

Description

The D³GaN (Direct Drive D-Mode) V22TC065S1X01 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.

An **Isolated High Power SMD** package enables 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 connection
- Normally-Off
- High power density
- Fully isolated package (3.5KV)
- High Threshold Voltage >5V
- Driven by standard 15V driver
- Top cooling package

Applications

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

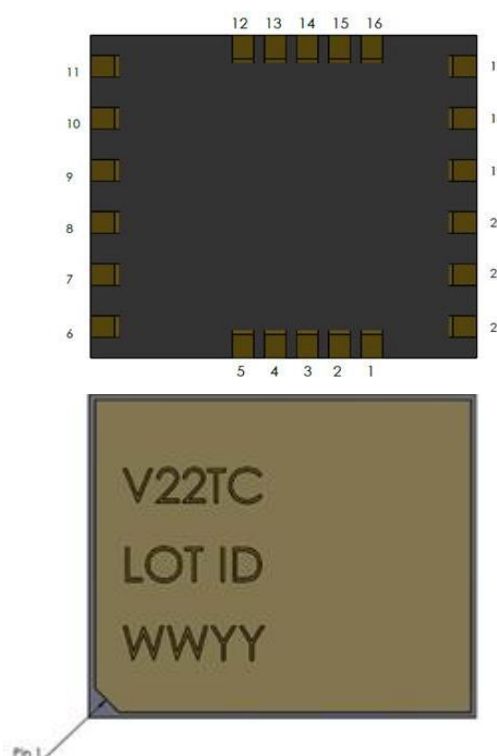


Fig. 1: Die Pinout

Key Performance Parameters

Parameter	Value	Units
V_{DS}	650	V
$R_{DS(ON)}$	22	m Ω
Q_G	41	nC
$I_{D,pulse}$	250	A
I_D	100	A

Pin	Function
17-	Source
1	Activation signal
2	Com signal
3	Gate
4	Com power
5	Enable
6-11	Drain
12-	NC*

*Do not connect to any signal

Ordering Information:

Part Number	Packing	Marking	Ordering Number
V22TC065S1X01	Tray	V22TC065S1X01	V22TC065S1X01T

Maximum ratings (T _c =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	-	100	A	T _C =25°C ¹⁾
			80		T _C =100°C ¹⁾
Pulsed Drain current ²⁾	I _{D,pulse}	-	250	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}	-	278	W	
Operating and storage temperature	T _j , T _{stg}	-55	+150	°C	
Continuous reverse current	I _s	-	100	A	T _C =25°C ¹⁾
			80		T _C =100°C ¹⁾
Reverse pulse current ¹⁾	I _{s,pulse}	-	250	A	
Gate leakage	I _{gss}	-	200	uA	V _{DS} = 650V, V _{GS} = -15V
Thermal Characteristics					
Thermal resistance, junction-case	R _{θJC}	-	0.3	°C/W	
Thermal resistance, junction - ambient	R _{θJA}	-	65	°C/W	
Soldering peak body temperature	T _p	-	260	°C	
Time within 5°C from peak soldering temperature	t _c	-	30	S	

- 1) Limited by T_j max of 150°C, V_{gs} = 0V, considering R_{th}(JC) in a discrete package = 0.3°C/W
2) Duty cycle =10% and pulse width limited by T_jmax.

Electrical characteristics (T _J =25°C, V _{GS} = -15V unless otherwise specified)						
Parameter	Symbol	Min	Typical	Max	Unit	Conditions
Static						
Gate threshold voltage ¹	V _{th}	6.3	6.8	8.7	V	I _D =1mA
Recommended driving voltage ²	V _{DD}		15		V	Refer to driver GND
Drain Source leakage current	I _{DSS}	-	20	60	μA	V _{DS} = 650V
		-	75	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	-	-	0.2	V	I _D =10A, V _{GS} =0V
		-	-	0.4		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}	-	-	171	nC	V _{DS} =400V
Dynamic						
Input capacitance	C _{iss}	-	760	800	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)}	-	427	-	pF	V _{DS} = 0-400V
Turn-on delay time	t _{d(on)}	-	9	-	ns	V _{DS} =400V, V _{DD} =15V ¹ I _D =35A, BJT Gate Buffer R _{base} = 100Ω for ON & 20Ω for OFF
Fall time	t _f	-	10.8	-		
Turn-off delay time	t _{d(off)}	-	15.5	-		
Rise time	t _r	-	6.5	-		

- 1) Refers to driver GND, see typical operating circuit. Threshold voltage defined as V_{th}= V_{DD}+V_{th-GaN}= 15V+[-8.2]V=6.8V
- 2) In operation V_{gs} 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}	-	4.3	-	nC	V _{GS} =0V to -10V V _{DS} =400V I _D =32A
Gate to Drain charge	Q _{GD}	-	33	-		
Total Gate charge	Q _G	-	41	-		

Pin Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	Conditions
Pin 1 Activation signal ²⁾						
Enable voltage	Pin 1		0	5	V	
Disable voltage	Pin 1	10	15			
Absolute maximum rating ³⁾	Pin 1	-20		10		
Pin 2 Com signal – Do not force any voltage.						
Voltage at Disable mode	Pin 2				V	VDS >20V
Voltage at Enable mode	Pin 2					
Absolute maximum rating	Pin 2					
Pin 3 Gate ²⁾						
Gate Voltage for non-Conducting mode	Pin 3	0	-	4	V	
Gate Voltage for conducting mode	Pin 3	8.7	-	Aux		
Absolute maximum rating ³⁾	Pin 3	-25	-	6		
Pin 4 Com Power ²⁾						
Activation signal	Pin 4	10	Aux	15	V	
Absolute maximum rating ³⁾	Pin 4	-30		0		
Pin 5 Enable must be connected to pin1						

- 1) After applying Activation signal
- 2) Refers to circuit GND
- 3) Refers to Pin2

Typical Characteristics at 25C° (unless noted otherwise)

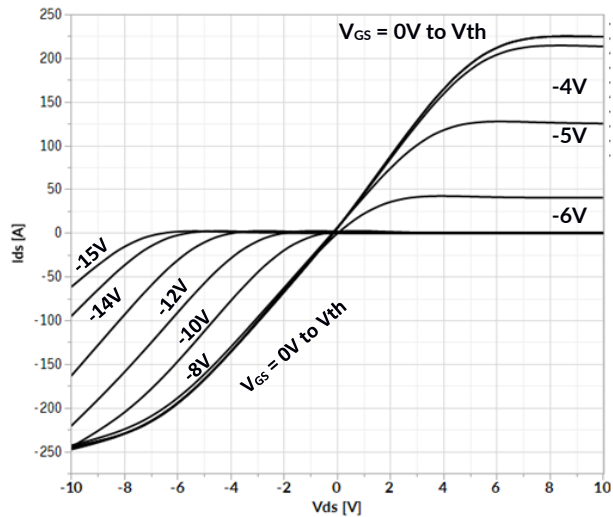


Figure 1 Output Characteristics

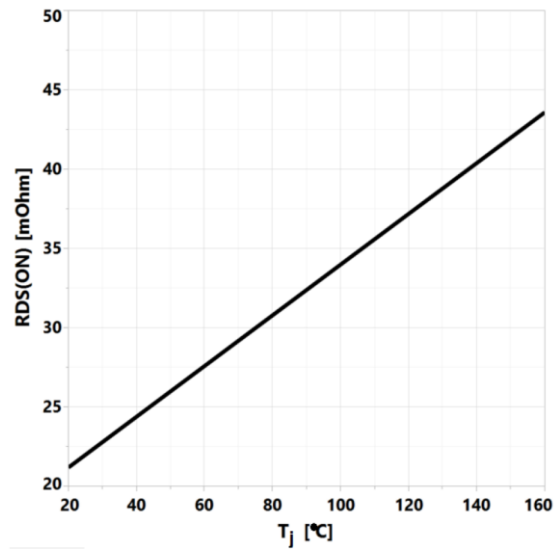


Figure 2 ON-State Resistance vs. Temperature

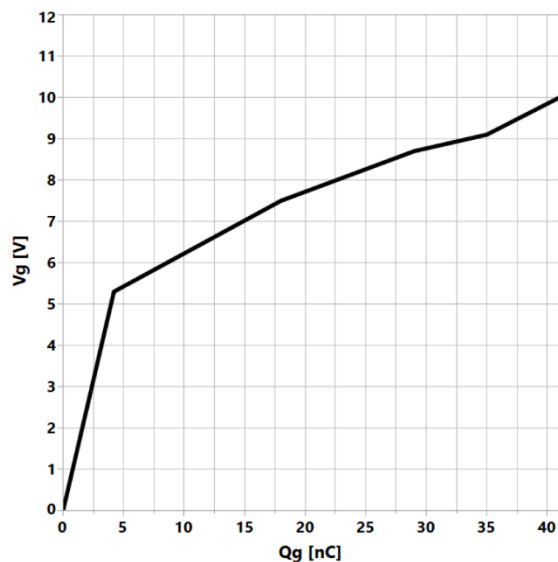


Figure 3 Typical Gate Charge

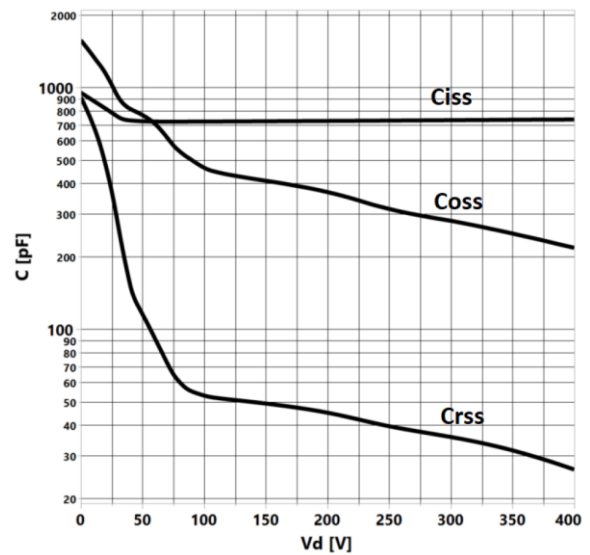


Figure 4 Typical Capacitances

Typical Characteristics cont.

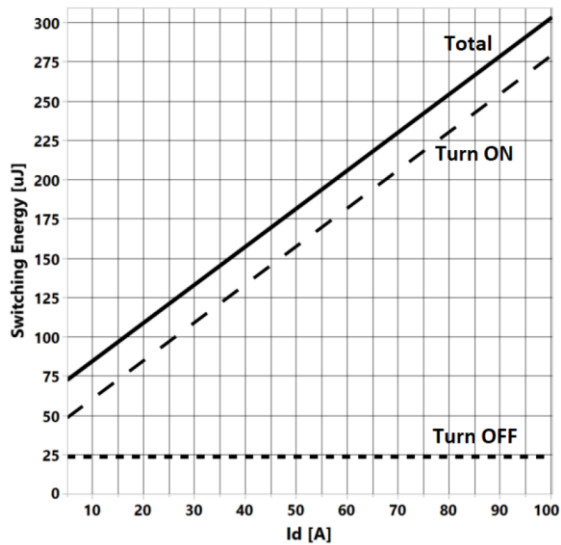


Figure 5 Typical Switching Energy vs Drain Current at 400V

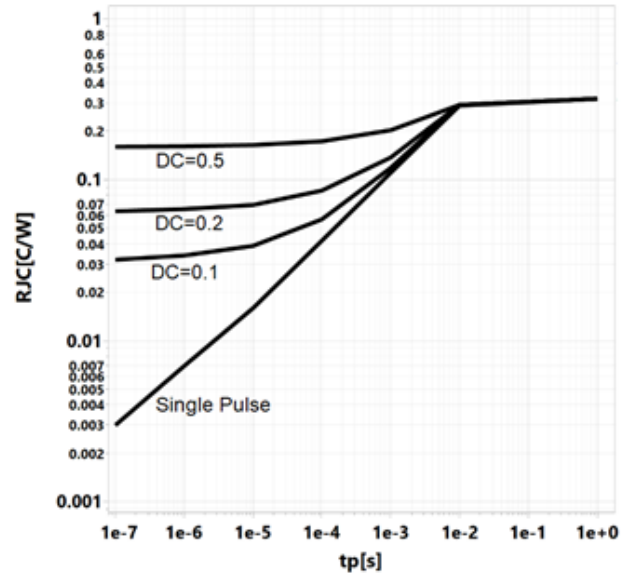


Figure 6 Transient Thermal Impedance

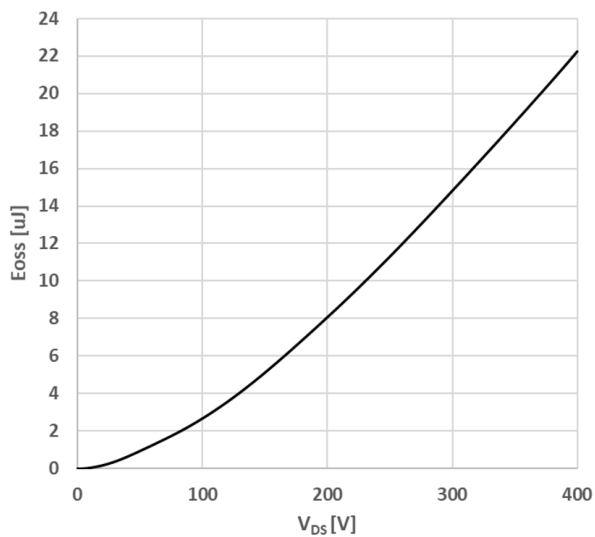


Figure 7 Typical Coss stored Energy

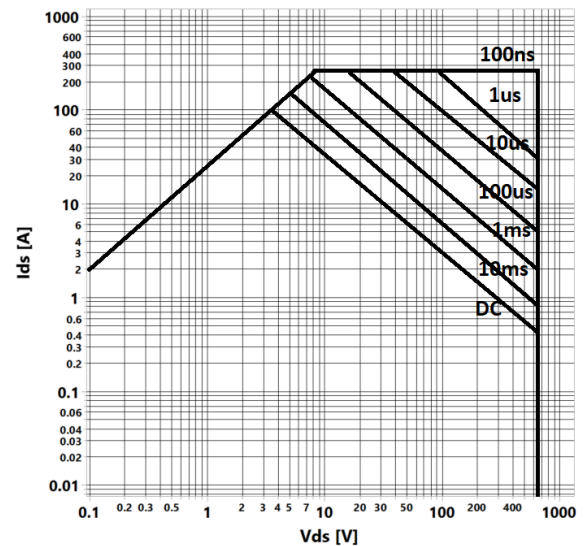


Figure 8 Safe Operation Area

Typical Characteristics cont.

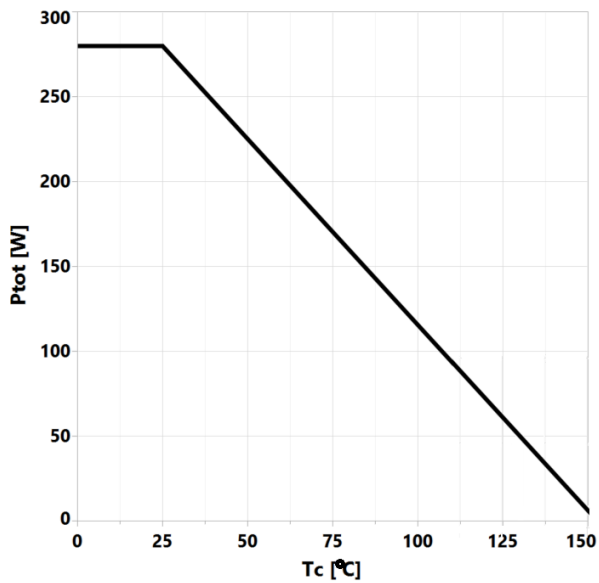


Figure 9 Power dissipation

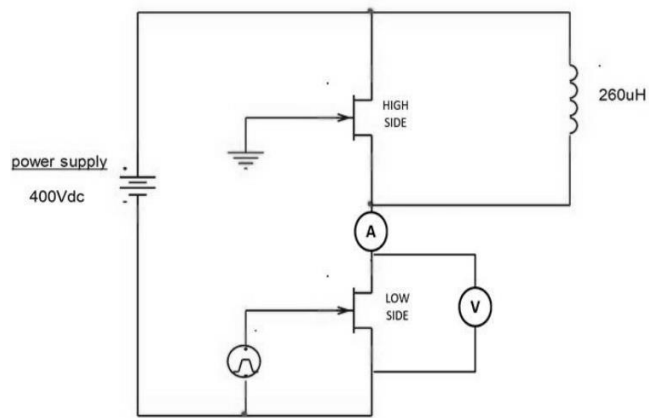


Fig.16: Switching parameters test circuit

Switching Time Waveforms

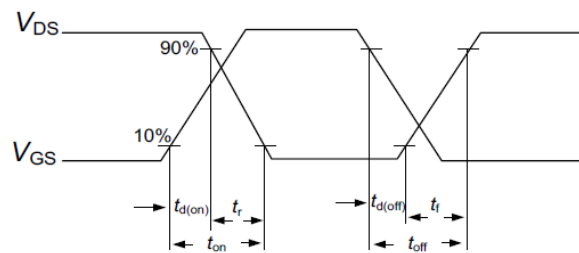


Fig.17: Switching time waveforms

PCB Footprint Recommendation

Top Metal Surface Plating: ENIEPIC

Spec:
Gold 0.05um Min
Nickel 3.00 um Min
Pd 0.1um Min

Dimension	Millimeter (SI)	Inch (Imperial)
A	18.0	0.702
B	15.0	0.585
C	3.3	0.132
d	9.00	0.351
e	7.50	0.292
f	6.00	0.234
g	1.10	0.044
h	1.00	0.04
i	1.90	0.076
j	2.40	0.096
k	1.50	0.06
l	8.45	0.338

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MILLIMETERS

INTERPRETATION OF DIMENSIONS AND TOLERANCES
PER: ASME Y14.5-2009/ASME Y14.1-2003

DO NOT SCALE DRAWING

Project name: V22TC

DATE: 26.06.19

BY: 7603857 New Stone Israel

Office: +972 8 9717193

Fax: 08-6909467

Scale: 1:1

Sheet: 01

Part: PAD LAYOUT DRAWING

Part Number: PAD22651000

Part Name: V22TC

Part Description: New Drawing

Part Date: 26.06.19

Part By: 7603857 New Stone Israel

Part Office: +972 8 9717193

Part Fax: 08-6909467

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Rev.	Date	Content of Change	Owner
1.0	29/07/2023	New datasheet and template under new part number	I.B

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