

VBQA165A20S Datasheet

650 V (D-S) GaN Enhancement mode transistor

PRODUCT SUMMARY

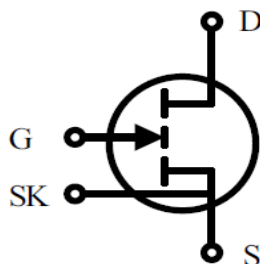
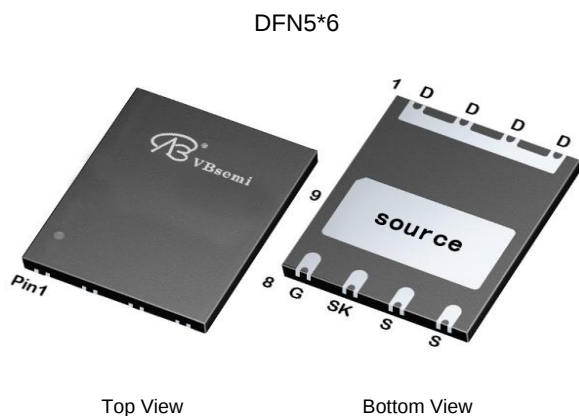
V_{DS} (V)	650	
$R_{DS(on)}$ at 25 °C (Ω)	$V_{GS} = 6\text{ V}$	0.110

FEATURES

- Ultra High Switching Frequency
- Enhancement Mode Transistor
- No reverse-recovery charge
- Ultra low gate charge (Q_g)
- ESD Protection

APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Fast Battery Charging



ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)					
PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V _{DS,max}	650	V
Gate-Source Voltage			V _{GS}	-1.4~+7	
Continuous Drain Current (T _J = 150 °C)	V _{GS} at 6 V	T _C = 25 °C	I _D	20	A
		T _C = 125 °C		10	
Pulsed Drain Current ^a			I _{DM}	30	
Drain-Source Voltage transient ^b			V _{DS,transient}	800	V
Drain-Source Voltage Pulse ^c			V _{DS,pulse}	750	V
Maximum Power Dissipation			P _D	119	W
Operating Junction and Storage Temperature Range			T _J , T _{stg}	-55 to +150	°C
Drain-Source Voltage Slope	T _J = 125 °C		dV/dt	150	V/ns
Drain-Source Voltage Slope ^d	T _J = 25 °C			200	
Soldering Recommendations (Peak Temperature) ^c	for 10 s			260	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- Non-repetitive events, $t_{pulse} < 200\text{ }\mu\text{s}$.
- Repetitive pulse, $t_{pulse} < 100\text{ ns}$.
- $I_{SD} \leq I_D$, $dI/dt = 100\text{ A}/\mu\text{s}$, starting $T_J = 25\text{ }^\circ\text{C}$.

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	1.05	

SPECIFICATIONS ($T_J = 25\text{ °C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Voltage	V _{DS}	-55 °C ≤ T _J ≤ 150 °C		-	-	650	V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 1 mA		-	0.60	-	V/°C
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 17.2 mA		1.2	-	2.5	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = 6 V		-	50	-	μA
		V _{DS} = 0 V, V _{GS} = 7 V		-	-	1	mA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 650V, V _{GS} = 0 V		-	1	25	μA
		V _{DS} = 650 V, V _{GS} = 0 V, T _J = 150°C		-	10	-	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 6 V	I _D =3.5A	-	0.110	-	Ω
Gate Resistance	R _g	F = 5MHz, Open drain		-	3.5	-	Ω
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 400 V, f = 100 kHz		-	120	-	pF
Output Capacitance	C _{oss}			-	37	-	
Reverse Transfer Capacitance	C _{rss}			-	0.4	-	
Effective Output Capacitance, Energy Related ^a	C _{o(er)}	V _{DS} = 0 V to 400 V, V _{GS} = 0 V		-	60	-	
Effective Output Capacitance, Time Related ^b	C _{o(tr)}			-	80	-	
Total Gate Charge	Q _g	V _{GS} = 6 V	I _D = 5 A, V _{DS} = 400 V	-	3.3	-	nC
Gate-Source Charge	Q _{gs}			-	0.3	-	
Gate-Drain Charge	Q _{gd}			-	1.2	-	
Turn-On Delay Time	t _{d(on)}	V _{DS} = 400 V, I _D = 5 A, V _{GS} = 6 V, R _g = 3 Ω		-	3	-	ns
Rise Time	t _r			-	4	-	
Turn-Off Delay Time	t _{d(off)}			-	5	-	
Fall Time	t _f			-	4	-	
Output Charge	Q _{oss}	V _{DS} = 0 V to 400 V, V _{GS} = 0 V		-	33.5	-	pF
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I _S	V _{GS} = 6 V		-	-	10	A
Pulsed Diode Forward Current	I _{SM}			-	-	30	
Diode Forward Voltage	V _{SD}	T _J = 25 °C, I _S = 3 A, V _{GS} = 0 V		-	2.4	-	V
Reverse Recovery Time	t _{rr}	T _J = 25 °C, I _F = I _S = 5 A, di/dt = 100 A/μs, V _R = 400 V		-	0	-	ns
Reverse Recovery Charge	Q _{rr}			-	0	-	μC

Notes

- a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .
 b. $C_{oss(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .

TYPICAL CHARACTERISTICS($T_c=25^{\circ}\text{C}$, unless otherwise noted)

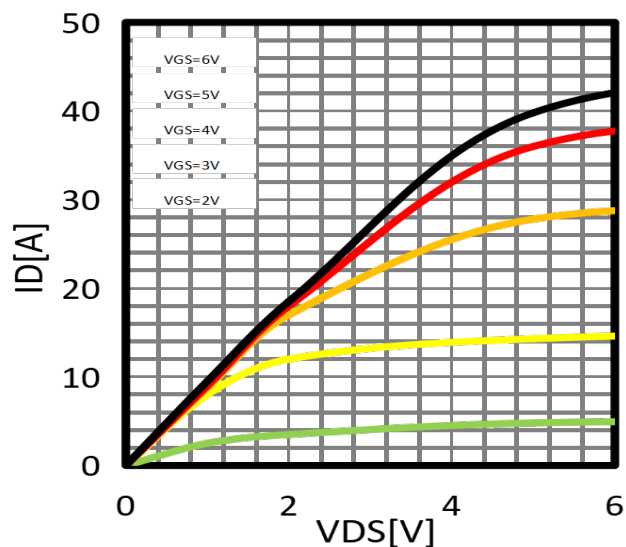


Fig.1: Output Characteristics

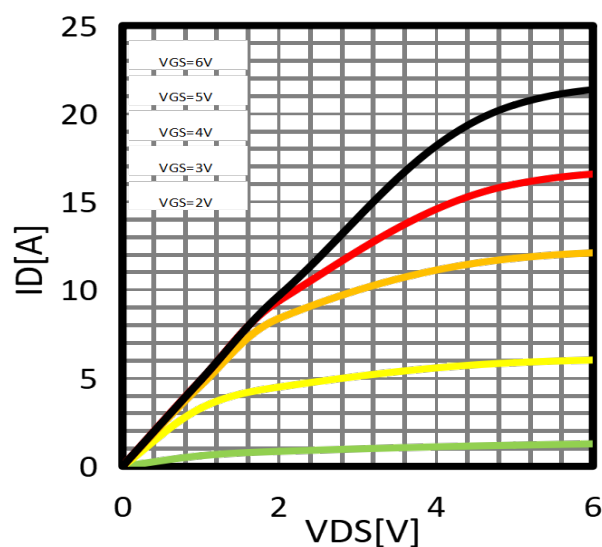


Fig.2: Output Characteristics(125°C)

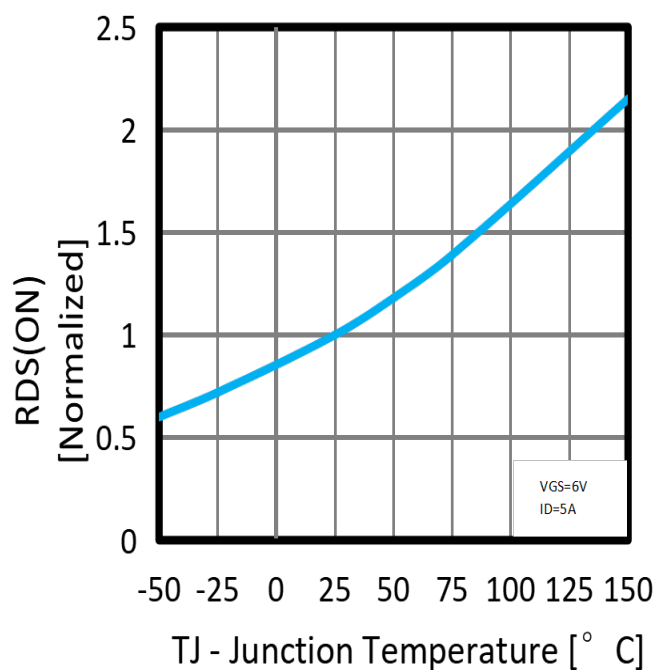


Fig.3: Drain-source on-state resistance

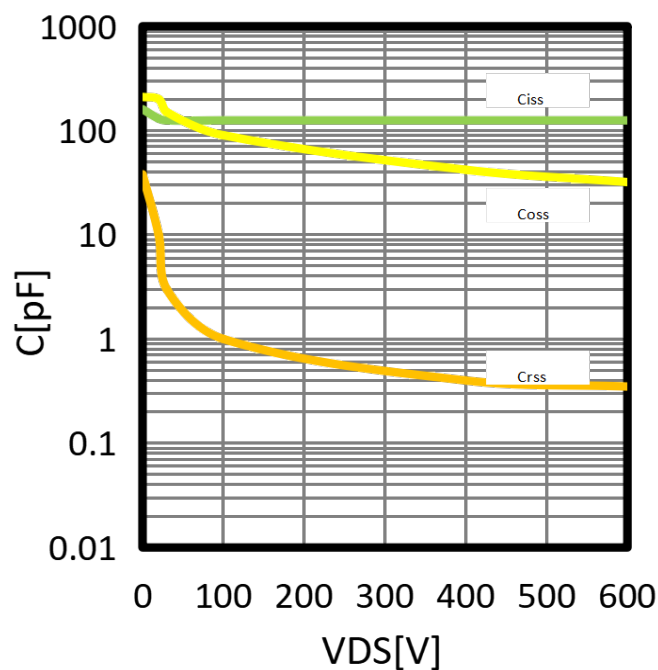
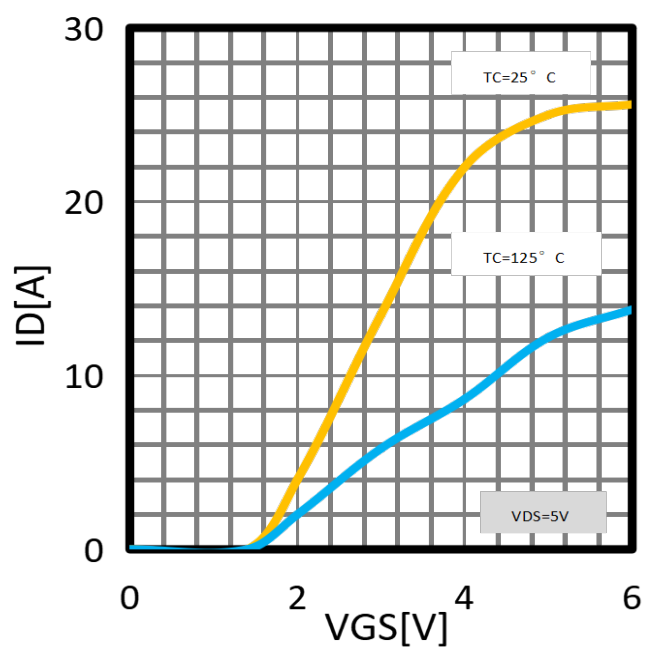
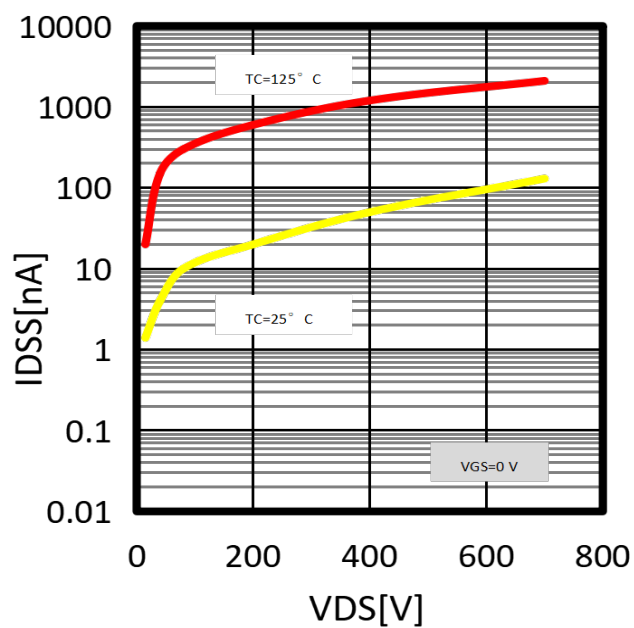
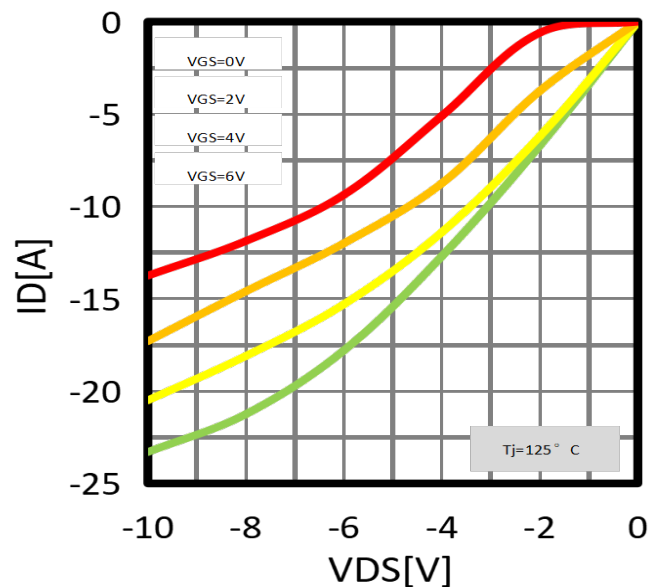
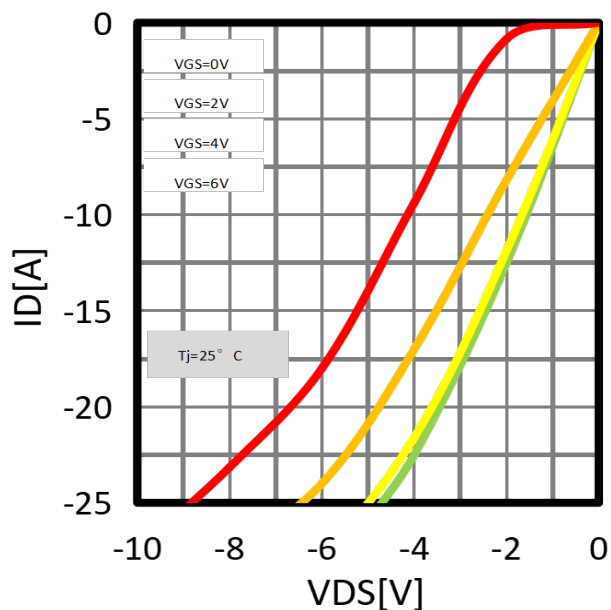


Fig.4: Typical Capacitance



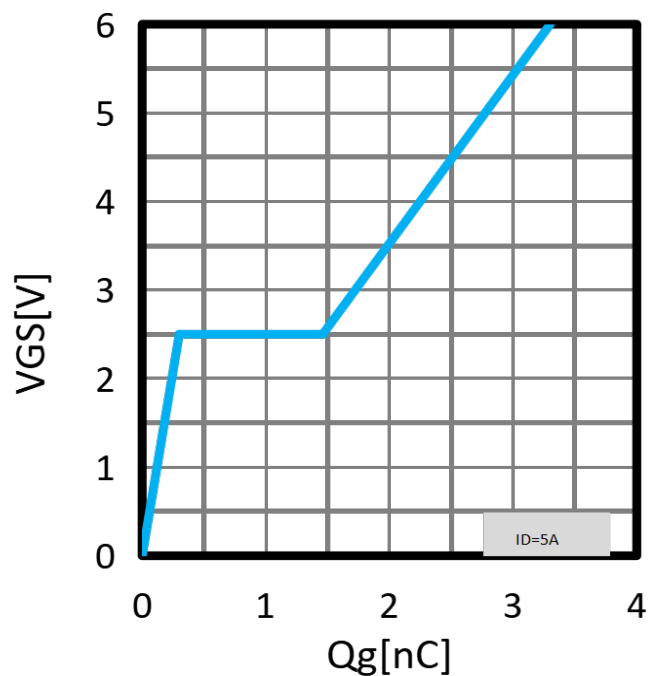


Fig.9:Gate Charge

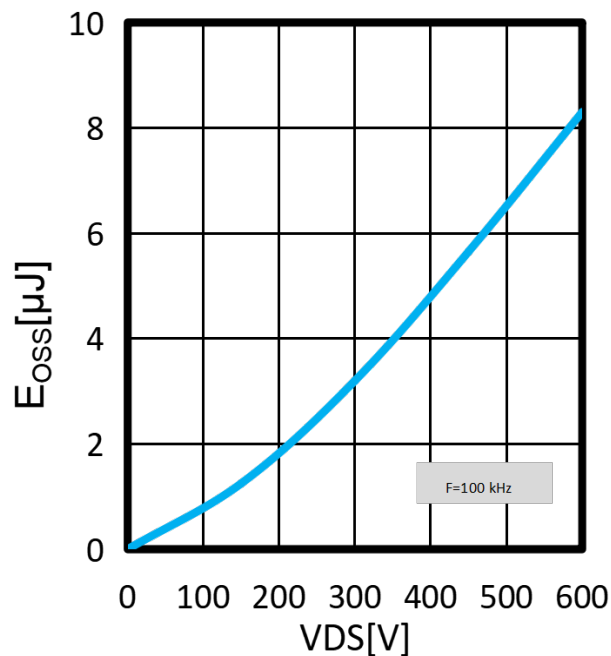


Fig.10:Typical Coss Stored Energy

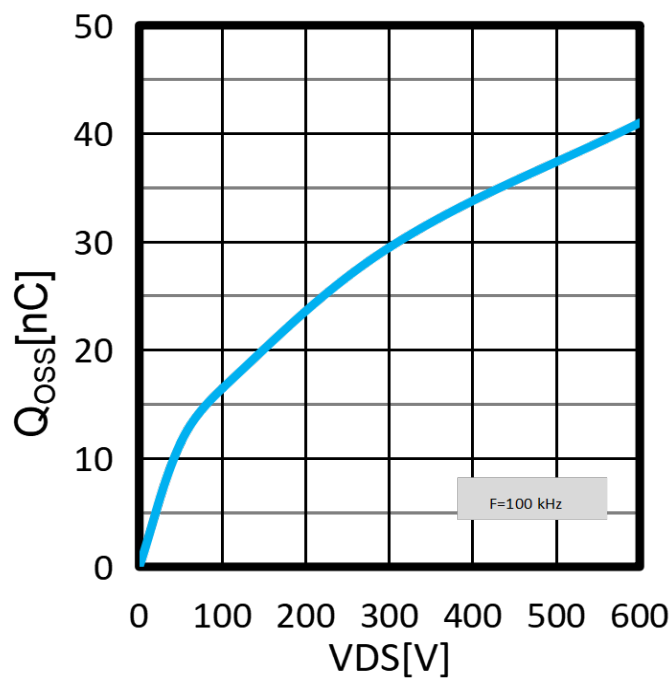


Fig.11:Typical Output Charge

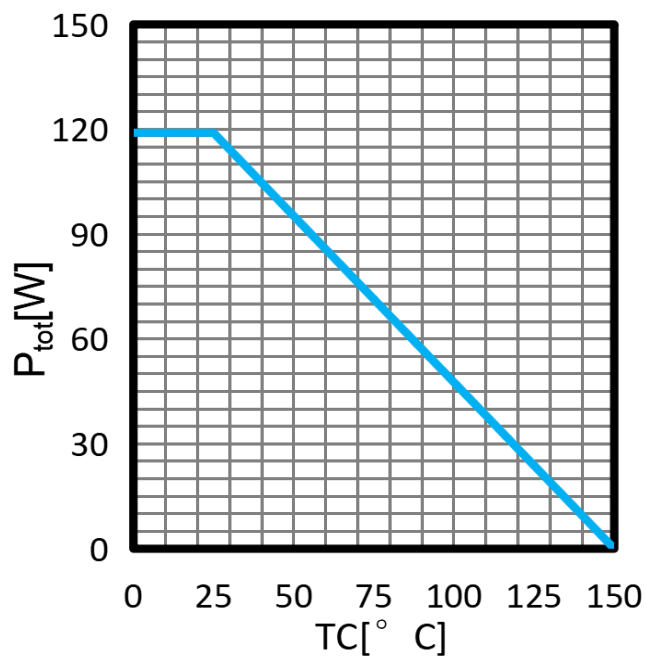


Fig.12:Power Dissipation

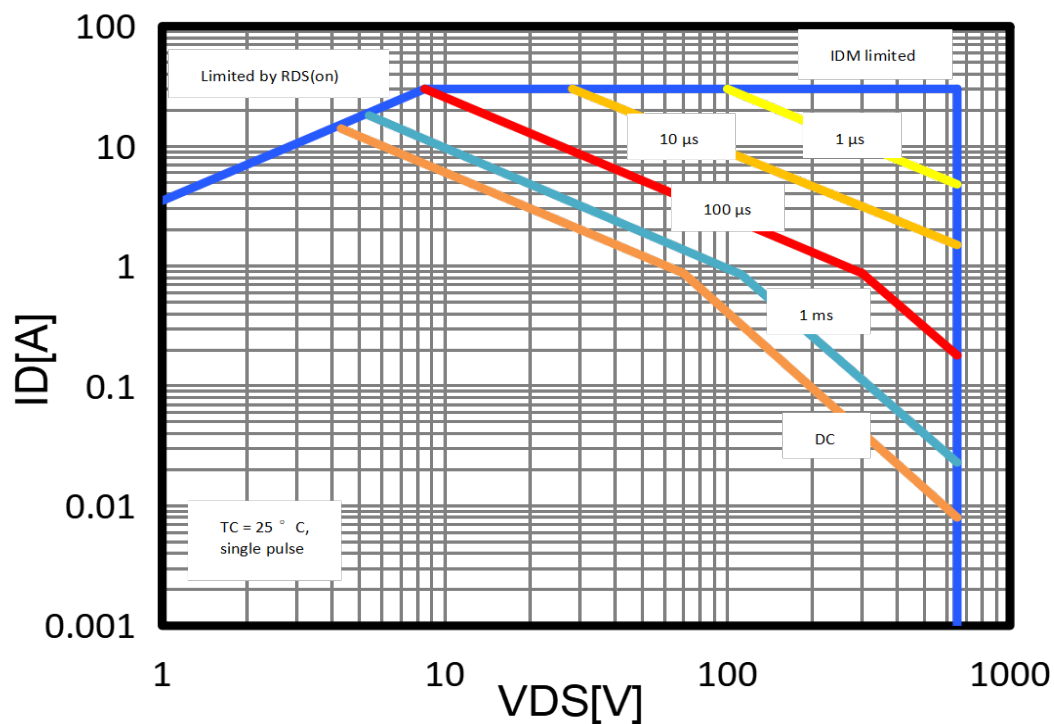


Fig.13:Safe Operating Area

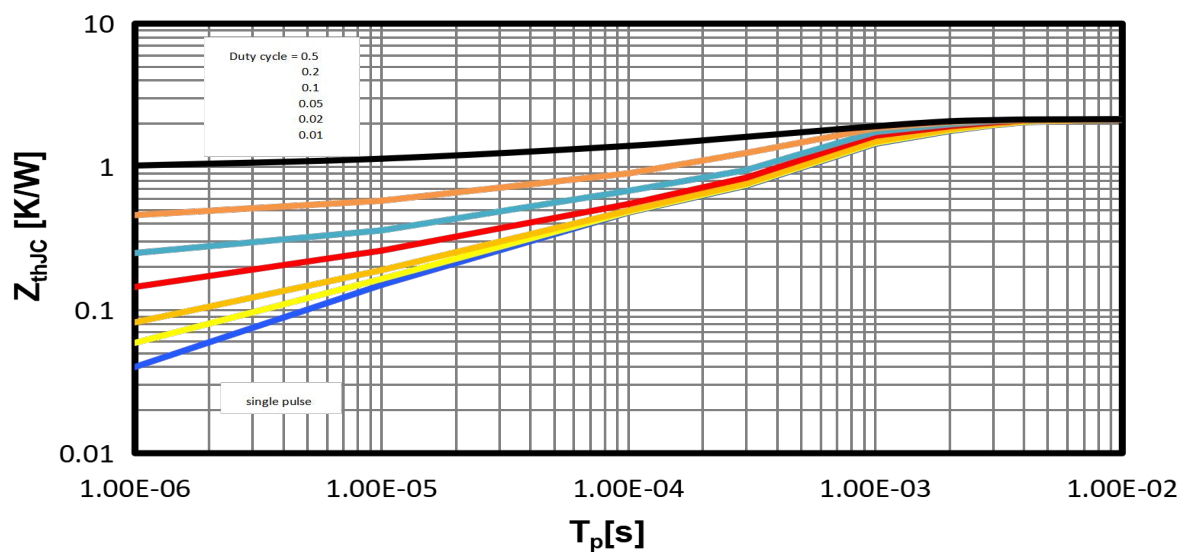
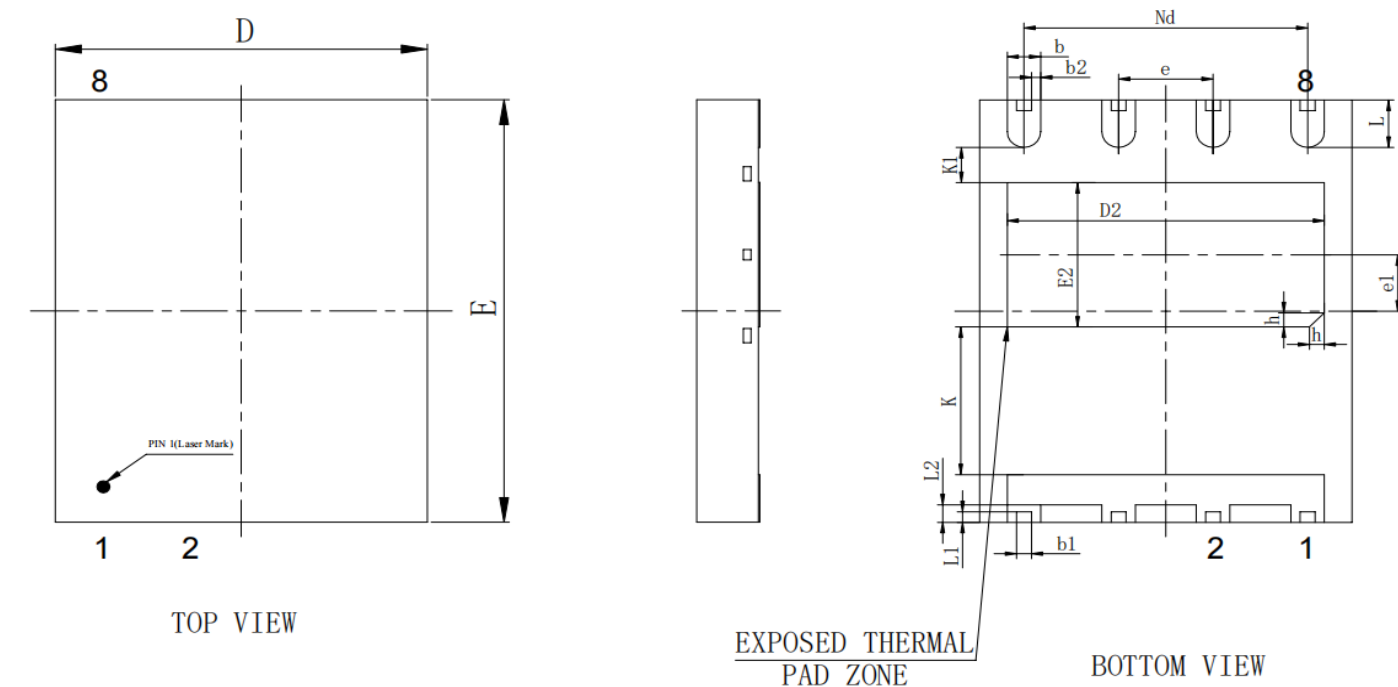


Fig.14:Transient Thermal Impedance

DFN 5x6 Package Information



SYMBOL	MILL IMETER		
	MIN	NOM	MAX
A	0.80	0.85	0.90
A1	0	0.02	0.05
b	0.40	0.45	0.50
b1	0.20REF		
b2	0.125REF		
C	0.203REF		
D	4.90	5.00	5.10
D2	4.16	4.26	4.36
e	1.27BSC		
e1	0.80BSC		
Nd	3.81BSC		
E	5.90	6.00	6.10
E2	1.95	2.05	2.15
L	0.625	0.675	0.725
L1	0.15REF		
L2	0.25REF		
h	0.15	0.20	0.25
k	2.10REF		
k1	0.50REF		

Disclaimer

All products due to improve reliability, function or design or for other reasons, product specifications and data are subject to change without notice.

Shenzhen VBsemi Electronics Co., Ltd., branches, agents, employees, and all persons acting on its or their representatives (collectively, the "Shenzhen VBsemi"), assumes no responsibility for any errors, inaccuracies or incomplete data contained in the table or any other any disclosure of any information related to the product.(www.VBsemi.com)

Shenzhen VBsemi makes no guarantee, representation or warranty on the product for any particular purpose of any goods or continuous production. To the maximum extent permitted by applicable law on Shenzhen VBsemi relinquished: (1) any application and all liability arising out of or use of any products; (2) any and all liability, including but not limited to special, consequential damages or incidental ; (3) any and all implied warranties, including a particular purpose, non-infringement and merchantability guarantee.

Statement on certain types of applications are based on knowledge of the product is often used in a typical application of the general product VBsemi Shenzhen demand that the Shenzhen VBsemi of. Statement on whether the product is suitable for a particular application is non-binding. It is the customer's responsibility to verify specific product features in the products described in the specification is appropriate for use in a particular application. Parameter data sheets and technical specifications can be provided may vary depending on the application and performance over time. All operating parameters, including typical parameters must be made by customer's technical experts validated for each customer application. Product specifications do not expand or modify Shenzhen VBsemi purchasing terms and conditions, including but not limited to warranty herein.

Unless expressly stated in writing, Shenzhen VBsemi products are not intended for use in medical, life saving, or life sustaining applications or any other application. Wherein VBsemi product failure could lead to personal injury or death, use or sale of products used in Shenzhen VBsemi such applications using client did not express their own risk. Contact your authorized Shenzhen VBsemi people who are related to product design applications and other terms and conditions in writing.

The information provided in this document and the company's products without a license, express or implied, by estoppel or otherwise, to any intellectual property rights granted to the VBsemi act or document. Product names and trademarks referred to herein are trademarks of their respective representatives will be all.

Material Category Policy

Shenzhen VBsemi Electronics Co., Ltd., hereby certify that all of the products are determined to be RoHS compliant and meets the definition of restrictions under Directive of the European Parliament 2011/65 / EU, 2011 Nian. 6. 8 Ri Yue restrict the use of certain hazardous substances in electrical and electronic equipment (EEE) - modification, unless otherwise specified as inconsistent.(www.VBsemi.com)

Please note that some documents may still refer to Shenzhen VBsemi RoHS Directive 2002/95 / EC. We confirm that all products identified as consistent with the Directive 2002/95 / EC European Directive 2011/65 /.

Shenzhen VBsemi Electronics Co., Ltd. hereby certify that all of its products comply identified as halogen-free halogen-free standards required by the JEDEC JS709A. Please note that some Shenzhenese VBsemi documents still refer to the definition of IEC 61249-2-21, and we are sure that all products conform to confirm compliance with IEC 61249-2-21 standard level JS709A.