

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 ($t_p = 10 \mu\text{s}$)		V_{GS}	± 30	V
Continuous Drain Current – $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	63	A
		$T_C = 100^\circ\text{C}$	45	
Power Dissipation – $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	107	W
		$T_C = 100^\circ\text{C}$	54	
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	I_{DM}	252	A
Operating Junction and Storage Temperature		T_J, T_{STG}	-55 to 175	$^\circ\text{C}$
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	$^\circ\text{C}$

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	$^\circ\text{C}/\text{W}$

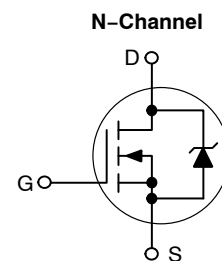
1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).



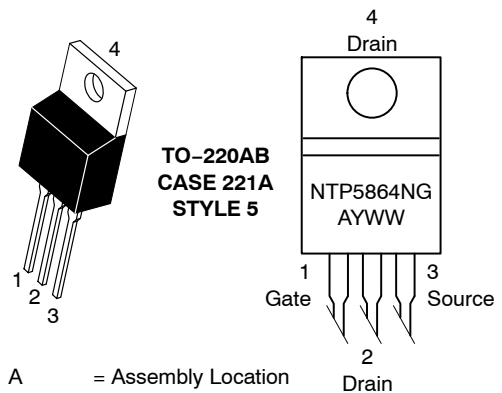
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$V_{(BR)DSS}$	$R_{DS(ON) MAX}$	$I_D MAX$ (Note 1)
60 V	12.4 mΩ @ 10 V	63 A



MARKING DIAGRAM & PIN ASSIGNMENT



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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			58		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 60\text{ V}$			1.0	μA
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	2.0		4.0	V
Gate Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			-10		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		10.2	12.4	m Ω
Forward Transconductance	g_{FS}	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$		10		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 25\text{ V}$		1680		pF
Output Capacitance	C_{OSS}			189		
Reverse Transfer Capacitance	C_{RSS}			124		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 48\text{ V}, I_D = 20\text{ A}$		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, $V_{GS} = 10\text{ V}$ (Note 3)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DD} = 48\text{ V}, I_D = 20\text{ A}, R_g = 2.5\ \Omega$		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}	$V_{GS} = 0\text{ V}, I_S = 40\text{ A}$	$T_J = 25^\circ\text{C}$	0.94	1.2	V
			$T_J = 125^\circ\text{C}$	0.84		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_{SD}/dt = 100\text{ A}/\mu\text{s}, I_S = 20\text{ A}$		24		ns
Charge Time	t_a			16		
Discharge Time	t_b			7.9		
Reverse Recovery Charge	Q_{RR}			20		

- Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
- Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

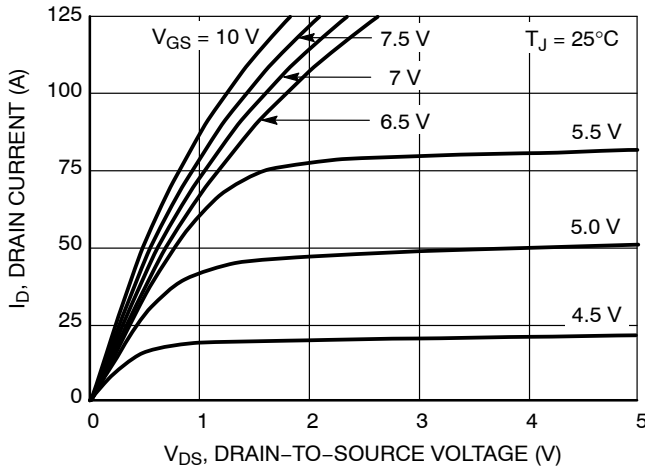


Figure 1. On-Region Characteristics

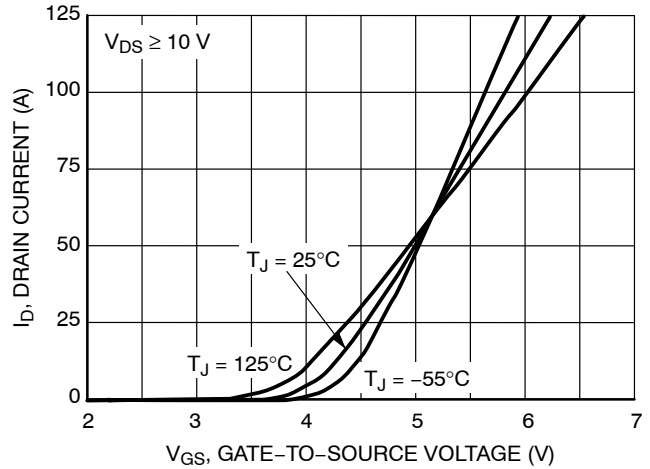


Figure 2. Transfer Characteristics

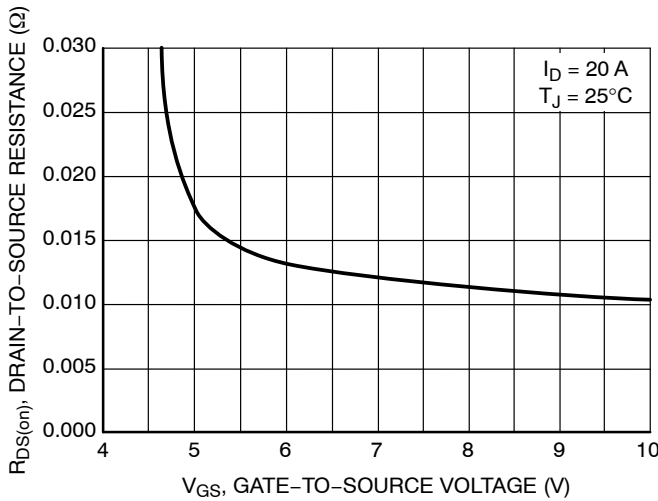


Figure 3. On-Resistance vs. Gate Voltage

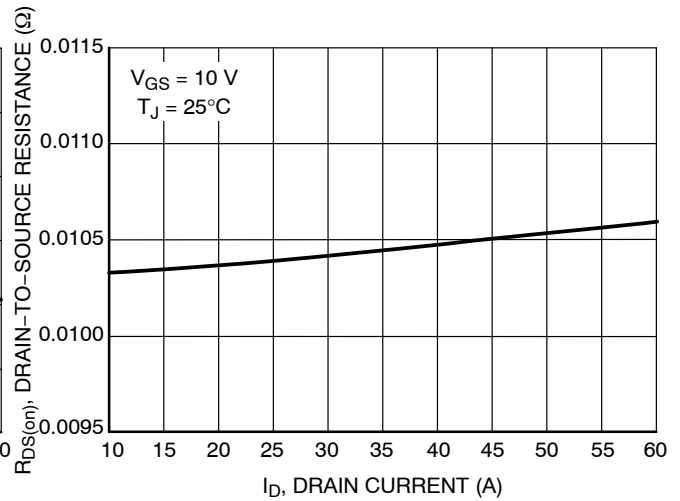


Figure 4. On-Resistance vs. Drain Current

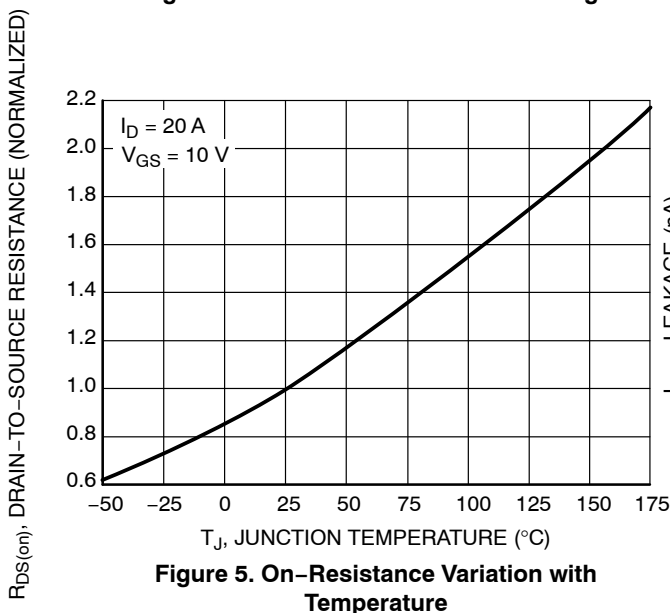


Figure 5. On-Resistance Variation with Temperature

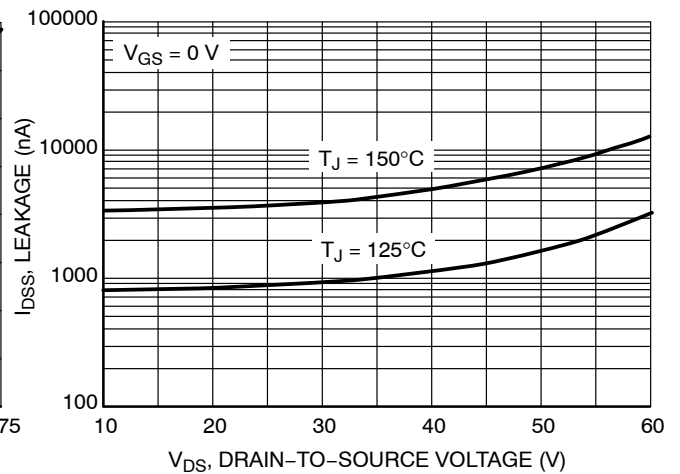


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

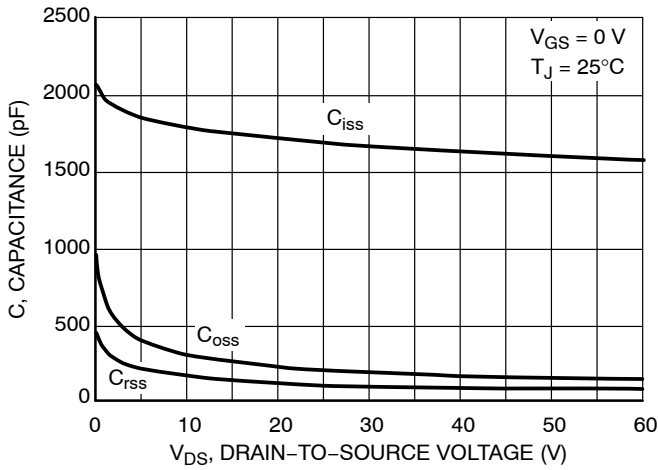


Figure 7. Capacitance Variation

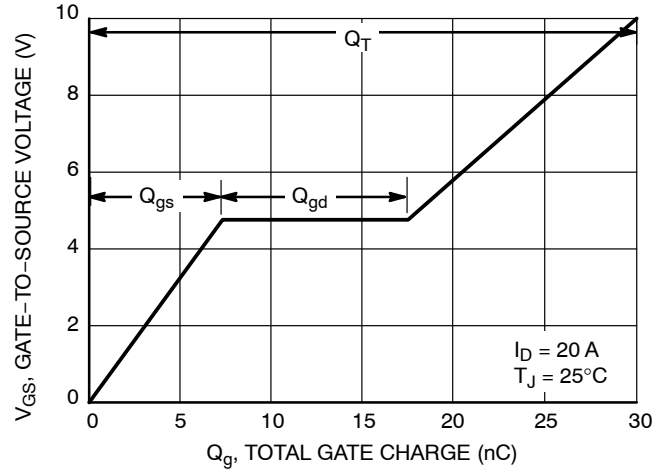


Figure 8. Gate-to-Source vs. Total Charge

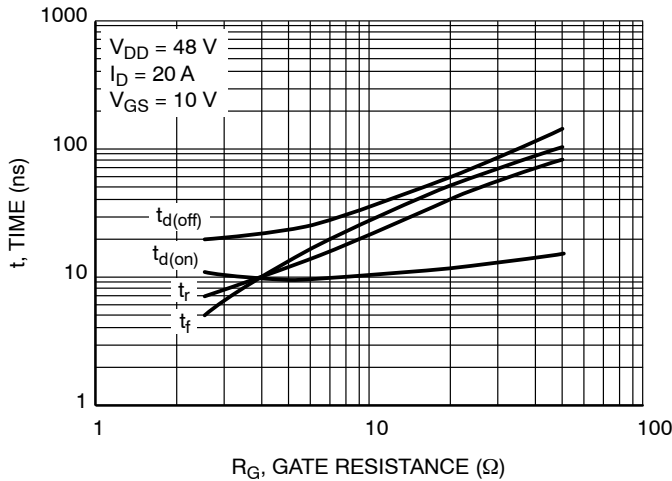


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

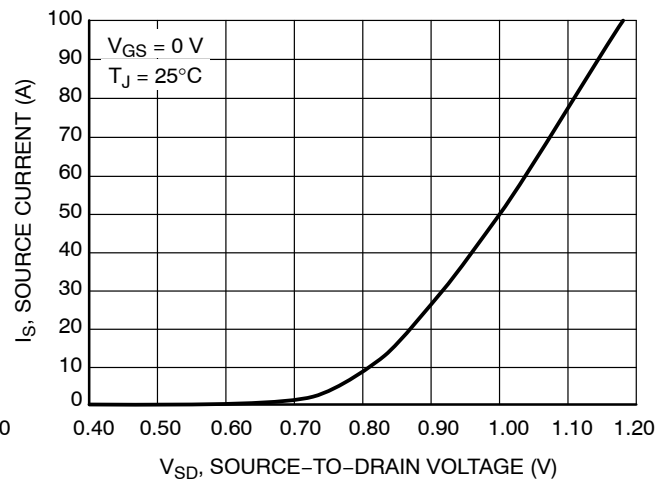


Figure 10. Diode Forward Voltage vs. Current

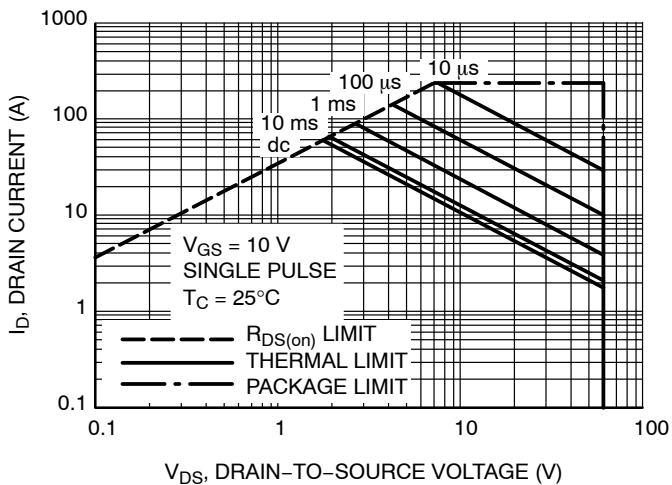


Figure 11. Maximum Rated Forward Biased Safe Operating Area

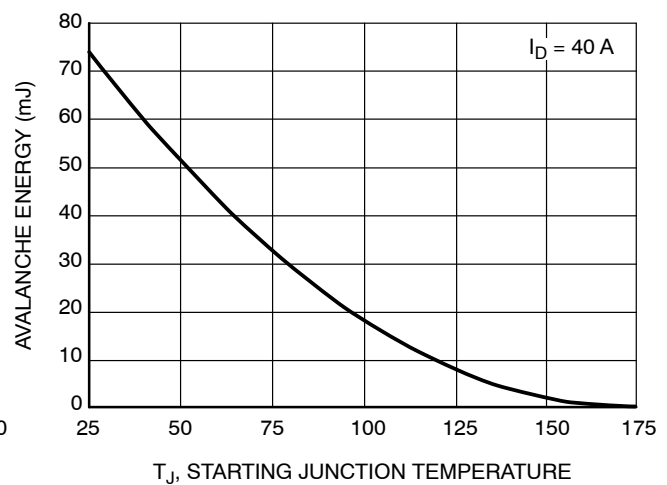


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

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TYPICAL CHARACTERISTICS

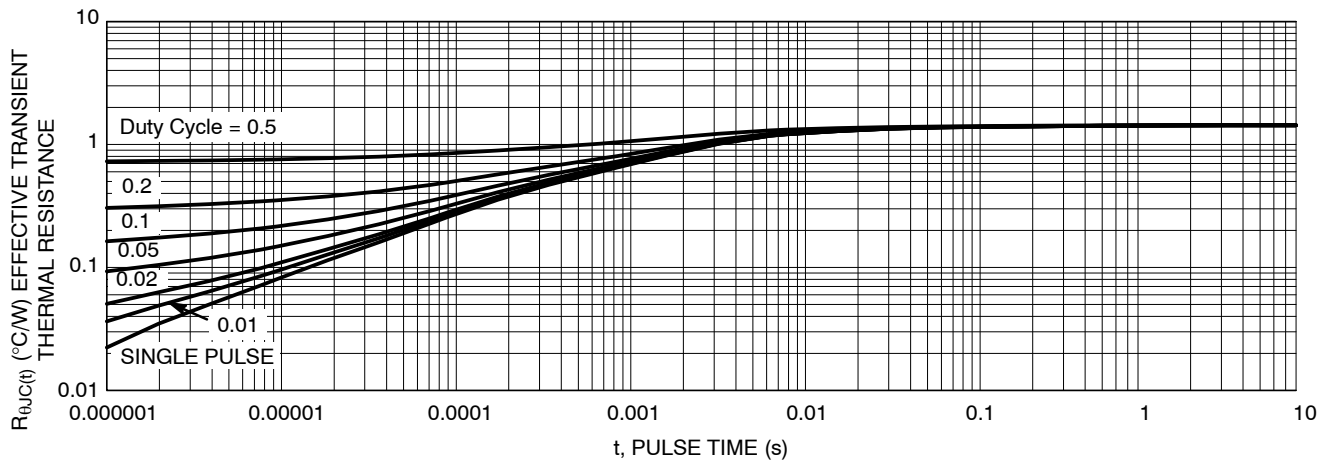
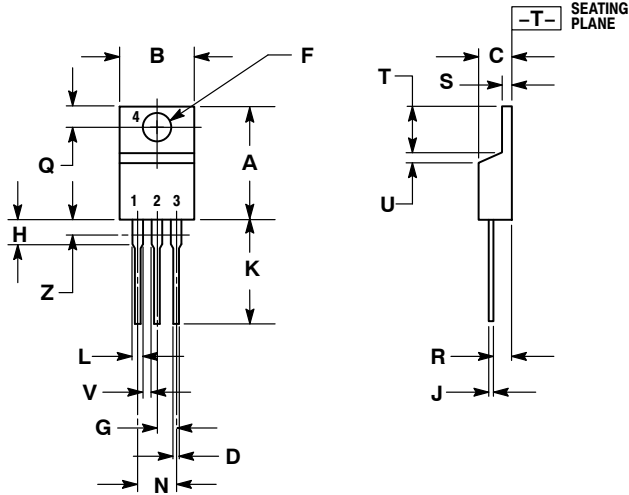


Figure 13. Thermal Response

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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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