

SM1A54NHU-VB Datasheet

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

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
100	0.0185 at $V_{GS} = 10$ V	45	38 nC

FEATURES

- Trench Power MOSFET
- 100 % R_g and UIS Tested

APPLICATIONS

- Primary Side Switch
- Isolated DC/DC Converter



RoHS
COMPLIANT

TO-252



Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	100	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	$T_C = 25^\circ\text{C}$	I_D	45 ^a	A
	$T_C = 100^\circ\text{C}$		30	
	$T_A = 25^\circ\text{C}$		9.2 ^b	
	$T_A = 100^\circ\text{C}$		6.8 ^b	
Pulsed Drain Current		I_{DM}	140	
Continuous Source-Drain Diode Current	$T_C = 25^\circ\text{C}$	I_S	45 ^a	
	$T_A = 25^\circ\text{C}$		2 ^b	
Single Pulse Avalanche Current	$L = 0.1$ mH	I_{AS}	35	mJ
Avalanche Energy		E_{AS}	101	
Maximum Power Dissipation	$T_C = 25^\circ\text{C}$	P_D	136.4	W
	$T_C = 100^\circ\text{C}$		68.2	
	$T_A = 25^\circ\text{C}$		3 ^b	
	$T_A = 100^\circ\text{C}$		1.5 ^b	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 175	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^b	Steady State	R_{thJA}	40	50	$^\circ\text{C/W}$
Maximum Junction-to-Case		R_{thJC}	0.85	1.1	

Notes:

a. Package limited.

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

SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	100			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		110		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 12.5		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	2.5		5	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 100 V, V _{GS} = 0 V			1	μA
		V _{DS} = 100 V, V _{GS} = 0 V, T _J = 125 °C			50	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	30			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 15 A		0.0185		Ω
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 15 A		33		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 50 V, V _{GS} = 0 V, f = 1 MHz		2400		pF
Output Capacitance	C _{oss}			230		
Reverse Transfer Capacitance	C _{rss}			80		
Total Gate Charge	Q _g	V _{DS} = 50 V, V _{GS} = 10 V, I _D = 50 A		38	70	nC
Gate-Source Charge	Q _{gs}			14		
Gate-Drain Charge	Q _{gd}			12		
Gate Resistance	R _g	f = 1 MHz		1.6	2.5	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 50 V, R _L = 1 Ω I _D ≅ 50 A, V _{GEN} = 10 V, R _g = 1 Ω		12	20	ns
Rise Time	t _r			10	20	
Turn-Off Delay Time	t _{d(off)}			18	35	
Fall Time	t _f			8	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode	I _S	T _C = 25 °C			35	A
Pulse Diode Forward Current ^a	I _{SM}				100	
Body Diode Voltage	V _{SD}	I _S = 15 A		0.85	1.5	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 50 A, dI/dt = 100 A/μs, T _J = 25 °C		80	120	ns
Body Diode Reverse Recovery Charge	Q _{rr}			160	240	nC
Reverse Recovery Fall Time	t _a			57		ns
Reverse Recovery Rise Time	t _b			23		

Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

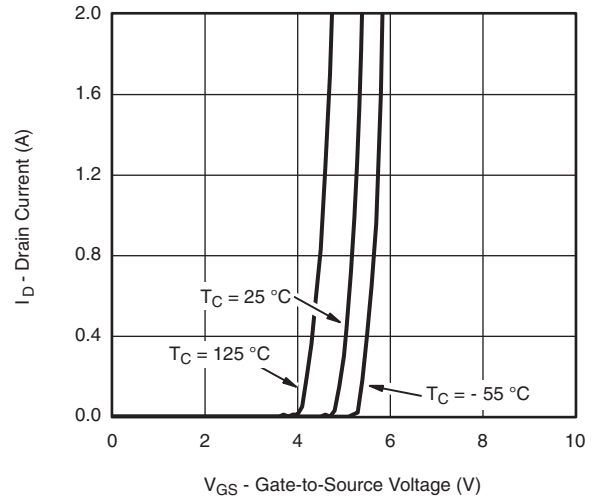
b. Guaranteed by design, not subject to production testing.

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.

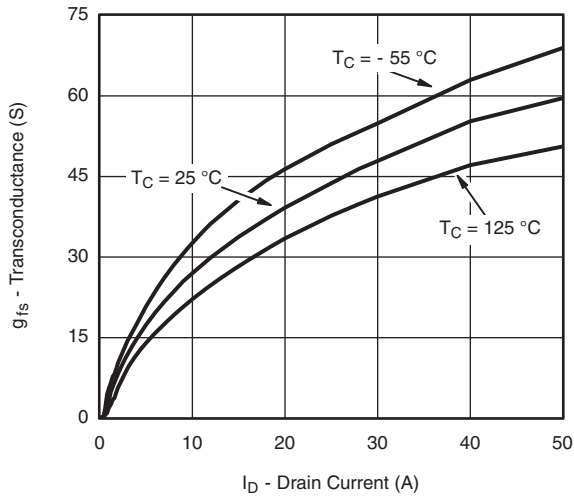
TYPICAL CHARACTERISTICS (25 °C, unless otherwise note)



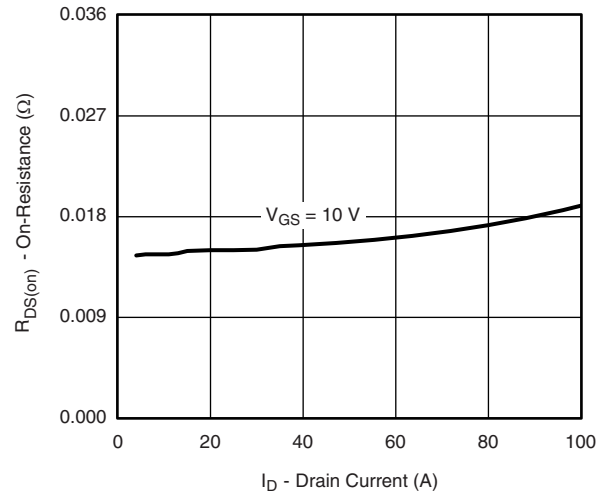
Output Characteristics



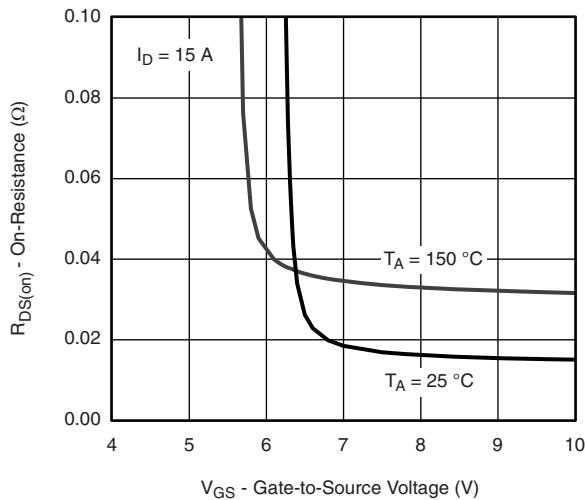
Transfer Characteristics



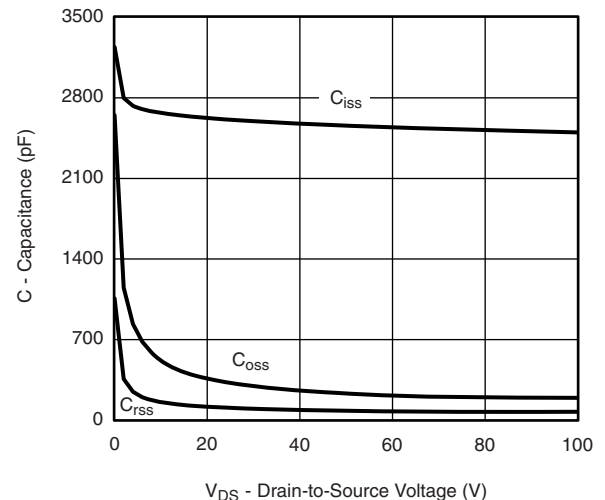
Transconductance



On-Resistance vs. Drain Current



On-Resistance vs. Gate-to-Source Voltage



Capacitance

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient



* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Case



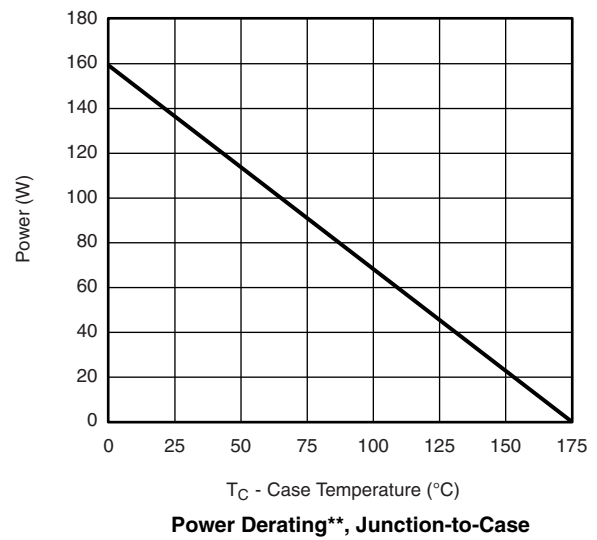
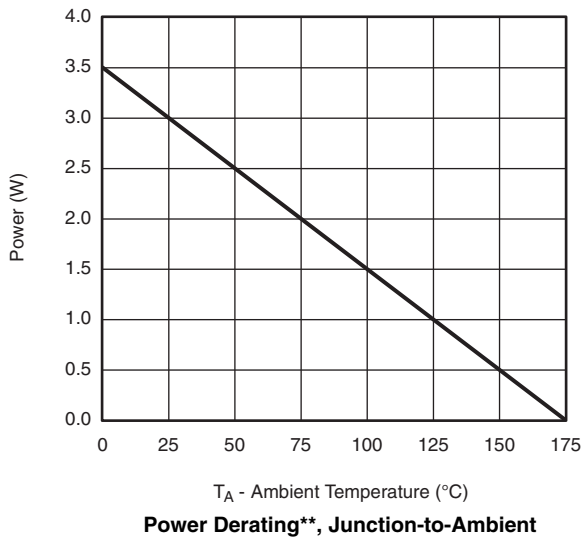
Current Derating, Junction-to-Ambient**



Current Derating, Junction-to-Case**

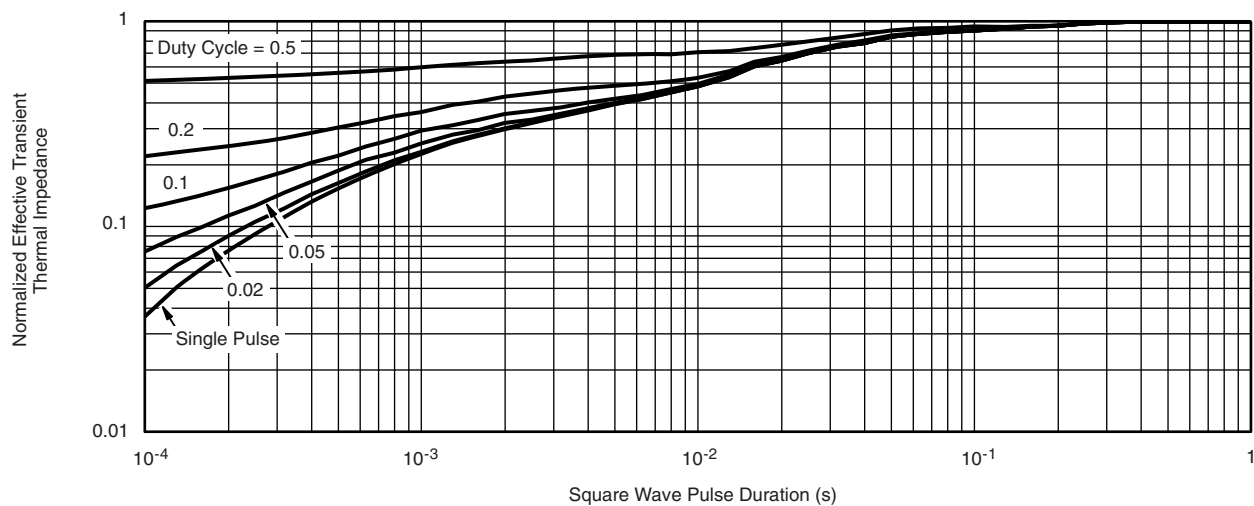
** The power dissipation P_D is based on $T_{J(max.)} = 175^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



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TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Case

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