

# NTD14N03R

## Power MOSFET 14 Amps, 25 Volts N-Channel DPAK

### Features

- Planar HD3e Process for Fast Switching Performance
- Low  $R_{DS(on)}$  to Minimize Conduction Loss
- Low  $C_{iss}$  to Minimize Driver Loss
- Low Gate Charge
- Optimized for High Side Switching Requirements in High-Efficiency DC-DC Converters

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	25	vdc
Gate-to-Source Voltage – Continuous	$V_{GS}$	$\pm 20$	vdc
Thermal Resistance – Junction-to-Case	$R_{\theta JC}$	6.0	$^\circ\text{C}/\text{W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	20.8	W
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$ , Chip	$I_D$	14	A
– Continuous @ $T_A = 25^\circ\text{C}$ , Limited by Package	$I_D$	11.4	A
– Single Pulse ( $t_p \leq 10 \mu\text{s}$ )	$I_D$	28	A
Thermal Resistance – Junction-to-Ambient (Note 1)	$R_{\theta JA}$	80	$^\circ\text{C}/\text{W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	1.56	W
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$	$I_D$	3.1	A
Thermal Resistance – Junction-to-Ambient (Note 2)	$R_{\theta JA}$	120	$^\circ\text{C}/\text{W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	1.04	W
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$	$I_D$	2.5	A
Operating and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	$T_L$	260	$^\circ\text{C}$

1. When surface mounted to an FR4 board using 0.5 sq. in pad size.
2. When surface mounted to an FR4 board using minimum recommended pad size.

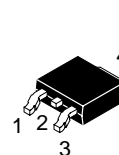
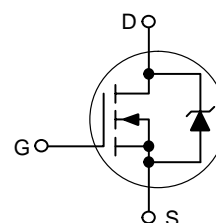


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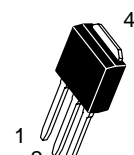
<http://onsemi.com>

**14 AMPERES, 25 VOLTS**  
 **$R_{DS(on)} = 70.4 \text{ m}\Omega$  (Typ)**

N-CHANNEL

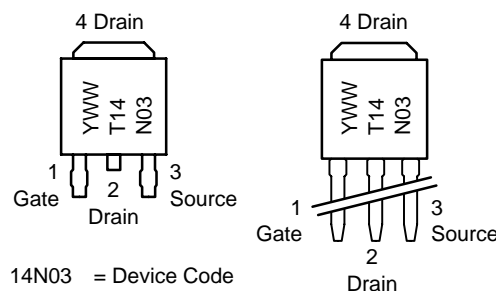


**CASE 369C**  
**DPAK**  
**(Surface Mount)**  
**STYLE 2**



**CASE 369D**  
**DPAK**  
**(Straight Lead)**  
**STYLE 2**

### MARKING DIAGRAM & PIN ASSIGNMENTS



14N03 = Device Code  
Y = Year  
WW = Work Week

### ORDERING INFORMATION

Device	Package	Shipping
NTD14N03R	DPAK	75 Units/Rail
NTD14N03R-1	DPAK Straight Lead	75 Units/Rail
NTD14N03RT4	DPAK	2500 Tape & Reel

# NTD14N03R

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

Characteristics	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (Note 3) ( $V_{GS} = 0\text{ Vdc}$ , $I_D = 250\ \mu\text{Adc}$ ) Temperature Coefficient (Positive)	$V_{(br)DSS}$	25 –	28 –	– –	Vdc mV/°C
Zero Gate Voltage Drain Current ( $V_{DS} = 20\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ ) ( $V_{DS} = 20\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $T_J = 150^\circ\text{C}$ )	$I_{DSS}$	– –	– –	1.0 10	$\mu\text{Adc}$
Gate-Body Leakage Current ( $V_{GS} = \pm 20\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	–	–	$\pm 100$	nAdc

### ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage (Note 3) ( $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{Adc}$ ) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	1.0 –	1.5 –	2.0 –	Vdc mV/°C
Static Drain-to-Source On-Resistance (Note 3) ( $V_{GS} = 4.5\text{ Vdc}$ , $I_D = 5\text{ Adc}$ ) ( $V_{GS} = 10\text{ Vdc}$ , $I_D = 5\text{ Adc}$ )	$R_{DS(on)}$	– –	117 70.4	130 95	m $\Omega$
Forward Transconductance (Note 3) ( $V_{DS} = 10\text{ Vdc}$ , $I_D = 5\text{ Adc}$ )	$g_{FS}$	–	7.0	–	Mhos

### DYNAMIC CHARACTERISTICS

Input Capacitance	$(V_{DS} = 20\text{ Vdc}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$ )	$C_{iss}$	–	115	–	pF
Output Capacitance		$C_{oss}$	–	62	–	
Transfer Capacitance		$C_{rss}$	–	33	–	

### SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$(V_{GS} = 10\text{ Vdc}$ , $V_{DD} = 10\text{ Vdc}$ , $I_D = 5\text{ Adc}$ , $R_G = 3\ \Omega$ )	$t_{d(on)}$	–	3.8	–	ns
Rise Time		$t_r$	–	27	–	
Turn-Off Delay Time		$t_{d(off)}$	–	9.6	–	
Fall Time		$t_f$	–	2.0	–	
Gate Charge	$(V_{GS} = 5\text{ Vdc}$ , $I_D = 5\text{ Adc}$ , $V_{DS} = 10\text{ Vdc}$ ) (Note 3)	$Q_T$	–	1.8	–	nC
		$Q_1$	–	0.8	–	
		$Q_2$	–	0.7	–	

### SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage	$(I_S = 5\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ ) (Note 3) $(I_S = 5\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ , $T_J = 125^\circ\text{C}$ )	$V_{SD}$	– –	0.93 0.82	1.2 –	Vdc
Reverse Recovery Time	$(I_S = 5\text{ Adc}$ , $V_{GS} = 0\text{ Vdc}$ , $di_S/dt = 100\text{ A}/\mu\text{s}$ ) (Note 3)	$t_{rr}$	–	6.6	–	ns
		$t_a$	–	4.75	–	
		$t_b$	–	1.88	–	
Reverse Recovery Stored Charge		$Q_{RR}$	–	0.002	–	$\mu\text{C}$

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

4. Switching characteristics are independent of operating junction temperatures.

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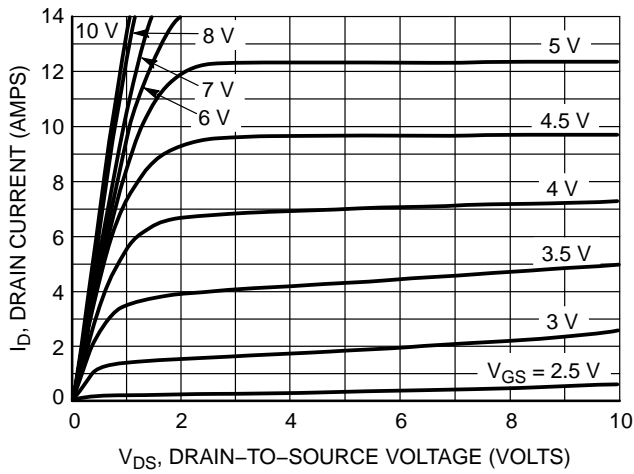


Figure 1. On-Region Characteristics

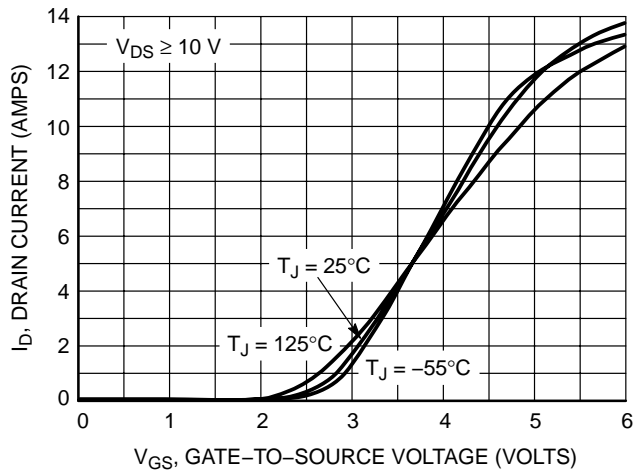


Figure 2. Transfer Characteristics

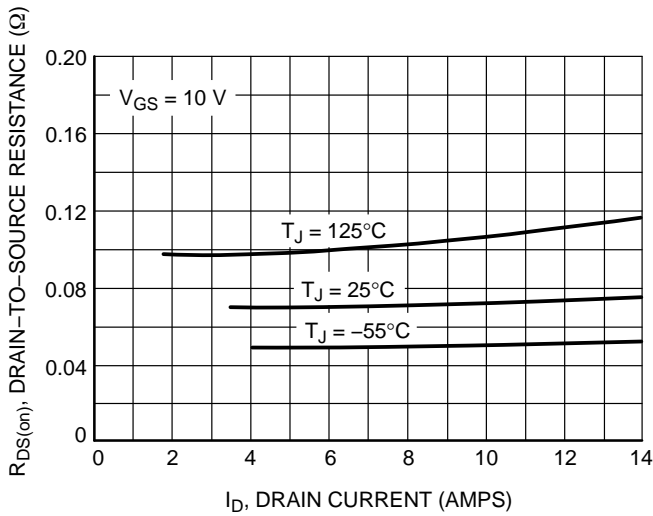


Figure 3. On-Resistance versus Drain Current and Temperature

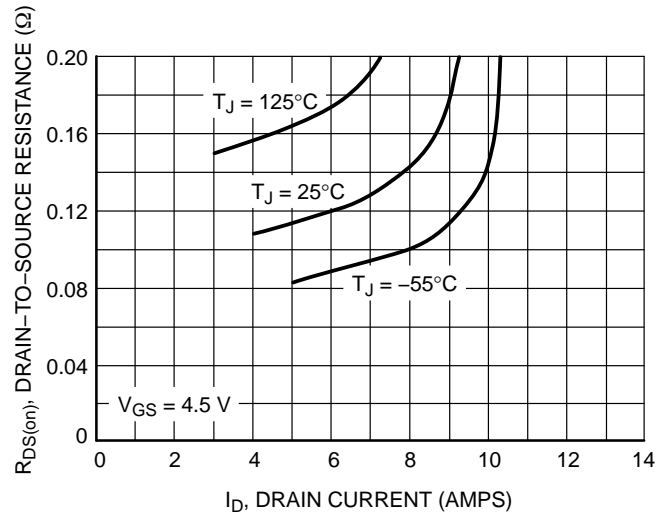


Figure 4. On-Resistance versus Drain Current and Temperature

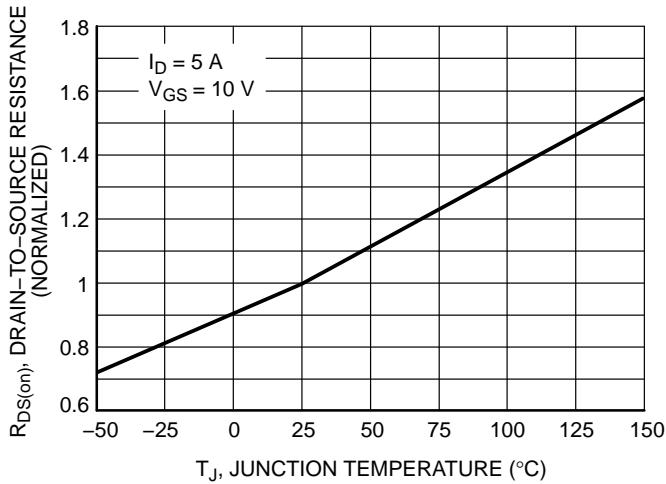


Figure 5. On-Resistance Variation with Temperature

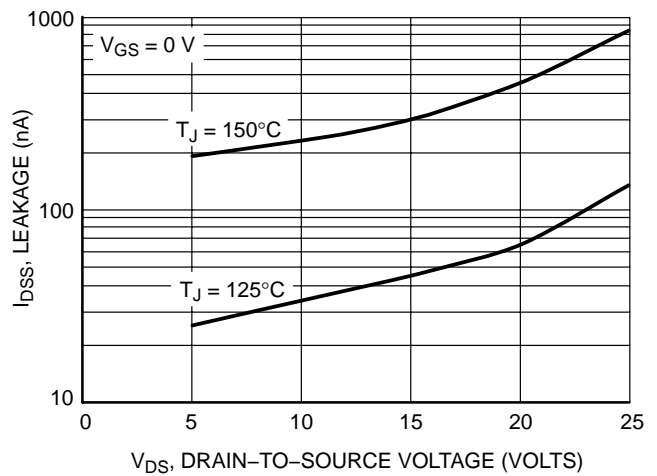
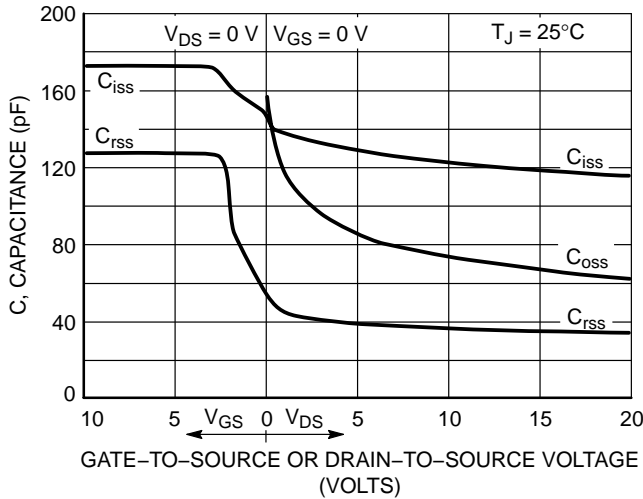
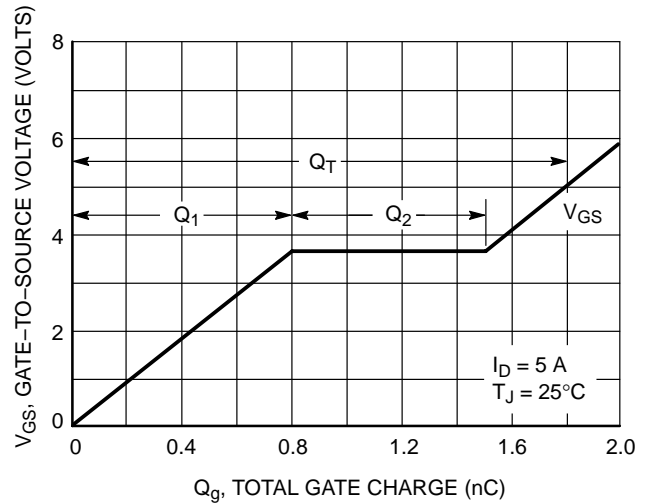


Figure 6. Drain-to-Source Leakage Current versus Voltage

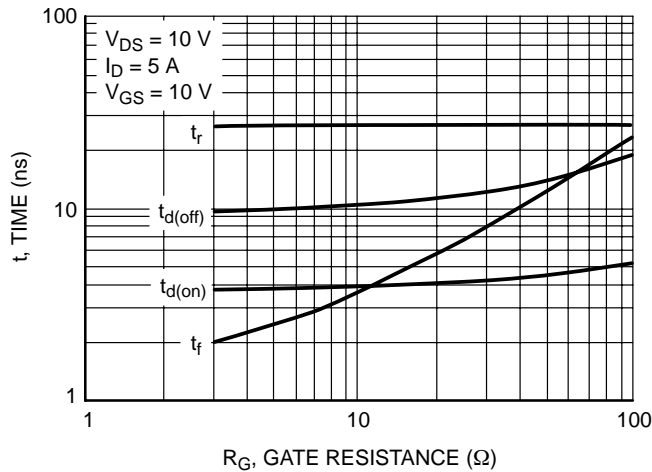
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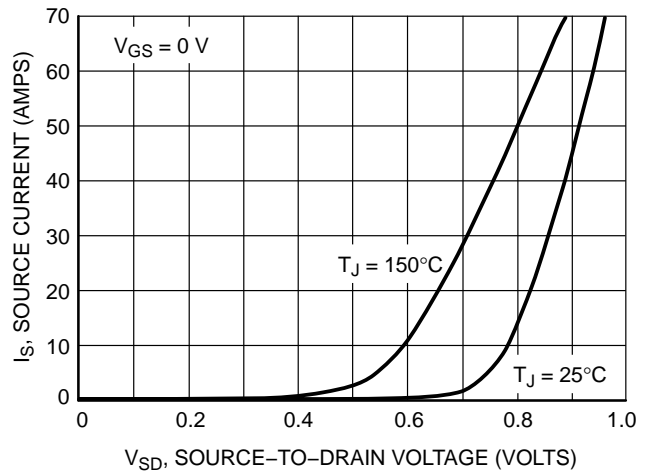
**Figure 7. Capacitance Variation**



**Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge**



**Figure 9. Resistive Switching Time Variation versus Gate Resistance**

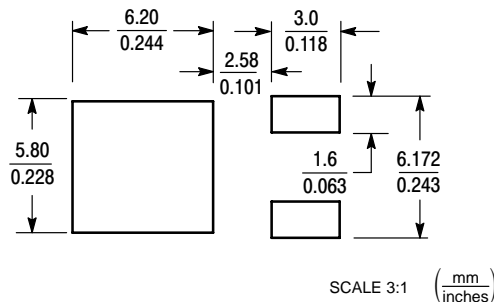


**Figure 10. Diode Forward Voltage versus Current**

## RECOMMENDED FOOTPRINTS FOR SURFACE MOUNTED APPLICATIONS

Surface mount board layout is a critical portion of the total design. The footprint for the semiconductor packages must be the correct size to ensure proper solder connection

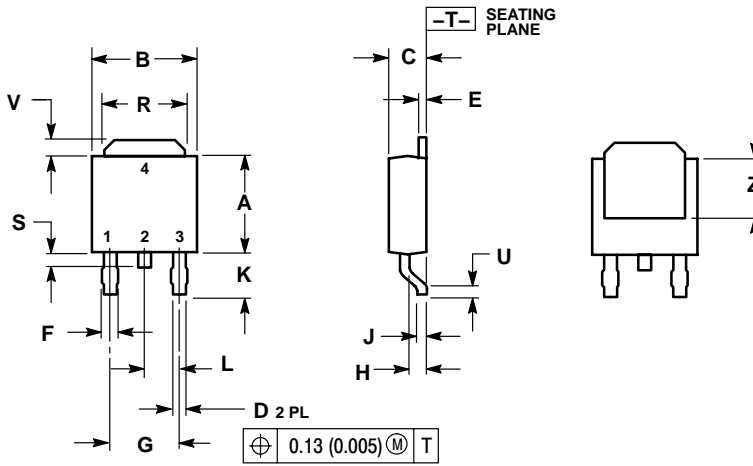
interface between the board and the package. With the correct pad geometry, the packages will self align when subjected to a solder reflow process.



# NTD14N03R

## PACKAGE DIMENSIONS

### DPAK (SINGLE GAUGE) CASE 369C ISSUE O

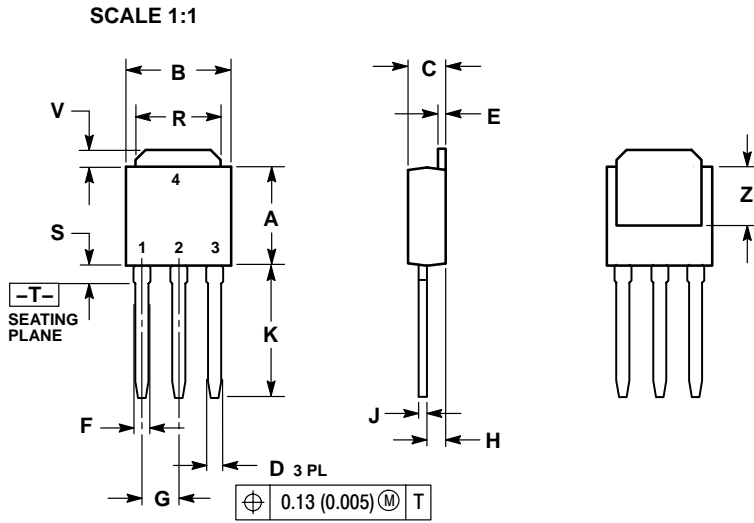


- NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.180 BSC		4.58 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
L	0.090 BSC		2.29 BSC	
R	0.180	0.215	4.57	5.45
S	0.025	0.040	0.63	1.01
U	0.020	---	0.51	---
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

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

### DPAK (SINGLE GAUGE) CASE 369D ISSUE O



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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.090 BSC		2.29 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.180	0.215	4.45	5.45
S	0.025	0.040	0.63	1.01
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

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

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