


Fig 6 : Typical V_{GS} vs. Q_G @ $V_{DS} = 100, 400\text{ V}$



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Characteristics Curves

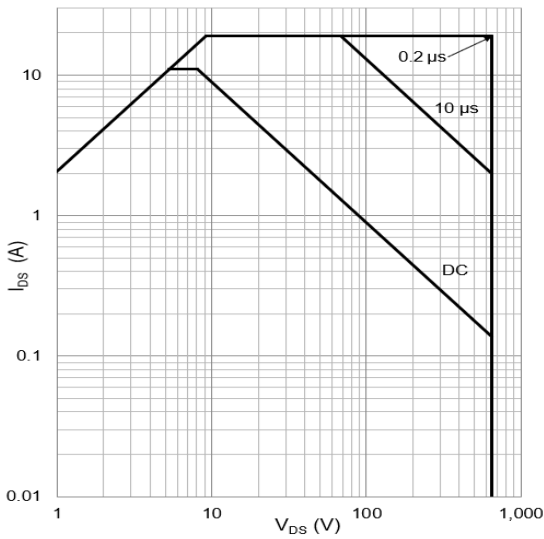


Fig 7 : Safe Operating Area @ $T_{case} = 25^\circ C$

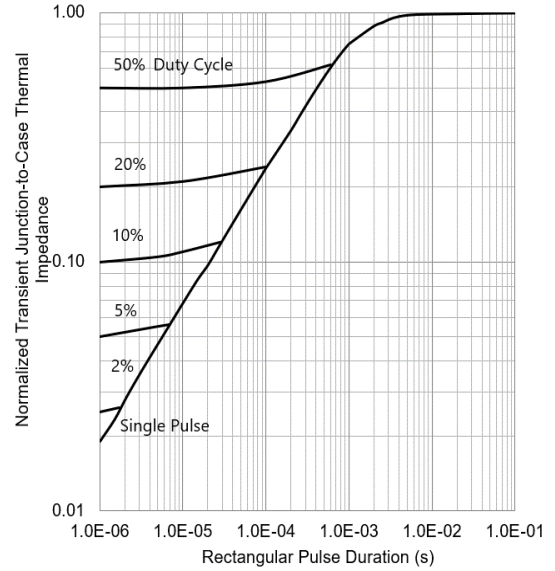


Fig 8 : Transient Thermal Impedance
(1.00 = Nominal DC thermal impedance)

Test Circuits

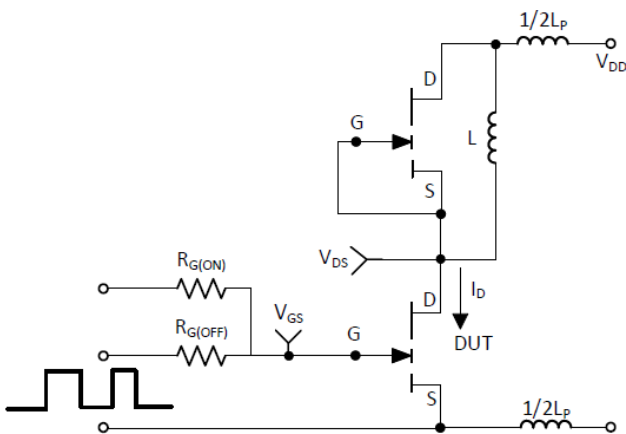


Fig 9 : Switching Test Circuit

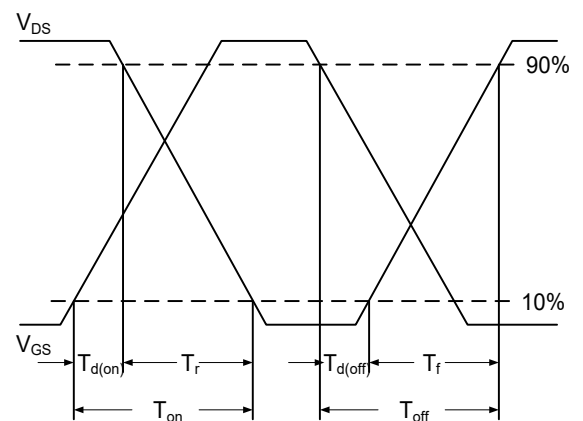
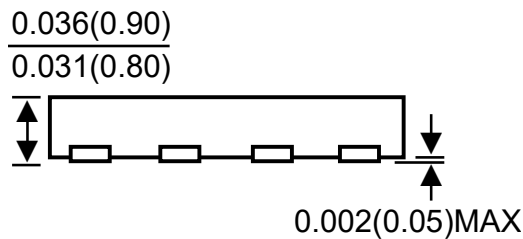
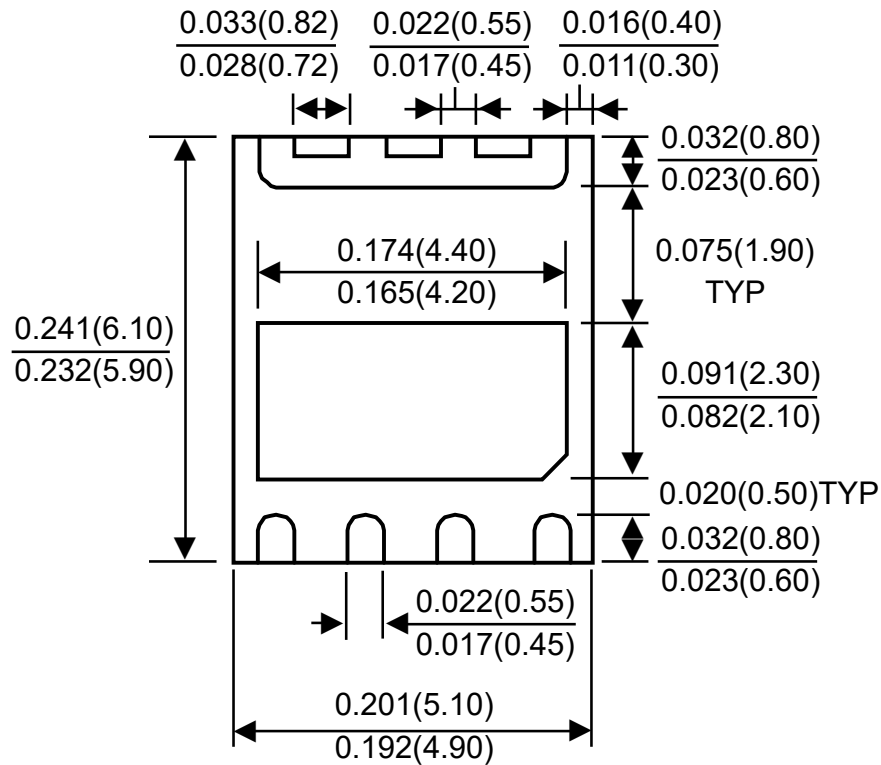


Fig 10 : Switching Time Waveforms



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Package Outline Dimensions



DFN5x6A

Dimensions in inches and (millimeters)



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