GaNPower International Inc.

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230 -3410 LOUGHEED HWY
VANCOUVER, BC, V5M 2A4 CANADA

GPIHV5DK

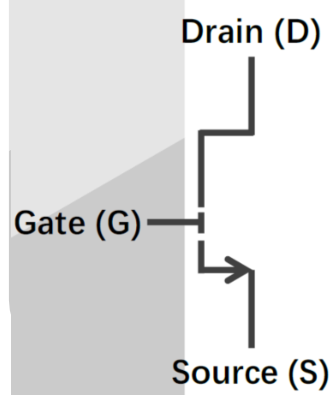
N-channel 1200V 5A GaN Power HEMT in TO252 Package

Datasheet version 1.1 : Preliminary

Features

BV_{dss}	R_{dson}	I_{ds}	Q_g
1200 V	260 mΩ	5 A	1.9 nC

- Ultra-low R_{DS}(on)
- High dv/dt capability
- Extremely low input capacitance
- Zero Qrr
- Outstanding switching performance
- Low Profile



Applications

- Switching Power Applications
- Server and Telecom Power Application
- EVOBC and DC-DC Converters
- UPS, Inverters, PV

Description

These devices are N-channel 1200 V Power GaN HEMTs based on proprietary E-mode GaN on silicon technology. The resulting product has extremely low on state resistance, very low input capacitance and zero reverse recovery charge making it especially suitable for applications which require superior power density, ultra-high switching frequency and outstanding efficiency.

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Device Characteristics

Static Parameters				**Test data**			
	Parameters		**Conditions**	**Min**	**Typical**	**Max**	**Unit**
1	$V_{gs(TH)}$	Gate threshold voltage	$V_{ds}=V_{gs}$ Id=2.5mA	1.2	1.4	1.7	V
2	BV_{dss}	Drain-Source breakdown voltage	$V_{gs}=0V$ $I_d < 14\ \mu A$ (T=25 °C)		1200		V
3	I_{dss}	Zero gate voltage drain current, $T_C = 25℃$	$V_{gs}=0V$ $V_{ds}=1200V$		1.4	14	μA
4	I_{gss}	Gate-Source Leakage	$V_{gs} = 6V$ $V_{ds} = 0V$		15	700	μA
5	R_{dson}	Static drain-source on resistance, $T_C = 25℃$	$V_{gs}=6V$ $I_d=2.5A$		260	300	mΩ
6	V_{sd}	Reverse conduction voltage	$I_{sd}=1A$ $V_{gs}=0V$	1.5	1.7		V
7	R_g	Gate resistance	f=25Mhz Open drain		2.6		Ω
Dynamic Parameters				**Test data**			
	Parameters		**Conditions**	**Min**	**Typical**	**Max**	**Unit**
1	C_{iss}	Input capacitance	$V_{gs}=0V$ $V_{ds}=700V$ f=1MHz		90		pf
	C_{oss}	Output capacitance			27.2		pf
	C_{rss}	Reverse transfer capacitance			4.9		pf
3	Q_g	Gate charge	$V_{ds}=400V$ $I_d=9A$ $V_{gs}=6V$		1.9		nC
	Q_{gs}	Gate to source charge			0.3		nC
	Q_{gd}	Gate to drain charge			0.4		nC
2	Q_{rr}	Reverse recovery charge			0		nC
Switching Performance				**Test data**			
	Parameters		**Conditions**	**Min**	**Typical**	**Max**	**Unit**
1	$t_{d(on)}$	Turn-on delay time	$V_{ds}=800V$ RL=500Ω, $I_d=1.6A$ $R_g=22/2Ω$ $V_{gs}=-1.5/6.5V$		6		ns
2	t_r	Rise time			24		ns
3	$t_{d(off)}$	Turn-off delay time			5		ns
4	t_f	Fall time			27		ns

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Absolute Max. Ratings

	Symbols	Parameters	Value	Unit
1	$V_{DS\text{-}max}$	Breakdown voltage transient @ T_{case}=25°C	1500	V
	$V_{DS\text{-}max}$	Breakdown voltage transient @ T_{case}=125°C	1250	V
2	$V_{GS\text{-}max}$	Gate to source max. voltage @ T_{case}=25°C	-12 to +7.5	V
3	$I_{ds\text{-}max}$	Drain to source DC current @ T_{case}=25°C	5	A
4	$I_{ds\text{-}max}$	Drain to source DC current @ T_{case}=100°C	4	A
5	$dv/dt_{\text{-}max}$	Drain to source voltage slew rate	150	V/ns
6	$T_{J\text{-}max}$	Max junction temperature	150	°C
7	$T_{S\text{-}storage}$	Storage temperature	-55 to 150	°C

Thermal and Soldering Characteristics (Typical)

	Symbols	Parameters	Value	Unit
1	R_{thJC}	Thermal resistance (junction to case)	1.25	°C /W
2	R_{thJA}	Thermal resistance (junction to ambient)	60	°C /W
2	T_{solder}	Reflow soldering temperature	260	°C

Ordering

Order Code	Package Type	Packaging Method	Qty
GPIHV5DK	TO-252		

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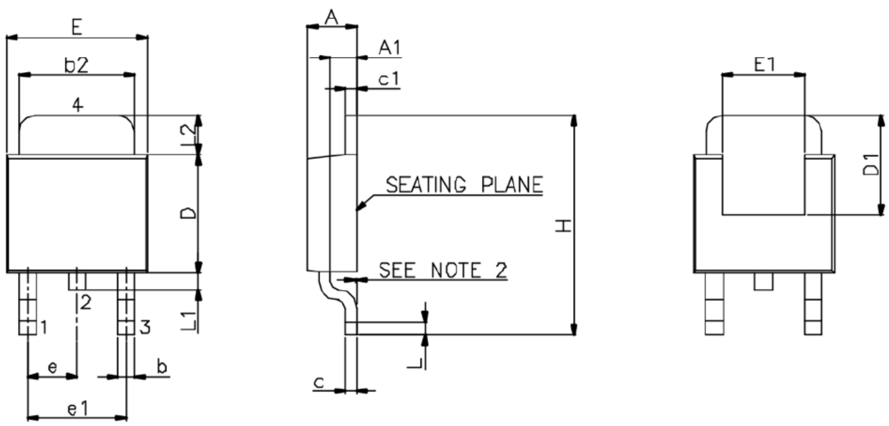
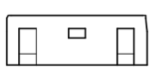
Package Information



VARIATIONS (ALL DIMENSIONS SHOWN IN INCH)

SYMBOLS	MIN.	MAX.
A	0.086	0.094
A1	0.040	0.050
b	0.024 TYP.	
b2	0.205	0.215
c	0.018	0.023
c1	0.018	0.023
D	0.210	0.220
E	0.250	0.265
D1	0.180	—
E1	0.150	—
e	0.090 BSC.	
e1	0.180 BSC.	
H	0.370	0.410
L	0.020	—
L1	0.025	0.040
L2	0.06	0.08

NOTES:
1. JEDEC OUTLINE : TO-252 AB
2. 2 MILS SUGGESTED FOR POSITIVE CONTACT AT MOUNTING.



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GaN HEMT Frequently Asked Questions

1	Q: Can we do pin to pin switch for silicon MOSFET or IGBT? A: The short answer is no. GaN HEMT power devices are far superior than the best silicon devices such as super junction MOSFETs. However, due to different requirements of gate driving voltage and extremely high dv/dt slew rate, special drivers and optimized PCB layouts are recommended to minimize the impact from circuit parasitics. Some packaging forms such as GaNPower's DFN packaged devices offer both sense and force for the source terminal. Also, for traditional TO220 packages, please be advised that the pins are arranged as Gate – Source -Drain, and the thermal pad is connected to the source instead of drain.
2	Q: Are GaN power devices reliable? A: GaN power HEMTs have been tested by GaNPower and many other vendors, users and testing facilities to be as reliable (if not better than) silicon counterparts.
3	Q: How do GaN power devices compare with SiC? A: Currently GaN power HEMT devices are most suitable for low to medium voltage (⩽1200V) and power (<20KW) applications. GaN is the ideal choice for high frequency applications. SiC devices are better choice for high voltage and high-power applications (>20KW).
4	Q: Do we need to parallel an FRD for applications such as inverters? A: GaN devices are different from silicon MOSFET or IGBT in that they have no inherent PN junction diodes that cause reverse recovery issue. User do not need to parallel an FRD for the purpose of suppressing the body diode reverse recovery effect, since GaN HEMT can operate in both first and third quadrants. However, care should be taken for the dead time power loss since the Vsd voltage of GaN HEMT is usually close to 2V. This is especially true when a negative gate voltage is applied.
5	Q: Can we parallel GaN HEMT devices? A: Yes, GaN HEMT is ideal for paralleling, due to positive temperature coefficient of Rdson and slightly positive temperature coefficient of threshold voltage.
6	Q: Where can we find drivers for GaNPower HEMT devices? A: While some of the GaNPower's HEMTs are either monolithically integrated with gate driver or co-packaged with a silicon driver, drivers can be easily found from vendors such as TI and Silicon Lab for either single sided or half-bridge configurations: ✓ TI: LM5114: Single 7.6A Peak Current Low-Side Gate Driver ✓ TI: UCC27611: 5V, 4A/6A Low Side GaN Driver ✓ Maxim: MAX5048C: 7A Sink/3A Source Current, 8ns, SOT23, MOSFET Drive ✓ Fairchild: FAN3122: Single 9-A High-Speed, Low-Side Gate Driver ✓ Silicon Lab: Si827X: 4 Amp ISO driver with High Transient (dv/dt) Immunity