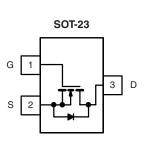


SPN2302DS23RGB-VB Datasheet

N-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY						
V _{DS} (V)	$R_{DS(on)}\left(\Omega\right)$	I _D (A) ^e	Q _g (Typ.)			
	0.028 at V _{GS} = 4.5 V	6 ^a				
20	0.042 at V _{GS} = 2.5 V	6 ^a	8.8 nC			
	0.050 at V _{GS} = 1.8 V	5.6				



FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



ROHS COMPLIANT HALOGEN FREE

APPLICATIONS

- DC/DC Converters
- Load Switch for Portable Applications

Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V_{DS}	20	V	
Gate-Source Voltage		V _{GS}	± 12	V
	T _C = 25 °C		6 ^a	
Continuous Dunin Commant /T 150 °C\	T _C = 70 °C	1 . [5.1	
Continuous Drain Current (T _J = 150 °C)	T _A = 25 °C		5 ^{b, c}	
	T _A = 70 °C	1	4 ^{b, c}	A
Pulsed Drain Current		I _{DM}	20	
Continuous Source-Drain Diode Current	T _C = 25 °C		1.75	
	T _A = 25 °C	ls -	1.04 ^{b, c}	
	T _C = 25 °C		2.1	
Maximum Power Dissipation	T _C = 70 °C	1 6 [1.3	w
	T _A = 25 °C	P _D	1.25 ^{b, c}	VV
	T _A = 70 °C	1	0.8 ^{b, c}	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Tempera	İ	260		

THERMAL RESISTANCE RATINGS							
Parameter		Symbol	Typical	Maximum	Unit		
Maximum Junction-to-Ambient ^{b, d}	t ≤ 5 s	R _{thJA}	80	100	°C/W		
Maximum Junction-to-Foot (Drain)	Steady State	R _{thJF}	40	60	C/ VV		

Notes:

- a. Package limited
- b. Surface Mounted on 1" x 1" FR4 board.
- c. t = 5 s
- d. Maximum under steady state conditions is 125 $^{\circ}\text{C/W}.$
- e. Based on $T_C = 25$ °C.

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Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit	
Static	<u> </u>		,				
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	20			V	
V _{DS} Temperature Coefficient	$\Delta V_{DS}/T_{J}$	I _D = 250 μA		25		mV/°C	
V _{GS(th)} Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	I _D = 250 μA		- 2.6			
Gate-Source Threshold Voltage	V _{GS(th)}	$V_{DS} = V_{GS}$, $I_{D} = 250 \mu A$	0.45		1.0	V	
Gate-Source Leakage	I _{GSS}	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 8 \text{ V}$			± 100	nA	
		$V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}$			1	μΑ	
Zero Gate Voltage Drain Current	IDSS	$V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 70 \text{ °C}$			10		
On-State Drain Current ^a	I _{D(on)}	$V_{DS} \le 5 \text{ V}, V_{GS} = 4.5 \text{ V}$	20			Α	
		$V_{GS} = 4.5 \text{ V}, I_D = 5.0 \text{ A}$		0.028	0.028		
Drain-Source On-State Resistance ^a	R _{DS(on)}	$V_{GS} = 2.5 \text{ V}, I_D = 4.7 \text{ A}$		0.042		Ω	
		$V_{GS} = 1.8 \text{ V}, I_D = 4.3 \text{ A}$		0.050			
Forward Transconductance ^a				24		S	
Dynamic ^b			L		L		
Input Capacitance	C _{iss}			865		pF	
Output Capacitance	C _{oss}	$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		105			
Reverse Transfer Capacitance	C _{rss}			55			
· ·		$V_{DS} = 10 \text{ V}, V_{GS} = 5 \text{ V}, I_D = 5.0 \text{ A}$		12	18		
Total Gate Charge	Qg			8.8	14	nC	
Gate-Source Charge	Q_{gs}	$V_{DS} = 10 \text{ V}, V_{GS} = 4.5 \text{ V}, I_D = 5.0 \text{ A}$		1.1			
Gate-Drain Charge	Q_{gd}			0.7			
Gate Resistance	R_{g}	f = 1 MHz	0.5	2.4	4.8	Ω	
Turn-On Delay Time	t _{d(on)}			8	16		
Rise Time	t _r	V_{DD} = 10 V, R_L = 2.2 Ω		17	26	1	
Turn-Off Delay Time	t _{d(off)}	$I_D\cong 4$ A, V_{GEN} = 4.5 V, R_g = 1 Ω		31	47		
Fall Time	t _f			8	16	ns	
Turn-On Delay Time	t _{d(on)}			5	10		
Rise Time	t _r	V_{DD} = 10 V, R_L = 2.2 Ω		13	20		
Turn-Off Delay Time	t _{d(off)}	$I_D \cong 4 \text{ A}, V_{GEN} = 5 \text{ V}, R_g = 1 \Omega$		21	32		
Fall Time	t _f			6	12		
Drain-Source Body Diode Characteristic	es				L		
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			1.75		
Pulse Diode Forward Current	I _{SM}				20	A	
Body Diode Voltage	V_{SD}	I _S = 4 A, V _{GS} = 0 V		0.75	1.2	V	
Body Diode Reverse Recovery Time	t _{rr}			12	20	ns	
Body Diode Reverse Recovery Charge	Q _{rr}	I 4 A dI/dt 100 A/vo T 05 °C		5	10	nC	
Reverse Recovery Fall Time	t _a	$I_F = 4 \text{ A}, \text{ dI/dt} = 100 \text{ A/}\mu\text{s}, T_J = 25 \text{ °C}$		7			
Reverse Recovery Rise Time	t _b	\dashv		5		ns	

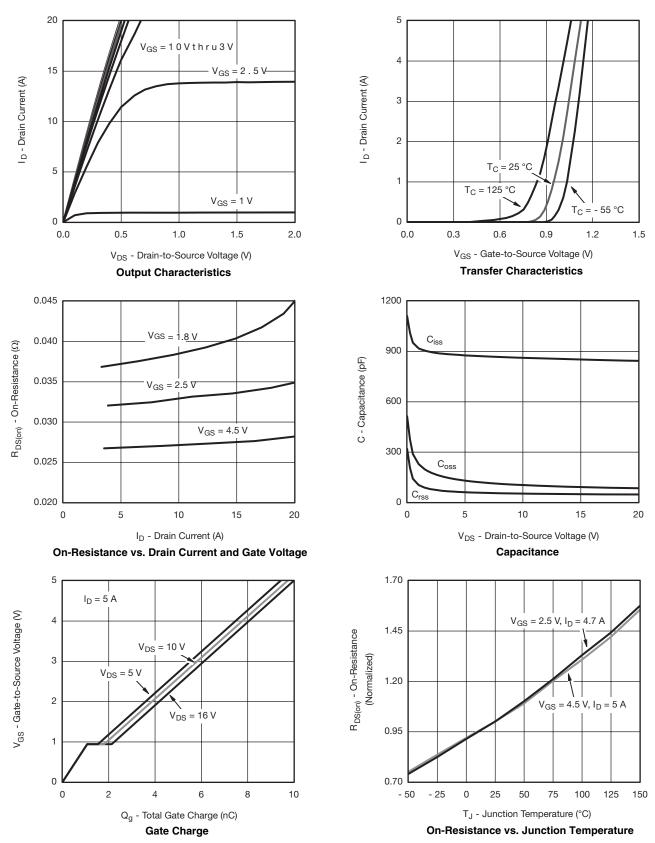
Notes:

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

a. Pulse test; pulse width \leq 300 $\mu s,$ duty cycle \leq 2 % b. Guaranteed by design, not subject to production testing.

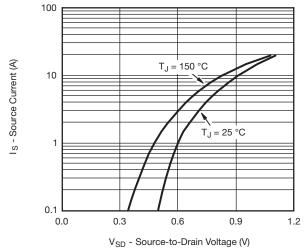


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

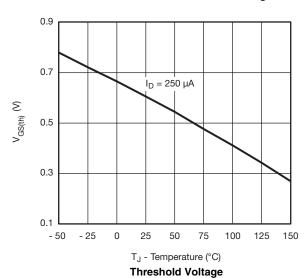




TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

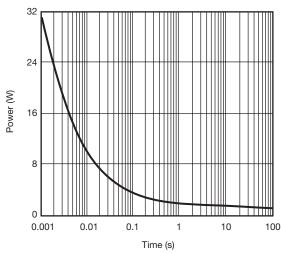


Source-Drain Diode Forward Voltage

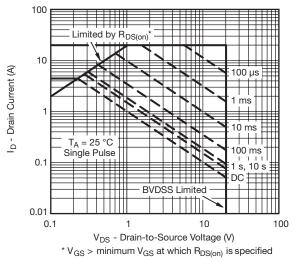


 $I_{D} = 5 \text{ A}$ $I_{D} = 5 \text$

On-Resistance vs. Gate-to-Source Voltage



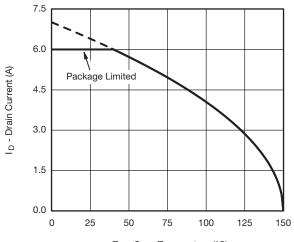
Single Pulse Power (Junction-to-Ambient)



Safe Operating Area, Junction-to-Ambient

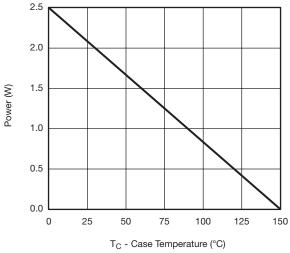


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

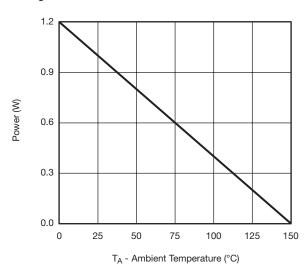


T_C - Case Temperature (°C)

Current Derating*







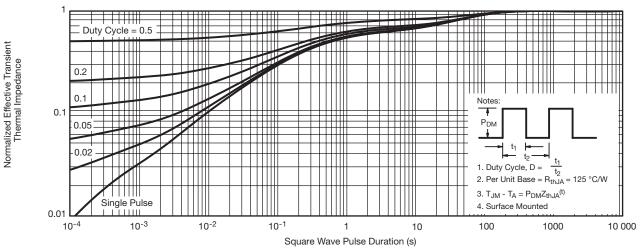
Power Derating, Junction-to-Ambient

^{*} The power dissipation P_D is based on $T_{J(max.)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

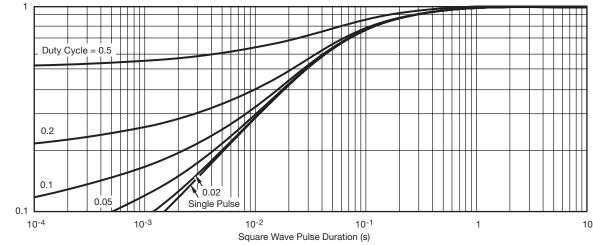
Normalized Effective Transient Thermal Impedance



TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



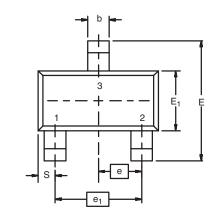
Normalized Thermal Transient Impedance, Junction-to-Ambient

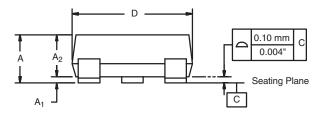


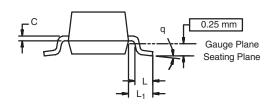
Normalized Thermal Transient Impedance, Junction-to-Foot



SOT-23 (TO-236): 3-LEAD







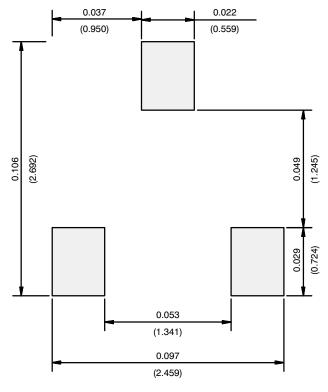
Dim	MILLIM	IETERS	INCHES		
	Min	Max	Min	Max	
Α	0.89	1.12	0.035	0.044	
A ₁	0.01	0.10	0.0004	0.004	
A ₂	0.88	1.02	0.0346	0.040	
b	0.35	0.50	0.014	0.020	
С	0.085	0.18	0.003	0.007	
D	2.80	3.04	0.110	0.120	
E	2.10	2.64	0.083	0.104	
E ₁	1.20	1.40	0.047	0.055	
е	0.95 BSC		0.0374 Ref		
e ₁	1.90 BSC		0.0748 Ref		
L	0.40	0.60	0.016	0.024	
L ₁	0.64 Ref		0.025 Ref		
S	0.50 Ref		0.020 Ref		
q	3°	8°	3°	8°	

ECN: S-03946-Rev. K, 09-Jul-01

DWG: 5479



RECOMMENDED MINIMUM PADS FOR SOT-23



Recommended Minimum Pads Dimensions in Inches/(mm)



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