

NTP5864N

Power MOSFET

60 V, 63 A, 12.4 mΩ

Features

- Low $R_{DS(on)}$
- High Current Capability
- Avalanche Energy Specified
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

Parameter			Symbol	Value	Units
Drain-to-Source Voltage			V_{DSS}	60	V
Gate-to-Source Voltage – Continuous			V_{GS}	± 20	V
Gate-to-Source Voltage – Non-Repetitive ($t_p = 10 \mu s$)			V_{GS}	± 30	V
Continuous Drain Current – $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^{\circ}C$	I_D	63	A
		$T_C = 100^{\circ}C$		45	
Power Dissipation – $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^{\circ}C$	P_D	107	W
		$T_C = 100^{\circ}C$		54	
Pulsed Drain Current	$t_p = 10 \mu s$		I_{DM}	252	A
Operating Junction and Storage Temperature			T_J, T_{STG}	-55 to 175	$^{\circ}C$
Source Current (Body Diode) Pulsed			I_S	63	A
Single Pulse Drain-to-Source Avalanche Energy – ($L = 0.1 \text{ mH}$)			EAS	80	mJ
			IAS	40	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	$^{\circ}C$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Units
Junction-to-Case (Drain) – Steady State (Note 1)	$R_{\theta JC}$	1.4	$^\circ\text{C}/\text{W}$
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	33	$^\circ\text{C}/\text{W}$

1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).

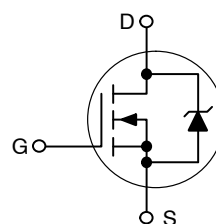


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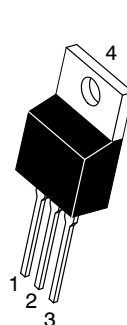
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$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$ (Note 1)
60 V	12.4 mΩ @ 10 V	63 A

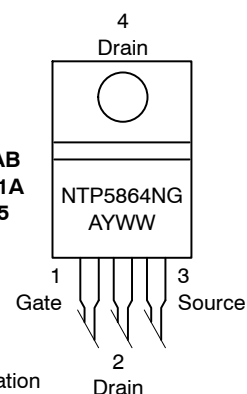
N-Channel



MARKING DIAGRAM & PIN ASSIGNMENT



TO-220AB
CASE 221A
STYLE 5



A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

Device	Package	Shipping
NTP5864NG	TO-220 (Pb-Free)	50 Units / Rail

NTP5864N

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise stated)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J			58		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 60 V			1.0	μA
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = ±20 V			±100	nA

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 250 μA	2.0		4.0	V
Gate Threshold Temperature Coefficient	V _{GS(TH)} /T _J			-10		mV/°C
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 20 A		10.2	12.4	mΩ
Forward Transconductance	g _{FS}	V _{DS} = 15 V, I _D = 20 A		10		S

CHARGES AND CAPACITANCES

Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = 25 V		1680		pF
Output Capacitance	C _{OSS}			189		
Reverse Transfer Capacitance	C _{RSS}			124		
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 48 V, I _D = 20 A		31		nC
Threshold Gate Charge	Q _{G(TH)}			2.0		
Gate-to-Source Charge	Q _{GS}			7.3		
Gate-to-Drain Charge	Q _{GD}			10		
Gate Resistance	R _g			0.5		Ω

SWITCHING CHARACTERISTICS, V_{GS} = 10 V (Note 3)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = 10 V, V _{DD} = 48 V, I _D = 20 A, R _G = 2.5 Ω		10		ns
Rise Time	t _r			6.4		
Turn-Off Delay Time	t _{d(OFF)}			18		
Fall Time	t _f			4.6		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 40 A	T _J = 25°C		0.94	1.2	V
			T _J = 125°C		0.84		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _{SD} /dt = 100 A/μs, I _S = 20 A			24		ns
Charge Time	t _a				16		
Discharge Time	t _b				7.9		
Reverse Recovery Charge	Q _{RR}				20		nC

- Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
- Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

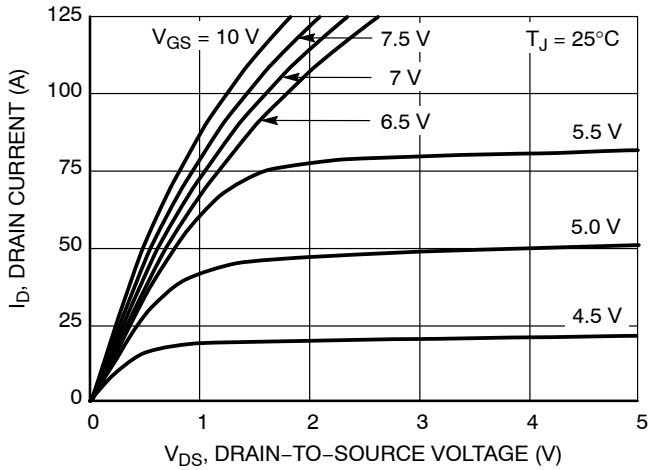


Figure 1. On-Region Characteristics

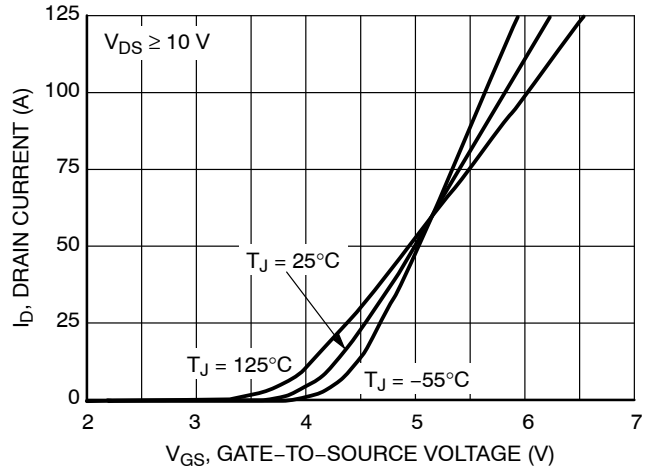


Figure 2. Transfer Characteristics

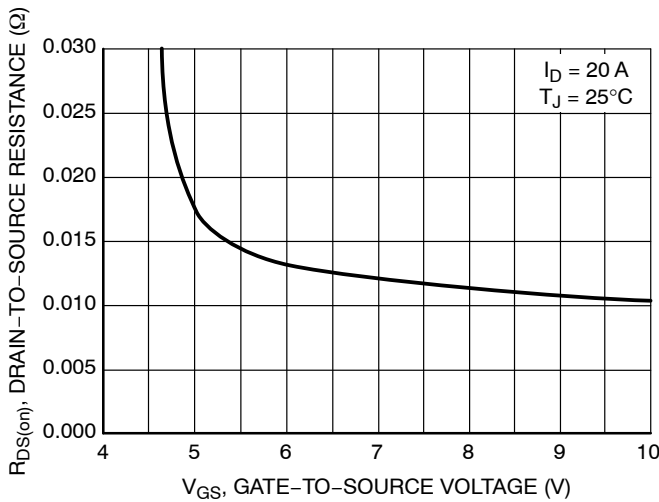


Figure 3. On-Resistance vs. Gate Voltage

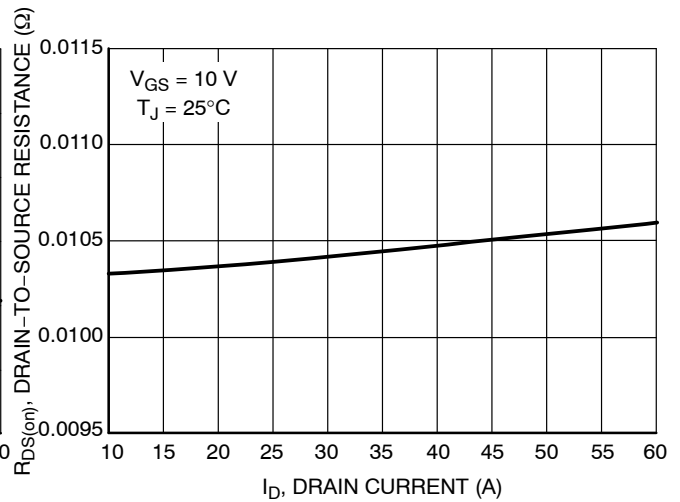


Figure 4. On-Resistance vs. Drain Current

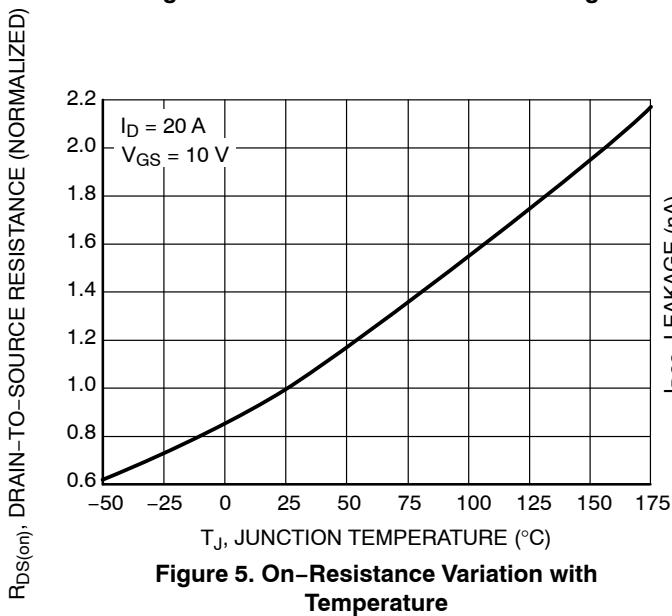


Figure 5. On-Resistance Variation with Temperature

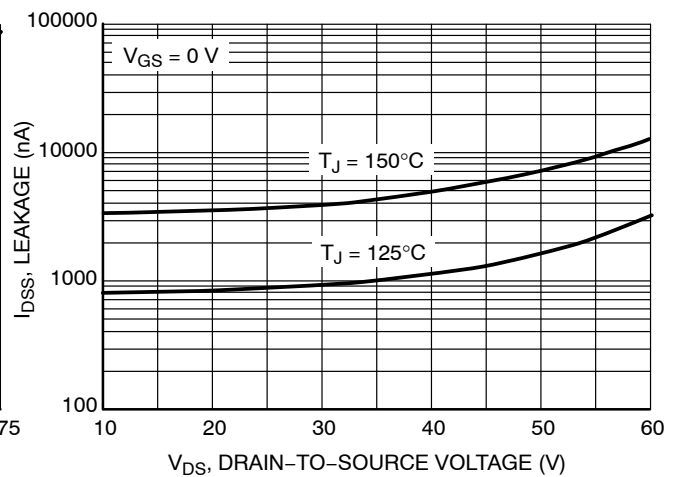


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

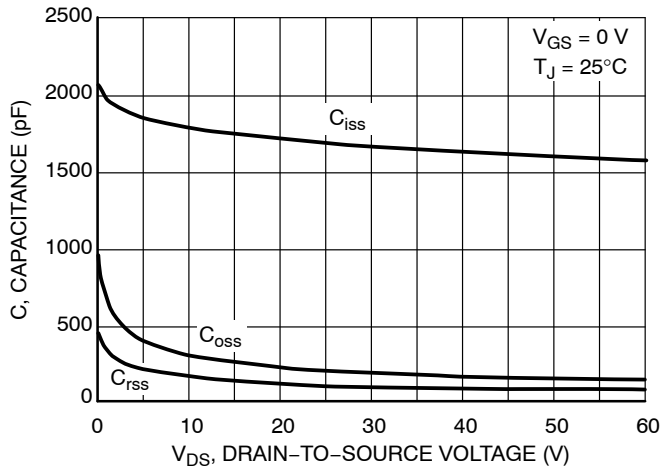


Figure 7. Capacitance Variation

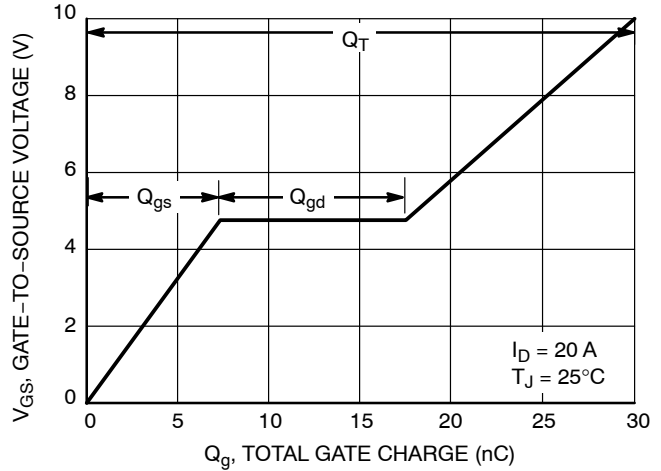


Figure 8. Gate-to-Source vs. Total Charge

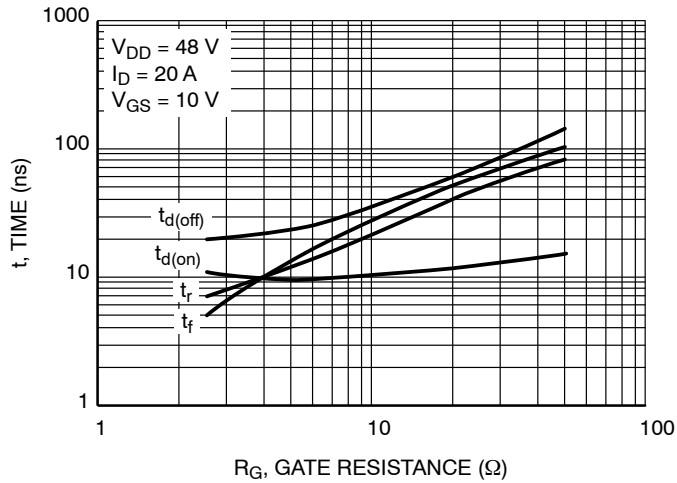


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

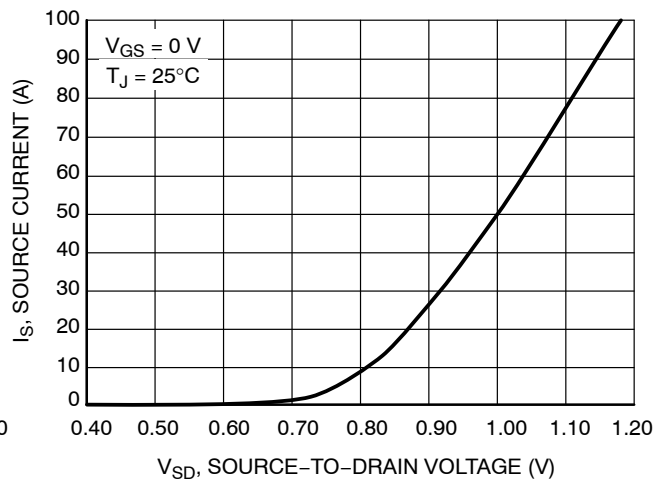


Figure 10. Diode Forward Voltage vs. Current

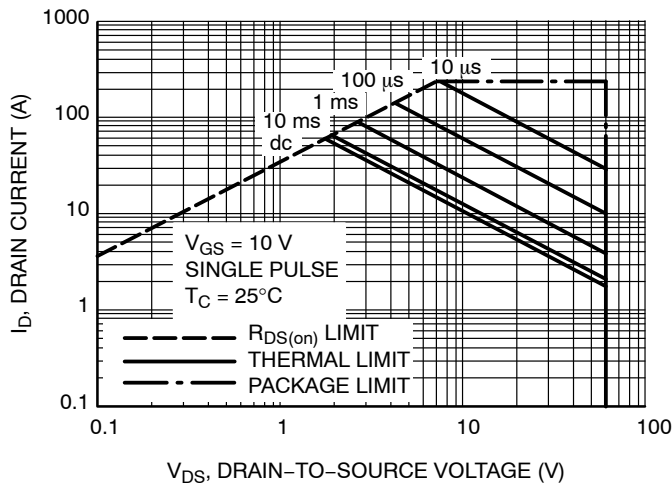


Figure 11. Maximum Rated Forward Biased Safe Operating Area

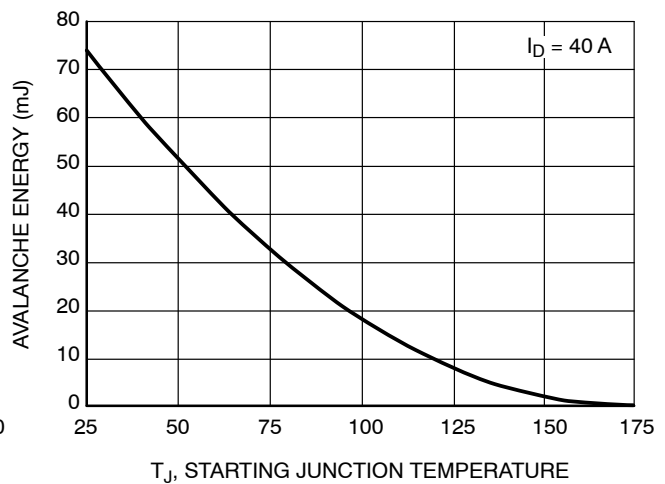


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

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TYPICAL CHARACTERISTICS

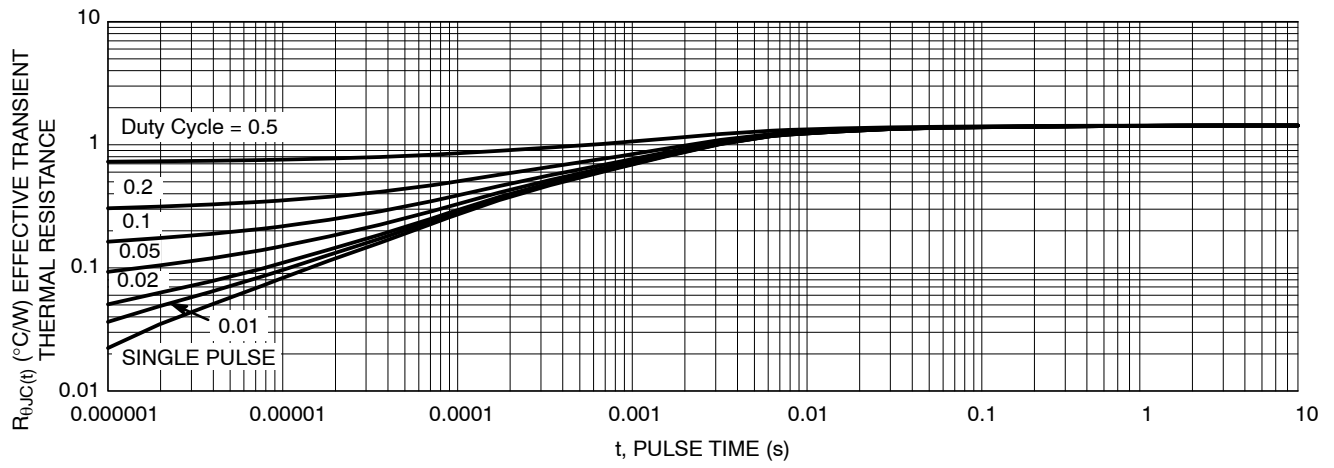
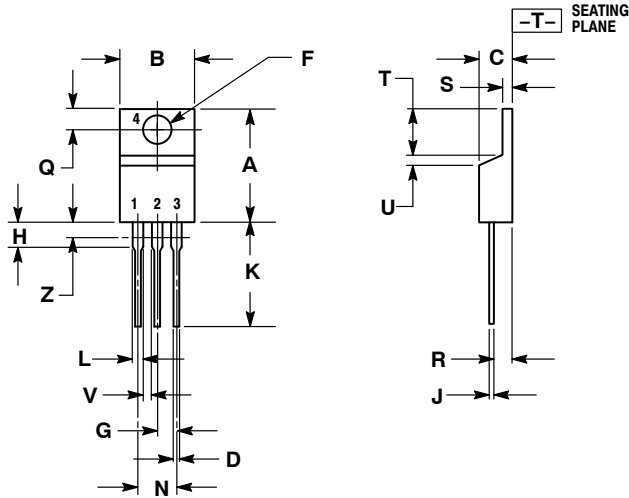


Figure 13. Thermal Response

NTP5864N

PACKAGE DIMENSIONS

TO-220
CASE 221A-09
ISSUE AF



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.014	0.025	0.36	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 5:

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

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