

NIF9N05CL

Advance Information

Power MOSFET

2.6 Amps, 52 Volts

N-Channel, Logic Level, Clamped MOSFET w/ ESD Protection in a SOT-223 Package

Benefits

- High Energy Capability for Inductive Loads
- Low Switching Noise Generation

Features

- Diode Clamp Between Gate and Source
- ESD Protection - HBM 5000 V
- Active Over-Voltage Gate to Drain Clamp
- Scalable to Lower or Higher $R_{DS(on)}$
- Internal Series Gate Resistance

Applications

- Automotive and Industrial Markets:
Solenoid Drivers, Lamp Drivers, Small Motor Drivers

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage Internally Clamped	V_{DSS}	52-59	Vdc
Gate-to-Source Voltage - Continuous	V_{GS}	± 12	Vdc
Drain Current - Continuous @ $T_A = 25^\circ\text{C}$ - Single Pulse ($t_p = 10 \mu\text{s}$)	I_D I_{DM}	2.6 10	A
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	1.69	W
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy - Starting $T_J = 125^\circ\text{C}$ ($V_{DD} = 50 \text{ V}$, $I_{D(pk)} = 1.5 \text{ A}$, $V_{GS} = 10 \text{ V}$, $R_G = 25 \Omega$)	E_{AS}	TBD	mJ
Thermal Resistance - Junction-to-Case - Junction-to-Ambient (Note 1) - Junction-to-Ambient (Note 2)	$R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	- 74 169	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from Case for 10 Sec.	T_L	260	$^\circ\text{C}$

1. When surface mounted to an FR4 board using 1" pad size, (Cu area 1.127 in²)
2. When surface mounted to an FR4 board using minimum recommended pad size, (Cu area 0.412 in²)

This document contains information on a new product. Specifications and information herein are subject to change without notice.



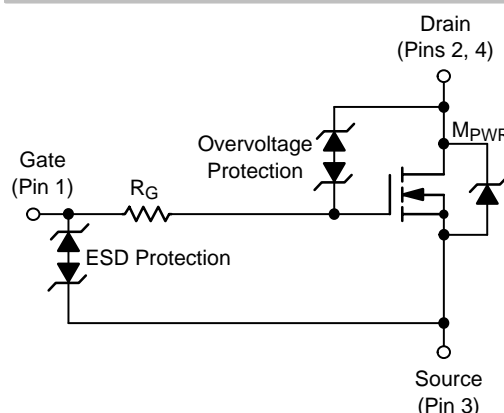
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2.6 AMPERES

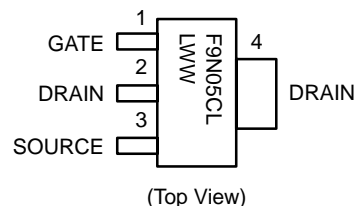
52 V CLAMPED

$R_{DS(on)} = 120 \text{ m}\Omega$ (Typ.)



SOT-223
CASE 318E
STYLE 3

MARKING DIAGRAM



F9N05CL = Specific Device Code
L = Location Code
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
NIF9N05CLT4	SOT-223	2500/Tape & Reel

NIF9N05CL

MOSFET ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (Note 3) ($V_{GS} = 0\text{ Vdc}$, $I_D = 1.0\text{ mAdc}$) Temperature Coefficient (Negative)	$V_{(BR)DSS}$	52 -	55 -10	59 -	Vdc mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current ($V_{DS} = 40\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) ($V_{DS} = 40\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	I_{DSS}	- -	- -	10 25	μAdc
Gate-Body Leakage Current ($V_{GS} = \pm 8\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$) ($V_{GS} = \pm 14\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$)	I_{GSS}	- -	- ± 22	± 10 -	μAdc

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage (Note 3) ($V_{DS} = V_{GS}$, $I_D = 100\text{ }\mu\text{Adc}$) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	1.3 -	1.75 -4.5	2.5 -	Vdc mV/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance (Note 3) ($V_{GS} = 4.0\text{ Vdc}$, $I_D = 1.5\text{ Adc}$) ($V_{GS} = 3.5\text{ Vdc}$, $I_D = 0.6\text{ Adc}$) ($V_{GS} = 3.0\text{ Vdc}$, $I_D = 0.2\text{ Adc}$) ($V_{GS} = 12\text{ Vdc}$, $I_D = 2.6\text{ A}$)	$R_{DS(on)}$	- - - 70 67		200 385 1225 - -	$\text{m}\Omega$
Forward Transconductance (Note 3) ($V_{DS} = 15\text{ Vdc}$, $I_D = 9.0\text{ Adc}$)	g_{FS}	-	24	-	Mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	$(V_{DS} = 40\text{ Vdc}$, $V_{GS} = 0\text{ V}$, $f = 10\text{ kHz}$)	C_{iss}	-	155	250	pF
Output Capacitance		C_{oss}	-	60	100	
Transfer Capacitance		C_{rss}	-	25	40	
Input Capacitance	$(V_{DS} = 25\text{ Vdc}$, $V_{GS} = 0\text{ V}$, $f = 10\text{ kHz}$)	C_{iss}	-	175	-	pF
Output Capacitance		C_{oss}	-	70	-	
Transfer Capacitance		C_{rss}	-	30	-	

3. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperatures.

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MOSFET ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 4)					
Turn-On Delay Time	$t_{d(on)}$	-	130	200	ns
Rise Time	t_r	-	500	750	
Turn-Off Delay Time	$t_{d(off)}$	-	1300	2000	
Fall Time	t_f	-	1150	1850	
Turn-On Delay Time	$t_{d(on)}$	-	200	-	ns
Rise Time	t_r	-	500	-	
Turn-Off Delay Time	$t_{d(off)}$	-	2500	-	
Fall Time	t_f	-	1800	-	
Turn-On Delay Time	$t_{d(on)}$	-	120	-	ns
Rise Time	t_r	-	275	-	
Turn-Off Delay Time	$t_{d(off)}$	-	1600	-	
Fall Time	t_f	-	1100	-	
Gate Charge	Q_T	-	4.5	7.0	nC
	Q_1	-	1.2	-	
	Q_2	-	2.7	-	
Gate Charge	Q_T	-	3.6	-	nC
	Q_1	-	1.0	-	
	Q_2	-	2.0	-	

SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage	($I_S = 4.5\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$) (Note 3) ($I_S = 4.0\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$) ($I_S = 4.5\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	V_{SD}	- - -	0.86 0.845 0.725	1.2 - -	Vdc
Reverse Recovery Time	($I_S = 4.5\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $di_s/dt = 100\text{ A}/\mu\text{s}$) (Note 3)	t_{rr}	-	700	-	ns
		t_a	-	200	-	
		t_b	-	500	-	
Reverse Recovery Stored Charge		Q_{RR}	-	6.5	-	μC

ESD CHARACTERISTICS

Electro-Static Discharge Capability	Human Body Model (HBM)	ESD	5000	-	-	V
	Machine Model (MM)		500	-	-	

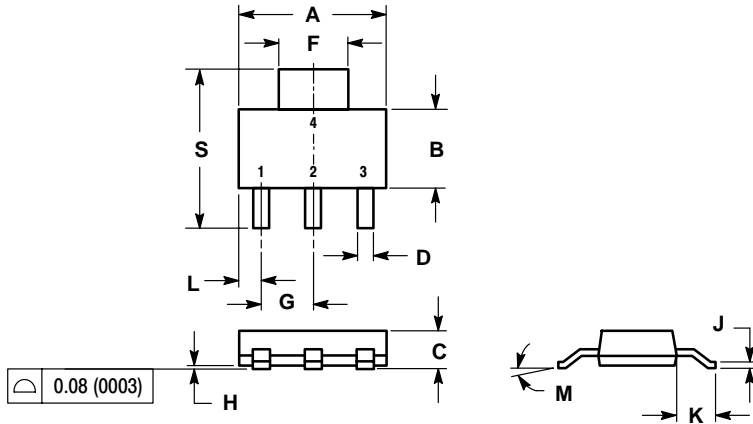
3. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperatures.

NIF9N05CL

PACKAGE DIMENSIONS


SOT-223
CASE 318E-04
ISSUE K



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.249	0.263	6.30	6.70
B	0.130	0.145	3.30	3.70
C	0.060	0.068	1.50	1.75
D	0.024	0.035	0.60	0.89
F	0.115	0.126	2.90	3.20
G	0.087	0.094	2.20	2.40
H	0.0008	0.0040	0.020	0.100
J	0.009	0.014	0.24	0.35
K	0.060	0.078	1.50	2.00
L	0.033	0.041	0.85	1.05
M	0°	10°	0°	10°
S	0.264	0.287	6.70	7.30

STYLE 3:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

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