GaNPower International Inc.

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

GPI65005DF

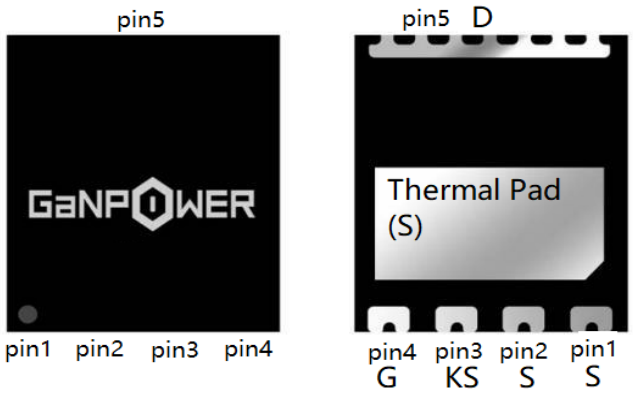
N-channel 650V 5A GaNPower HEMT in DFN 5X6 Package

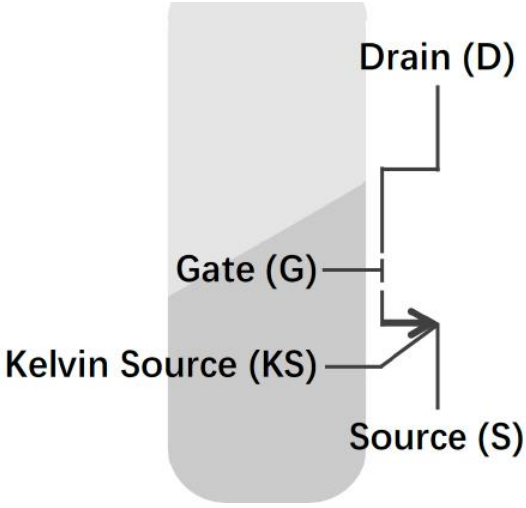
Datasheet version 2.9

Features

BV_{dss}	R_{dson}	I_{ds}	Q_g
650 V	235 mΩ	5A	1.6 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 650 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	$V_{ds}=V_{gs}$, I_d=3.5mA (T_J=25 °C)	0.9	1.25	2.9	V
			$V_{ds}=V_{gs}$, I_d=3.5mA (T_J=150 °C)		1.15		V
2	BV_{dss}	Drain-Source breakdown voltage	V_{gs}=0V, I_d < 20 µA (T_J=25 °C)		650		V
3	I_{dss}	Zero gate voltage drain leakage current	V_{gs}=0V, V_{ds}= 650V T_J = 25 °C		0.01	10	µA
			V_{gs} = 0V V_{ds} = 650V T_J = 150 °C		3		µA
4	I_{gss}	Gate-Source Leakage	V_{gs} = 6V, V_{ds} = 0V		13	500	µA
5	R_{dson}	drain-source on resistance	V_{gs}=6V, I_d=1A T_J = 25 °C		235	320	mΩ
			V_{gs}=6V, I_d=1A T_J = 150 °C		580		mΩ
6	V_{sd}	Reverse conduction voltage	I_{sd}=0.1A, V_{gs}=0V	1.2	2.2	3	V
7	R_g	Gate resistance	f=25Mhz Open drain		1		Ω
Dynamic Parameters				**Test data**			
	Parameters		**Conditions**	**Min**	**Typical**	**Max**	**Unit**
1	C_{ISS}	Input capacitance	V_{gs} = 0 V V_{ds} = 500 V f = 100 kHz		39		pf
2	C_{OSS}	Output capacitance			11.8		pf
3	C_{RSS}	Reverse transfer capacitance			0.24		pf
4	$C_{O(er)}$	Effective output capacitance, energy related	V_{ds} = 0 - 500 V		15		pf
5	Q_g	Gate charge	V_{ds} = 500 V I_d = 2.5 A V_{gs} = 6 V		1.6		nC
6	Q_{gs}	Gate to source charge			0.30		nC
7	Q_{gd}	Gate to drain charge			0.38		nC
8	Q_{OSS}	Output Charge	V_{ds} = 0 - 500 V		10		nC
9	Q_{rr}	Reverse recovery charge			0		nC

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Switching Performance				Test data			
	Parameters		Conditions	Min	Typical	Max	Unit
1	td(on)	Turn-on delay time	V_{ds} = 500 V Id = 1.25 A R_g= 22/2 Ω V_{gs} = -3/6 V		5		ns
2	tr	Rise time			10		ns
3	td(off)	Turn-off delay time			16		ns
4	tf	Fall time			11		ns

Absolute Max. Ratings

	Symbols	Parameters	Value	Unit
1	$V_{DS\text{-}max}$	Breakdown voltage transient @ Tcase=25°C	800	V
2	$V_{DS\text{-}max}$	Breakdown voltage transient @ Tcase=125°C	650	V
3	$V_{GS\text{-}max}$	Gate to source max. voltage @ Tcase=25°C	-12 to +7.5	V
4	$I_{ds\text{-}max}$	Drain to source DC current @ Tcase=25 °C	5	A
5	$I_{ds\text{-}max}$	Drain to source pulse current @ Tcase=25°C, pulse width 10 µs, V_{GS} = 6 V	11	A
6	$I_{ds\text{-}max}$	Drain to source pulse current @ Tcase=125°C	5	A
7	$dv/dt_{\text{-}max}$	Drain to source voltage slew rate	150	V/ns
8	$T_{J\text{-}max}$	Max junction temperature	150	°C
9	$T_{S\text{-}storage}$	Storage temperature	-55 to 150	°C

Thermal and Soldering Characteristics (Typical)

	Symbols	Parameters	Value	Unit
1	R_{thJC}	Thermal resistance (junction to case)	1.4	°C /W
2	R_{thJA}	Thermal resistance (junction to ambient)	62	°C /W
3	T_{solder}	Reflow soldering temperature	260	°C

Ordering

Order Code	Package Type	Packaging Method	Qty
GPI65005DF	DFN5x6		

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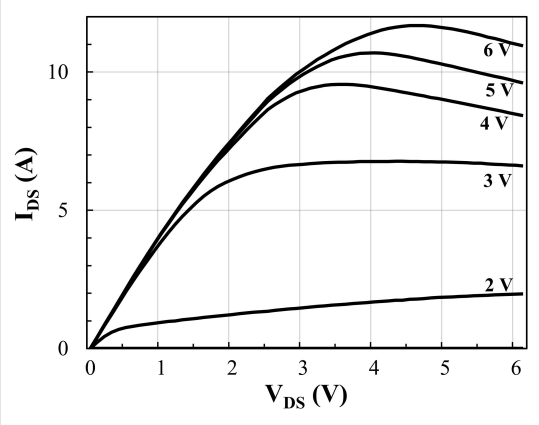
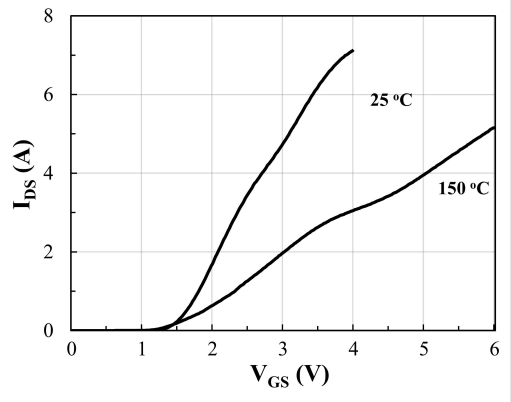
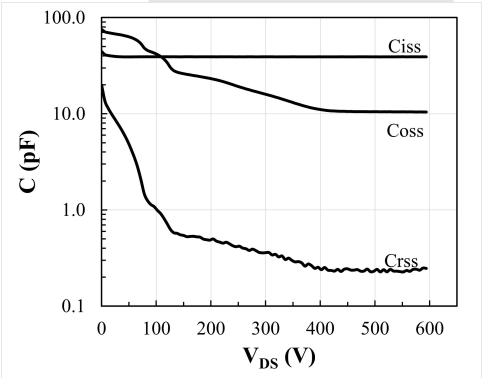
Electrical Performance



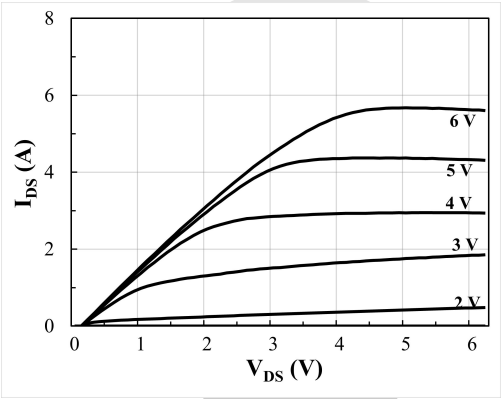
I_{DS} vs. V_{DS} @ T_j = 25 °C



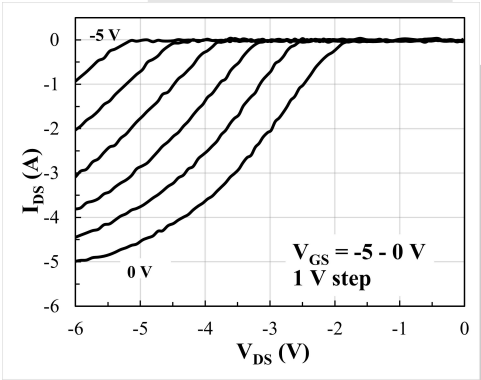
I_{DS} vs. V_{GS} @ T_j = 25 °C and 150 °C



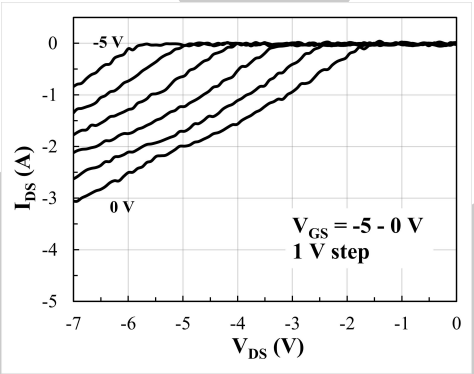
Capacitance vs. V_{ds} Curve @ T_j=25 °C



I_{DS} vs. V_{DS} @ T_j = 150 °C



I_{sd} vs. V_{sd} reverse conduction curve @ T_j = 25 °C



I_{sd} vs. V_{sd} reverse conduction curve @ T_j = 150°C

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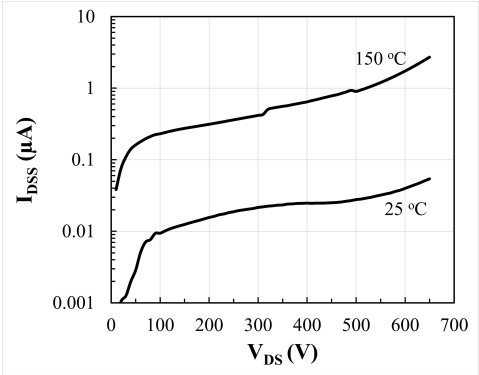
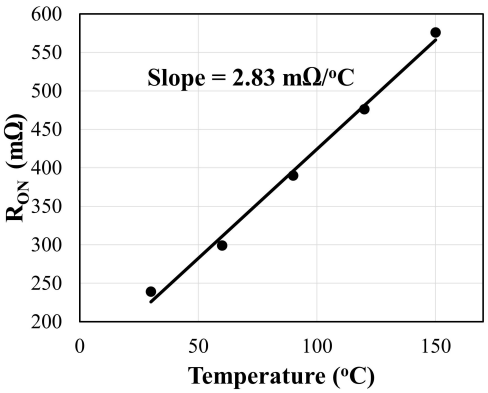
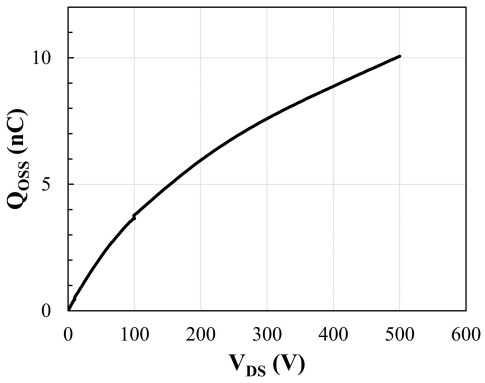


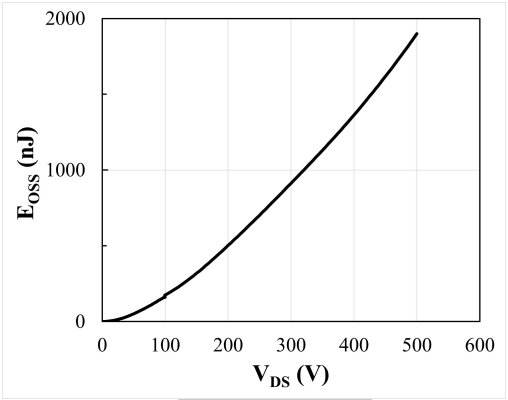
Typical off-state drain leakage current I_{DSS} vs. V_{DS} @ T_J = 25 °C and 150 °C



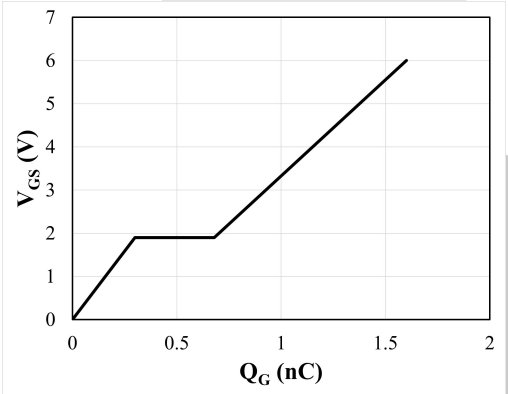
On-state resistance vs. T_J @ I_D = 2.5 A, V_{GS} = 6V



Output charge Q_{OSS} vs. V_{DS}



Stored Energy Characteristic E_{OSS} vs. V_{DS}



Gate charge V_{GS} vs. Q_G

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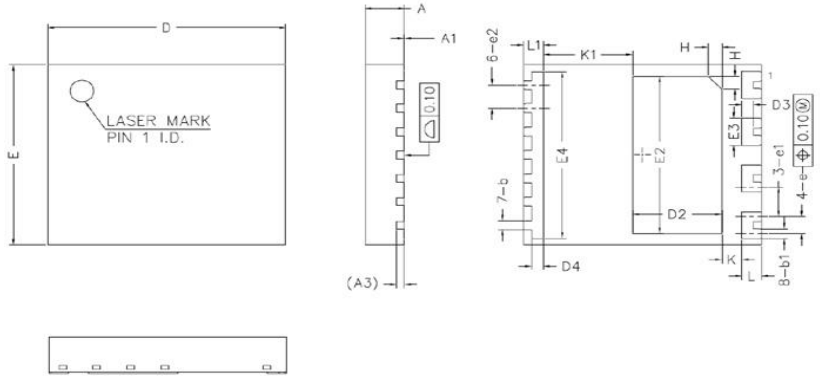
Package Information



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	0.02	0.05
A3		0.203REF	
b	0.20	0.25	0.30
b1	0.225	0.275	0.325
D	5.90	6.00	6.10
E	4.90	5.00	5.10
D2	2.15	2.25	2.35
E2	4.27	4.37	4.47
D3	0.20	0.30	0.40
E3	0.65	0.75	0.85
D4	0.20	0.30	0.40
E4	4.525	4.625	4.725
e	0.375	0.475	0.575
e1	0.725	0.825	0.925
e2	0.55	0.65	0.75
H		0.35REF	
K	0.35	0.50	0.65
K1	2.10	2.25	2.40
L	0.40	0.50	0.60
L1	0.40	0.50	0.60

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Further Information

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Data Source– Data here are based on recent tests but all parameters may not be up to date. Actual final test data from packaging production are available for selected customers upon request.