

# NIF62514

Preferred Device

## Self-protected FET with Temperature and Current Limit

HDPlus devices are an advanced series of power MOSFETs which utilize ON Semiconductor's latest MOSFET technology process to achieve the lowest possible on-resistance per silicon area while incorporating smart features. Integrated thermal and current limits work together to provide short circuit protection. The devices feature an integrated Drain-to-Gate Clamp that enables them to withstand high energy in the avalanche mode. The Clamp also provides additional safety margin against unexpected voltage transients. Electrostatic Discharge (ESD) protection is provided by an integrated Gate-to-Source Clamp.

### Features

- Current Limitation
- Thermal Shutdown with Automatic Restart
- Short Circuit Protection
- Low  $R_{DS(on)}$
- $I_{DSS}$  Specified at Elevated Temperature
- Avalanche Energy Specified
- Slew Rate Control for Low Noise Switching
- Overvoltage Clamped Protection

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage Internally Clamped	$V_{DSS}$	40	Vdc
Drain-to-Gate Voltage Internally Clamped ( $R_{GS} = 1.0\text{ M}\Omega$ )	$V_{DGR}$	40	Vdc
Gate-to-Source Voltage	$V_{GS}$	$\pm 16$	Vdc
Drain Current	$I_D$ $I_{D1}$ $I_{DM}$	Internally Limited	
		- Continuous @ $T_A = 25^\circ\text{C}$ - Continuous @ $T_A = 100^\circ\text{C}$ - Pulsed ( $t_p \leq 10\ \mu\text{s}$ )	
Total Power Dissipation	$P_D$	1.1 1.73 8.93	W
		@ $T_A = 25^\circ\text{C}$ (Note 1) @ $T_A = 25^\circ\text{C}$ (Note 2) @ $T_A = 25^\circ\text{C}$ (Note 3)	
Thermal Resistance	$R_{\theta JT}$ $R_{\theta JA}$ $R_{\theta JA}$	14 114 72.3	$^\circ\text{C/W}$
		- Junction-to-Tab - Junction-to-Ambient (Note 1) - Junction-to-Ambient (Note 2)	
Single Pulse Drain-to-Source Avalanche Energy ( $V_{DD} = 25\text{ Vdc}$ , $V_{GS} = 5.0\text{ Vdc}$ , $V_{DS} = 40\text{ Vdc}$ , $I_L = 2.8\text{ Apk}$ , $L = 80\text{ mH}$ , $R_G = 25\ \Omega$ )	$E_{AS}$	300	mJ
Operating and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$

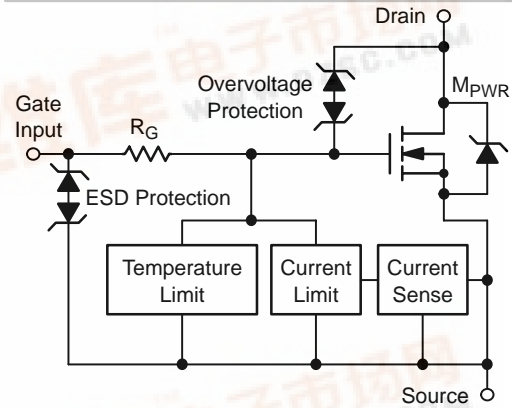
1. Mounted onto min pad board.
2. Mounted onto 1" pad board.
3. Mounted onto large heatsink.



ON Semiconductor®

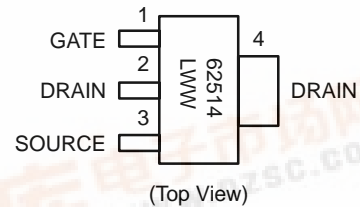
<http://onsemi.com>

**6.0 AMPERES\***  
**40 VOLTS CLAMPED**  
 **$R_{DS(on)} = 90\text{ m}\Omega$**



SOT-223  
CASE 318E  
STYLE 3

### MARKING DIAGRAM



62514 = Specific Device Code  
L = Location Code  
WW = Work Week

### ORDERING INFORMATION

Device	Package	Shipping
NIF62514T1	SOT-223	1000/Tape & Reel
NIF62514T3	SOT-223	4000/Tape & Reel

\*Limited by the current limit circuit.

Preferred devices are recommended choices for future use and best overall value.



# NIF62514

## MOSFET ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Clamped Breakdown Voltage (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 250 μAdc) (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 250 μAdc, T <sub>J</sub> = 150°C)	V <sub>(BR)DSS</sub>	42 42	46 45	50 50	Vdc
Zero Gate Voltage Drain Current (V <sub>DS</sub> = 32 Vdc, V <sub>GS</sub> = 0 Vdc) (V <sub>DS</sub> = 32 Vdc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 150°C)	I <sub>DSS</sub>	- -	0.5 2.0	2.0 10	μAdc
Gate Input Current (V <sub>GS</sub> = 5.0 Vdc, V <sub>DS</sub> = 0 Vdc) (V <sub>GS</sub> = -5.0 Vdc, V <sub>DS</sub> = 0 Vdc)	I <sub>GSS</sub>	- -	50 550	100 1000	μAdc

### ON CHARACTERISTICS

Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 150 μAdc) Threshold Temperature Coefficient (Negative)	V <sub>GS(th)</sub>	1.0 -	1.7 4.0	2.0 6.0	Vdc mV/°C
Static Drain-to-Source On-Resistance (Note 4) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 1.4 Adc, T <sub>J</sub> @ 25°C) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 1.4 Adc, T <sub>J</sub> @ 150°C)	R <sub>DS(on)</sub>	- -	90 165	100 190	mΩ
Static Drain-to-Source On-Resistance (Note 4) (V <sub>GS</sub> = 5.0 Vdc, I <sub>D</sub> = 1.4 Adc, T <sub>J</sub> @ 25°C) (V <sub>GS</sub> = 5.0 Vdc, I <sub>D</sub> = 1.4 Adc, T <sub>J</sub> @ 150°C)	R <sub>DS(on)</sub>	- -	105 185	120 210	mΩ
Source-Drain Forward On Voltage (I <sub>S</sub> = 7 A, V <sub>GS</sub> = 0 V)	V <sub>SD</sub>	-	1.05	-	V

### SWITCHING CHARACTERISTICS

Turn-on Delay Time R <sub>L</sub> = 4.7 Ω, V <sub>in</sub> = 0 to 10 V, V <sub>DD</sub> = 12 V	10% V <sub>in</sub> to 10% I <sub>D</sub> t <sub>d(on)</sub>	-	4.0	8.0	μs
Turn-on Rise Time R <sub>L</sub> = 4.7 Ω, V <sub>in</sub> = 0 to 10 V, V <sub>DD</sub> = 12 V	10% I <sub>D</sub> to 90% I <sub>D</sub> t <sub>rise</sub>	-	11	20	μs
Turn-off Delay Time R <sub>L</sub> = 4.7 Ω, V <sub>in</sub> = 10 to 0 V, V <sub>DD</sub> = 12 V	90% V <sub>in</sub> to 90% I <sub>D</sub> t <sub>d(off)</sub>	-	32	50	μs
Turn-off Fall Time R <sub>L</sub> = 4.7 Ω, V <sub>in</sub> = 10 to 0 V, V <sub>DD</sub> = 12 V	90% I <sub>D</sub> to 10% I <sub>D</sub> t <sub>fall</sub>	-	27	50	μs
Slew-Rate On V <sub>in</sub> = 0 to 10 V, V <sub>DD</sub> = 12 V	R <sub>L</sub> = 4.7 Ω, -dV <sub>DS</sub> /dt <sub>on</sub>	-	1.5	2.5	μs
Slew-Rate Off V <sub>in</sub> = 10 to 0 V, V <sub>DD</sub> = 12 V	R <sub>L</sub> = 4.7 Ω, dV <sub>DS</sub> /dt <sub>off</sub>	-	0.6	1.0	μs

### SELF PROTECTION CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Current Limit (V <sub>GS</sub> = 5.0 Vdc) (V <sub>GS</sub> = 5.0 Vdc, T <sub>J</sub> = 150°C)	I <sub>LIM</sub>	6.0 3.0	9.0 5.0	11 8.0	Adc
Current Limit (V <sub>GS</sub> = 10 Vdc) (V <sub>GS</sub> = 10 Vdc, T <sub>J</sub> = 150°C)	I <sub>LIM</sub>	7.0 4.0	10.5 7.5	13 10	Adc
Temperature Limit (Turn-off)	T <sub>LIM(off)</sub>	150	175	200	°C
Temperature Limit (Circuit Reset)	T <sub>LIM(on)</sub>	135	160	185	°C
Temperature Limit (Turn-off)	T <sub>LIM(off)</sub>	150	155	185	°C
Temperature Limit (Circuit Reset)	T <sub>LIM(on)</sub>	130	140	170	°C

### ESD ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Electro-Static Discharge Capability	Human Body Model (HBM)	ESD	4000	-	-	V
Electro-Static Discharge Capability	Machine Model (MM)	ESD	400	-	-	V

4. Pulse Test: Pulse Width = 300 μs, Duty Cycle = 2%.

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## TYPICAL ELECTRICAL CHARACTERISTICS

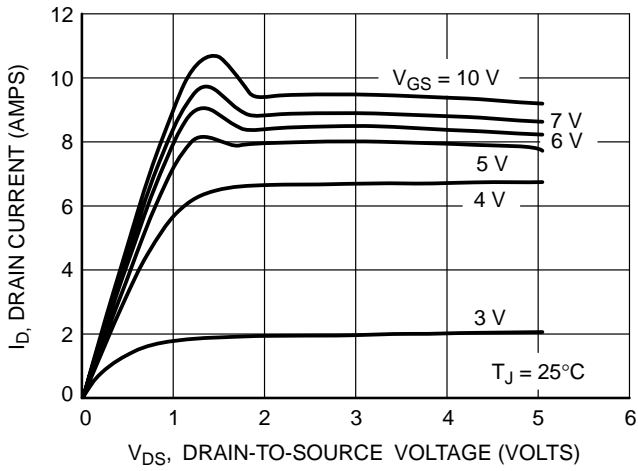


Figure 1. Output Characteristics

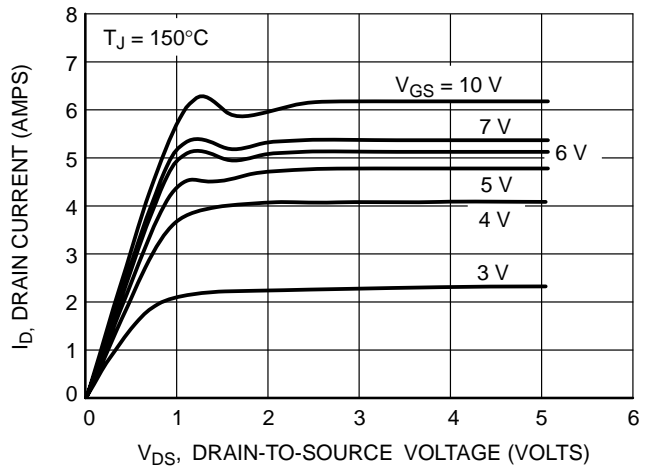


Figure 2. Output Characteristics

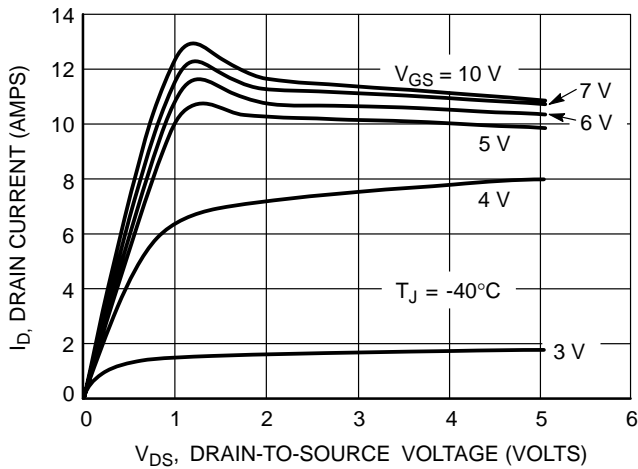


Figure 3. Output Characteristics

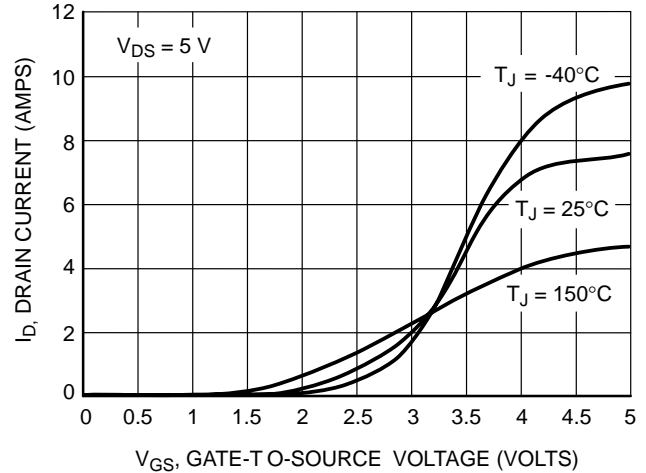


Figure 4. Transfer Characteristics

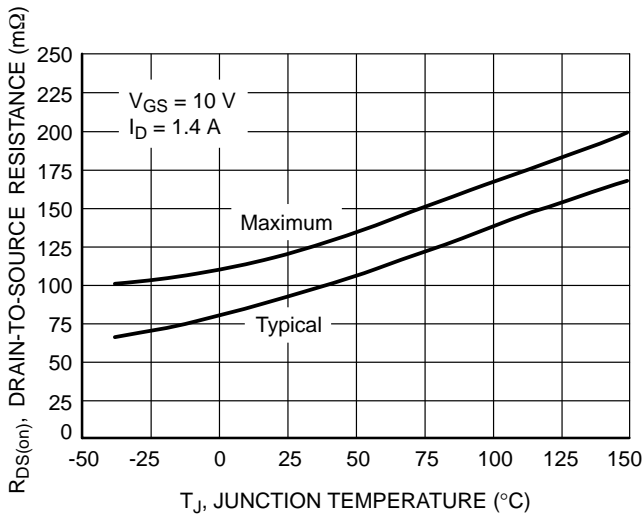


Figure 5. Drain-to-Source Resistance versus Junction Temperature

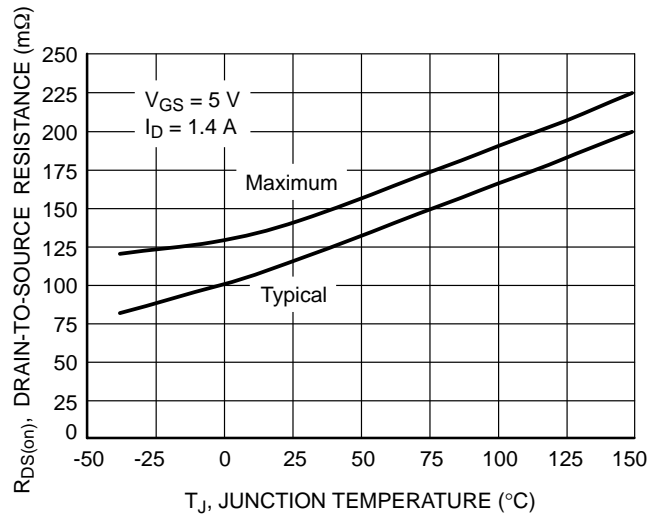
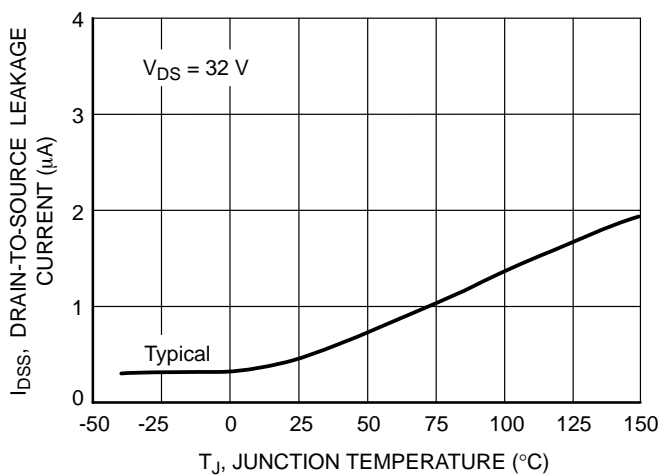
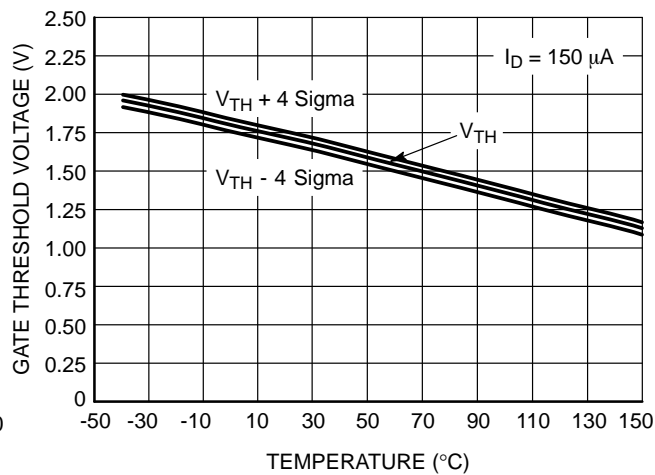


Figure 6. Drain-to-Source Resistance versus Junction Temperature

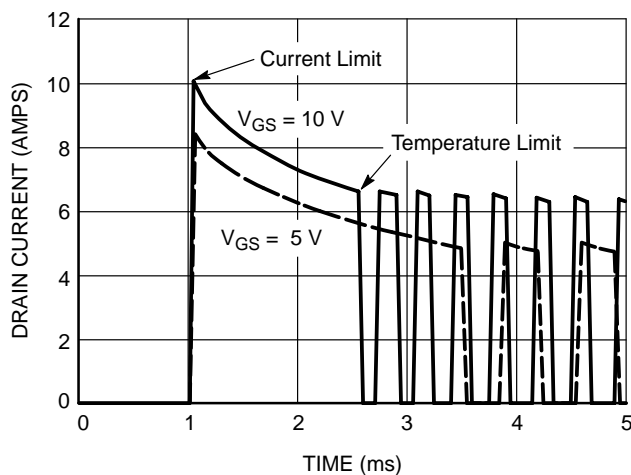
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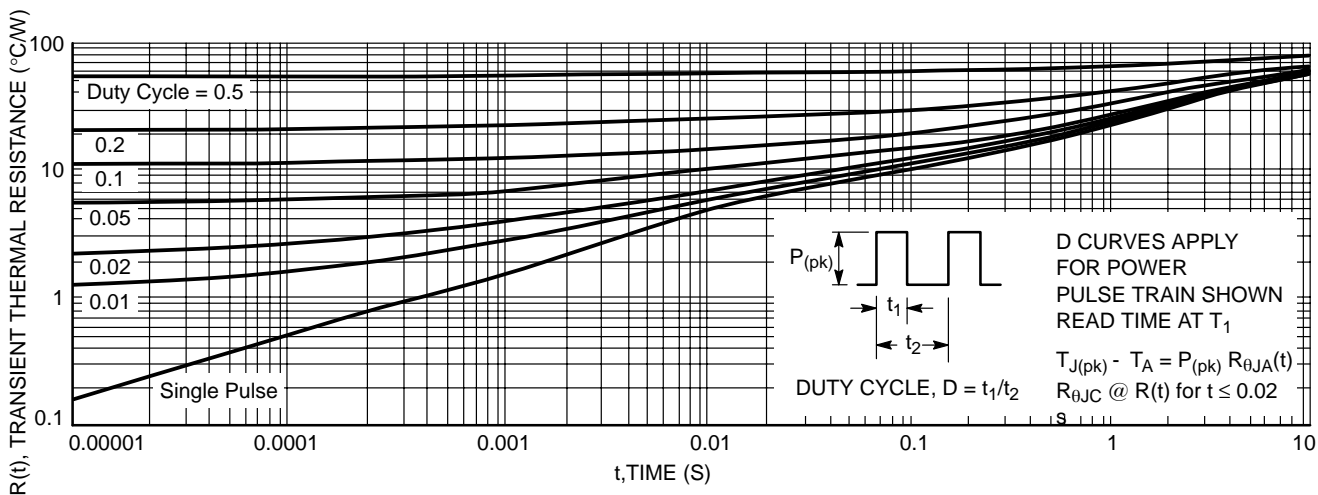
**Figure 7. Drain-to-Source Resistance versus Junction Temperature**



**Figure 8. Gate Threshold Voltage versus Temperature**



**Figure 9. Short-circuit Response**

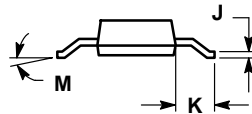
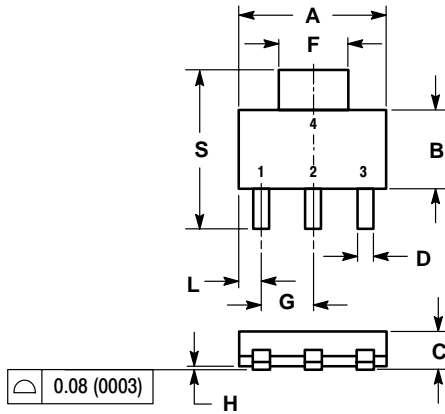


**Figure 10. Transient Thermal Resistance (Non-normalized Junction-to-Ambient mounted on minimum pad area)**

# NIF62514

## 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

# NIF62514

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