

SPD21N05L-VB Datasheet

N-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A) ^a
60	0.025 at $V_{GS} = 10$ V	45
	0.030 at $V_{GS} = 4.5$ V	40

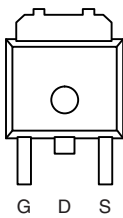
FEATURES

- Trench Power MOSFET
- 175 °C Junction Temperature



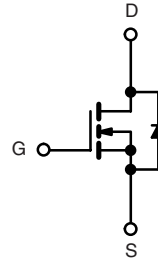
Available
RoHS*
 COMPLIANT

TO-252



Top View

Drain Connected to Tab



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °C, unless otherwise noted

Parameter		Symbol	Limit	Unit
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current ($T_J = 175$ °C) ^b	$T_C = 25$ °C	I_D	45	A
	$T_C = 100$ °C		35	
Pulsed Drain Current		I_{DM}	100	
Continuous Source Current (Diode Conduction)		I_S	23	
Avalanche Current		I_{AS}	20	
Single Avalanche Energy (Duty Cycle ≤ 1 %)	$L = 0.1$ mH	E_{AS}	20	mJ
Maximum Power Dissipation	$T_C = 25$ °C	P_D	100	W
	$T_A = 25$ °C		3 ^a	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 175	°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	$t \leq 10$ sec	R_{thJA}	18	22	°C/W
	Steady State		40	50	
Maximum Junction-to-Case		R_{thJC}	3.2	4	

Notes:

a. Surface Mounted on 1" x 1" FR4 board, $t \leq 10$ sec.

SPECIFICATIONS T _J = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ ^a	Max	Unit
Static						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA	60			V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1.0	2.0	3.0	
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 60 V, V _{GS} = 0 V			1	μA
		V _{DS} = 60 V, V _{GS} = 0 V, T _J = 125 °C			50	
		V _{DS} = 60 V, V _{GS} = 0 V, T _J = 175 °C			250	
On-State Drain Current ^b	I _{D(on)}	V _{DS} = 5 V, V _{GS} = 10 V	50			A
Drain-Source On-State Resistance ^b	r _{DS(on)}	V _{GS} = 10 V, I _D = 15 A		0.025		Ω
		V _{GS} = 10 V, I _D = 15 A, T _J = 125 °C		0.055		
		V _{GS} = 10 V, I _D = 15 A, T _J = 175 °C		0.069		
		V _{GS} = 4.5 V, I _D = 10 A		0.030		
Forward Transconductance ^b	g _{fs}	V _{DS} = 15 V, I _D = 15 A		20		S
Dynamic ^a						
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 25 V, f = 1 MHz		1500		pF
Output Capacitance	C _{oss}			140		
Reverse Transfer Capacitance	C _{rss}			60		
Total Gate Charge ^c	Q _g	V _{DS} = 30 V, V _{GS} = 10 V, I _D = 23 A		11	17	nC
Gate-Source Charge ^c	Q _{gs}			3		
Gate-Drain Charge ^c	Q _{gd}			3		
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 30 V, R _L = 1.3 Ω I _D ≅ 23 A, V _{GEN} = 10 V, R _g = 2.5 Ω		8	15	ns
Rise Time ^c	t _r			15	25	
Turn-Off Delay Time ^c	t _{d(off)}			30	45	
Fall Time ^c	t _f			25	40	
Source-Drain Diode Ratings and Characteristics (T _C = 25 °C)						
Pulsed Current	I _{SM}				50	A
Diode Forward Voltage	V _{SD}	I _F = 15 A, V _{GS} = 0 V		1.0	1.5	V
Reverse Recovery Time	t _{rr}	I _F = 15 A, di/dt = 100 A/μs		30	60	ns

Notes:

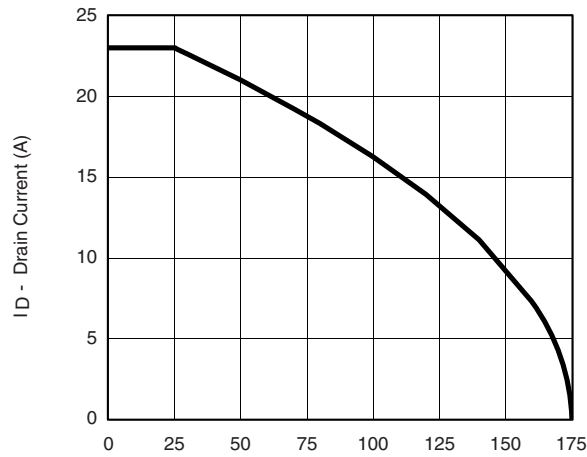
- a. For design aid only; not subject to production testing.
 b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 c. Independent of operating temperature.

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.

TYPICAL CHARACTERISTICS 25 °C unless noted**Output Characteristics****Transfer Characteristics****Transconductance****On-Resistance vs. Drain Current****Capacitance****Gate Charge**

TYPICAL CHARACTERISTICS 25 °C unless noted**On-Resistance vs. Junction Temperature****Source-Drain Diode Forward Voltage**

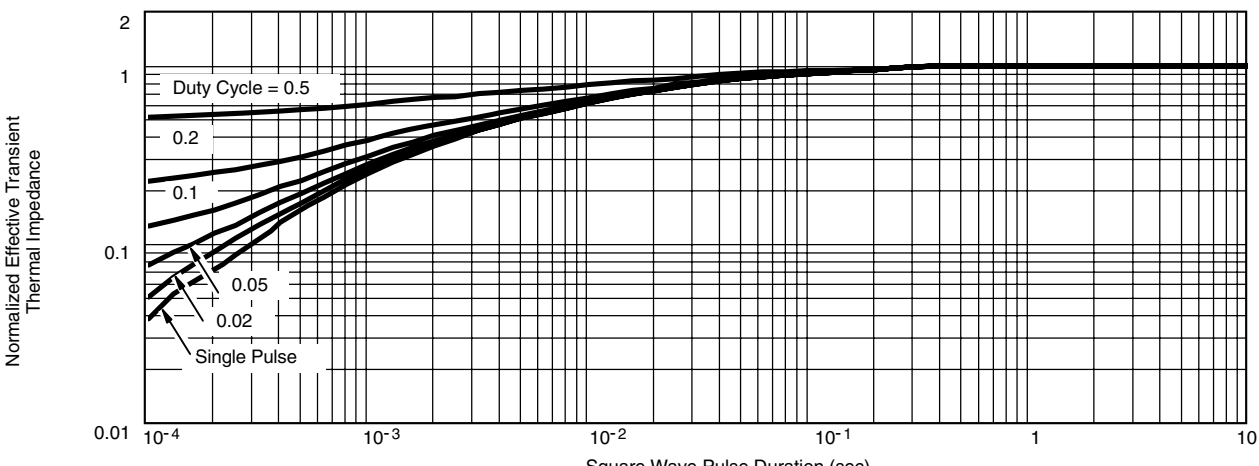
THERMAL RATINGS



T_A - Ambient Temperature (°C)
**Maximum Drain Current
vs. Ambient Temperature**



V_{DS} - Drain-to-Source Voltage (V)
 $*V_{GS} > \text{minimum } V_{GS} \text{ at which } r_{DS(on)} \text{ is specified}$
Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

TO-252AA CASE OUTLINE



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.21	-	0.205	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
H	9.40	10.41	0.370	0.410
e	2.28 BSC		0.090 BSC	
e1	4.56 BSC		0.180 BSC	
L	1.40	1.78	0.055	0.070
L3	0.89	1.27	0.035	0.050
L4	-	1.02	-	0.040
L5	1.14	1.52	0.045	0.060
ECN: X12-0247-Rev. M, 24-Dec-12				
DWG: 5347				

Note

- Dimension L3 is for reference only.

RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads
Dimensions in Inches/(mm)

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