

## GPI65005DF56

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

Datasheet version 3.1

### Features

$BV_{DSS}$	$R_{DS(on)}$	$I_{DS}$	$Q_G$
700 V	235 mΩ	5A	1.6 nC

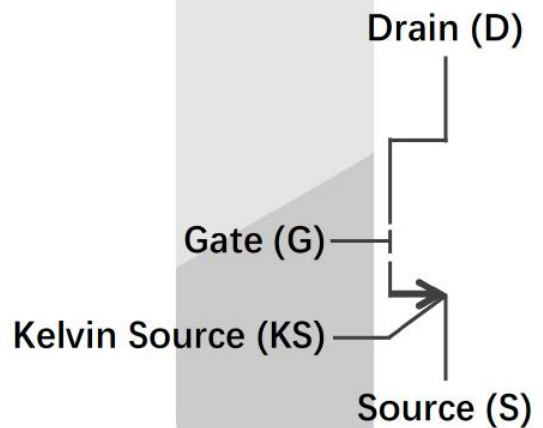
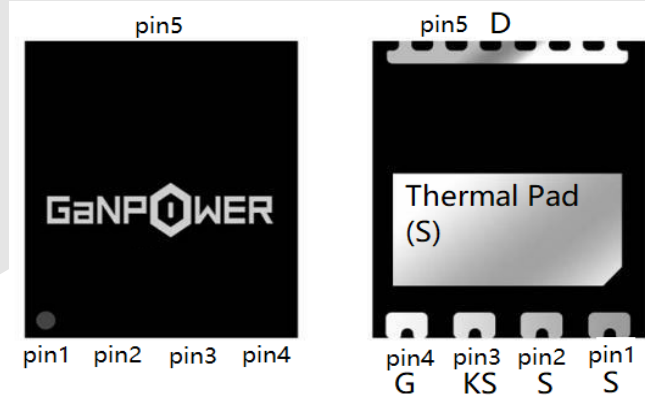
- Ultra-low  $R_{DS(on)}$
- High  $dv/dt$  capability
- Extremely low input capacitance
- Zero  $Q_{rr}$
- Outstanding switching performance
- Low Profile

### Applications

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

### Description

These devices are N-channel 650V 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.



## Device Characteristics

Static Parameters				Test data				
	Parameters		Conditions	Min	Typical	Max	Unit	
1	$V_{GS(TH)}$	Gate threshold voltage	$V_{DS}=V_{GS}, I_D=3.5mA$ ( $T_J=25\text{ }^\circ\text{C}$ )	0.9	1.25	2.9	V	
			$V_{DS}=V_{GS}, I_D=3.5mA$ ( $T_J=150\text{ }^\circ\text{C}$ )		1.15		V	
2	$BV_{DSS}$	Drain-Source breakdown voltage	$V_{GS}=0V, I_D < 20\text{ }\mu A$ ( $T_J=25\text{ }^\circ\text{C}$ )		700		V	
3	$I_{DSS}$	Zero gate voltage drain leakage current	$V_{GS}=0V, V_{DS}=650V$ $T_J = 25\text{ }^\circ\text{C}$		0.01	10	$\mu A$	
			$V_{GS}=0V, V_{DS}=650V$ $T_J = 150\text{ }^\circ\text{C}$		3		$\mu A$	
4	$I_{GSS}$	Gate-Source Leakage	$V_{GS} = 6V, V_{DS} = 0V$		13	500	$\mu A$	
5	$R_{DS(on)}$	drain-source on resistance	$V_{GS}=6V, I_D=1A$ $T_J = 25\text{ }^\circ\text{C}$		235	320	m $\Omega$	
			$V_{GS}=6V, I_D=1A$ $T_J = 150\text{ }^\circ\text{C}$		580		m $\Omega$	
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		$\Omega$	
Dynamic Parameters				Test data				
	Parameters		Conditions	Min	Typical	Max	Unit	
1	$C_{ISS}$	Input capacitance	$V_{GS} = 0\text{ V}$ $V_{DS} = 500\text{ V}$ 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	$V_{DS} = 0 - 500\text{ V}$		15		pf	
5	$Q_G$	Gate charge	$V_{DS} = 500\text{ V}$		1.6		nC	
6	$Q_{GS}$	Gate to source charge	$I_D = 2.5\text{ A}$ $V_{GS} = 6\text{ V}$		0.30		nC	
7	$Q_{GD}$	Gate to drain charge				0.38		nC
8	$Q_{OSS}$	Output Charge	$V_{DS} = 0 - 500\text{ V}$		10		nC	
9	$Q_{RR}$	Reverse recovery charge			0		nC	

Switching Performance				Test data			
	Parameters		Conditions	Min	Typical	Max	Unit
1	$t_{D(ON)}$	Turn-on delay time	$V_{DS} = 500\text{ V}$ $I_D = 1.25\text{ A}$ $R_G = 22/2\ \Omega$ $V_{GS} = -3/6\text{ V}$		5		ns
2	$t_R$	Rise time			10		ns
3	$t_{D(OFF)}$	Turn-off delay time			16		ns
4	$t_F$	Fall time			11		ns

## Absolute Max. Ratings

	Symbols	Parameters	Value	Unit
1	$V_{DS-max}$	Breakdown voltage transient @ $T_{case}=25^\circ\text{C}$	800	V
2	$V_{DS-max}$	Breakdown voltage transient @ $T_{case}=125^\circ\text{C}$	650	V
3	$V_{GS-max}$	Gate to source max. voltage @ $T_{case}=25^\circ\text{C}$	-12 to +7.5	V
4	$I_{DS-max}$	Drain to source DC current @ $T_{case}=25^\circ\text{C}$	5	A
5	$I_{DS-max}$	Drain to source pulse current @ $T_{case}=25^\circ\text{C}$ , pulse width 10 $\mu\text{s}$ , $V_{GS} = 6\text{ V}$	11	A
6	$I_{DS-max}$	Drain to source pulse current @ $T_{case}=100^\circ\text{C}$	5	A
7	$dv/dt-max$	Drain to source voltage slew rate	150	V/ns
8	$T_J-max$	Max junction temperature	150	$^\circ\text{C}$
9	$T_S-storage$	Storage temperature	-55 to 150	$^\circ\text{C}$

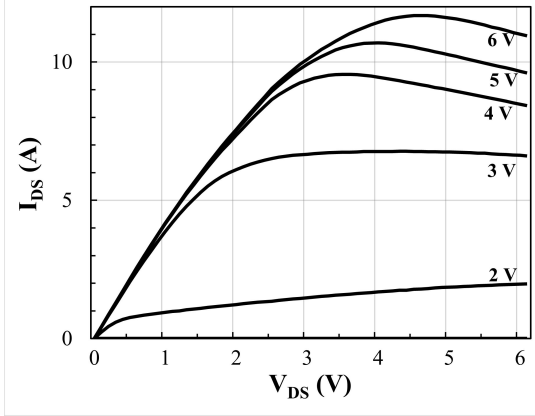
## Thermal and Soldering Characteristics (Typical)

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

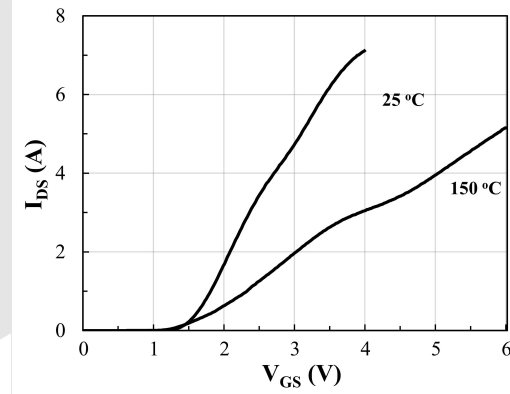
## Ordering

Order Code	Package Type	Packaging Method	Qty
GPI65005DF56	DFN5x6		

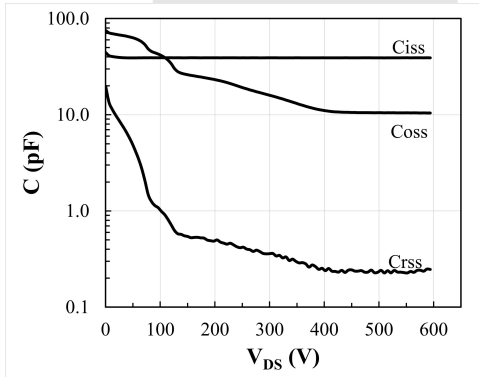
## Electrical Performance



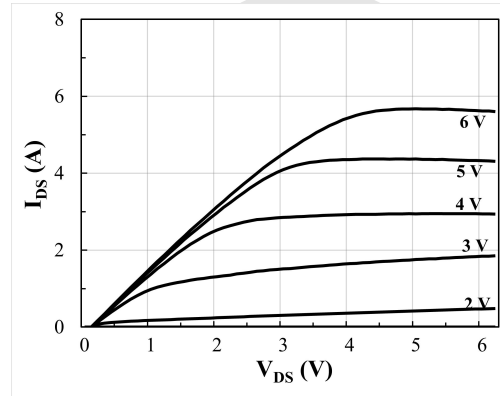
$I_{DS}$  vs.  $V_{DS}$  @  $T_J = 25\text{ }^\circ\text{C}$



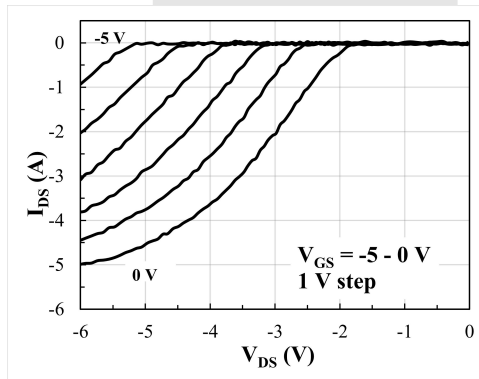
$I_{DS}$  vs.  $V_{GS}$  @  $T_J = 25\text{ }^\circ\text{C}$  and  $150\text{ }^\circ\text{C}$



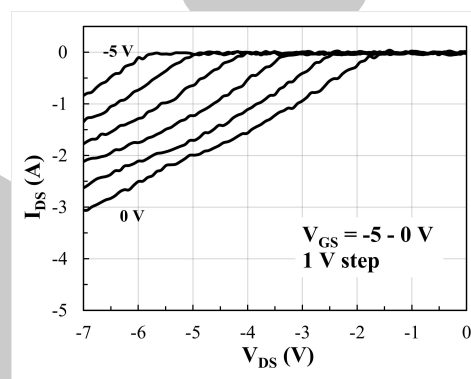
Capacitance vs.  $V_{DS}$  Curve @  $T_J = 25\text{ }^\circ\text{C}$



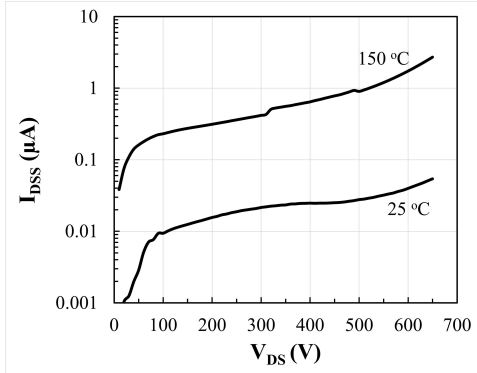
$I_{DS}$  vs.  $V_{DS}$  @  $T_J = 150\text{ }^\circ\text{C}$



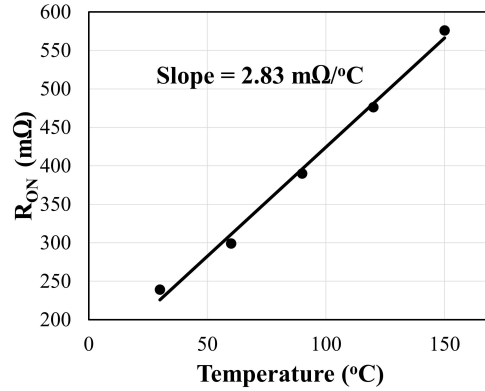
$I_{SD}$  vs.  $V_{SD}$  reverse conduction curve @  $T_J = 25\text{ }^\circ\text{C}$



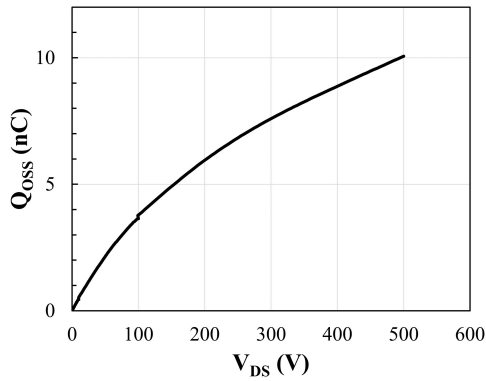
$I_{SD}$  vs.  $V_{SD}$  reverse conduction curve @  $T_J = 150\text{ }^\circ\text{C}$



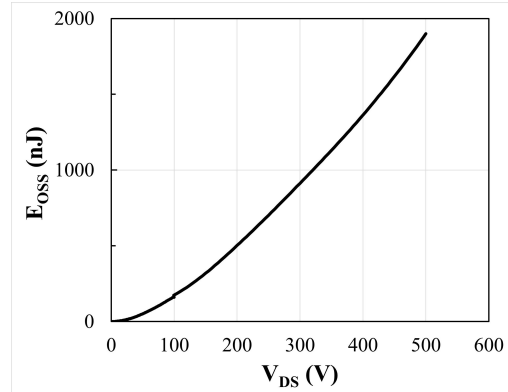
Typical off-state drain leakage current  $I_{DSS}$  vs.  $V_{DS}$  @  $T_J = 25^\circ C$  and  $150^\circ C$



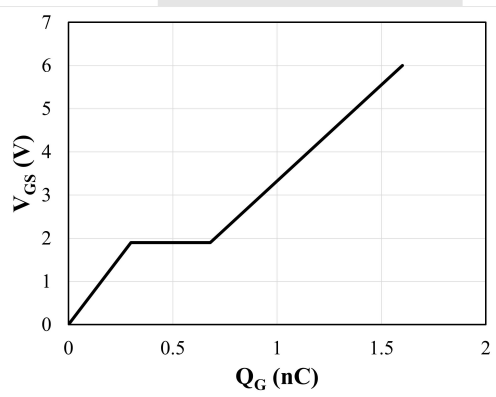
On-state resistance vs.  $T_J$  @  $I_D = 2.5 A$ ,  $V_{GS} = 6V$



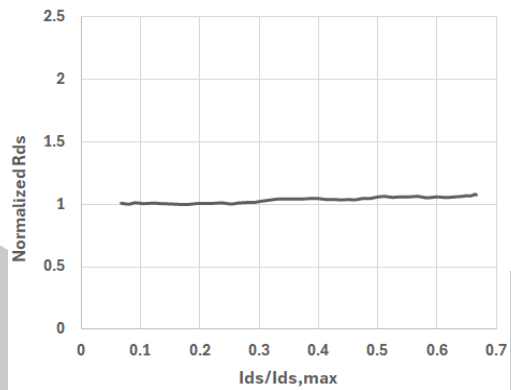
Output charge  $Q_{OSS}$  vs.  $V_{DS}$



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

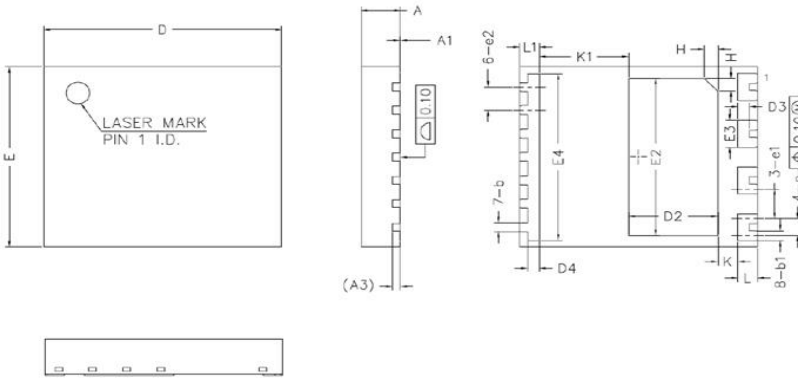


Gate charge  $V_{GS}$  vs.  $Q_G$



Normalized  $R_{DS(on)}$  vs.  $I_{DS}$  @  $T_J = 25^\circ C$

## 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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