

## NP80N04NUG-S18-AY-VB Datasheet

### N-Channel 40-V (D-S) 175 °C MOSFET

#### PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)	$Q_g$ (Typ.)
40	0.005 at $V_{GS} = 10$ V	100	95

#### FEATURES

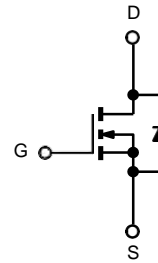
- Trench Power MOSFET
- 175 °C Junction Temperature
- High Threshold Voltage at High Temperature



TO-262



Top View



N-Channel MOSFET

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

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		$V_{DS}$	40	V
Gate-Source Voltage		$V_{GS}$	20	
Continuous Drain Current ( $T_J = 175$ °C)	$T_C = 25$ °C	$I_D$	110	A
	$T_C = 125$ °C		70	
Pulsed Drain Current		$I_{DM}$	300	
Avalanche Current		$I_{AR}$	50	
Repetitive Avalanche Energy <sup>a</sup>	$L = 0.1$ mH	$E_{AR}$	125	mJ
Maximum Power Dissipation <sup>a</sup>	$T_C = 25$ °C	$P_D$	150 <sup>b</sup>	W
	$T_A = 25$ °C <sup>c</sup>		3.75	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	- 55 to 175	°C

#### THERMAL RESISTANCE RATINGS

Parameter		Symbol	Limit	Unit
Junction-to-Ambient	PCB Mount <sup>c</sup>	$R_{thJA}$	40	°C/W
Junction-to-Case		$R_{thJC}$	1	

Notes:

a. Duty cycle  $\leq 1$  %.

b. See SOA curve for voltage derating.

c. When Mounted on 1" square PCB (FR-4 material).

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0	2.0	4.0	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^{\circ}\text{C}$			50	
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^{\circ}\text{C}$			250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = 5\text{ V}, V_{GS} = 10\text{ V}$	120			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.005		$\Omega$
		$V_{GS} = 10\text{ V}, I_D = 15\text{ A}, T_J = 125\text{ }^{\circ}\text{C}$		0.008		
		$V_{GS} = 10\text{ V}, I_D = 15\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$		0.0106		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$	20	50		S
Dynamic <sup>b</sup>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		3200		pF
Output Capacitance	$C_{oss}$			600		
Reverse Transfer Capacitance	$C_{rss}$			320		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		95		nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			37		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			21		
Gate Resistance	$R_g$	$f = 1.0\text{ MHz}$		1.7		$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 0.4\text{ }\Omega$ $I_D \cong 50\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$		20	30	ns
Rise Time <sup>c</sup>	$t_r$			95	145	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			50	75	
Fall Time <sup>c</sup>	$t_f$			12	20	
Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^{\circ}\text{C}$ <sup>b</sup>						
Continuous Current	$I_S$				100	A
Pulsed Current	$I_{SM}$				300	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 30\text{ A}, V_{GS} = 0\text{ V}$		0.90	1.50	V
Reverse Recovery Time	$t_{rr}$	$I_F = 30\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		40	60	ns

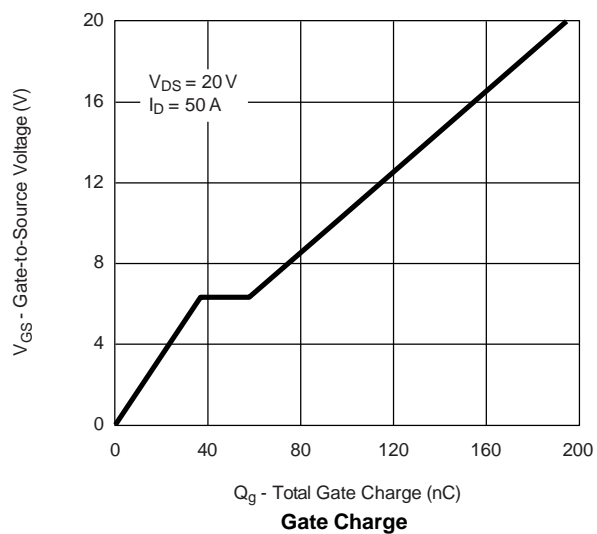
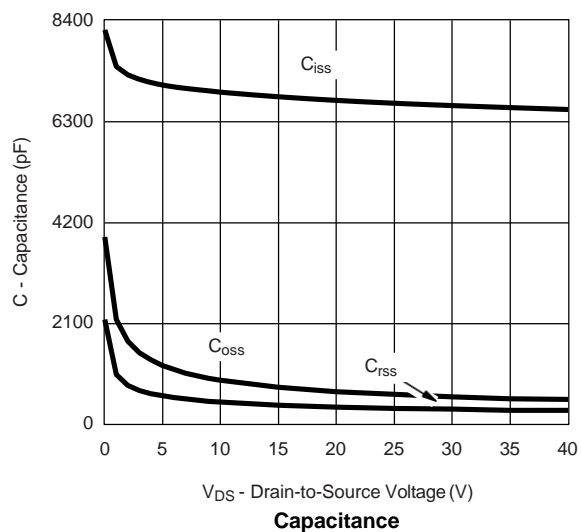
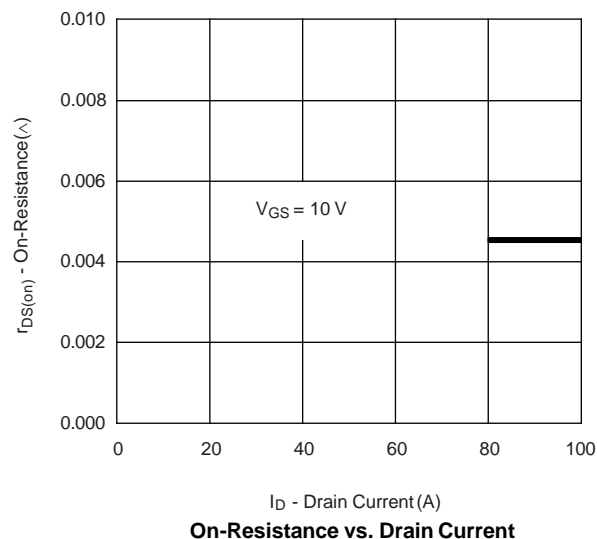
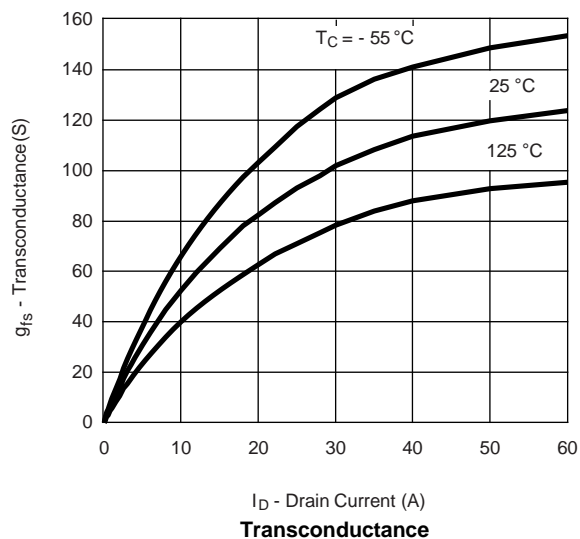
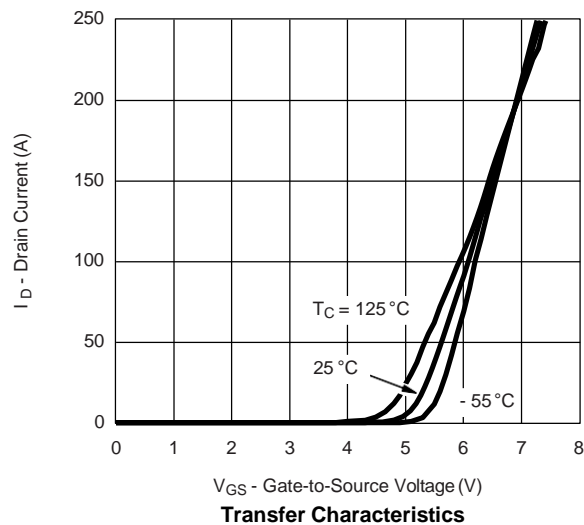
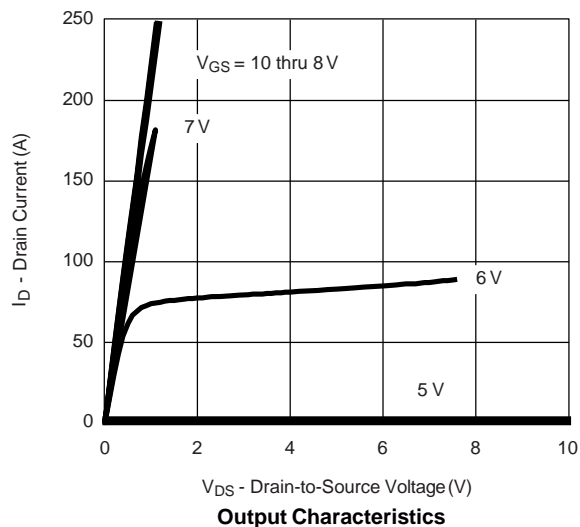
Notes:

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

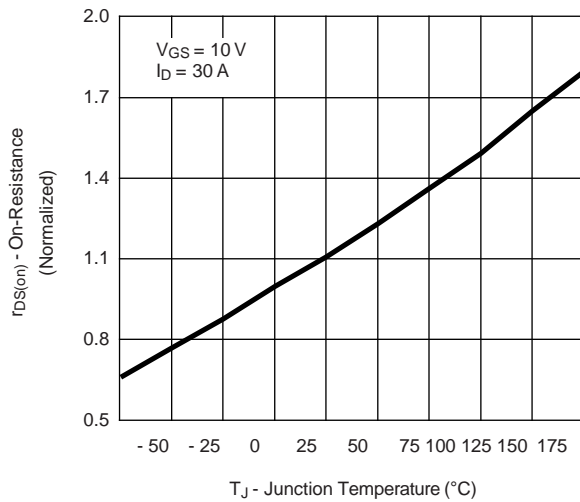
b. Guaranteed by design, not subject to production testing.

c. Independent of operating temperature.

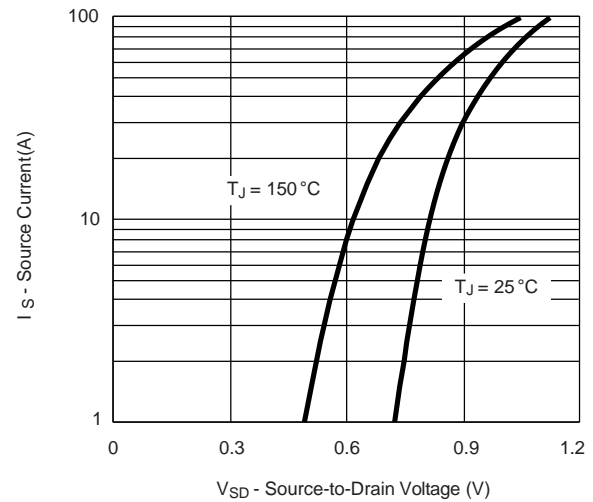
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



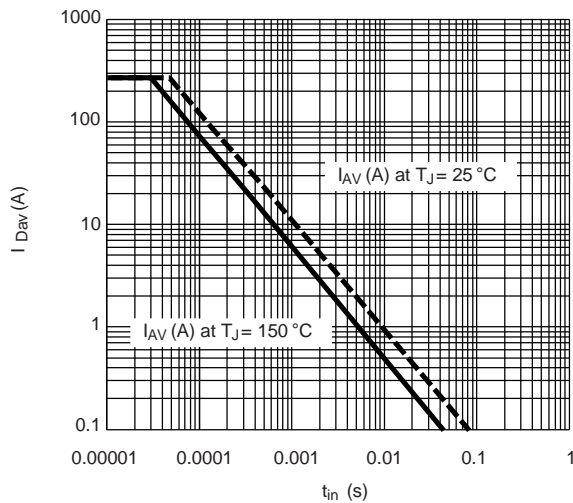
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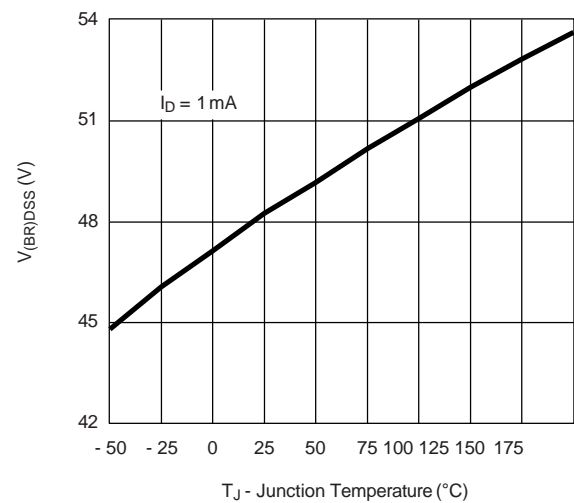
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**



**Avalanche Current vs. Time**

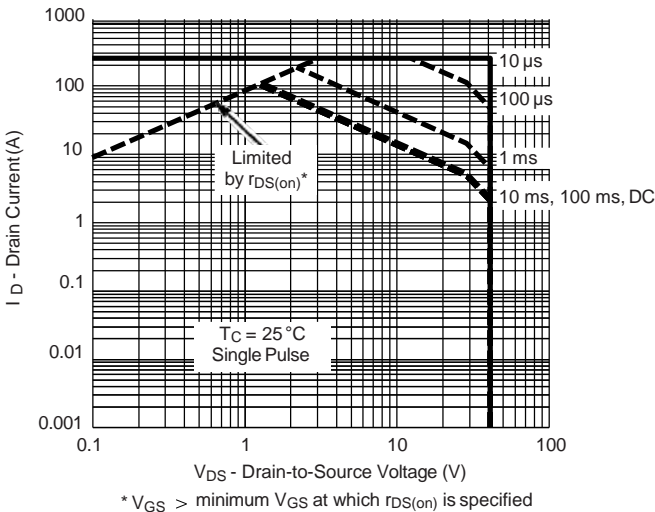


**Drain Source Breakdown vs. Junction Temperature**

THERMAL RATINGS



Maximum Avalanche and Drain Current  
vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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