V08DI065R1X11
650V D-Mode GaN Power Transistor
Preliminary Datasheet

Description

VisIC V08DI065R1X11 GaN Die is a high-density, lateral GaN power transistor with extremely low $R_{DS(ON)}$, exceptionally fast switching performance and a conveniently small footprint. It is very effective in applications requiring high current, high power density and low cost.

Key features

- Depletion Mode GaN
- No Reverse-Recovery charge
- Ultra-low On State resistance of 8mΩ
- Low Gate Charge
- High noise immunity with V_{th} >5V
- Driven by standard 15V Si-MOSFET driver

Applications

- Automotive
- AC motors
- Solar Inverter
- AC-DC Power Supply
- Battery chargers
- Laser driver

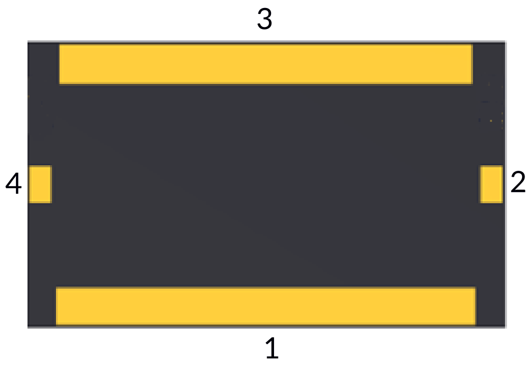


Fig. 1: Die Pinout

Key Performance Parameters

Parameter	Value	Units
V_{DS}	650	V
$R_{DS(ON)}$	8	mΩ
Q_G	200	nC
$I_{D,pulse}$	450	A
I_D	200	A

Pad	Function
1	Source
2, 4	Gate
3	Drain
5 (Back Side)	Substrate

Ordering Information:

Part Number	Packing	Marking	Ordering Number
V08DI065R1X11	Tray	NA	V08DI065R1X11T

Maximum ratings (Tc =25°C unless otherwise specified)

Parameter	Symbol	Min	Max	Unit	Conditions
Drain-Source breakdown voltage	$V_{(BR)DS}$	650	-	-	
Drain Source Transient voltage	$V_{DS(transient)}$		800	V	Pulse ≤1us
Continuous Drain current 1)	I_D	-	280	A	
			170		T_C =100°C 1)
Pulsed Drain current 2)	$I_{D,pulse}$	-	450	A	
Gate Source voltage	V_{GS}	-20	0	V	
Transient Gate Source voltage	$V_{GS(transient)}$	-25	6	V	Pulse ≤1us
Power dissipation	P_{TOT}	-	500	W	
Operating and storage temperature	T_j ,T_{stg}	-55	+150	°C	
Continuous reverse current	I_s	-	200	A	
					T_C =100°C 1)
Reverse pulse current 1)	$I_{s,pulse}$	-	450	A	
Gate leakage	I_{gss}	-	100	nA	V_{DS}= 650V, V_{GS}= -15V

1) Limited by Tj max of 150°C, Vgs = 0V, considering Rth(JC) in a discrete package = 0.1°C/W
2) Duty cycle =10% and pulse width limited by Tjmax.

Electrical characteristics (T_J =25°C, V_{GS} = -15V unless otherwise specified)

Parameter	Symbol	Min	Typical	Max	Unit	Conditions
Static						
Gate threshold voltage	Vth	-10	-9.5	-9	V	I_D=47mA , V_{DS}=10V
Recommended driving voltage[1]	V_{DD}		15		V	Refer to driver GND
Drain Source leakage current	I_{DSS}	-	30	60	µA	V_{DS}= 650V
		-	75	200		V_{DS}= 650V T_J=150°C
Gate resistance	R_G	-	0.5	-	Ω	f=1Mhz
Drain-Source on state resistance	$R_{DS(ON)}$	-	8	10	mΩ	V_{GS}=0V I_D=100A
		15	17.5	20		V_{GS}=0V I_D=100A T_j =150°C
Reverse voltage drop- GaN non conductive	V_R	-	-	7.5	V	I_D=10A
		-	-	9.5		I_D=10A T_j =150°C
Reverse voltage drop- GaN conductive	V_R	-	-	0.08	V	I_D=10A, V_{GS}=0V
		-	-	0.175		I_D=10A, T_j =150°C V_{GS}=0V
Reverse recovery time	t_{rr}	-	-	0	ns	
Reverse recovery charge	Q_{rr}	-	-	0	nC	
Output Charge	Q_{oss}	-	-	420	nC	V_{DS}=400V
Dynamic						
Input capacitance	C_{iss}	-	1900	-	pF	f=1MHz V_{DS}=400V
Output capacitance	C_{oss}	-	500	-		
Reverse transfer capacitance	C_{rss}	-	70	-		
Effective Output Capacitance, Energy Related	$C_{O(ER)}$	-	1100	-	pF	V_{DS}= 0-400V
Turn-on delay time	$t_{d(on)}$	-	8	-	ns	V_{DS}=400V, V_{DD}=15V[1] I_D=150A, BJT Gate Buffer R_{base}= 20Ω for ON & 2Ω for OFF
Fall time	t_f	-	6.5	-		
Turn-off delay time	$t_{d(off)}$	-	15	-		
Rise time	t_r	-	16	-		

1) In operation Vgs swings from -V_{DD} (OFF state) to 0V (ON state).

Electrical characteristics (T_J =25°C unless otherwise specified)						
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**	**Conditions**
Gate Charge characteristics						
Gate to Source charge	Q_{GS}	-	8	-	nC	V_{GS}=0V to -14V V_{DS}=400V I_D=32A
Gate to Drain charge	Q_{GD}	-	130	-		
Total Gate charge	Q_G	-	200	-		

Typical Characteristics at 25C° (unless noted otherwise)

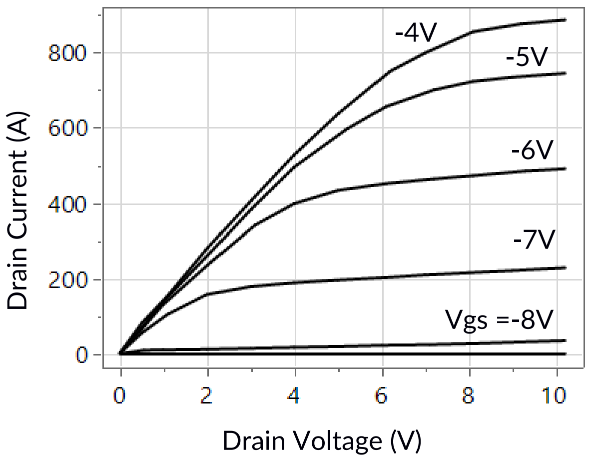


Figure 1 Output (Forward) Characteristics

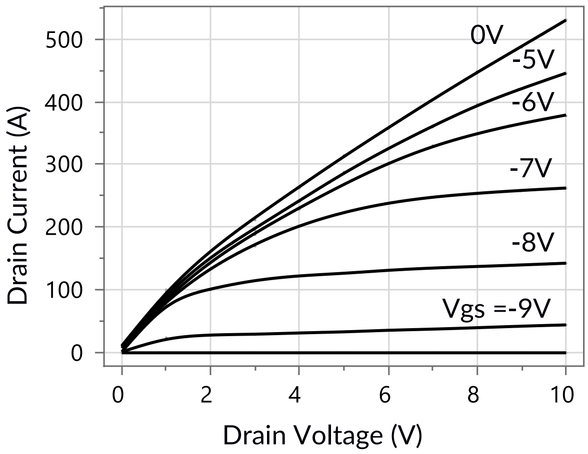


Figure 2 Output (Forward) Characteristics
Tj=150C

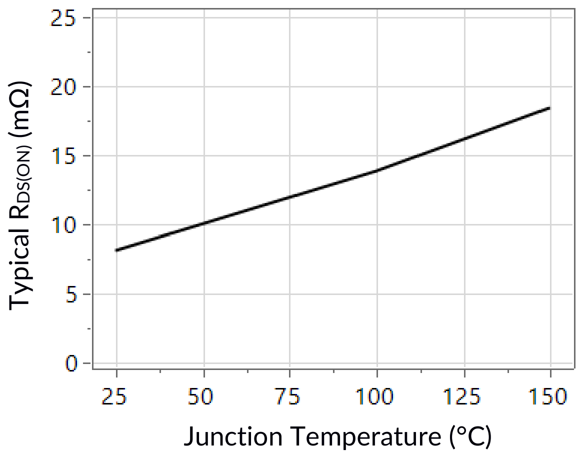


Figure 3 ON-State Resistance vs. Temperature

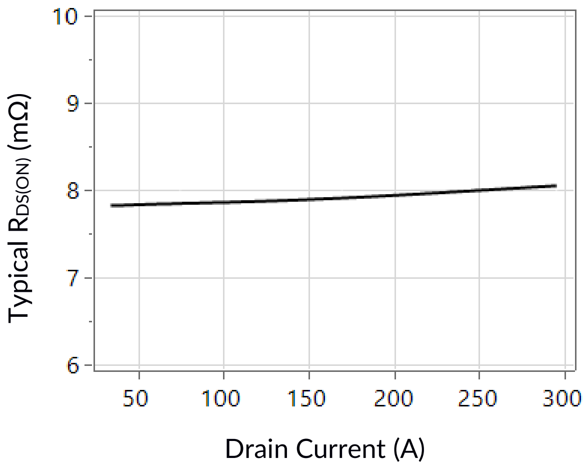


Figure 4 ON-State Resistance vs. Current at 25°C

Typical Characteristics cont.

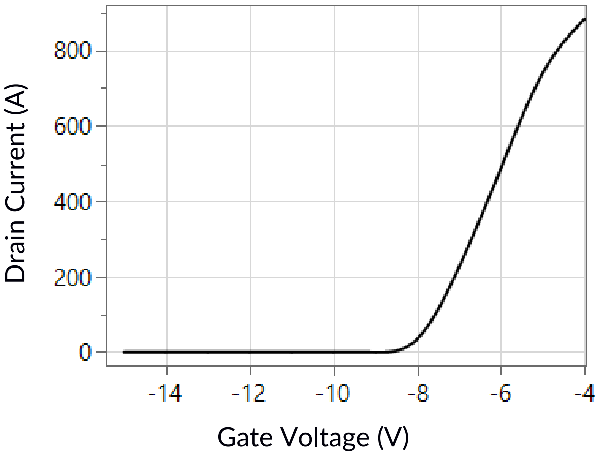


Figure 5 Transfer Characteristics

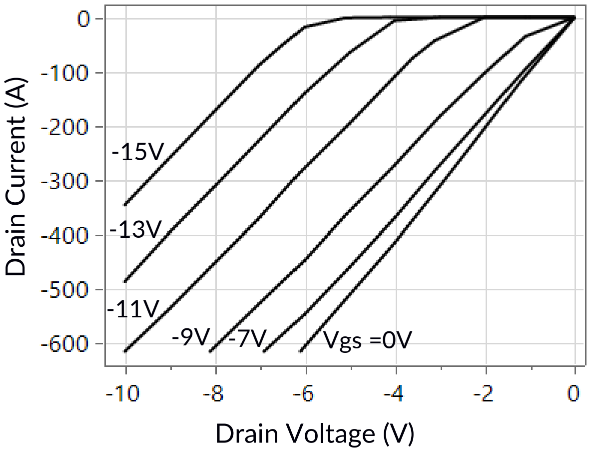


Figure 6 Reverse Conduction vs. Gate Voltage

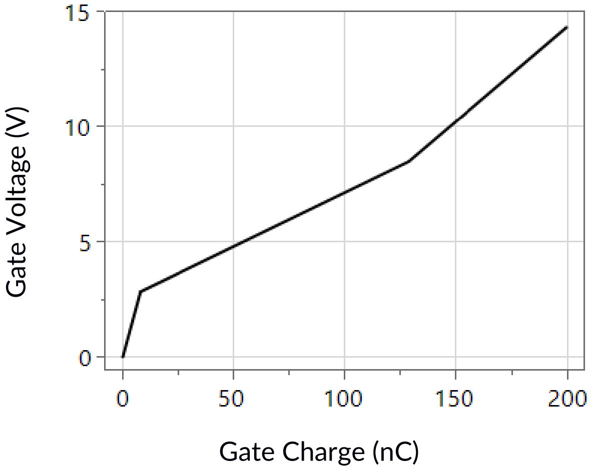


Figure 7 Typical Gate Charge

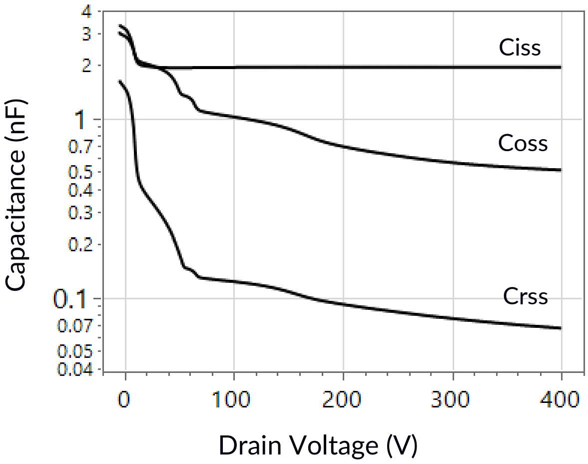


Figure 8 Typical Capacitances

Typical Characteristics cont.

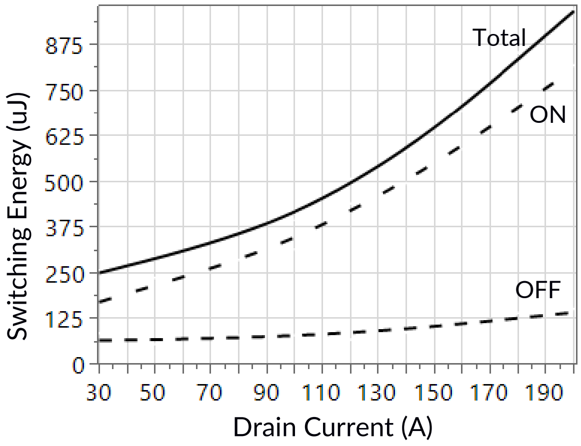


Figure 9 Typical Switching Energy vs Drain Current at 400V

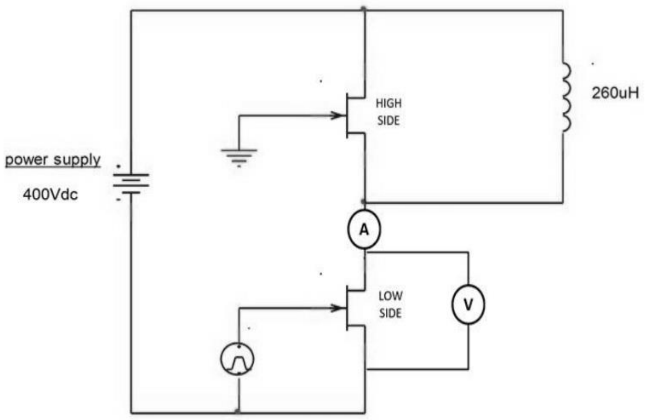


Fig.16: Switching parameters test circuit

Switching Time Waveforms

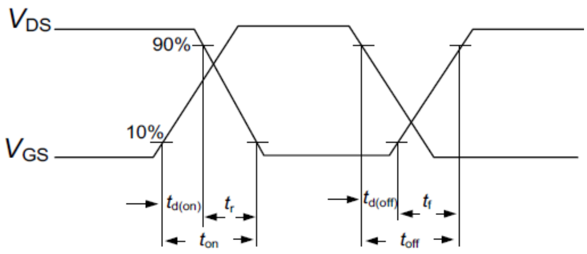
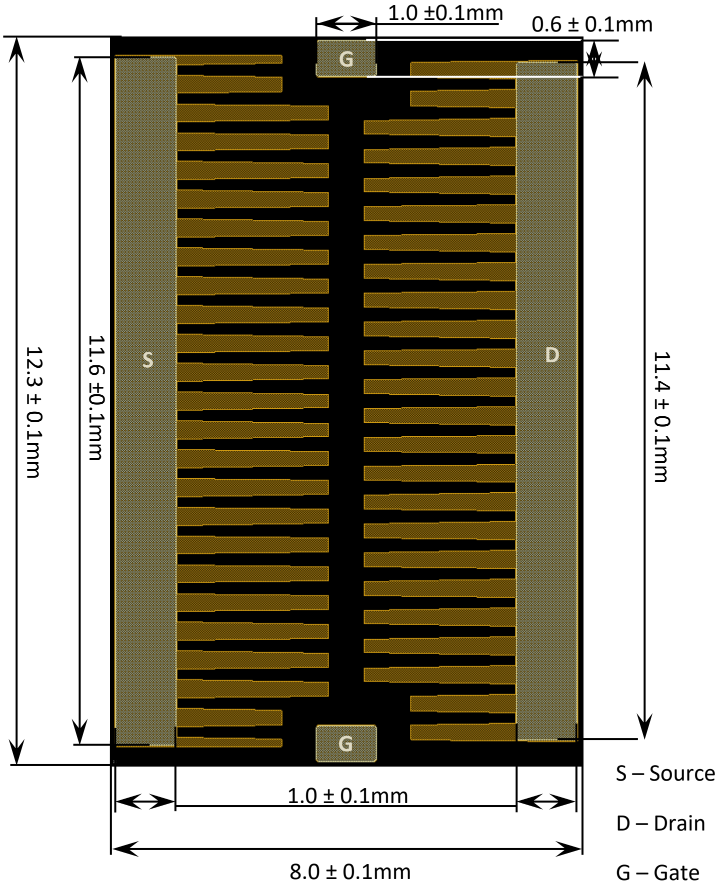


Fig.17: Switching time waveforms

Die Outlines:



Mechanical Characteristics						
Parameter		**Min**	**Typical**	**Max**	**Unit**	**Material**
Die thickness		260	270	280	µm	
Backside metal		0.1/0.3/0.01/1			µm	Ti/Ni/Ti/Ag
Topside pads metal		-	9	-	µm	Cu

Rev.	Date	Content of Change	Owner
1.0	15/06/2023	New datasheet and template under new part number	I.B
1.1	26/10/2023	Updated key performance parameters table	I.B

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