

NTP5863N

N-Channel Power MOSFET

60 V, 97 A, 7.8 mΩ

Features

- Low $R_{DS(on)}$
- High Current Capability
- 100% Avalanche Tested
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant

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

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		V_{DSS}	60	V	
Gate-to-Source Voltage – Continuous		V_{GS}	± 20	V	
Gate-to-Source Voltage – Nonrepetitive ($T_P < 10 \mu\text{s}$)		V_{GS}	30	V	
Continuous Drain Current	Steady State	I_D	$T_C = 25^\circ\text{C}$	97	A
			$T_C = 100^\circ\text{C}$	68	
Power Dissipation	Steady State	P_D	$T_C = 25^\circ\text{C}$	150	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	I_{DM}	383	A	
Operating and Storage Temperature Range		T_J, T_{stg}	-55 to +175	$^\circ\text{C}$	
Source Current (Body Diode)		I_S	97	A	
Single Pulse Drain-to-Source Avalanche Energy ($L = 0.1 \text{ mH}, I_{L(pk)} = 56 \text{ A}$)		E_{AS}	157	mJ	
Peak Diode Recovery (dV/dt)		dV/dt	4.1	V/ns	
Lead Temperature for Soldering Purposes (1/8" from Case for 10 Seconds)		T_L	260	$^\circ\text{C}$	

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Case (Drain) Steady State	$R_{\theta JC}$	1.0	$^\circ\text{C/W}$
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	36	

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.

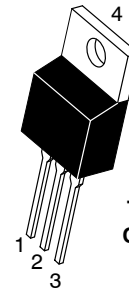
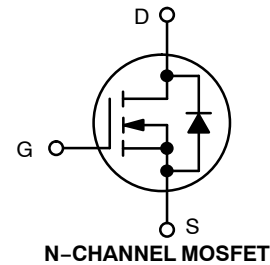
1. Surface mounted on FR4 board using 1 sq in pad size, (Cu Area 1.127 sq in [2 oz] including traces).



ON Semiconductor®

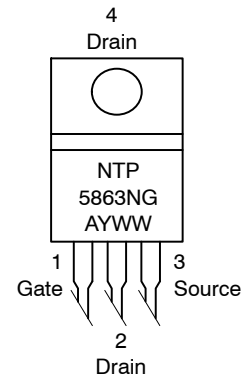
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
60 V	7.8 mΩ @ 10 V	97 A



TO-220AB
CASE 221A
STYLE 5

MARKING DIAGRAMS & PIN ASSIGNMENTS



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

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

NTP5863N

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

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{DS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = 250\ \mu\text{A}, \text{ref to } 25^\circ\text{C}$		47		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}$ $V_{DS} = 60\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 125^\circ\text{C}$		50	
Gate-Body 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
Negative Threshold Temperature Coefficient	$V_{GS(th)}/T_J$			9.1		mV/°C
Drain-to-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		6.5	7.8	m Ω
Forward Transconductance	g_{FS}	$V_{DS} = 15\text{ V}, I_D = 30\text{ A}$		12		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{iss}	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$		3200		pF
Output Capacitance	C_{oss}			350		
Transfer Capacitance	C_{rss}			230		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 48\text{ V},$ $I_D = 48\text{ A}$		55		nC
Threshold Gate Charge	$Q_{G(TH)}$			3.4		
Gate-to-Source Charge	Q_{GS}			14.5		
Gate-to-Drain Charge	Q_{GD}			19		
Gate Resistance	R_G			0.4		Ω

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

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10\text{ V}, V_{DD} = 48\text{ V},$ $I_D = 48\text{ A}, R_G = 2.5\ \Omega$		10		ns
Rise Time	t_r			34		
Turn-Off Delay Time	$t_{d(off)}$			25		
Fall Time	t_f			9.0		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}$ $I_S = 48\text{ A}$	$T_J = 25^\circ\text{C}$		0.96	1.5	V_{dc}
			$T_J = 150^\circ\text{C}$		0.85		
Reverse Recovery Time	t_{rr}	$V_{GS} = 0\text{ V}_{dc}, I_S = 48\text{ A}_{dc},$ $di_S/dt = 100\text{ A}/\mu\text{s}$			32		ns
Charge Time	t_a				20		
Discharge Time	t_b				12		
Reverse Recovery Stored Charge	Q_{RR}				28		

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

3. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CHARACTERISTICS

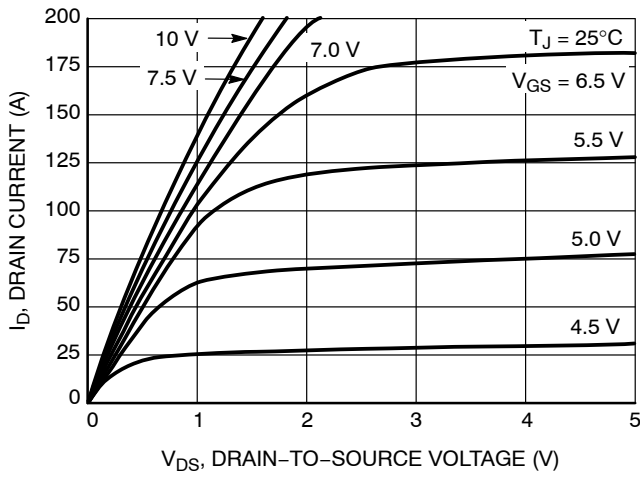


Figure 1. On-Region Characteristics

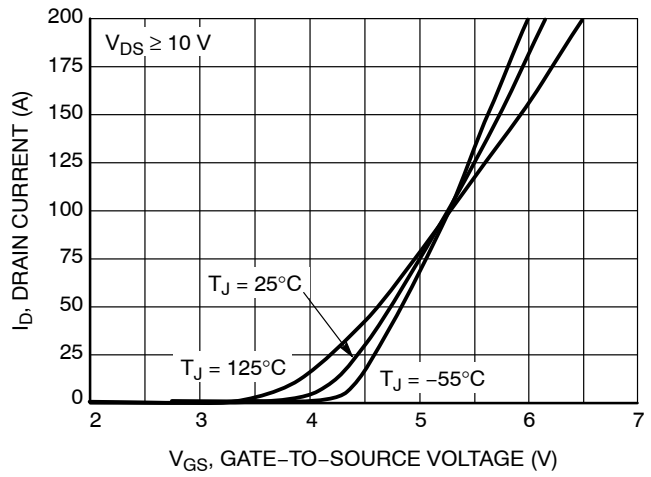


Figure 2. Transfer Characteristics

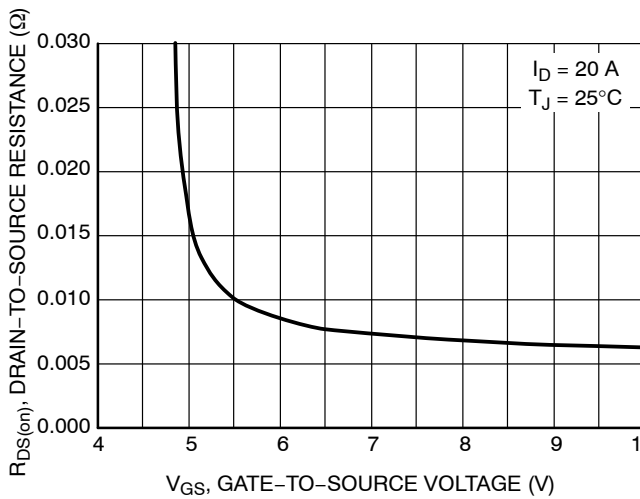


Figure 3. On-Resistance vs. Gate Voltage

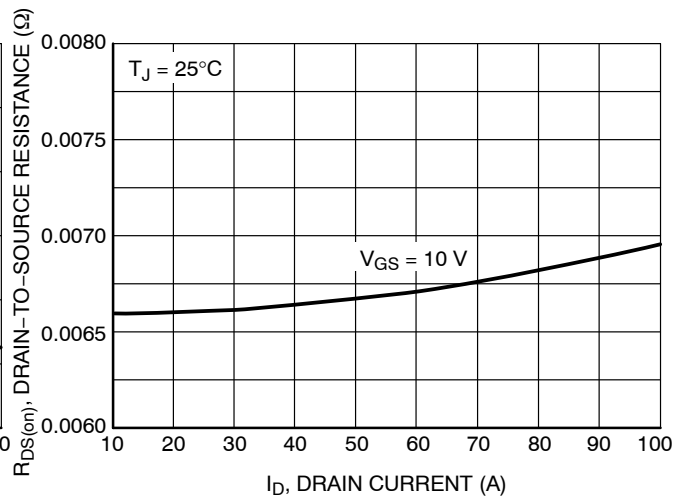


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

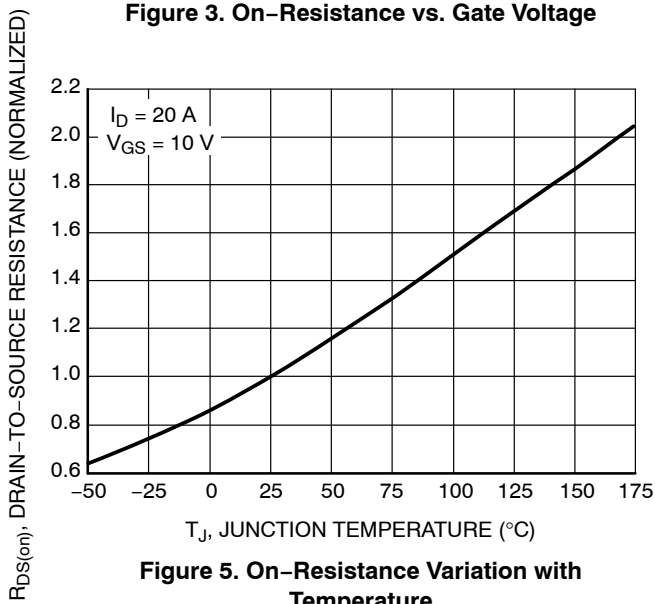


Figure 5. On-Resistance Variation with Temperature

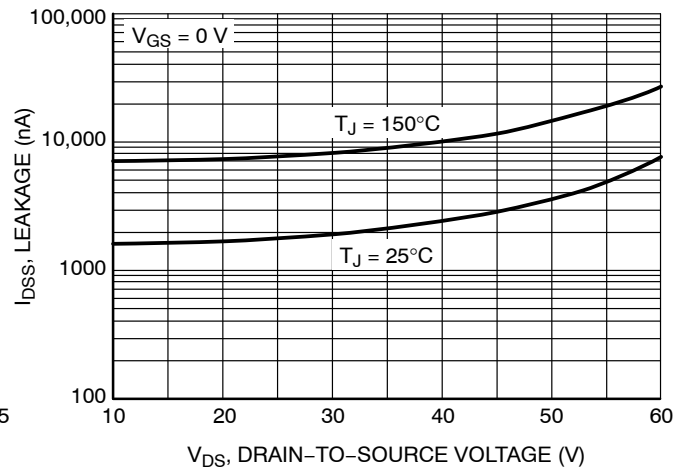


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CHARACTERISTICS

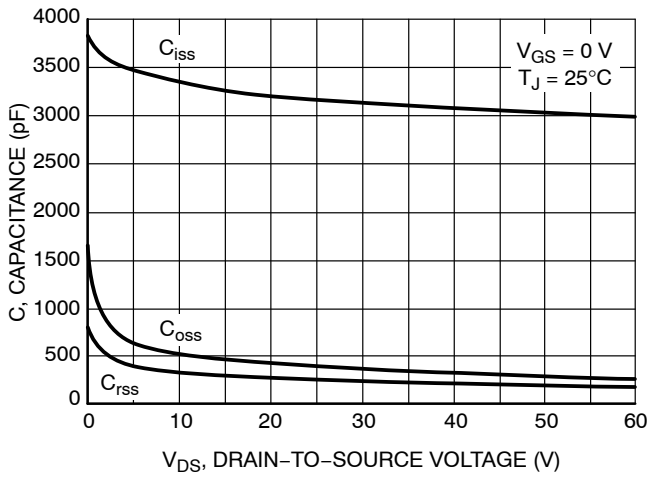


Figure 7. Capacitance Variation

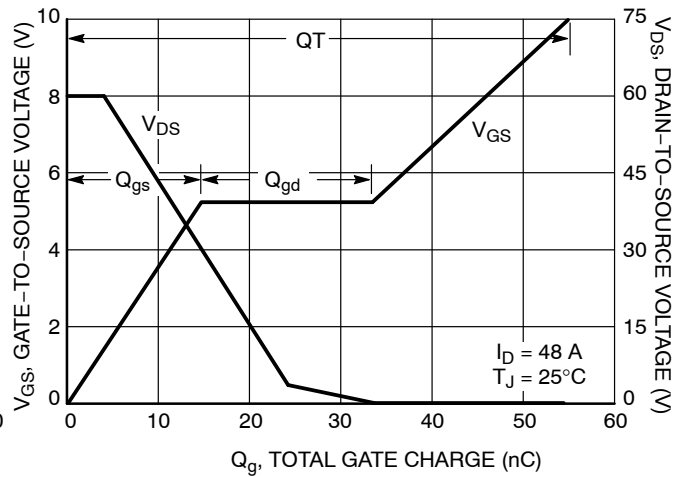


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

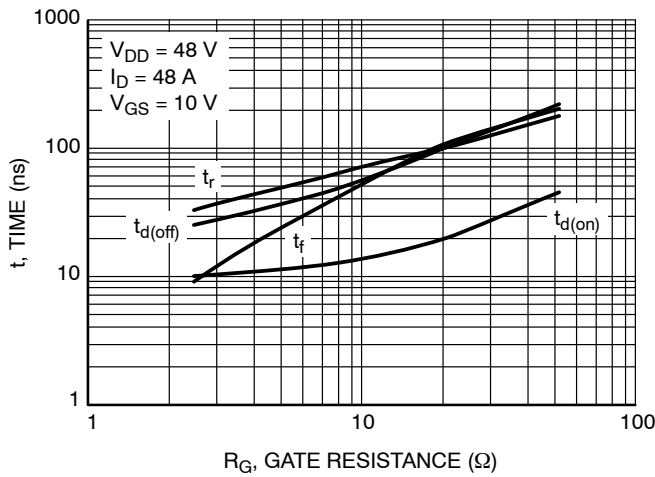


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

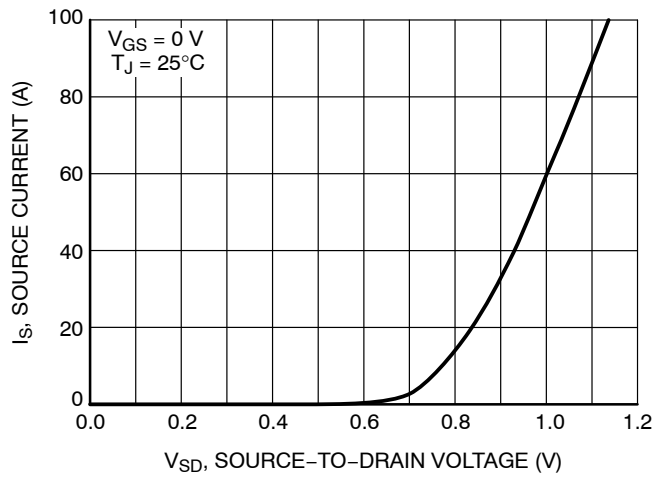


Figure 10. Diode Forward Voltage vs. Current

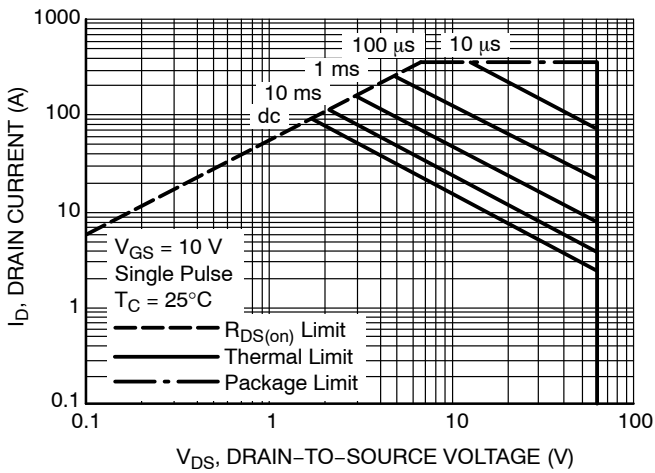


Figure 11. Maximum Rated Forward Biased Safe Operating Area

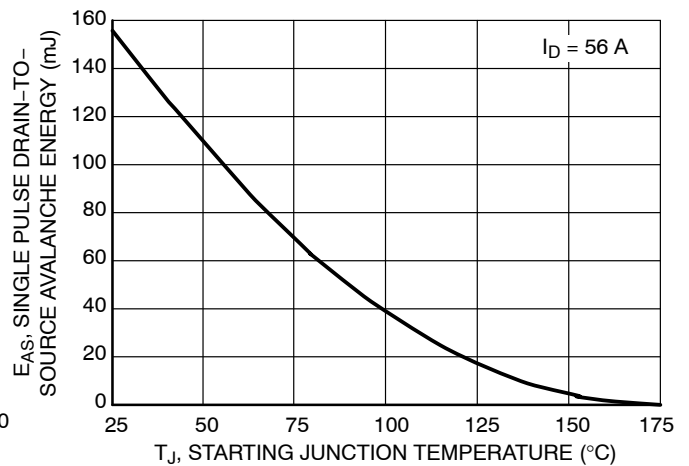


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

NTP5863N

TYPICAL PERFORMANCE CHARACTERISTICS

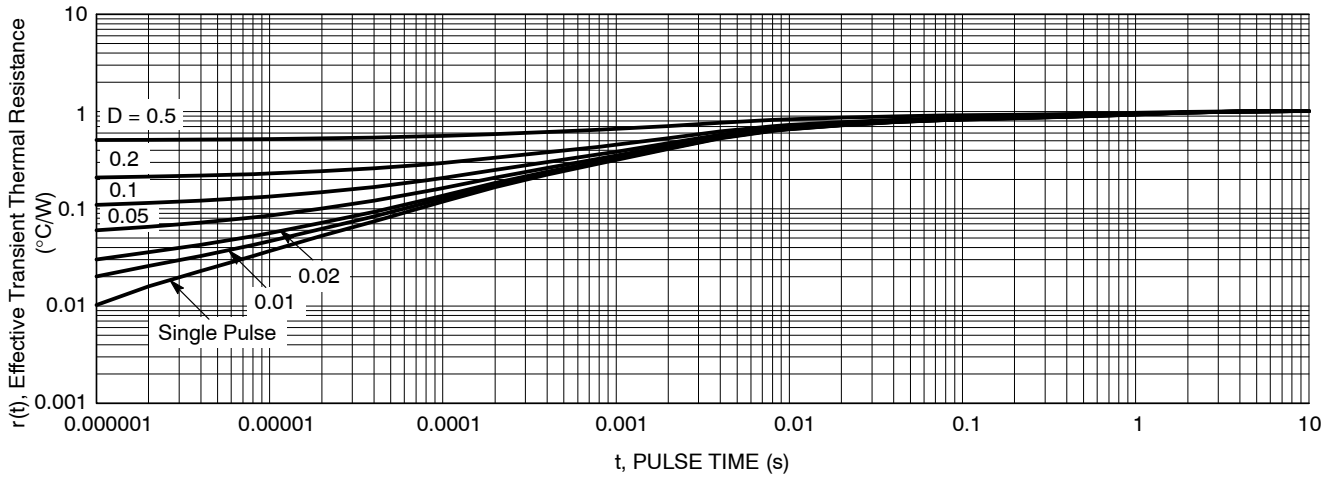


Figure 13. Thermal Response

ORDERING INFORMATION

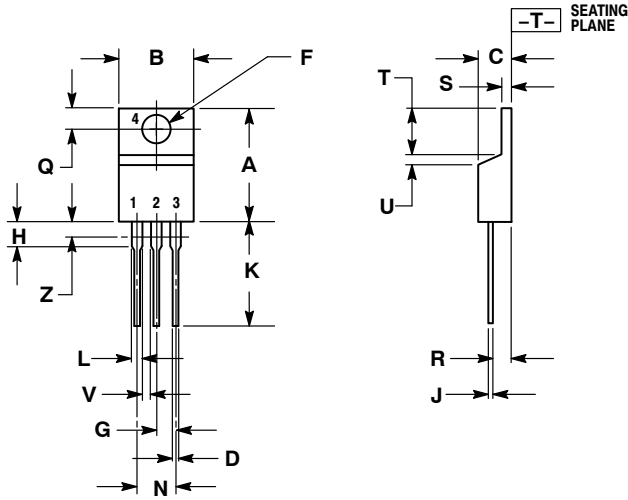
Device	Package	Shipping†
NTP5863NG	TO-220AB (Pb-Free)	50 Units / Rail

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

NTP5863N

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:

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

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