

## 4NF06L-VB Datasheet

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

#### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
60	0.028 at $V_{GS} = 10$ V	7.0
	0.033 at $V_{GS} = 4.5$ V	5.6

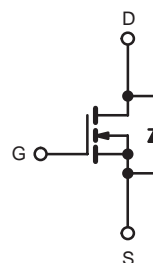
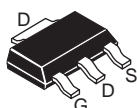
#### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFETs
- 175 °C Maximum Junction Temperature
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

SOT-223



N-Channel MOSFET

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

Parameter		Symbol	10 s	Steady State	Unit
Drain-Source Voltage		V <sub>DS</sub>	60		V
Gate-Source Voltage		V <sub>GS</sub>	± 20		
Continuous Drain Current (T <sub>J</sub> = 175 °C) <sup>a</sup>	T <sub>A</sub> = 25 °C	I <sub>D</sub>	7.0	6.0	A
	T <sub>A</sub> = 70 °C		6.1	5.0	
Pulsed Drain Current		I <sub>DM</sub>	40		
Avalanche Current		I <sub>AS</sub>	15		
Single Pulse Avalanche Energy		E <sub>AS</sub>	11		mJ
Maximum Power Dissipation <sup>a</sup>	T <sub>A</sub> = 25 °C	P <sub>D</sub>	3.3	1.7	W
	T <sub>A</sub> = 70 °C		2.3	1.2	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>sta</sub>	- 55 to 175		°C

#### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a</sup>	$R_{thJA}$	36	45	°C/W
		75	90	
Maximum Junction-to-Foot (Drain)	$R_{thJF}$	17	20	

Notes:

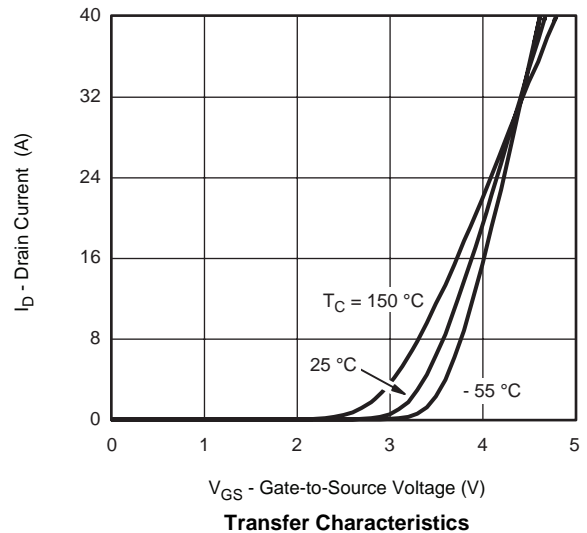
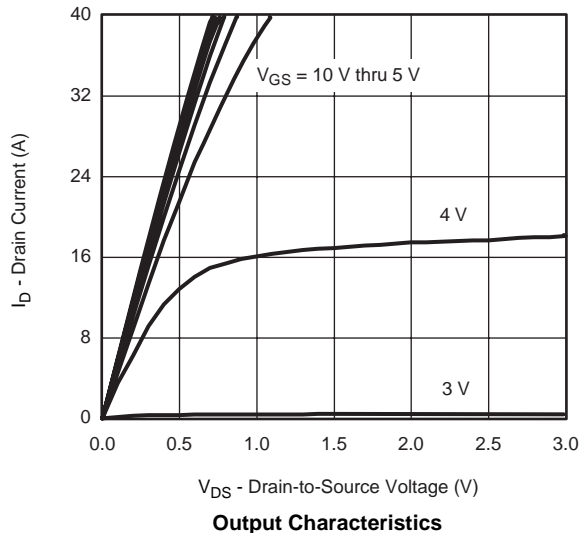
a. Surface Mounted on 1" x 1" FR4 board.

<b>SPECIFICATIONS</b> $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1		3	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^{\circ}\text{C}$			20	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	40			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 6.0\text{ A}$		0.028		$\Omega$
		$V_{GS} = 10\text{ V}, I_D = 6.0\text{ A}, T_J = 125\text{ }^{\circ}\text{C}$		0.032		
		$V_{GS} = 10\text{ V}, I_D = 6.0\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$		0.040		
		$V_{GS} = 4.5\text{ V}, I_D = 5.1\text{ A}$		0.033		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 6.0\text{ A}$		25		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 1.7\text{ A}, V_{GS} = 0\text{ V}$		0.8	1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 6.0\text{ A}$		18	27	nC
Gate-Source Charge	$Q_{gs}$			3.4		
Gate-Drain Charge	$Q_{gd}$			5.3		
Gate Resistance	$R_g$	$V_{GS} = 0.1\text{ V}, f = 5\text{ MHz}$	0.5	1.4	2.4	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 30\text{ }\Omega$ $I_D \cong 1\text{ A}, V_{GEN} = 10\text{ V}, R_g = 6\text{ }\Omega$		10	20	ns
Rise Time	$t_r$			10	20	
Turn-Off Delay Time	$t_{d(off)}$			25	50	
Fall Time	$t_f$			12	24	
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = 1.7\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		50	80	

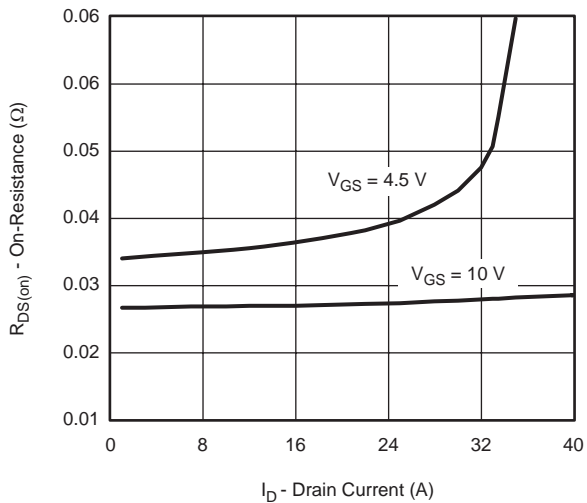
Notes:

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

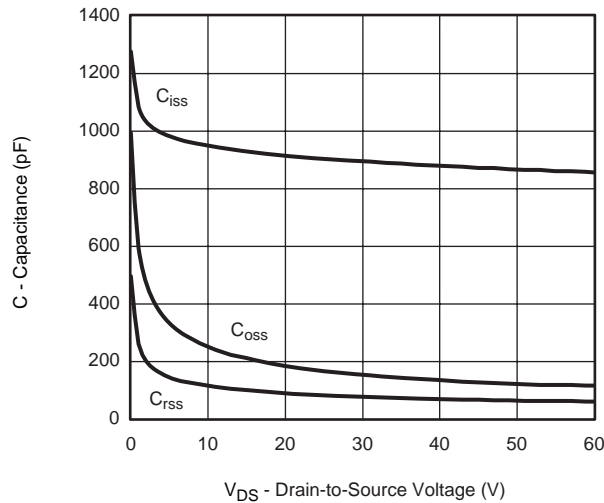
b. Guaranteed by design, not subject to production testing.

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

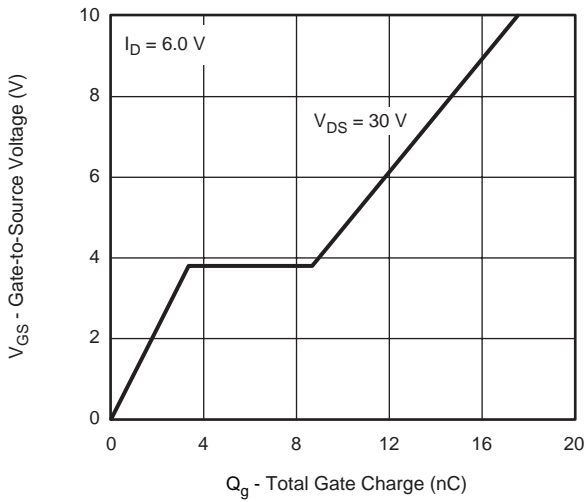
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



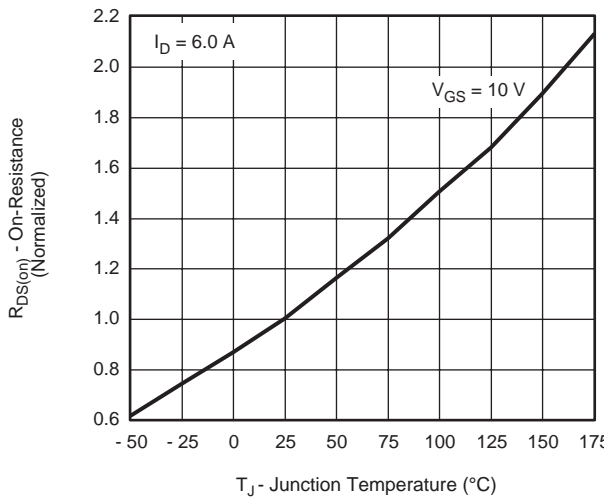
On-Resistance vs. Drain Current



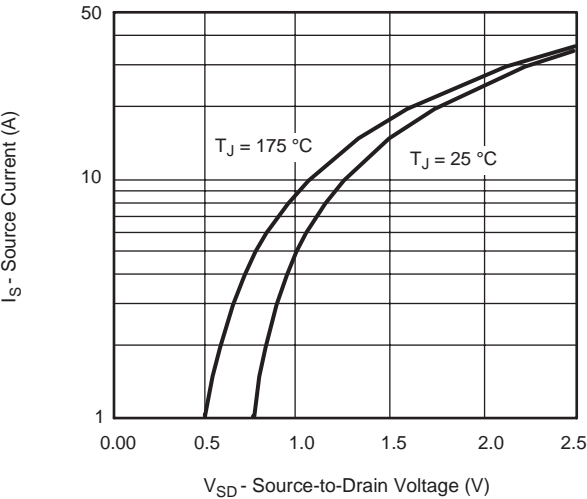
Capacitance



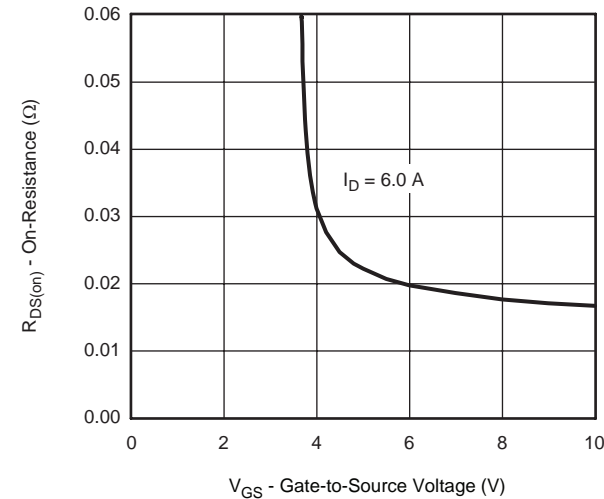
Gate Charge



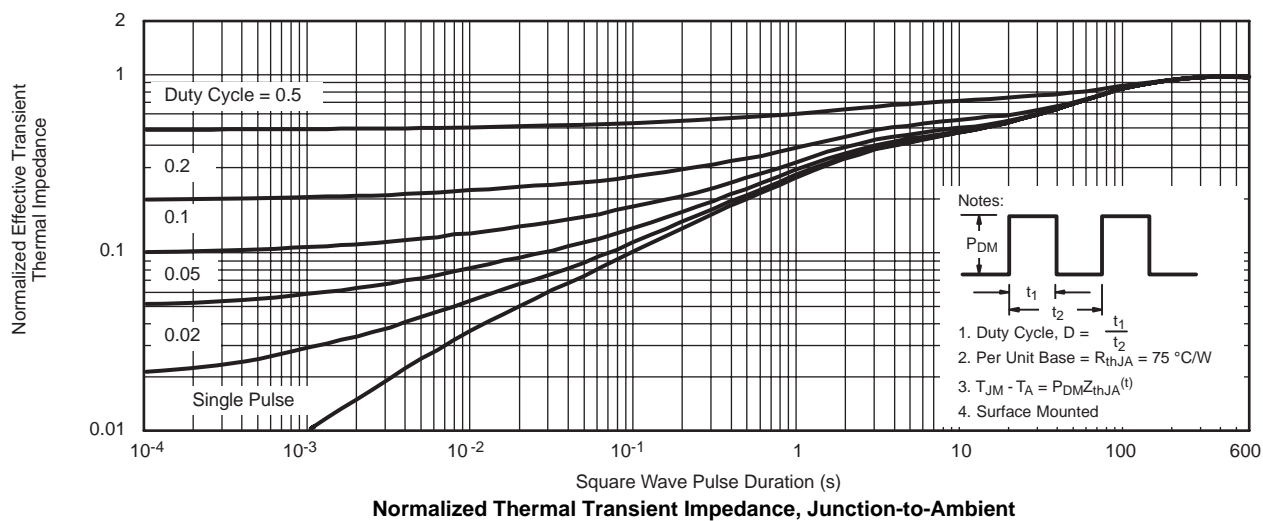
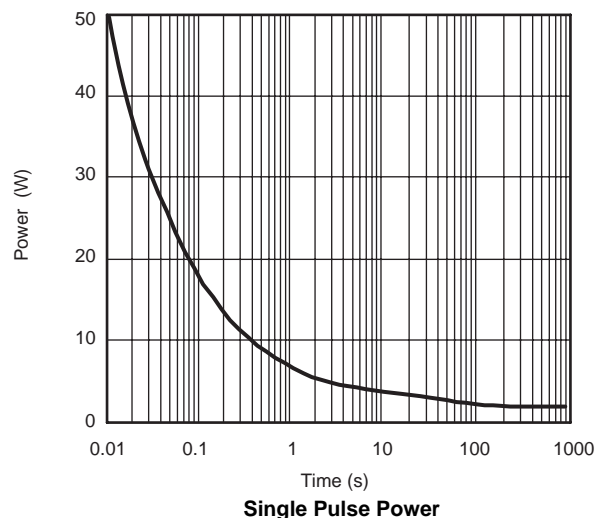
On-Resistance vs. Junction Temperature



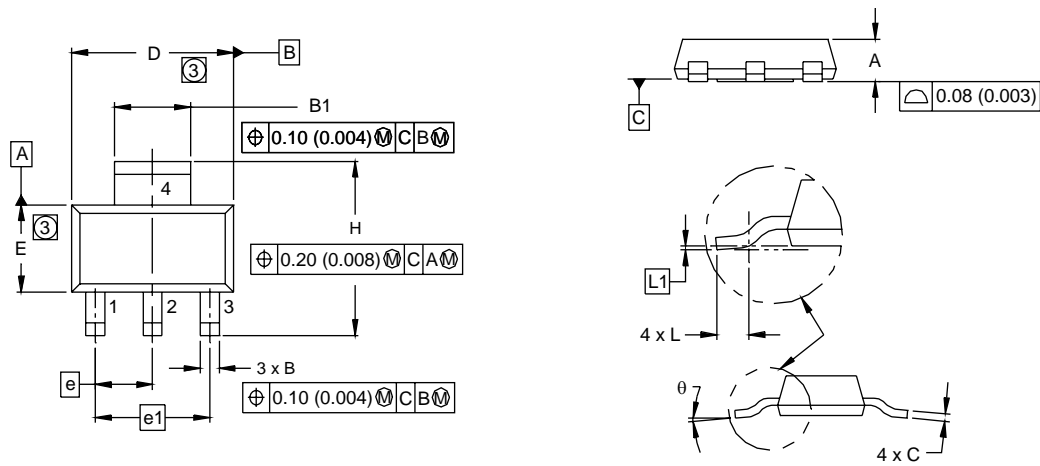
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted


SOT-223 (HIGH VOLTAGE)



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	1.55	1.80	0.061	0.071
B	0.65	0.85	0.026	0.033
B1	2.95	3.15	0.116	0.124
C	0.25	0.35	0.010	0.014
D	6.30	6.70	0.248	0.264
E	3.30	3.70	0.130	0.146
e	2.30 BSC		0.0905 BSC	
e1	4.60 BSC		0.181 BSC	
H	6.71	7.29	0.264	0.287
L	0.91	-	0.036	-
L1	0.061 BSC		0.0024 BSC	
θ	-	10°	-	10°

ECN: S-82109-Rev. A, 15-Sep-08  
DWG: 5969

- Notes**
1. Dimensioning and tolerancing per ASME Y14.5M-1994.
  2. Dimensions are shown in millimeters (inches).
  3. Dimension do not include mold flash.
  4. Outline conforms to JEDEC outline TO-261AA.

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