V22TG065S1X04

650V D³GaN™ Power Switch

Preliminary Datasheet

Description

The D³GaN (**D**irect **D**rive **D**-Mode) V22TG065S1X04 Power Switch integrates a patented, high-density, lateral GaN power transistor, into a **Normally - Off** product with low $R_{DS(ON)}$ and exceptionally efficient switching performance. The D³GaN technology has been implemented into an **Isolated High-Power SMD** package - it is very effective in applications requiring High Power and Efficiency, with Low Volume and Cost. The integrated safety function ensure safe operation during system start up and shutdown, while having no impact on the switching performance of the GaN transistor.

Key features

- Ultra-fast Switching
- Kelvin Source connection
- Depletion Mode GaN in Normally-Off package
- Top cooling fully isolated package (3.5KV)
- No Reverse-Recovery charge
- low On State resistance of 22mΩ
- Low Gate Charge
- High noise immunity with V_{th} >5V
- Driven by standard 15V Si-MOSFET driver

Applications

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

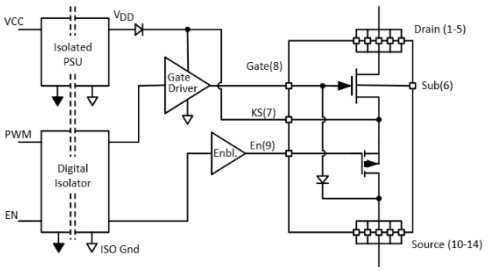


Figure 1 - Package Pinout & Simplified application scheme

Key Performance Parameters

Parameter	Value	Units
V_{DS}	650	V
$R_{DS(ON)}$	22	mΩ
Q_G	41	nC
$I_{D,pulse}$	280	A
I_D	80	A

Pin	Function
1-5	Drain
6	Substrate
7	Kelvin Source
8	Gate
9	Enable
10-14	Source

Ordering Information:

Part Number	Packing	Marking	Ordering Number
V22TG065S1X04	Tray	V22TG065S1X04	V22TG065S1X04T

7 Golda Meir st., Nes Ziona, Israel, 7403650
Tel.: +972-8-6883100 visic-tech.com

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	I_D	-	80	A	
			62		T_C =100°C
Pulsed Drain current[1)]	$I_{D,pulse}$	-	150	A	
Gate Source voltage	V_{GS}	-20	0	V	
Power dissipation	P_{TOT}	-	278	W	
Operating and storage temperature	T_j ,T_{stg}	-55	+150	°C	
	T_C		+150		
Continuous reverse current	I_s	-	80	A	
Reverse pulse current[1)]	$I_{s,pulse}$	-	150	A	
Gate leakage[2)]	I_{gss}	-	200	µA	See Note 2
Thermal Characteristics					
Thermal resistance, junction-case	$R_{\theta JC}$	-	0.3	°C/W	Junction to top thermal pad
Thermal resistance, junction - ambient	$R_{\theta JA}$	-	65	°C/W	
Soldering peak body temperature	Tp	-	260	°C	
Time within 5°C from peak soldering temperature	t_c	-	30	S	

1) Duty cycle =10% and pulse width limited by Tjmax.
2) High Gate leakage is attributed to D1 reverse leakage at 150C.

Electrical characteristics (T_J =25°C, V_{GS} = -15V unless otherwise specified)						
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**	**Conditions**
GaN Gate threshold voltage[3]	V_{th}	-10	-9	-8	V	I_D=1mA
Threshold voltage[4] ref. to driver GND	V_{th-VDD}	5	6	7	V	I_D=1mA V_{DD}=15V
Recommended driving voltage	V_{dd}	0	-	15	V	Ref. to driver GND
Transient Gate Source voltage[5]	$V_{GS(transient)}$	-25	-	+6	V	
Drain Source leakage current	I_{DSS}	-	3	4	µA	V_{DS}= 650V
		-	27	200		V_{DS}= 650V T_J=150°C
Gate resistance	R_G	-	1.4	-	Ω	f=1Mhz
Drain-Source on state resistance	$R_{DS(ON)}$	-	22	27	mΩ	V_{GS}=0V I_D=35A
		-	42	52		V_{GS}=0V I_D=35A 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	-	-	0.22	V	I_D=10A
		-	-	0.42		I_D=10A T_j =150°C
Reverse recovery time	t_{rr}	-	-	0	ns	
Reverse recovery charge	Q_{rr}	-	-	0	nC	
Output Charge	Q_{oss}	-	-	171	nC	V_{DS}=400V
Input capacitance	C_{iss}	-	780	820	pF	f=1MHz V_{DS}=400V
Output capacitance	C_{oss}	-	200	240		
Reverse Transfer capacitance	C_{rss}	-	26	30		
Effective Output capacitance, Energy Related	$C_{O(ER)}$	-	-	278	pF	V_{DS}= 0-400V
Turn-On delay time	$t_{d(on)}$	-	12	-	ns	V_{DS}=400V V_{DD}=15V I_D=35 R_{gate}= 1 Ohm
Fall time	t_f	-	8.6	-		
Turn-Off delay time	$t_{d(off)}$	-	15.5	-		
Rise time	t_r	-	8.8	-		

3) After applying Enable signal, see operation circuit below.
4) In operation Vgs swings from -V_{DD} (OFF state) to 0V (ON state). V_{th-VDD} threshold voltage is defined as V_{DD} +V_{th} =15V + [-8V] =7V.
5) In on/off-state, spike; spike duration <1µs.

Electrical characteristics (TJ =25°C, VGS = -15V unless otherwise specified)						
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**	**Conditions**
Gate Charge characteristics						
Gate to Source charge[6)]	Q_{GS}	-	4.3	-	nC	V_{GS}= 0V to -10V V_{DS}=400V I_D=30A
Gate to Drain charge[6)]	Q_{GD}	-	33	-		
Total Gate charge[1)]	QG	-	41	-		
Case to Drain Capacitance						
Capacitance	C_C	-	20	-	pF	f=1 MHz 0.1V RMS

6) After applying Enable signal, see Typical Operation circuit below.

Enable Pin Characteristics						
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**	**Conditions**
PMOS Vth	$V_{th\text{-}PMOS}$	-3		-2	V	Pin 9 ref. to Pin 7
Absolute maximum rating	$V_{En\text{-}KS}$	-20	-	10		

Recommended Operational Voltages						
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**	**Conditions**
Pin 9, Enable signal referenced to ISO GND						
Recommended V_{DD} voltage for **PMOS Enable**	$V_{En\text{-}PMOS}$		13.5		V	For 15V V_{DD}
Recommended V_{DD} voltage for **PWM UVLO**	$V_{PWM\text{-}UVLO}$		14			

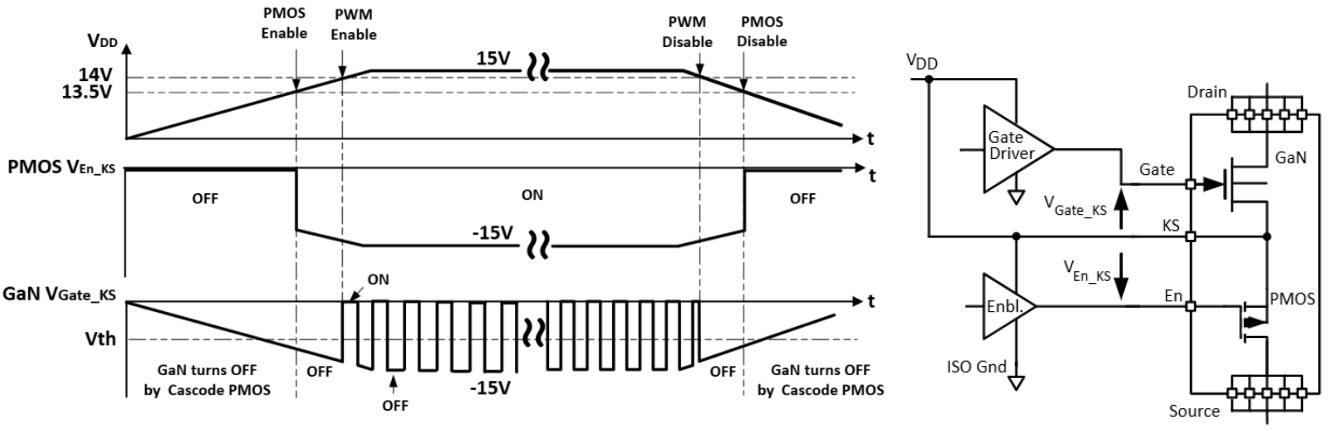


Figure 2 - Simplified D3GaN safe operation voltage references for Enable & PWM UVLO

Typical Characteristics at 25C° (unless noted otherwise)

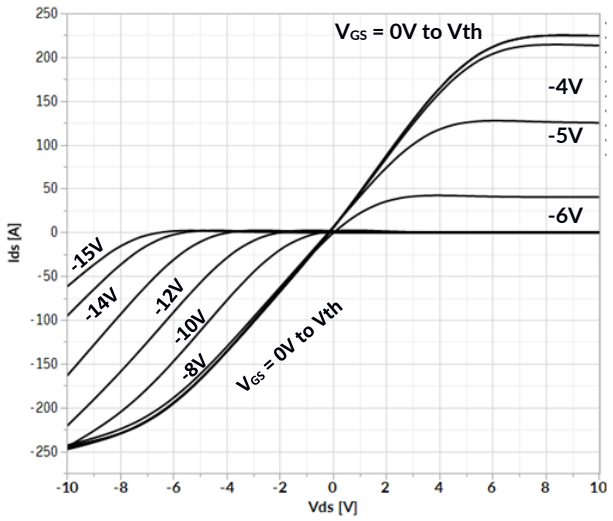


Figure 3 - Output Characteristics

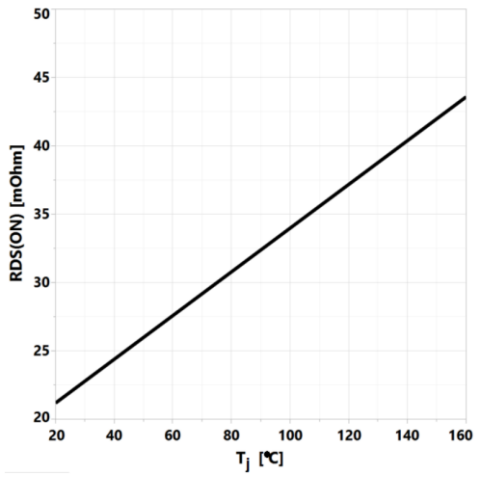


Figure 4 - ON-State Resistance vs. Temperature

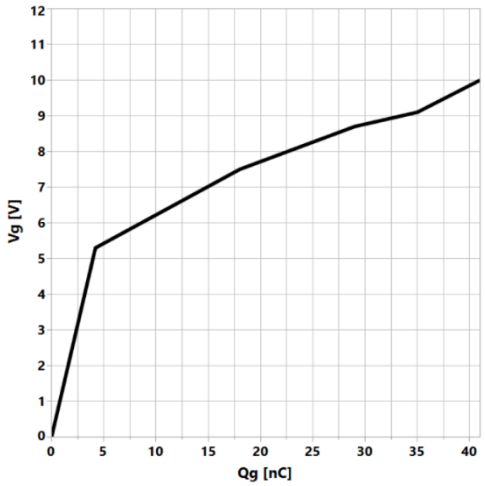


Figure 5 - Typical Gate Charge

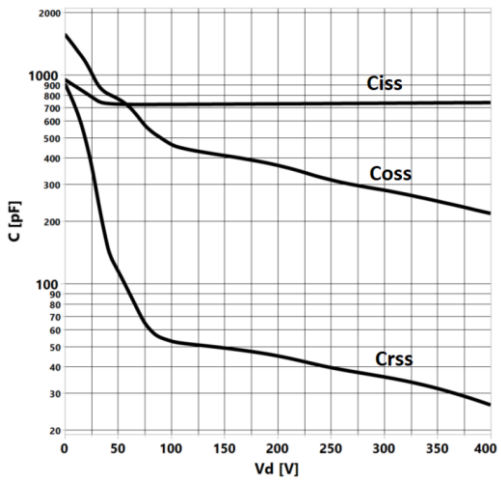


Figure 6 - Typical Capacitances

Typical Characteristics at 25C° (unless noted otherwise)

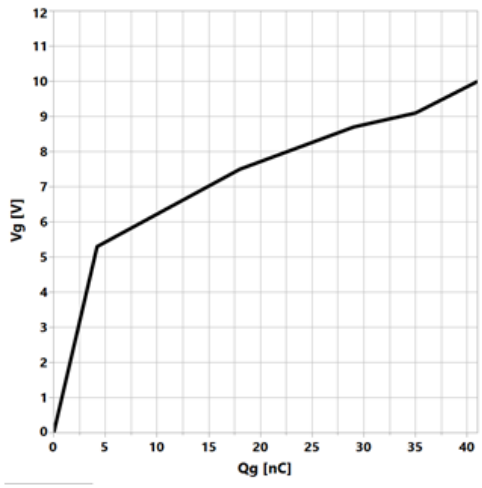


Figure 7 - Gate Charge

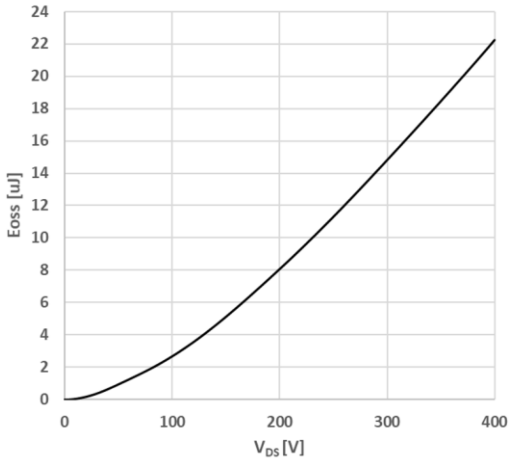


Figure 8 - Typical Coss stored Energy

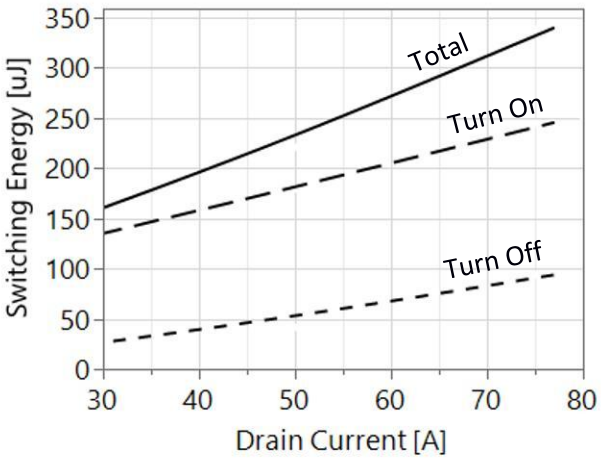
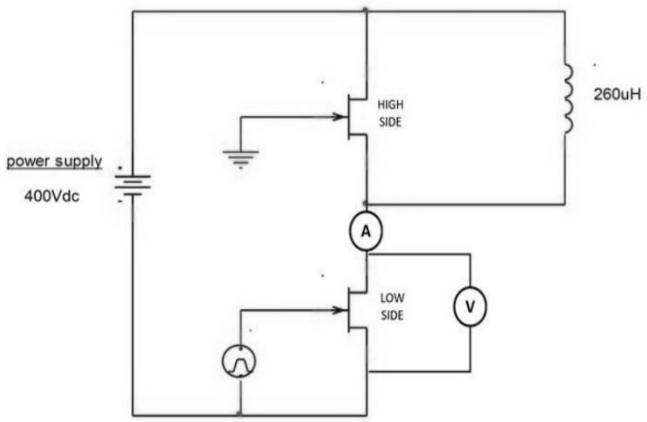
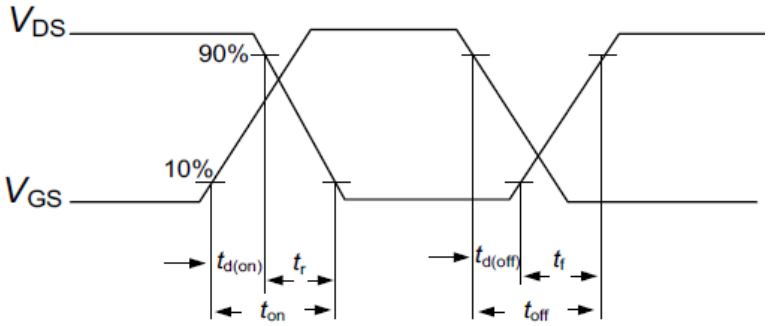


Figure 9 - Typical Switching Energy vs Drain Current at 400V

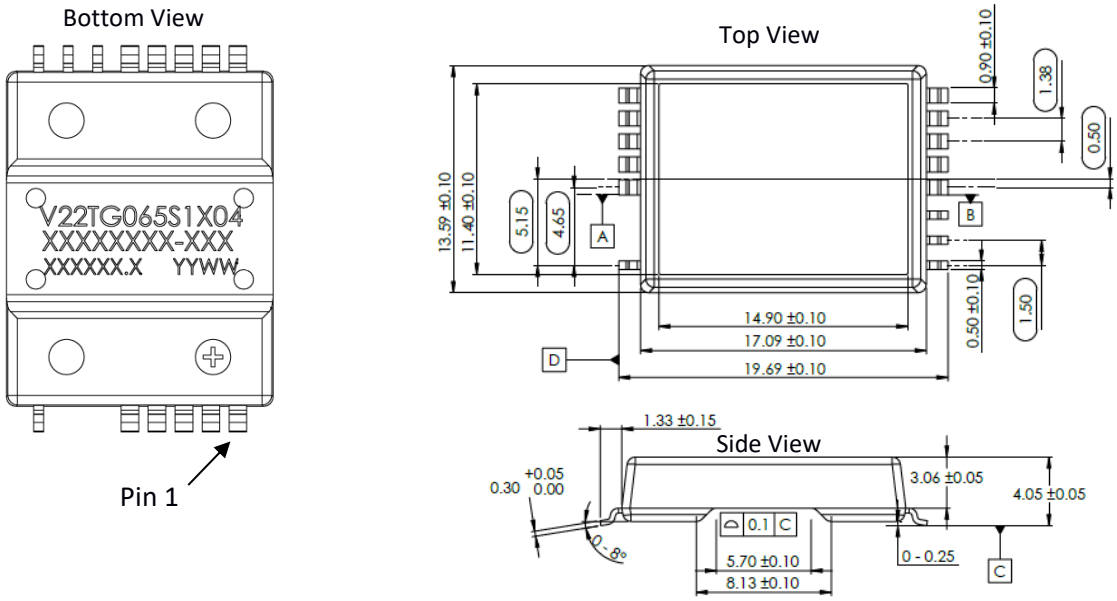
Test Circuit Schematic:



Switching Time Waveforms:



Package Outlines:



Recommended PCB Land Pattern:

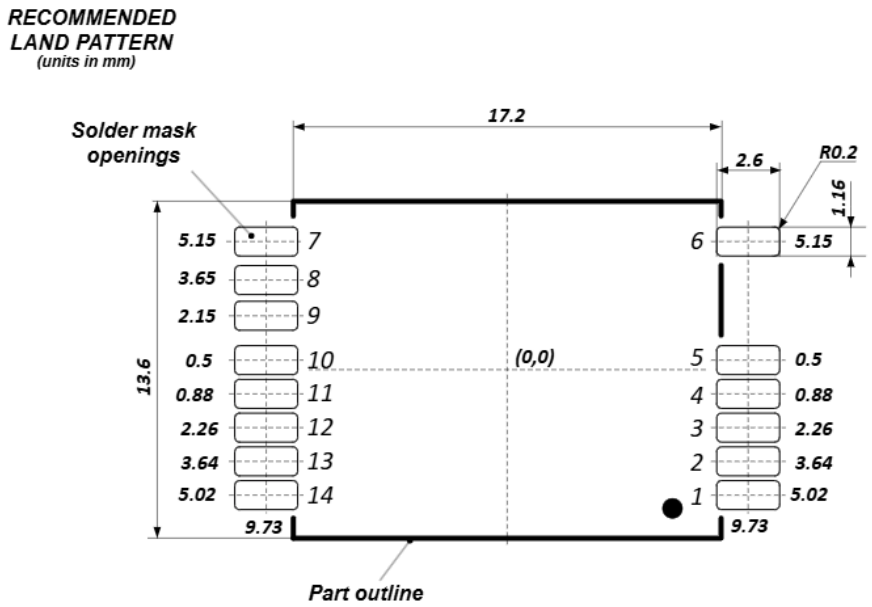


Figure 10 - Recommended PCB Land Pattern for V22TG Package (Units: mm)

Rev.	Date	Content of Change	Owner
1.0	26/05/2026	New datasheet and template under new part number	I.B