General Description

The WSF40N04 is the highest performance trench N-Channel MOSFETs with extreme high cell density , which provide excellent $R_{DS(ON)}$ and gate charge for most of the synchronous buck converter applications.

The WSF40N04 meet the RoHS and Green Product requirement 100% E_{AS} guaranteed with full function reliability approved.

Features

- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

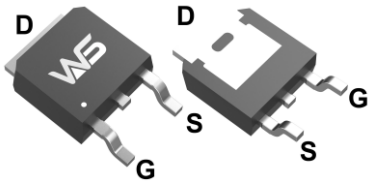
Product Summery

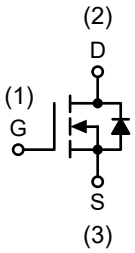
BV_{DSS}	$R_{DS(ON)}$	I_D
40V	13mΩ	40A

Applications

- Power Management in Desktop Computer or DC/DC Converters.

TO-252-2L Pin Configuration





Absolute Maximum Ratings (T_A=25°C, Unless Otherwise Noted)

Symbol	Parameter		Rating	Units
V_{DS}	Drain-Source Voltage		40	V
V_{GS}	Gate-Source Voltage		±20	
I_S	Diode Continuous Forward Current	T_C=25°C	40	A
I_D	Continuous Drain Current	T_C=25°C	40	
		T_C=100°C	24	
I_{DM} [1]	Pulsed Drain Current	T_C=25°C	120	
P_D	Maximum Power Dissipation	T_C=25°C	41.7	W
		T_C=100°C	16.7	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	Steady State	3	°C/W
I_D	Continuous Drain Current	T_A=25°C	12.7	A
		T_A=70°C	10.2	
P_D	Maximum Power Dissipation	T_A=25°C	2.8	W
		T_A=70°C	1.8	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	t≤10s	20	°C/W
		Steady State	45	
I_{AS} [2]	Avalanche Current, Single pulse	L=0.1mH	35	A
E_{AS} [2]	Avalanche Energy, Single pulse	L=0.1mH	61	mJ
T_{STG}	Storage Temperature Range		-55 to 150	°C
T_J	Maximum Junction Temperature		150	

Electrical Characteristics (T_A=25°C, Unless Otherwise Noted)

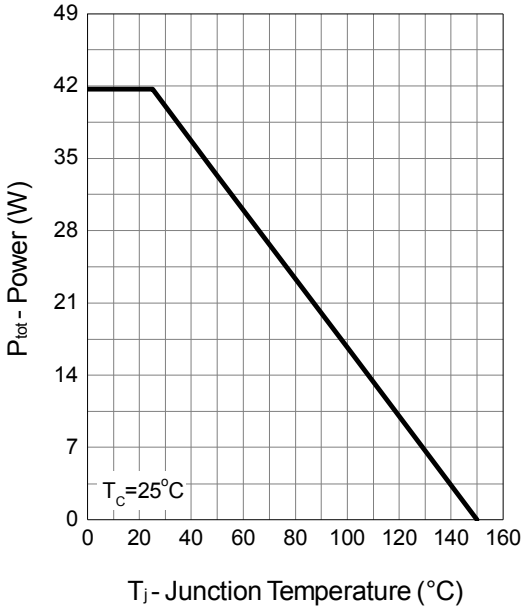
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_{DS}=250μA	40	---	---	V
$R_{DS(ON)}$ [3]	Drain-Source On-state Resistance	V_{GS}=10V , I_{DS}=30A	---	13	17	mΩ
		T_J=125°C	---	17.2	---	
		V_{GS}=4.5V , I_{DS}=15A	---	17	21.5	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_{DS}=250μA	1.5	1.8	2.5	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=32V , V_{GS}=0V	---	---	1.0	μA
		T_J=85°C	---	---	30	
I_{GSS}	Gate Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
G_{fs}	Forward Transconductance	V_{DS}=5V , I_{DS}=15A	---	30	---	S
Gate Charge Characteristics						
Q_g	Total Gate Charge	V_{DS}=20V , V_{GS}=4.5V , I_{DS}=30A	---	9.4	11.2	nC
Q_g	Total Gate Charge	V_{DS}=20V , V_{GS}=10V , I_{DS}=30A	---	20	24	
Q_{gth}	Threshold Gate Charge		---	1.4	---	
Q_{gs}	Gate-Source Charge		---	3.1	---	
Q_{gd}	Gate-Drain Charge		---	5.0	---	
Dynamic Characteristics						
R_G	Gate Resistance	V_{GS}=0V , V_{DS}=0V , F=1.0MHz	0.7	1.1	1.8	Ω
$T_{d(ON)}$	Turn-On Delay Time	V_{DD}=20V , R_L=20Ω , I_{DS}=1A , V_{GEN}=10V , R_G=1Ω	---	12.8	---	ns
T_r	Turn-On Rise Time		---	10.4	---	
$T_{d(OFF)}$	Turn-Off Delay Time		---	24	---	
T_f	Turn-Off Fall Time		---	5.6	---	
C_{iss}	Input Capacitance	V_{GS}=0V , V_{DS}=20V , Frequency = 1.0MHz	---	1120	---	pF
C_{oss}	Output Capacitance		---	132	---	
C_{rss}	Reverse Transfer Capacitance		---	75	---	
Diode Characteristics						
V_{SD} [3]	Diode Forward Voltage	I_{SD}=10A , V_{GS}=0V	---	0.9	1.1	V
t_{rr}	Reverse Recovery Time	I_{SD}=10A , dI_{SD}/dt=100A/μs	---	13.8	---	ns
t_a	Charge Time		---	9.8	---	
t_b	Discharge Time		---	4.0	---	
Q_{rr}	Reverse Recovery Charge		---	8.0	---	nC

Note:

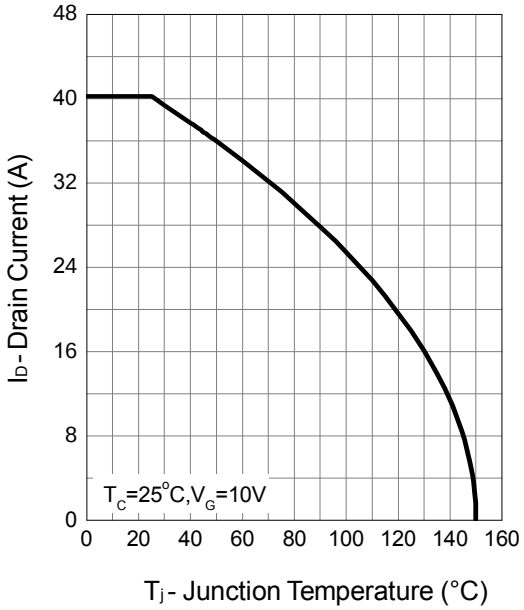
1. Max. current is limited by bonding wire.
2. UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature T_J=25°C).
3. Pulse test ; pulse width≤300ms, duty cycle≤2%.

Typical Characteristics

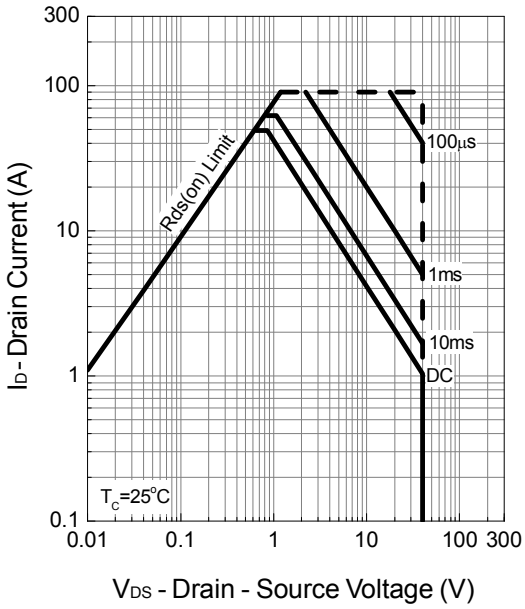
Power Dissipation



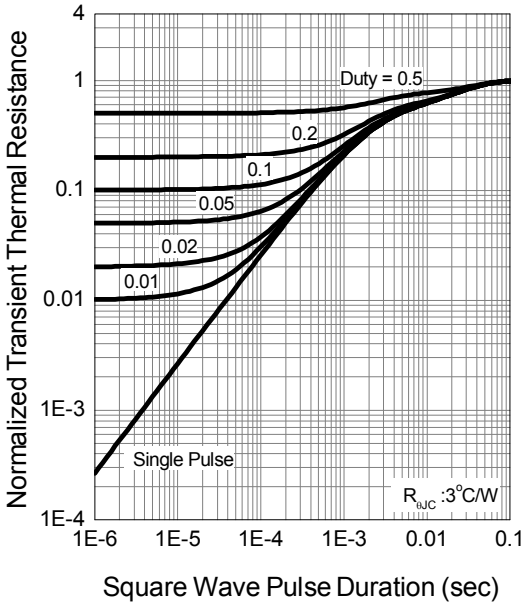
Drain Current



Safe Operation Area

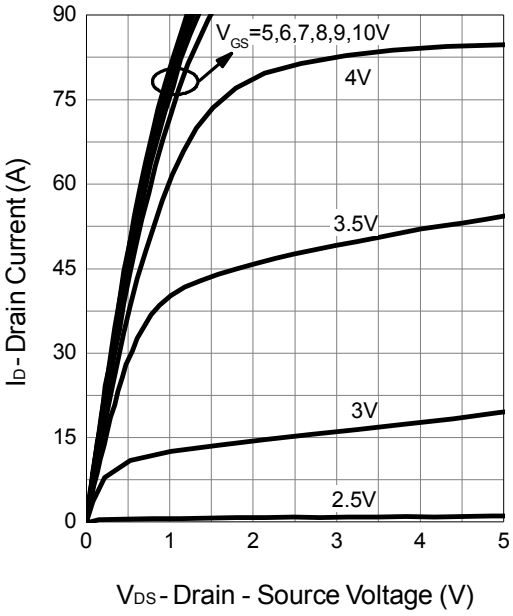


Thermal Transient Impedance

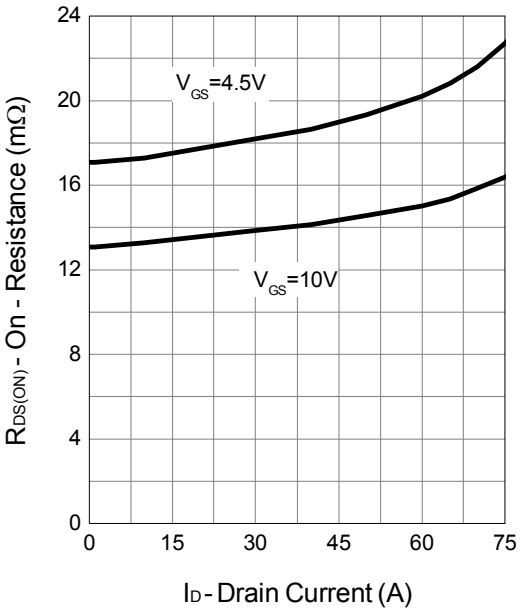


Typical Characteristics (Cont.)

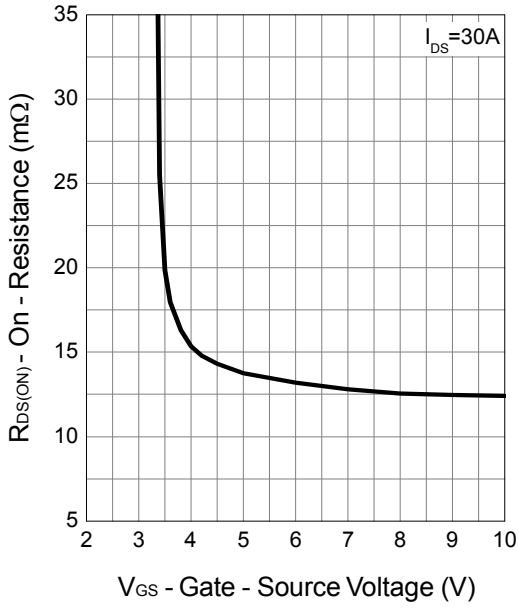
Output Characteristics



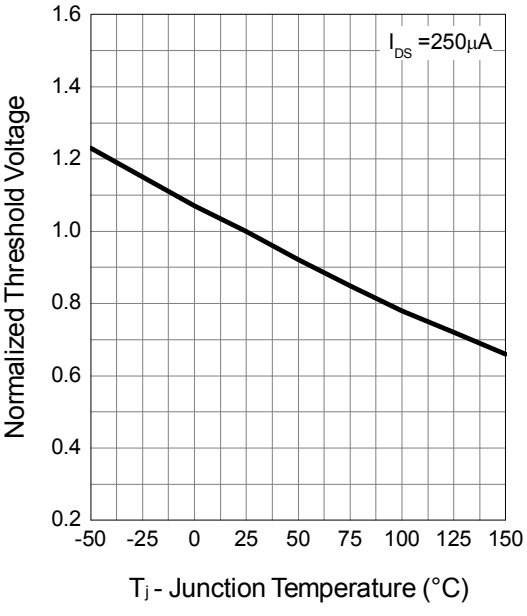
Drain-Source On Resistance



Gate-Source On Resistance

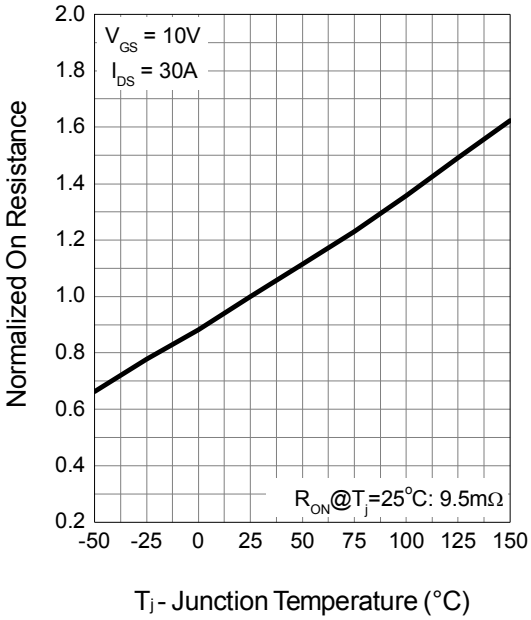


Gate Threshold Voltage

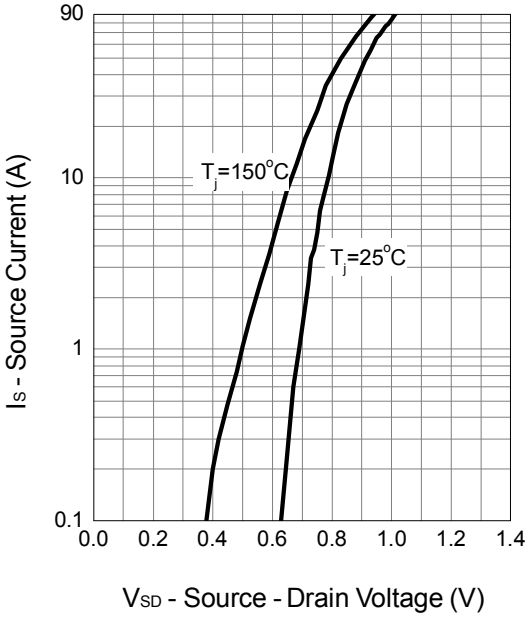


Typical Characteristics (Cont.)

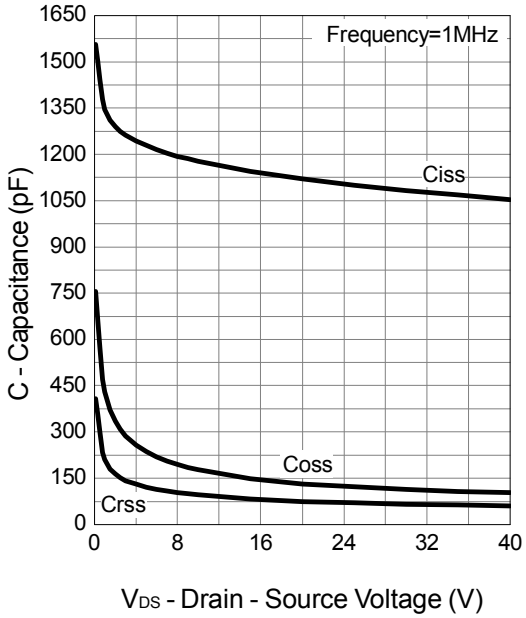
Drain-Source On Resistance



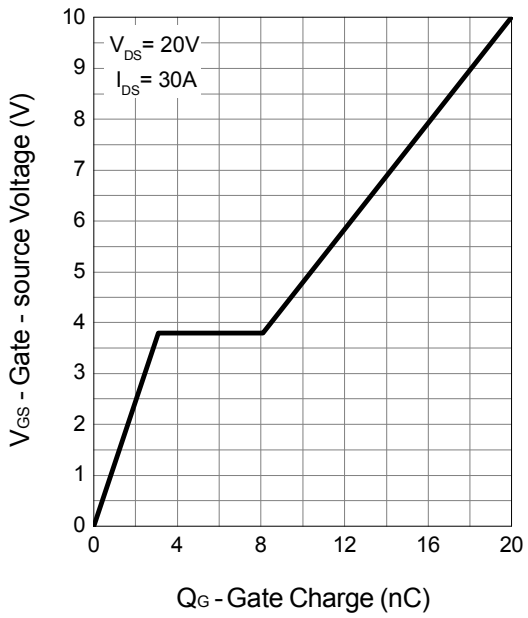
Source-Drain Diode Forward



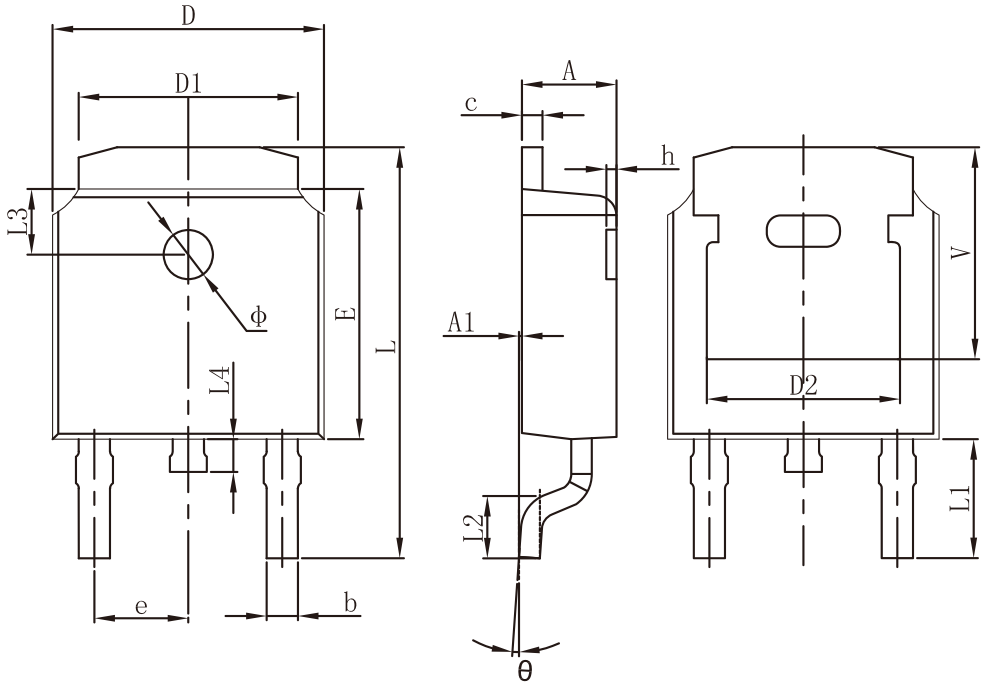
Capacitance



Gate Charge



Packaging information



SYMBOL	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.635	0.770	0.025	0.030
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.712	10.312	0.382	0.406
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.250 REF.		0.207 REF.	

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