

General Description

The WSF40N10 is the highest performance trench N-Ch MOSFET with extreme high cell density , which provide excellent RDS(on) and gate charge for most of the synchronous buck converter applications .

The WSF40N10 meet the RoHS and Green Product requirement , 100% EAS guaranteed with full function reliability approved.

Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent Cdv/dt effect decline
- Green Device Available

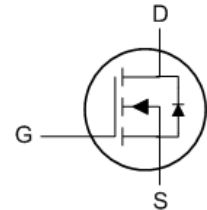
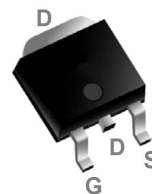
Product Summary

BVDSS	RDS(on)	ID
100V	32mΩ	40A

Applications

- High Frequency Point-of-Load Synchronous Buck Converter
- Networking DC-DC Power System
- Load Switch

TO-252 Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V _{DS}	Drain-Source Voltage	100	V
V _{GS}	Gate-Source Voltage	±20	V
I _D @T _C =25°C	Continuous Drain Current, V _{GS} @ 10V ¹	40	A
I _D @T _C =100°C	Continuous Drain Current, V _{GS} @ 10V ¹	30	A
I _D @T _A =25°C	Continuous Drain Current, V _{GS} @ 10V ¹	4.2	A
I _D @T _A =70°C	Continuous Drain Current, V _{GS} @ 10V ¹	3.4	A
I _{DM}	Pulsed Drain Current ²	45	A
EAS	Single Pulse Avalanche Energy ³	43.3	mJ
I _{AS}	Avalanche Current	27	A
P _D @T _C =25°C	Total Power Dissipation ⁴	52.1	W
P _D @T _A =25°C	Total Power Dissipation ⁴	2	W
T _{STG}	Storage Temperature Range	-55 to 150	°C
T _J	Operating Junction Temperature Range	-55 to 150	°C

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R _{θJA}	Thermal Resistance Junction-ambient ¹	---	62	°C/W
R _{θJC}	Thermal Resistance Junction-Case ¹	---	2.4	°C/W

Electrical Characteristics ($T_J=25^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	100	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BVDSS Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$	---	0.098	---	V/ $^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V, I_D=20A$	---	32	45	$\text{m}\Omega$
		$V_{GS}=6.0V, I_D=15A$	---	40	58	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.5	3.0	4.0	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-5.52	---	mV/ $^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=80V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	10	μA
		$V_{DS}=80V, V_{GS}=0V, T_J=55^\circ\text{C}$	---	---	100	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=5V, I_D=20A$	---	28.7	---	S
R_g	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$	---	1.6	3.2	Ω
Q_g	Total Gate Charge (10V)	$V_{DS}=80V, V_{GS}=10V, I_D=20A$	---	60	84	nC
Q_{gs}	Gate-Source Charge		---	9.7	14	
Q_{gd}	Gate-Drain Charge		---	11.8	16.5	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=50V, V_{GS}=10V, R_G=3.3\Omega, I_D=20A$	---	10.4	21	ns
T_r	Rise Time		---	46	83	
$T_{d(off)}$	Turn-Off Delay Time		---	54	108	
T_f	Fall Time		---	10	20	
C_{iss}	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$	---	3848	---	pF
C_{oss}	Output Capacitance		---	137	---	
C_{rss}	Reverse Transfer Capacitance		---	82	---	

Guaranteed Avalanche Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy ⁵	$V_{DD}=25V, L=0.1\text{mH}, I_{AS}=15A$	13.4	---	---	mJ

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,6}	$V_G=V_D=0V$, Force Current	---	---	12	A
I_{SM}	Pulsed Source Current ^{2,6}		---	---	45	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$	---	---	1.2	V
t_{rr}	Reverse Recovery Time	$I_F=20A, dI/dt=100A/\mu s, T_J=25^\circ\text{C}$	---	30	---	nS
Q_{rr}	Reverse Recovery Charge		---	37	---	nC

Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper, $t < 10\text{sec}$.
- 2.The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is $V_{DD}=25V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=15A$
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The Min. value is 100% EAS tested guarantee.
- 6.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Typical Characteristics

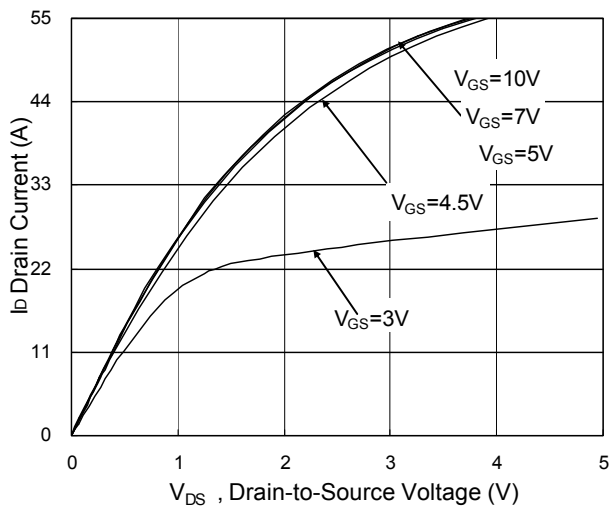


Fig.1 Typical Output Characteristics

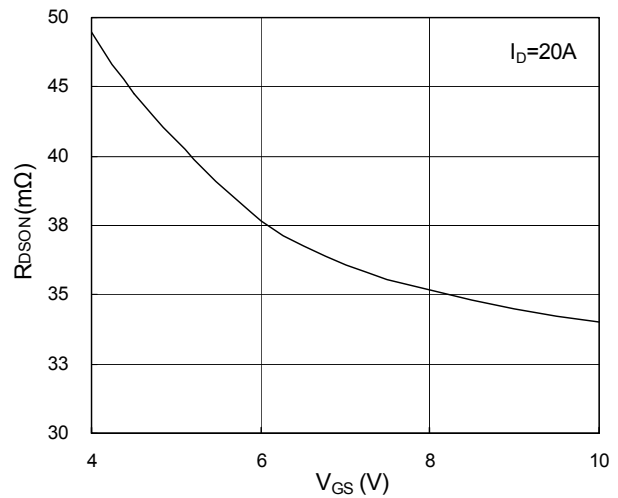


Fig.2 On-Resistance vs. Gate-Source

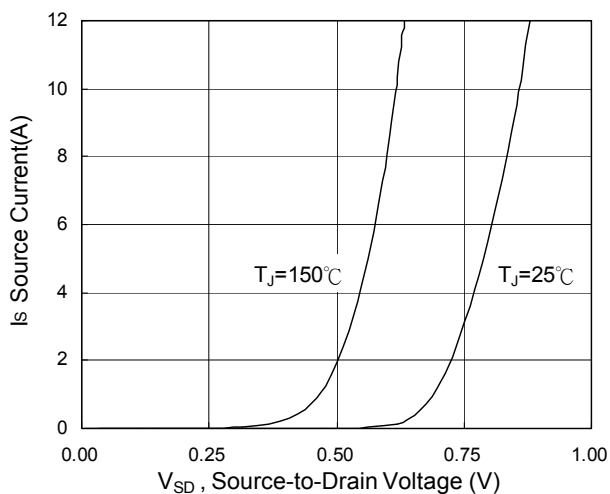


Fig.3 Forward Characteristics Of Reverse

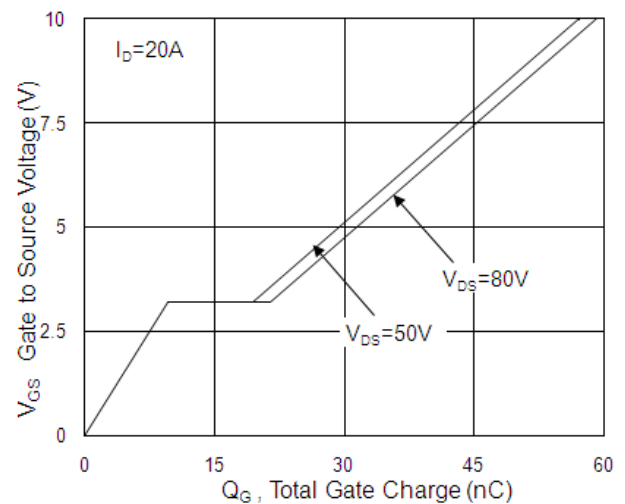


Fig.4 Gate-Charge Characteristics

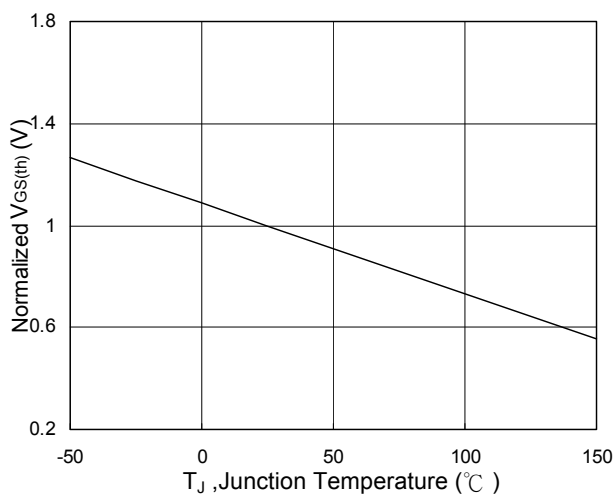


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

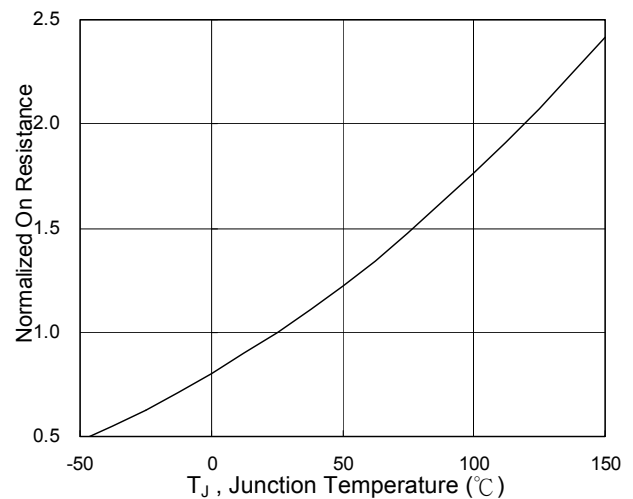


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

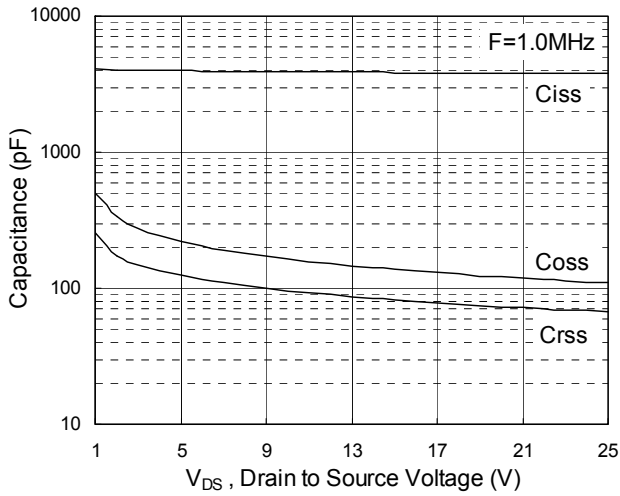


Fig.7 Capacitance

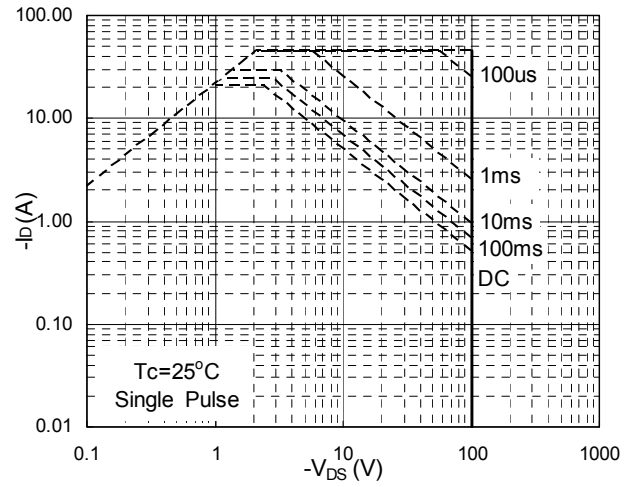


Fig.8 Safe Operating Area

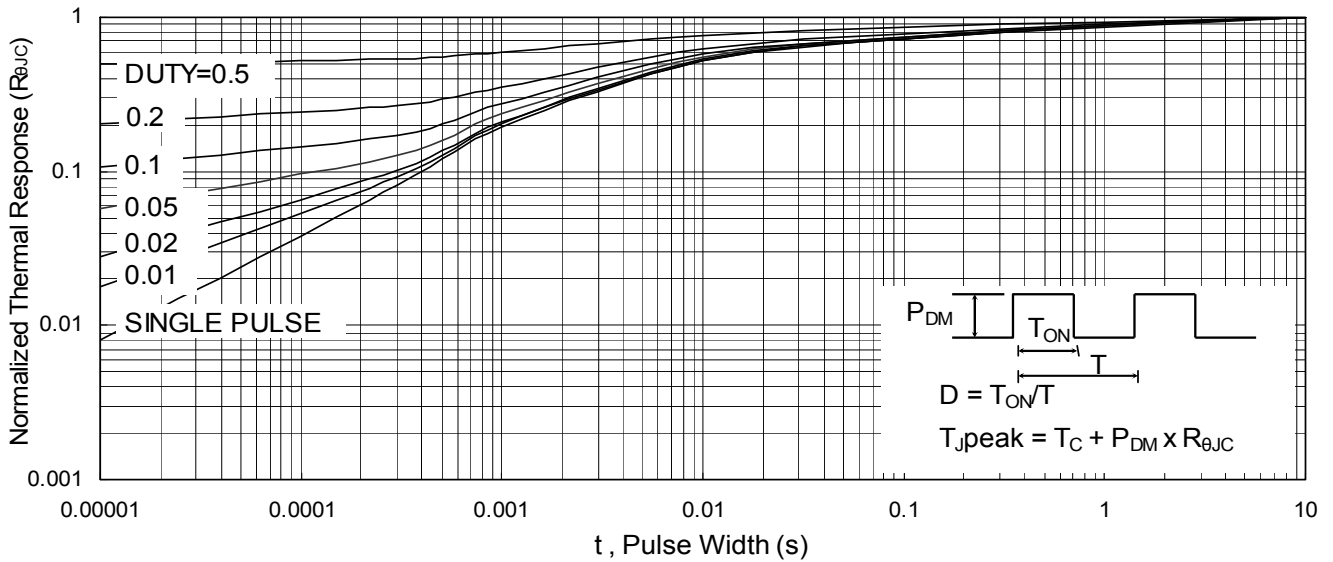


Fig.9 Normalized Maximum Transient Thermal Impedance

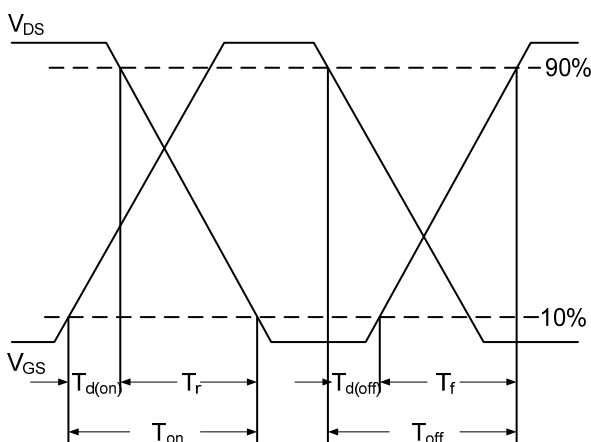


Fig.10 Switching Time Waveform

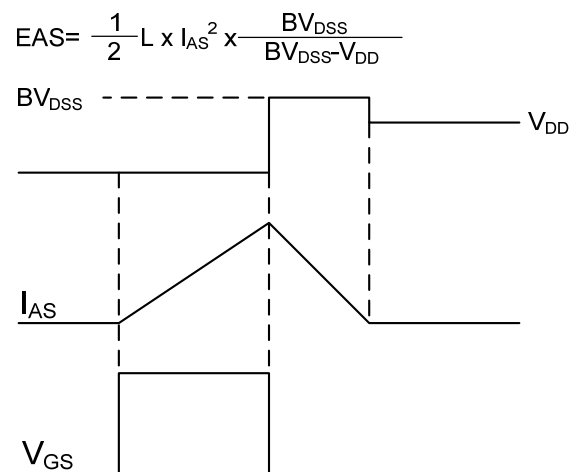


Fig.11 Unclamped Inductive Switching Waveform

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