

## General Description

The WSP4986 is the highest performance trench N-ch MOSFET with extreme high cell density , which provide excellent  $R_{DS(on)}$  and gate charge for most of the synchronous buck converter applications .

The WSP4986 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
- 100% EAS Guaranteed
- Green Device Available

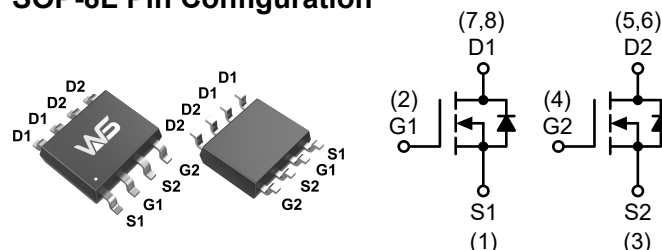
## Product Summary

$BV_{DSS}$	$R_{DS(on)}$	$I_D$
40V	13.7m $\Omega$	12A

## Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- Load Switch

## SOP-8L Pin Configuration



## Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	40	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D@T_C=25^{\circ}C$	Continuous Drain Current, $V_{GS} @ 10V^1$	12	A
$I_D@T_C=70^{\circ}C$	Continuous Drain Current, $V_{GS} @ 10V^1$	6.6	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	35	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	20	mJ
$I_{AS}$	Avalanche Current	15	A
$P_D@T_A=25^{\circ}C$	Total Power Dissipation <sup>4</sup>	2.5	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^{\circ}C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^{\circ}C$

## Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-ambient <sup>1</sup>	---	65.2	$^{\circ}C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	50	$^{\circ}C/W$

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V$ , $I_D=250\mu A$	40	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BVDSS Temperature Coefficient	Reference to $25^\circ\text{C}$ , $I_D=1mA$	---	0.044	---	V/ $^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=10V$ , $I_D=2A$	---	13.7	15	$m\Omega$
		$V_{GS}=4.5V$ , $I_D=2A$	---	17	20	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$ , $I_D=250\mu A$	1.0	1.5	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-3.8	---	mV/ $^\circ\text{C}$
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=24V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$	---	---	1	$\mu A$
		$V_{DS}=24V$ , $V_{GS}=0V$ , $T_J=55^\circ\text{C}$	---	---	5	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V$ , $V_{DS}=0V$	---	---	$\pm 100$	nA
$g_{fs}$	Forward Transconductance	$V_{DS}=5V$ , $I_D=4A$	---	25	---	S
$R_g$	Gate Resistance	$V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$	---	2.5	5	$\Omega$
$Q_g$	Total Gate Charge (10V)	$V_{DS}=20V$ , $V_{GS}=10V$ , $I_D=2A$	---	23	---	nC
$Q_{gs}$	Gate-Source Charge		---	3.6	---	
$Q_{gd}$	Gate-Drain Charge		---	6.4	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=20V$ , $V_{GEN}=10V$ , $R_G=6\Omega$ $I_D=4A$ , $R_L=30\Omega$	---	5.2	---	ns
$T_r$	Rise Time		---	14	---	
$T_{d(off)}$	Turn-Off Delay Time		---	23	---	
$T_f$	Fall Time		---	11	---	
$C_{iss}$	Input Capacitance	$V_{DS}=20V$ , $V_{GS}=0V$ , $f=1MHz$	---	950	---	pF
$C_{oss}$	Output Capacitance		---	102	---	
$C_{rss}$	Reverse Transfer Capacitance		---	60	---	

**Guaranteed Avalanche Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy <sup>5</sup>	$V_{DD}=20V$ , $L=0.1mH$ , $I_{AS}=15A$	20	---	---	mJ

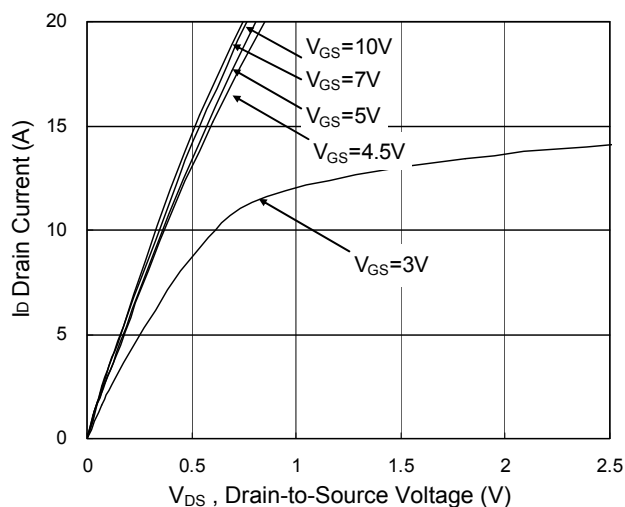
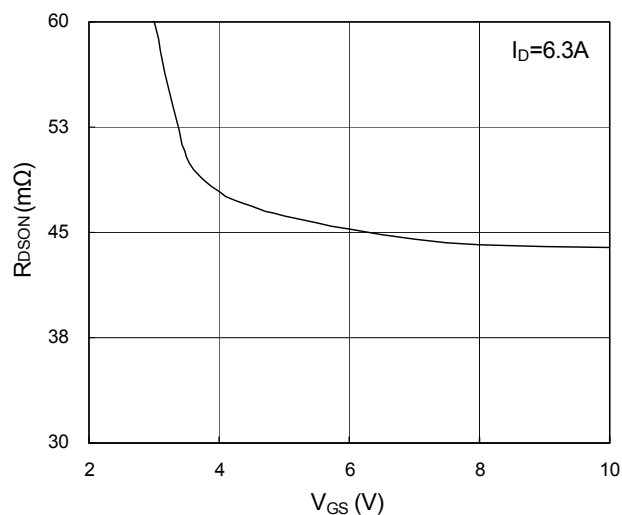
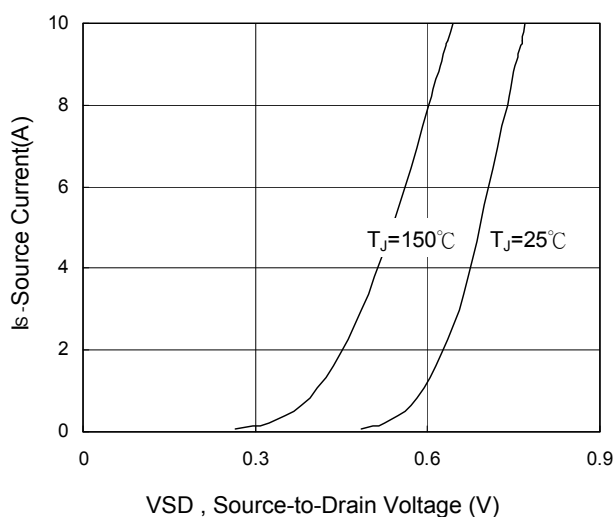
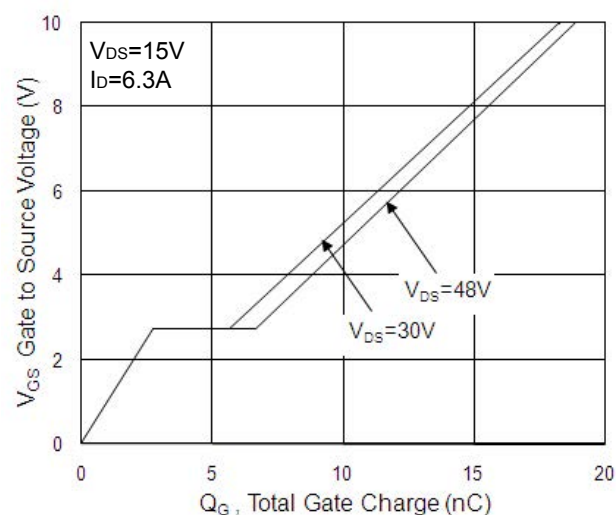
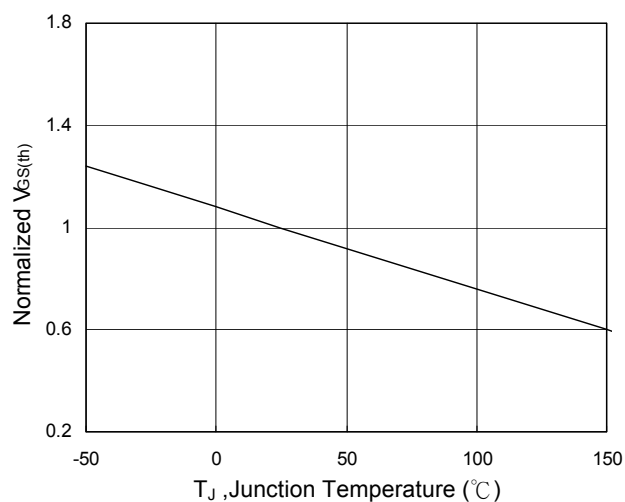
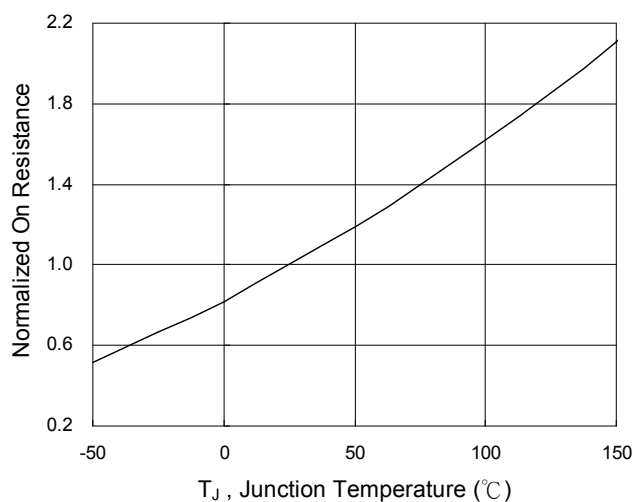
**Diode Characteristics**

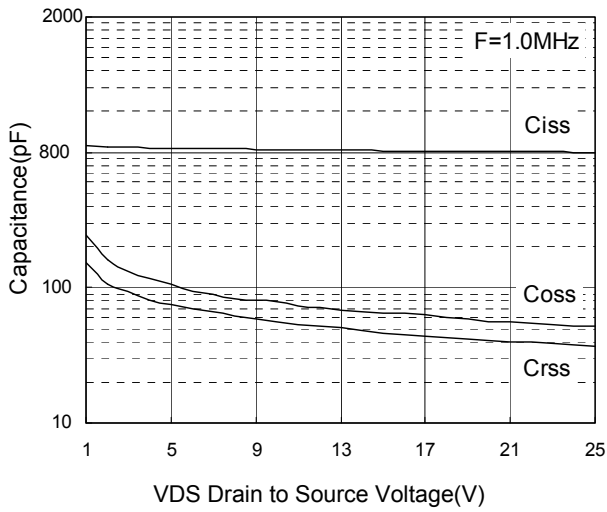
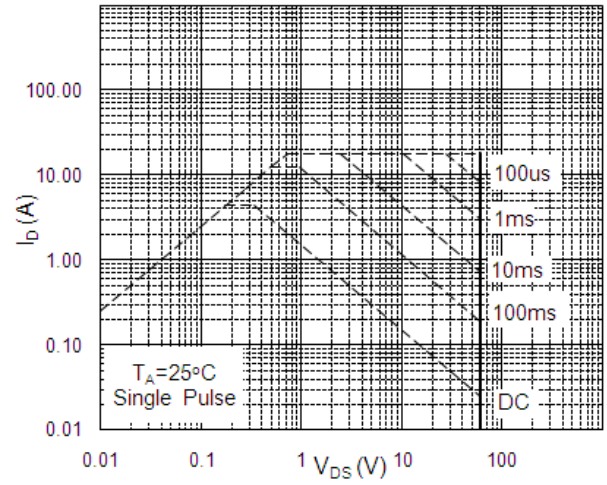
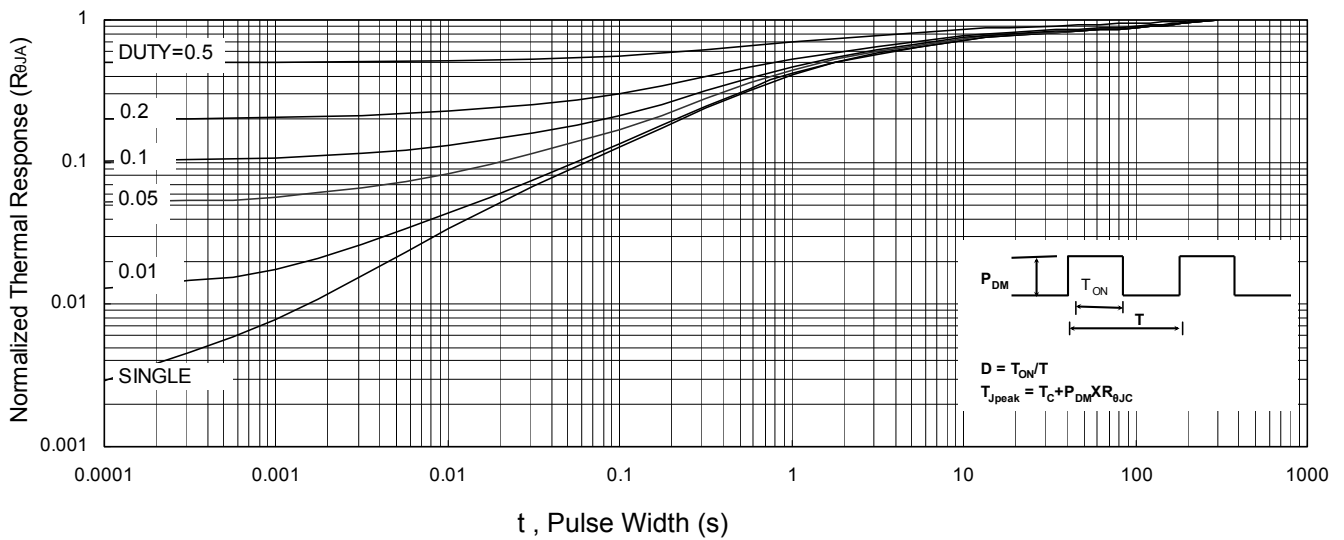
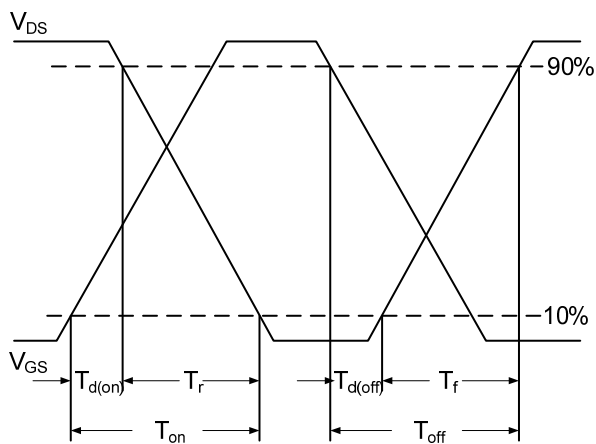
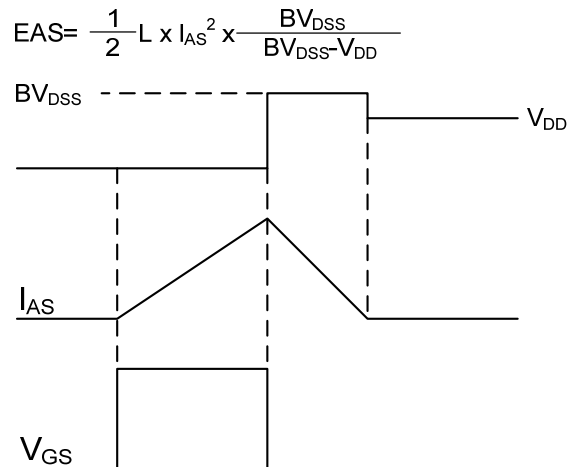
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current <sup>1,6</sup>	$V_G=V_D=0V$ , Force Current	---	---	5.0	A
$I_{SM}$	Pulsed Source Current <sup>2,6</sup>		---	---	14	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V$ , $I_S=1A$ , $T_J=25^\circ\text{C}$	---	---	1.1	V
$t_{rr}$	Reverse Recovery Time	$I_F=6.3A$ , $dI/dt=100A/\mu s$ , $T_J=25^\circ\text{C}$	---	18	---	nS
$Q_{rr}$	Reverse Recovery Charge		---	16	---	nC

Note :

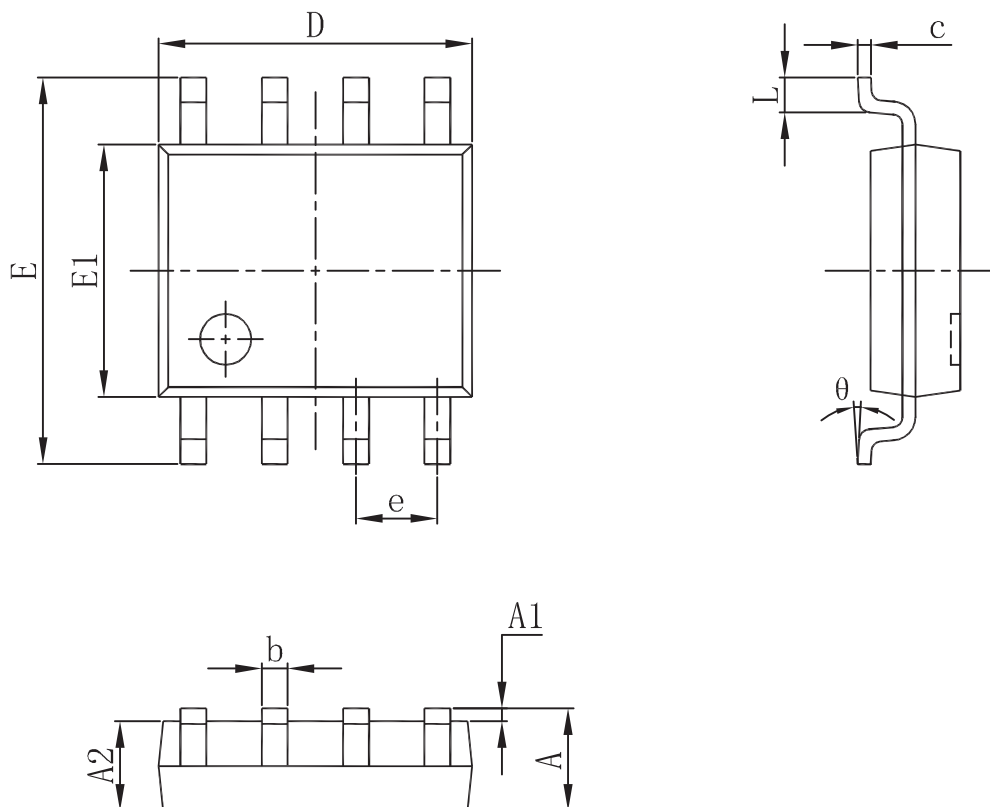
- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper,  $t<10sec$ .
- 2.The data tested by pulsed , pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is  $V_{DD}=25V$ ,  $V_{GS}=10V$ ,  $L=0.1mH$ ,  $I_{AS}=12A$
- 4.The power dissipation is limited by  $150^\circ\text{C}$  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**

## Packaging information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

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