N-channel 650V, 48A, 0.068Ω Super-Junction Power MOSFET

Features

- Ultra-fast body diode
- Very low FOM RDS(on)×Qg
- 100% UIS tested
- RoHS compliant

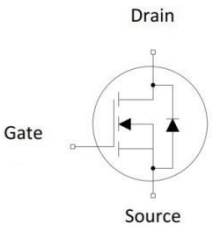
Applications

- Power factor correction (PFC).
- Switched mode power supplies (SMPS).
- Uninterrupted power supply (UPS).

Product Summary

V_{DS} @ $T_{j,25℃}$	650V
$R_{DS(on),max}$	0.068Ω
I_D	48A
$Q_{g,typ}$	70 nC

TO-247



N-Channel MOSFET

Marking information

Product	Package	Marking	Packing methed
SPW47N60CS	TO-247	SPW47N60	Tube

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	650	V
Continuous drain current (T_C = 25°C) (T_C = 100°C)	I_D	48 30.3	A A
Pulsed drain current [1]	I_{DM}	144	A
Gate-Source voltage	V_{GSS}	±30	V
Avalanche energy, single pulse [2]	E_{AS}	375	mJ
Avalanche current, repetitive [3]	I_{AR}	5	A
Power Dissipation TO-247 (T_C = 25°C) - Derate above 25°C	P_D	284 2.27	W W/°C
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C
Continuous diode forward current	I_S	48	A
Diode pulse current	$I_{S,pulse}$	144	A

Thermal Characteristics

Parameter	Symbol	Value	Unit
		TO-247	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.44	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	39	°C/W
Soldering temperature, wave soldering only allowed at leads. (1.6mm from case for 10s)	T_{sold}	260	°C

Electrical Characteristics

T_c = 25°C unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0 V, I_D=1mA	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=1mA	3		5	V
Drain cut-off current	I_{DSS}	V_{DS}=650 V, V_{GS}=0 V, T_j = 25°C T_j = 125°C	 - -	 - 50	 10	μA
Gate leakage current, Forward	I_{GSSF}	V_{GS}=30 V, V_{DS}=0 V	-	-	100	nA
Gate leakage current, Reverse	I_{GSSR}	V_{GS}=-30 V, V_{DS}=0 V	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=24 A T_j = 25°C	- - -	0.057	0.068	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS} = 100 V, V_{GS} = 0 V, f = 100KHz	-	3400	-	pF
Output capacitance	C_{oss}		-	120	-	
Reverse transfer capacitance	C_{rss}		-	4.3	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 400V, I_D = 24A R_G = 2.5Ω, V_{GS}=10V	-	32	-	ns
Rise time	t_r		-	32	-	
Turn-off delay time	$t_{d(off)}$		-	42	-	
Fall time	t_f		-	22.5	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DD}=480 V, I_D=24A, V_{GS}=0 to 10 V	-	22	-	nC
Gate to drain charge	Q_{gd}		-	28	-	
Gate charge total	Q_g		-	70	-	
Gate plateau voltage	$V_{plateau}$		-	6.6	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=48A	-	-	1.2	V
Reverse recovery time	t_{rr}	V_R=300 V, I_F=24A, dI_F/dt=100 A/μs	-	200	-	ns
Reverse recovery charge	Q_{rr}		-	1.4	-	μC
Peak reverse recovery current	I_{rrm}		-	13.7	-	A

Notes:

1. Limited by maximum junction temperature, maximum duty cycle is 0.75.
2. L =30mH, V_{DD} = 50V, Starting T_j= 25°C.

Electrical Characteristics Diagrams

Figure 1. Output Characteristics

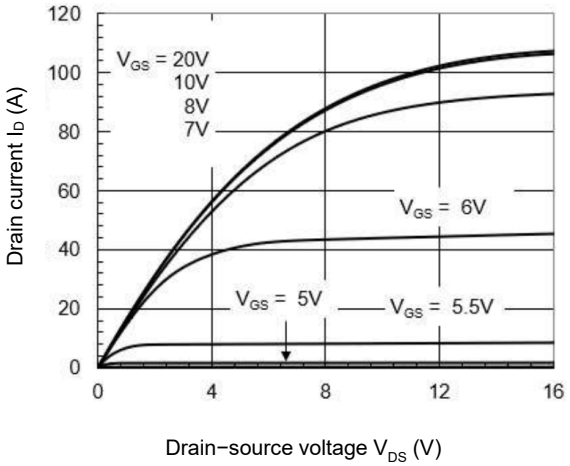


Figure 2. Transfer Characteristics

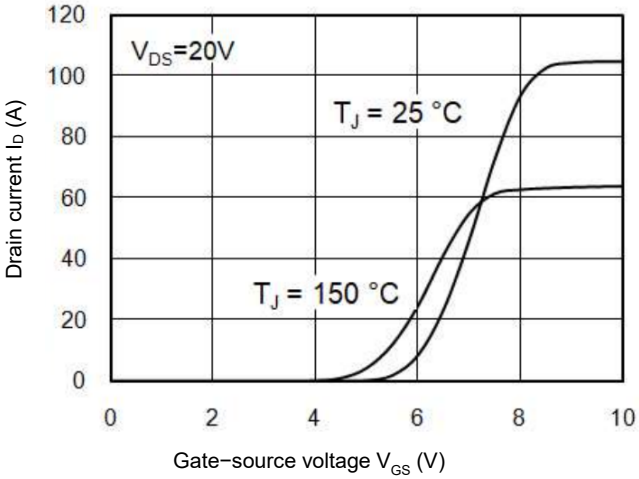


Figure 3. On-Resistance vs. Drain Current

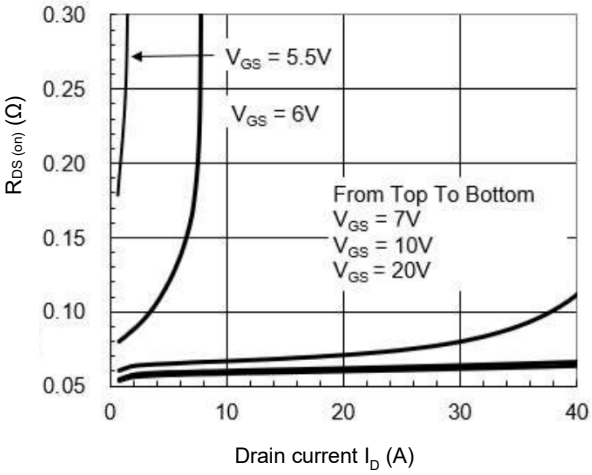


Figure 4. Capacitance Characteristics

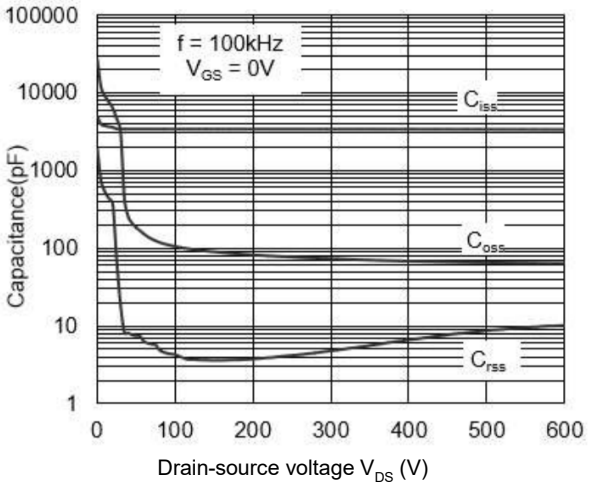


Figure 5. Gate Charge Characteristics

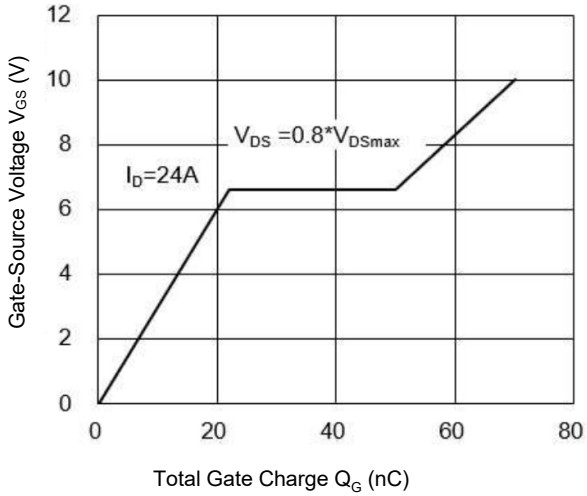


Figure 6. Body Diode Forward Voltage

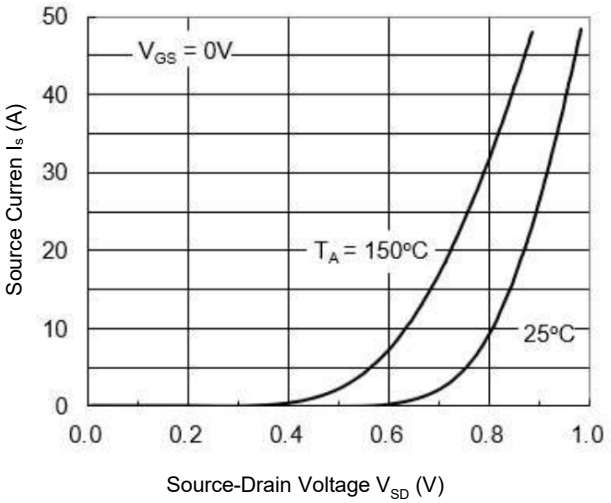


Figure 7. Breakdown Voltage vs. Temperature

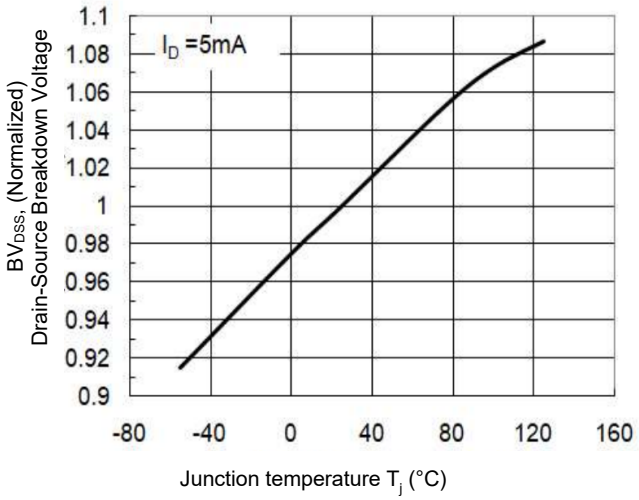


Figure 8. On-Resistance vs. Temperature

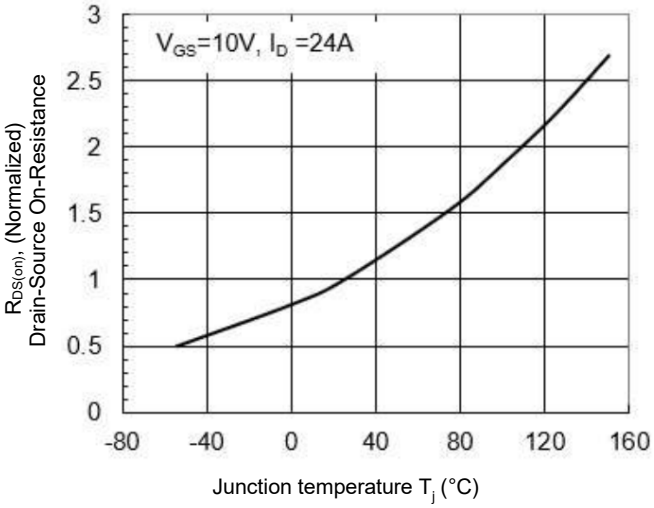


Figure 9. Maximum Safe Operating Area

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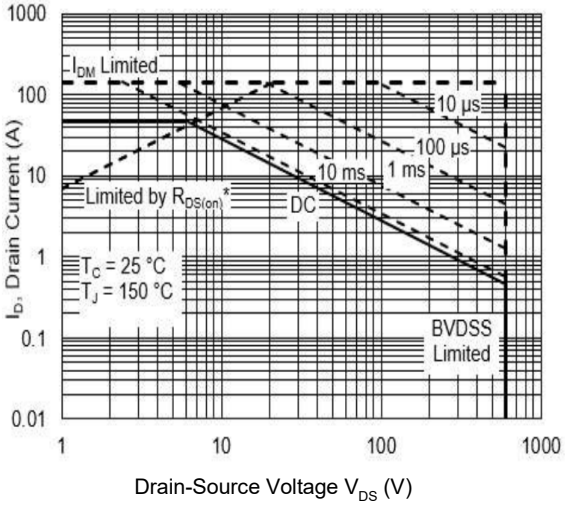

Figure 10. Transient Thermal Impedence

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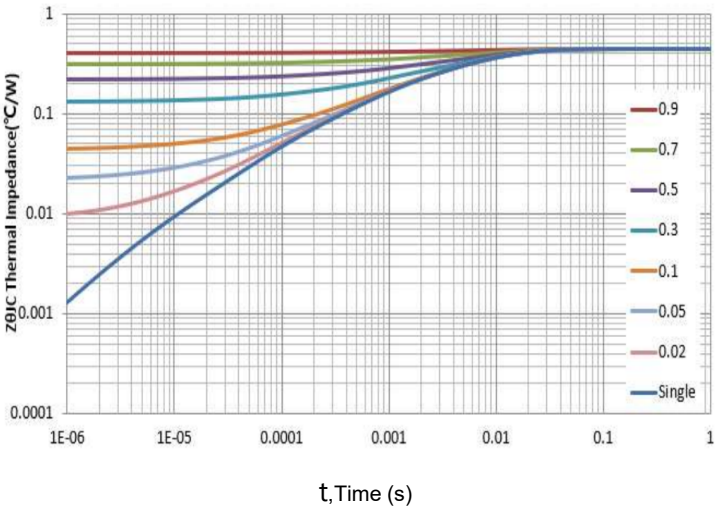
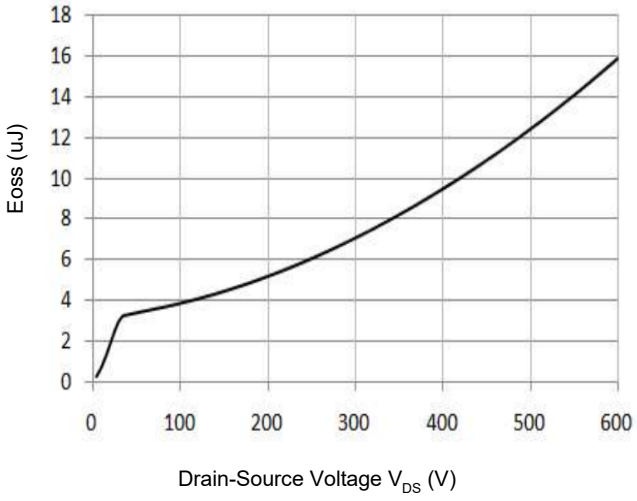
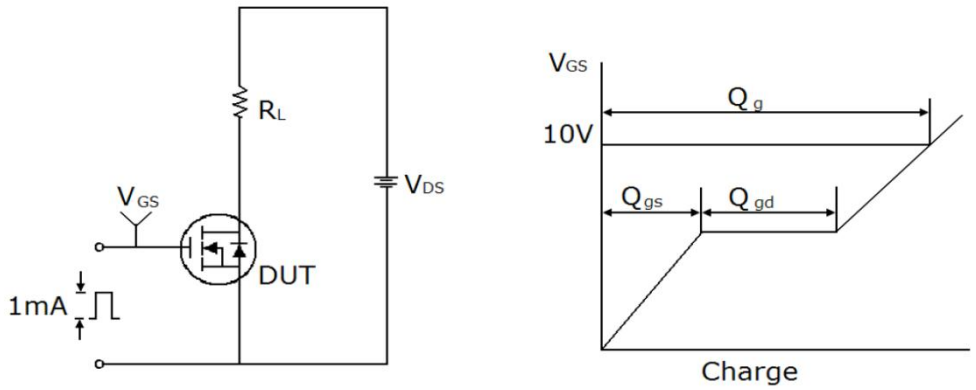


Figure 11. Typ. Coss Stored Energy

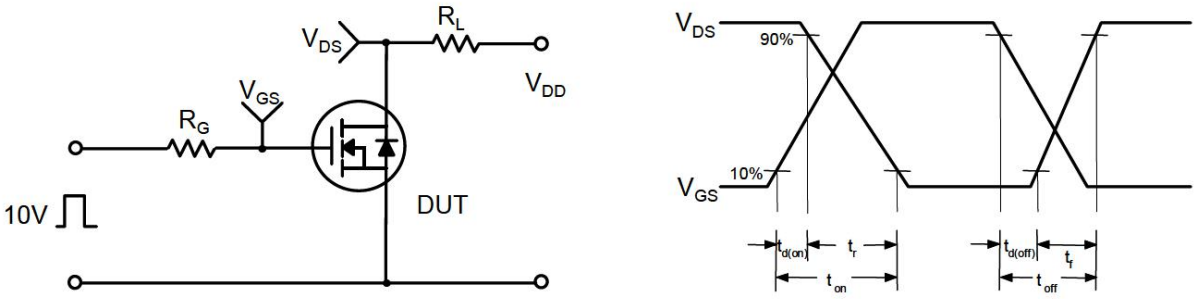


Test Circuits

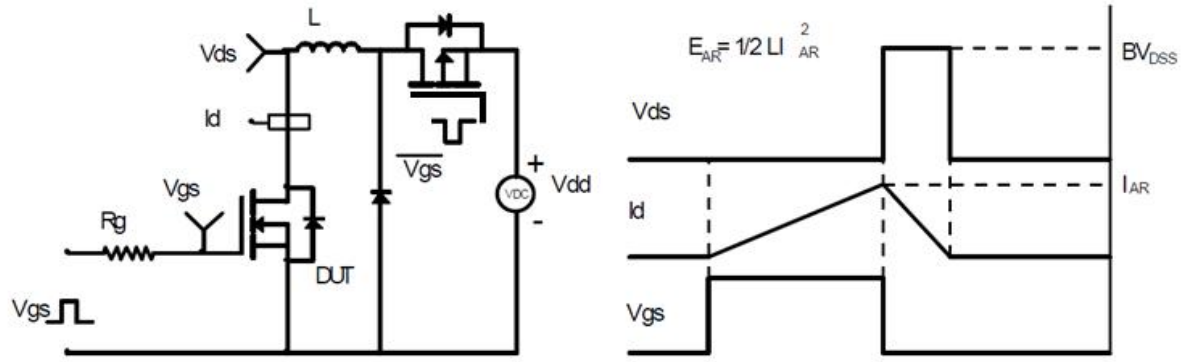
Gate Charge Test Circuit & Waveform



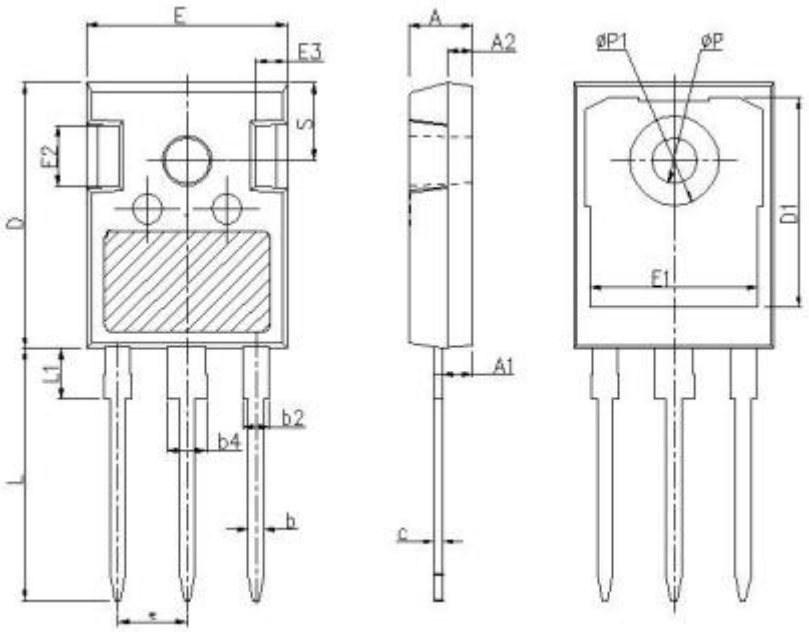
Switching Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveform



Mechanical Dimensions for TO-247



DIMENSIONS IN MILLITMETERS		
SYMBOL	MIN	MAX
A	4.8	5.21
A1	2.21	2.61
A2	1.85	2.16
b	1.07	1.36
b2	1.91	2.41
b4	2.87	3.38
c	0.51	0.75
D	20.7	21.3
D1	16.25	17.65
E	15.5	16.13
E1	13	13.6
E2	3.68	5.2
E3	1	2.7
e	5.44BSC	
L	19.62	20.32
L1	-	4.4
ΦP	3.4	3.8
ΦP1	-	7.4
S	6.04	6.3