

## SM1A53NHU-VB Datasheet

### N-Channel 100-V (D-S) MOSFET

PRODUCT SUMMARY		
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
100	0.0085 at $V_{GS} = 10$ V	85
	0.0105 at $V_{GS} = 4.5$ V	70

#### FEATURES

- Trench Power MOSFET
- 100 % R<sub>9</sub> Tested
- 100 % UIS Tested

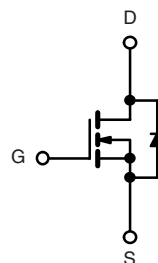


**RoHS**  
COMPLIANT

#### APPLICATIONS

- Primary Side Switch
- Isolated DC/DC Converter

TO-252



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	100	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150$ °C)	$I_D$	85	A
		75 <sup>a</sup>	
Pulsed Drain Current	$I_{DM}$	300	
Avalanche Current	$I_{AS}$	75	
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	280	mJ
Maximum Power Dissipation <sup>b</sup>	$P_D$	176	W
		3.75	
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 <sup>b</sup>	$R_{thJA}$	40	50	°C/W	Steady State
Maximum Junction-to-Case	$R_{thJC}$	0.85	1.1		

Notes:

a. Package limited.

b. Surface mounted on 1" x 1" FR4 board.

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.

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	100			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	1		4	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 80\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125\text{ }^{\circ}\text{C}$			50	
		$V_{DS} = 80\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 175^{\circ}\text{C}$			250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = \geq 5\text{ V}$ , $V_{GS} = 10\text{ V}$	50			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$		0.0085		$\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 20\text{ A}$		0.0105		
		$V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$		0.017		
		$V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$ , $T_J = 175\text{ }^{\circ}\text{C}$		0.022		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}$ , $I_D = 20\text{ A}$	25			S
Dynamic <sup>b</sup>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$		4000		pF
Output Capacitance	$C_{oss}$			565		
Reverse Transfer Capacitance	$C_{rss}$			205		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 50\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 45\text{ A}$		105	160	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			17		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			23		
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 20\text{ V}$ , $R_L = 0.6\text{ }\Omega$ $I_D \cong 45\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 2.5\text{ }\Omega$		12	25	ns
Rise Time <sup>c</sup>	$t_r$			90	135	
Turn-Off DelayTime <sup>c</sup>	$t_{d(off)}$			55	85	
Fall Time <sup>c</sup>	$t_f$			130	195	
Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^{\circ}\text{C}$ <sup>b</sup>						
Continuous Current	$I_S$				85	A
Pulsed Current	$I_{SM}$				140	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 45\text{ A}$ , $V_{GS} = 0\text{ V}$		1.0	1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = 50\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$		85	140	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			4.5	7	A
Reverse Recovery Charge	$Q_{rr}$			0.17	0.35	$\mu\text{C}$

Notes:

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

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## TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted



**Output Characteristics**



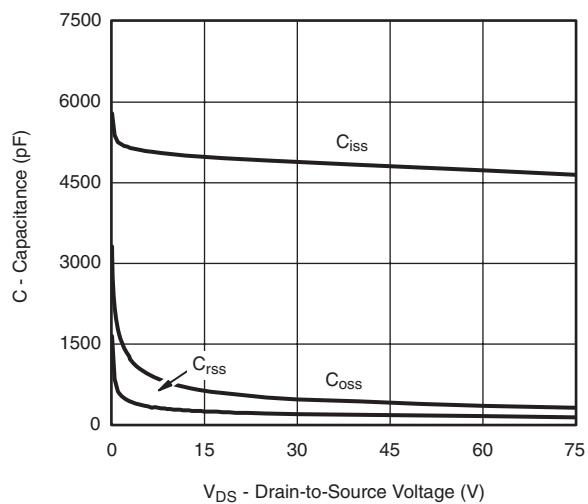
**Transfer Characteristics**



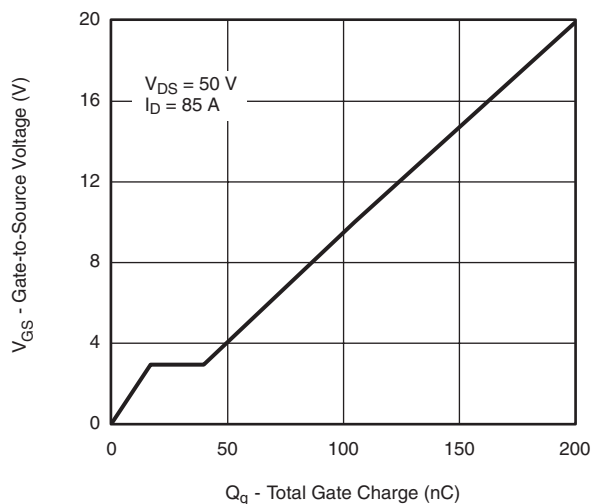
**Transconductance**



**On-Resistance vs. Drain Current**



**Capacitance**



**Gate Charge**

**TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted

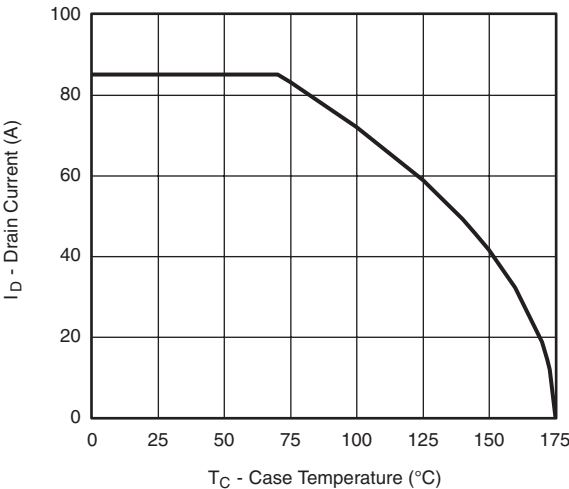
**On-Resistance vs. Junction Temperature**

**Source-Drain Diode Forward Voltage**

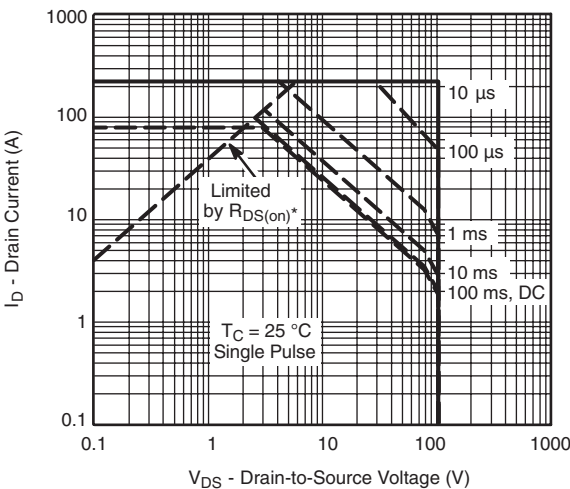
**Avalanche Current vs. Time**

 **$T_J$  - Drain-Source Breakdown vs. Junction-Temperature**

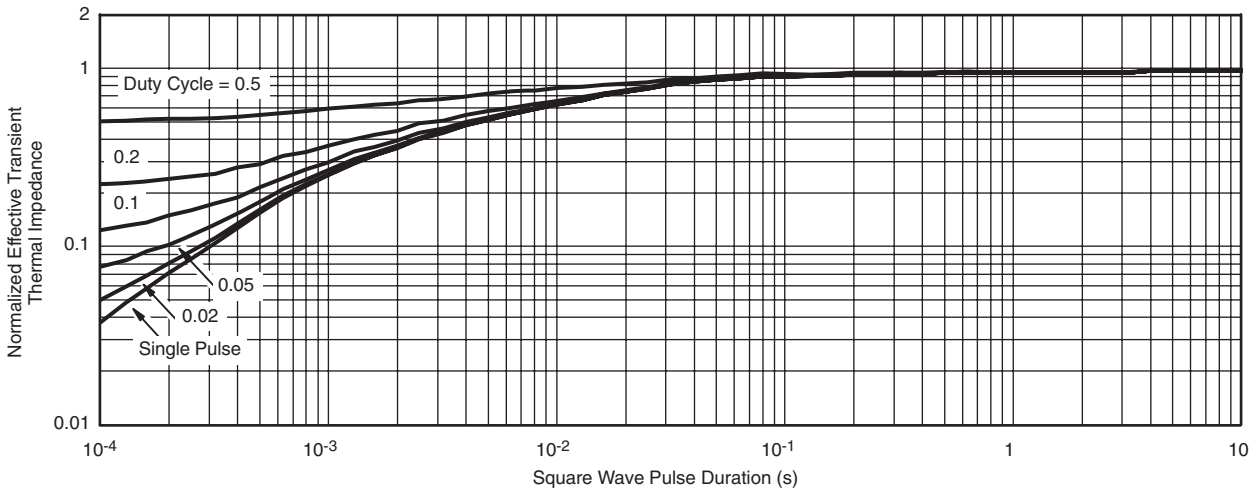
**THERMAL RATINGS**



**Maximum Avalanche and Drain Current  
vs. Case Temperature**

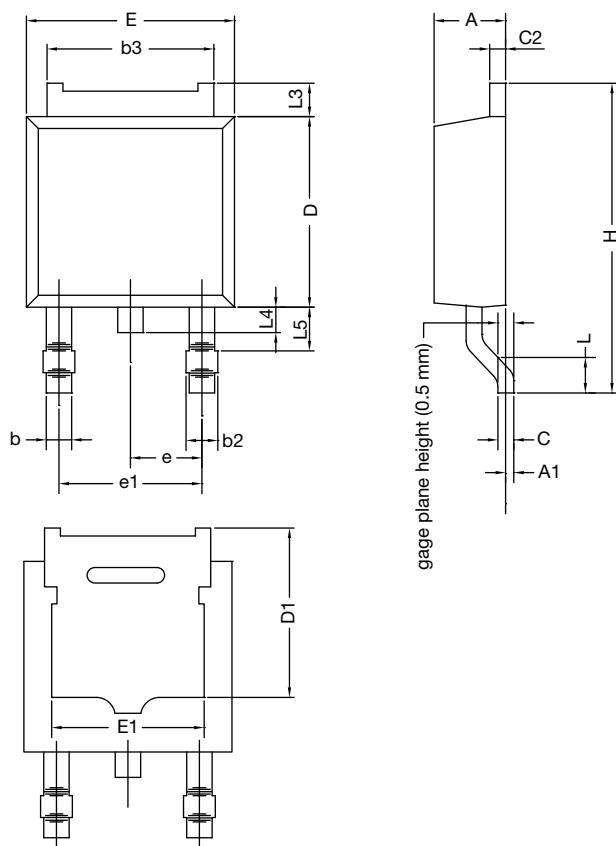


**\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified  
Safe Operating Area**



**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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