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NTL4502N

Quad Power MOSFET

24 V, 15 A, N−Channel

ON Semiconductor®

http://onsemi.com

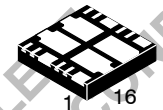
Features

- Four N−Channel MOSFETs in a Single Package
- High Drain Current (Up to 80A per Device, Single Pulse t_p < 10 μs, $R_{\theta JC}$ = 1.5 °C/W)
- High Input Impedance for Ease of Drive
- Ultra Low On−resistance ($R_{DS(on)}$) Provides Low Conduction Losses
- Very Fast Switching Times Provides Low Switching Losses
- Low Parasitic Inductance
- Low Stored Charge for Efficient Switching
- Very Low V_{SD} Ideal for Synchronous Rectification
- 200% Footprint Reduction Compared to Similar DPAK Solution for the Same Power
- Advanced Leadless Power Integrated Package

Applications

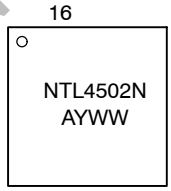
- DC−DC Converters
- Motherboard/Server Voltage Regulator
- Telecomm/Industrial Power Supply
- H−Bridge Circuits
- Low Voltage Motor Control

$V_{(BR)DSS}$	$R_{DS(ON)}$ TYP	I_D MAX (Note 1)
24 V	8.0 mΩ @ 4.5 V	15 A
	11.2 mΩ @ 10 V	



CASE 495
QFN16 FBIP
STYLE 1

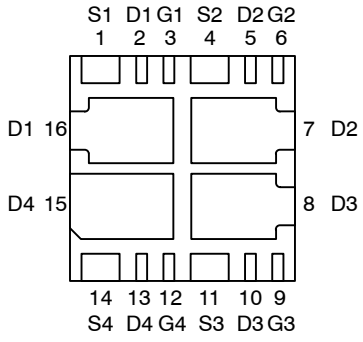
MARKING DIAGRAM



xx = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Parameter			Symbol	Value	Units
Drain−to−Source Voltage			V_{DSS}	24	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current (Note 1)	Steady State	T_A=25°C	I_D	15	A
		T_A=85°C		10.9	
	t≤10 s	T_A=25°C		18.8	
Power Dissipation (Note 1)	Steady State	T_A=25°C	P_D	2.9	W
	t≤10 s			4.5	
Continuous Drain Current (Note 2)	Steady State	T_A=25°C	I_D	11.4	A
		T_A=85°C		8.2	
Power Dissipation (Note 2)		T_A=25°C	P_D	1.7	W
Pulsed Drain Current	tp=10 μs		I_{DM}	32	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to 150	°C
Source Current (Body Diode)			I_S	15	A
Single Pulse Drain−to−Source Avalanche Energy − (V_{DD}= 25 V, V_G=10 V, I_{PK}=60 A, L=0.1 mH, R_G= 1.0 kΩ)			EAS	80	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	°C



Pinout Diagram

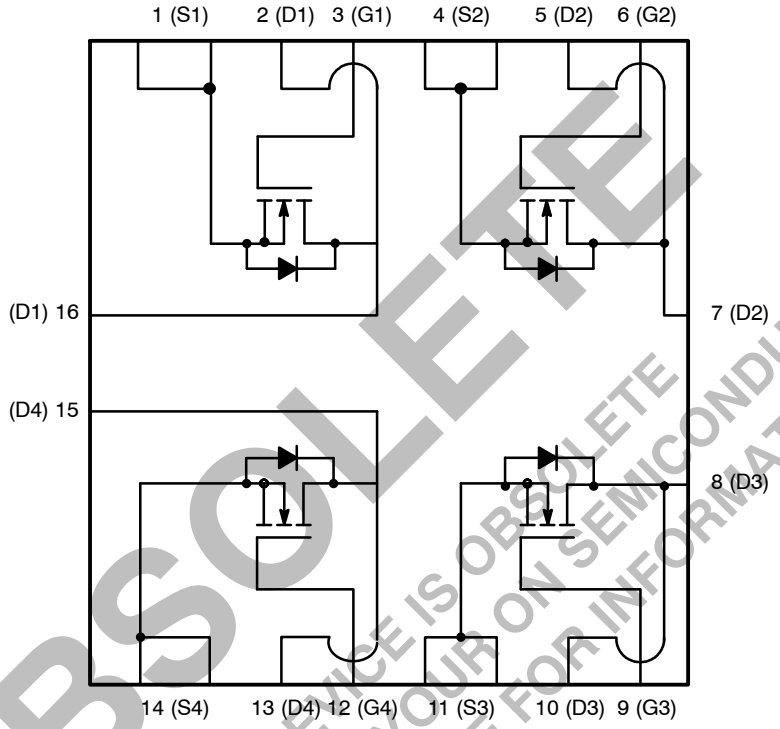
ORDERING INFORMATION

Device	Package	Shipping
NTL4502NT1	QFN16 FBIP	1500 / Tape & Reel

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Units
Junction−to−Case (Drain)	$R_{\theta JC}$	1.5	°C/W
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	43	
Junction−to−Ambient − t≤10 s (Note 1)	$R_{\theta JA}$	27.5	
Junction−to−Ambient − Steady State (Note 2)	$R_{\theta JA}$	75	

1. Surface−mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
2. Surface−mounted on FR4 board using minimum recommended pad size (Cu area = 0.440 in sq).



SCHEMATIC (TOP VIEW)

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

Characteristic	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		24	27.5		V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				25.5		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V	T_J=25°C			1.5	μA
			T_J=125°C			10	
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V				±100	nA
ON CHARACTERISTICS (Note 3)							
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA		1.0	1.5	2.0	V
Gate Threshold Voltage Temperature Coefficient	$V_{GS(th)}/T_J$				−4.1		mV/°C
Drain−to−Source On−Resistance	$R_{DS(on)}$	V_{GS} = 4.5 V, I_D = 15 A			11.2	13	mΩ
		V_{GS} = 10 V, I_D = 15 A			8.0	11	
Forward Transconductance	g_{FS}	V_{DS} = 10 V, I_D = 15 A			27		S
CHARGES AND CAPACITANCES							
Input Capacitance	C_{iss}	V_{DS} = 20 V, V_{GS} = 0 V, f = 1.0 MHz			1070	1605	pF
Output Capacitance	C_{oss}				408	612	
Reverse Transfer Capacitance	C_{rss}				142	213	
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, I_D = 15 A, V_{DS} = 24 V			13		nC
Threshold Gate Charge	$Q_{G(TH)}$				1.6		
Gate−to−Source Charge	Q_{GS}				3.3		
Gate−to−Drain Charge	Q_{GD}				7.0		
SWITCHING CHARACTERISTICS, V_{GS} = 10 V (Note 4)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 10 V, V_{DD} = 12 V, I_D = 15 A, R_G = 3.0 Ω			5.0	8.5	ns
Rise Time	t_r				28	47	
Turn−Off Delay Time	$t_{d(OFF)}$				22	37	
Fall Time	t_f				6.0	10	
SWITCHING CHARACTERISTICS, V_{GS} = 4.5 V (Note 4)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 4.5 V, V_{DD} = 12 V, I_D = 15 A, R_G = 3.0 Ω			9.5	16	ns
Rise Time	t_r				33	55	
Turn−Off Delay Time	$t_{d(OFF)}$				14	23.5	
Fall Time	t_f				7.5	12.5	
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 15 A	T_J=25°C		0.8	1.2	V
			T_J=125°C		0.7		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_S/dt = 100 A/μs, I_S = 15 A			31		ns
Charge Time	t_a				17		
Discharge Time	t_b				14		
Reverse Recovery Charge	Q_{RR}				20		nC

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

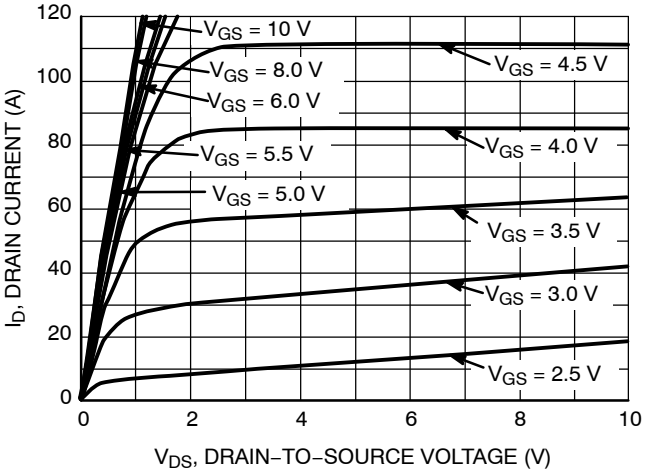


Figure 1. On−Region Characteristics

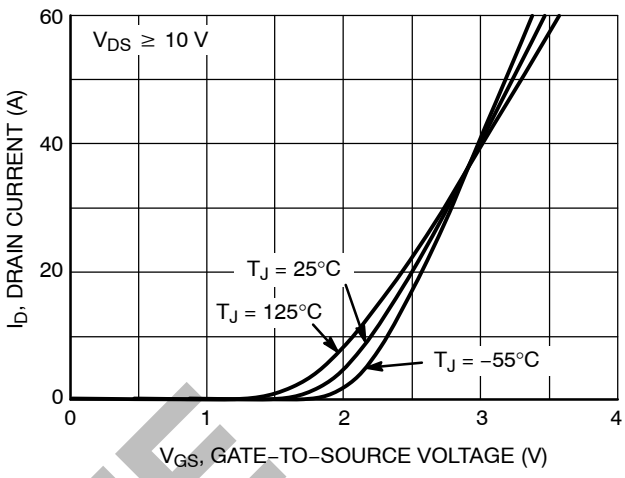


Figure 2. Transfer Characteristics

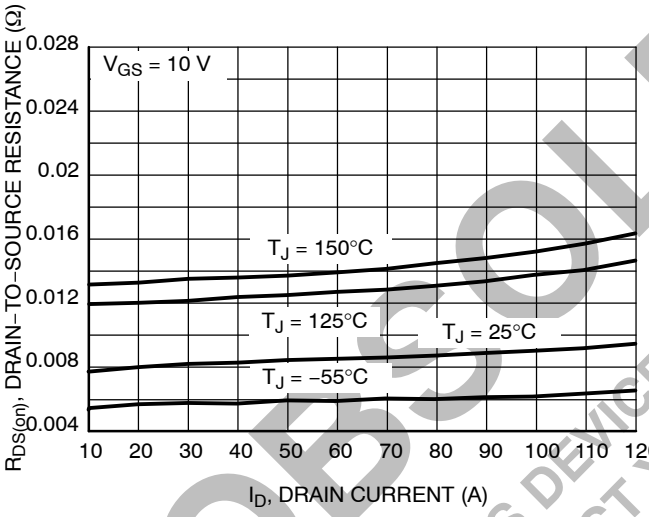


Figure 3. On−Resistance versus Drain Current and Temperature

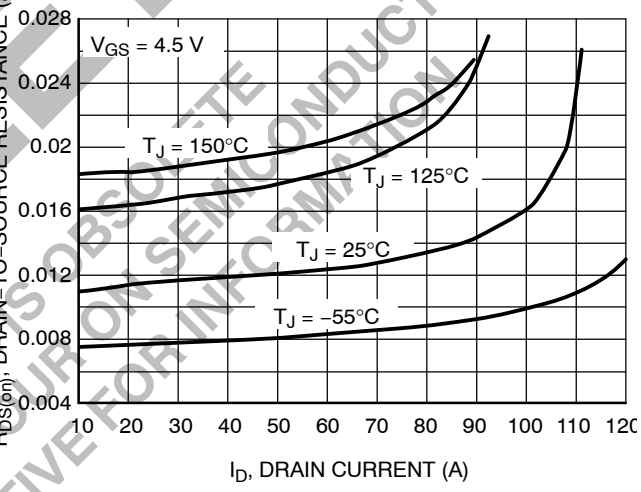


Figure 4. On−Resistance versus Drain Current and Temperature

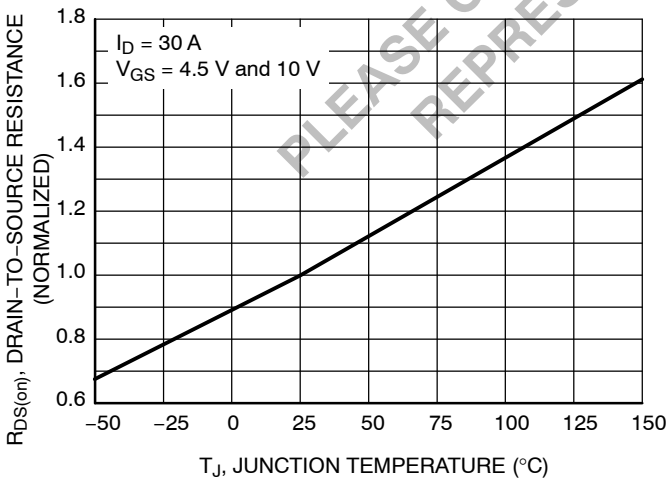


Figure 5. On−Resistance Variation with Temperature

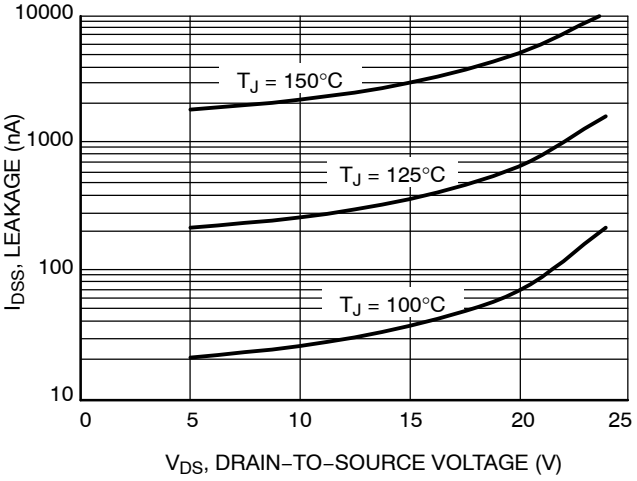


Figure 6. Drain−to−Source Leakage Current versus Voltage

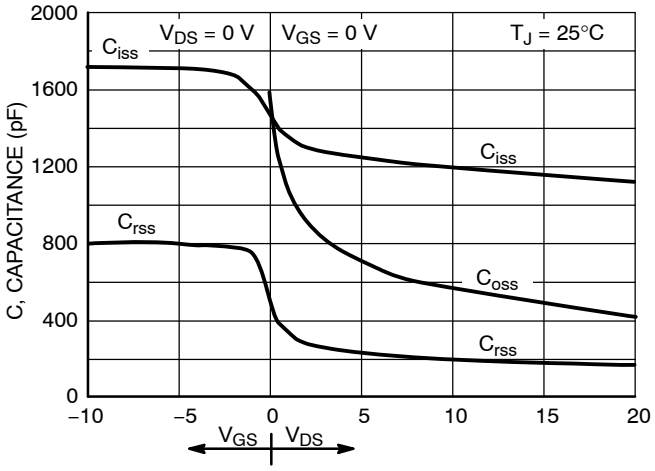


Figure 7. Capacitance Variation

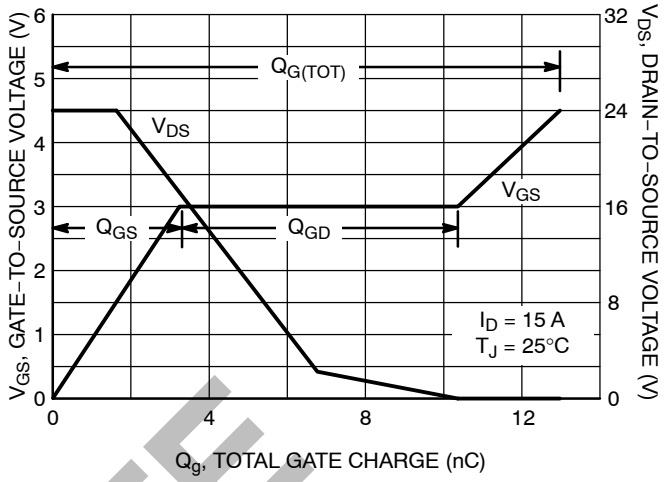


Figure 8. Gate−to−Source and Drain−to−Source Voltage versus Total Charge

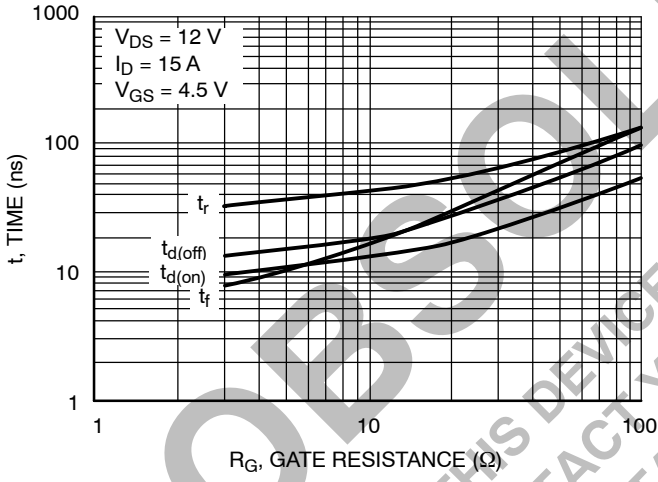


Figure 9. Resistive Switching Time Variation versus Gate Resistance

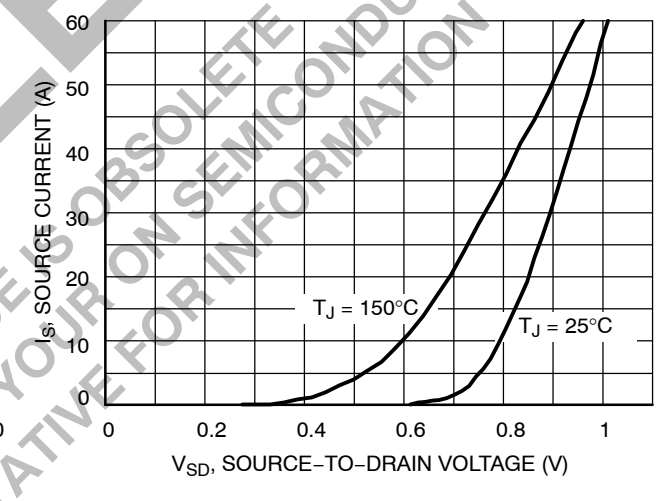


Figure 10. Diode Forward Voltage versus Current

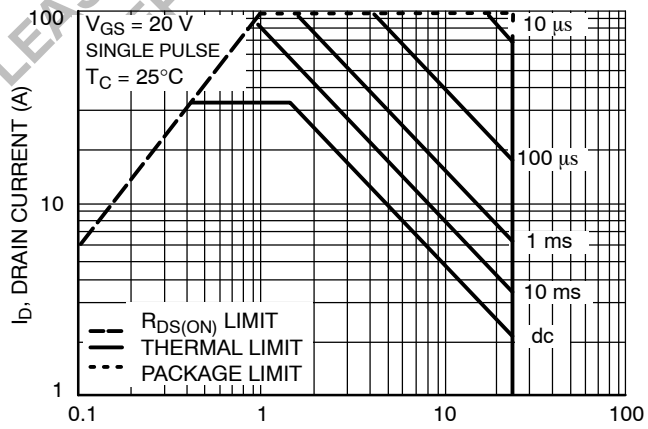
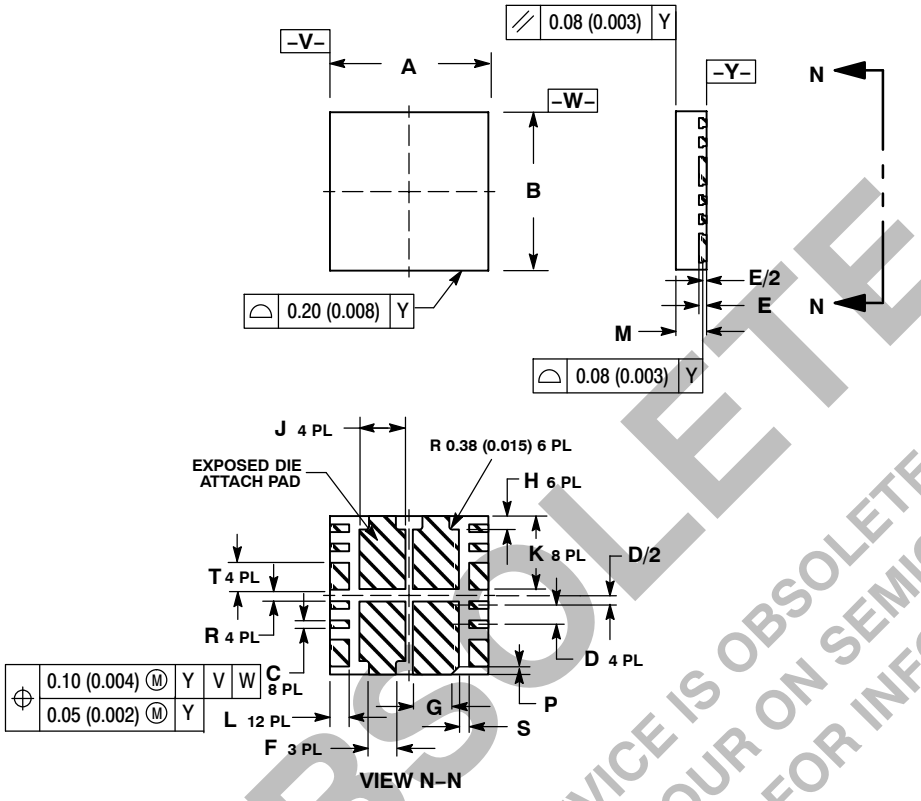


Figure 11. Maximum Rated Forward Biased Safe Operating Area

PACKAGE DIMENSIONS

QFN16 FBIP
CASE 495−01
ISSUE A



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. COPLANARITY APPLIES TO LEAD. DIE ATTACHED PAD.
4. OPTIONAL FEATURES ARE FOR REFERENCE ONLY.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	10.40	10.60	0.409	0.417
B	10.40	10.60	0.409	0.417
C	0.40	0.50	0.016	0.020
D	1.27 BSC		0.050 BSC	
E	0.50	0.52	0.020	0.020
F	1.70	1.90	0.067	0.075
G	2.45	2.55	0.096	0.100
H	0.80	1.00	0.031	0.039
J	2.90	3.10	0.114	0.122
K	4.75	4.95	0.187	0.195
L	1.10	1.30	0.043	0.051
M	2.00	2.20	0.079	0.087
P	0.30	0.50	0.012	0.020
R	0.70	0.90	0.028	0.035
S	0.58	0.78	0.023	0.031
T	1.68	1.78	0.066	0.070

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