RoHS Compliant
HALOGEN-FREE

MagnaChip

MDP12N50B / MDF12N50B

N-Channel MOSFET 500V, 11.5A, 0.65Ω

General Description

The MDP/F12N50B uses advanced Magnachip's MOSFET Technology, which provides low on-state resistance, high switching performance and excellent quality.

MDP/F12N50B is suitable device for SMPS, high Speed switching and general purpose applications.

Features

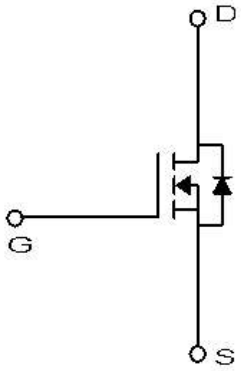
- V_{DS} = 500V
- I_D = 11.5A @V_{GS} = 10V
- $R_{DS(ON)}$ ≤ 0.65Ω @V_{GS} = 10V

Applications

- Power Supply
- PFC
- Ballast

TO-220
MDP Series

TO-220F
MDF Series



Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	MDP12N50B	MDF12N50B	Unit
Drain-Source Voltage		V_{DSS}	500		V
Gate-Source Voltage		V_{GSS}	±30		V
Continuous Drain Current	T_C=25°C	I_D	11.5	11.5*	A
	T_C=100°C		7.0	7.0*	A
Pulsed Drain Current(1)		I_{DM}	46	46*	A
Power Dissipation	T_C=25°C	P_D	165	42	W
	Derate above 25°C		1.33	0.32	W/°C
Repetitive Avalanche Energy(1)		E_{AR}	16.5		mJ
Peak Diode Recovery dv/dt(3)		dv/dt	4.5		V/ns
Single Pulse Avalanche Energy(4)		E_{AS}	460		mJ
Junction and Storage Temperature Range		T_J, T_{stg}	-55~150		°C

※ Id limited by maximum junction temperature

Thermal Characteristics

Characteristics	Symbol	MDP12N50B	MDF12N50B	Unit
Thermal Resistance, Junction-to-Ambient(1)	$R_{\theta JA}$	62.5	62.5	°C/W
Thermal Resistance, Junction-to-Case(1)	$R_{\theta JC}$	0.75	3.0	

Ordering Information

Part Number	Temp. Range	Package	Packing	RoHS Status
MDP12N50BTH	-55~150°C	TO-220	Tube	Halogen Free
MDF12N50BTH	-55~150°C	TO-220F	Tube	Halogen Free

Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	I_D = 250μA, V_{GS} = 0V	500	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	2.0	-	4.0	
Drain Cut-Off Current	I_{DSS}	V_{DS} = 500V, V_{GS} = 0V	-	-	1	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±30V, V_{DS} = 0V	-	-	100	nA
Drain-Source ON Resistance	$R_{DS(ON)}$	V_{GS} = 10V, I_D = 5.75A	-	0.55	0.65	Ω
Forward Transconductance	g_{fs}	V_{DS} = 30V, I_D = 5.75A	-	15	-	S
Dynamic Characteristics						
Total Gate Charge	Q_g	V_{DS} = 400V, I_D = 11.5A, V_{GS} = 10V(3)	-	19.3	-	nC
Gate-Source Charge	Q_{gs}		-	4.6	-	
Gate-Drain Charge	Q_{gd}		-	6.1	-	
Input Capacitance	C_{iss}	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	-	1034	-	pF
Reverse Transfer Capacitance	C_{rss}		-	5.1	-	
Output Capacitance	C_{oss}		-	126	-	
Turn-On Delay Time	$t_{d(on)}$	V_{GS} = 10V, V_{DS} = 250V, I_D =11.5A, R_G = 25Ω(3)	-	16	-	ns
Rise Time	t_r		-	35	-	
Turn-Off Delay Time	$t_{d(off)}$		-	31	-	
Fall Time	t_f		-	40	-	
Drain-Source Body Diode Characteristics						
Maximum Continuous Drain to Source Diode Forward Current	I_S		-	11.5	-	A
Source-Drain Diode Forward Voltage	V_{SD}	I_S = 11.5A, V_{GS} = 0V	-	-	1.4	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 11.5A, di/dt = 100A/μs	-	310	-	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	2.6	-	μC

Note :

1. Pulse width is based on $R_{\theta JC}$ & $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C.
2. Pulse test: pulse width ≤300us, duty cycle≤2%, pulse width limited by junction temperature $T_{J(MAX)}$=150°C.
3. I_{SD} ≤11.5A, di/dt≤200A/us, V_{DD}≤BV_{DSS}, R_g =25Ω, Starting T_J=25°C
4. L=6.3mH, I_{AS}=11.5A, V_{DD}=50V, , R_g =25Ω, Starting T_J=25°C

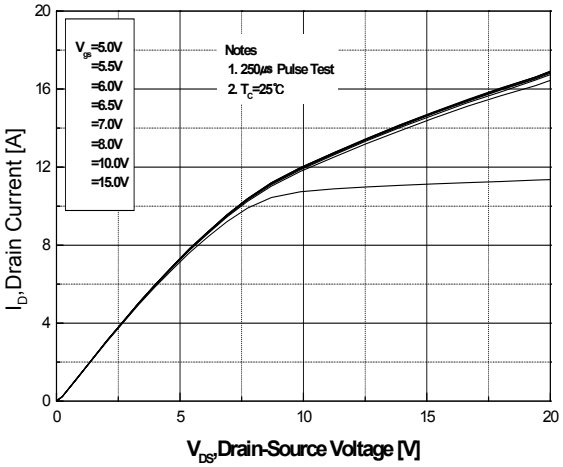


Fig.1 On-Region Characteristics

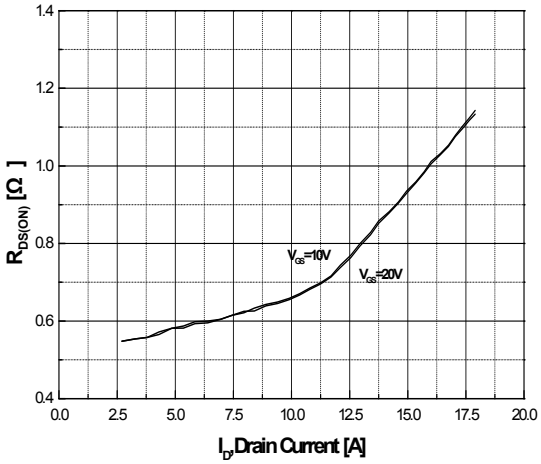


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

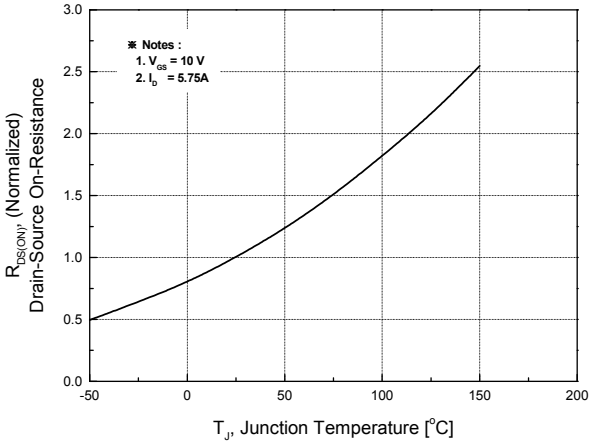


Fig.3 On-Resistance Variation with Temperature

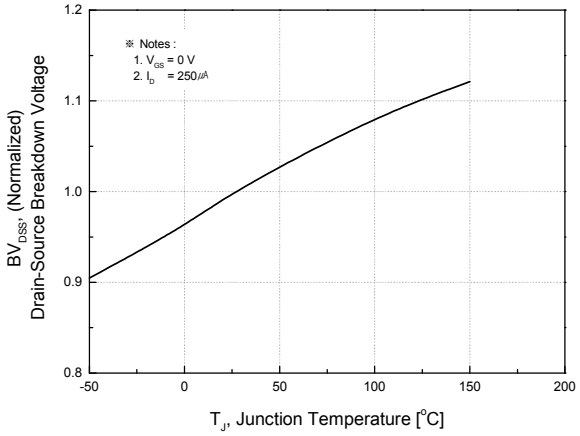


Fig.4 Breakdown Voltage Variation vs. Temperature

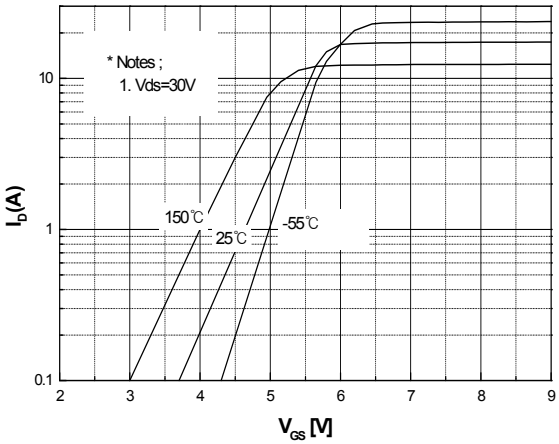


Fig.5 Transfer Characteristics

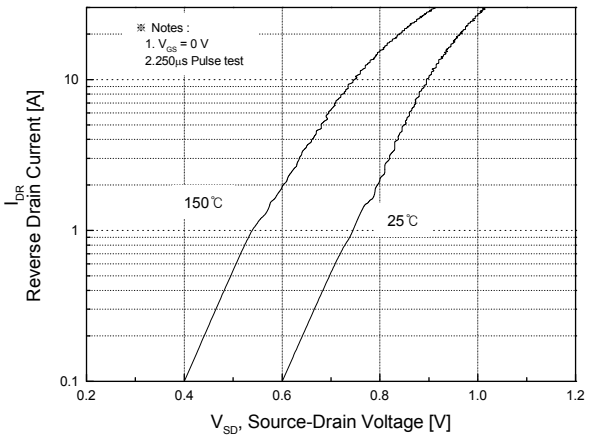


Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature

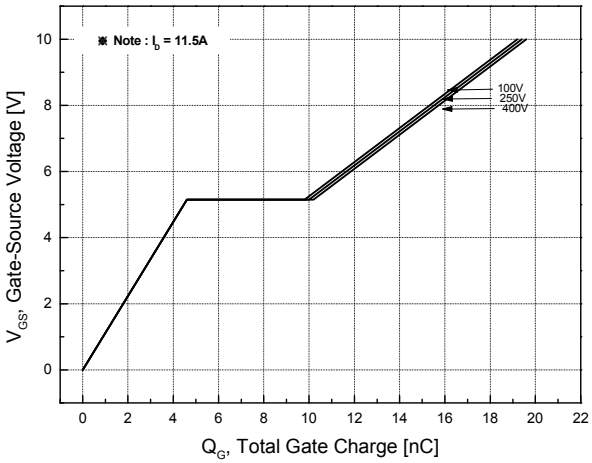


Fig.7 Gate Charge Characteristics

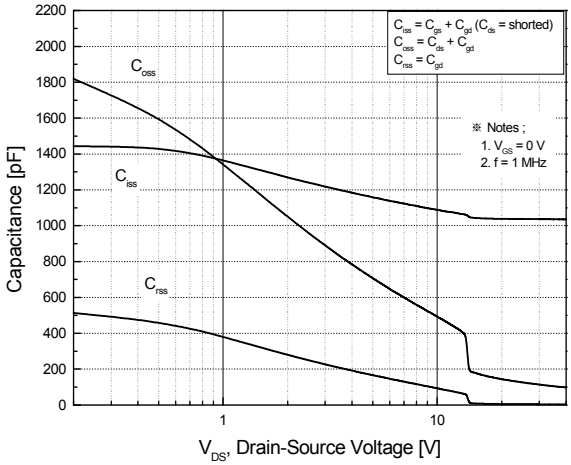


Fig.8 Capacitance Characteristics

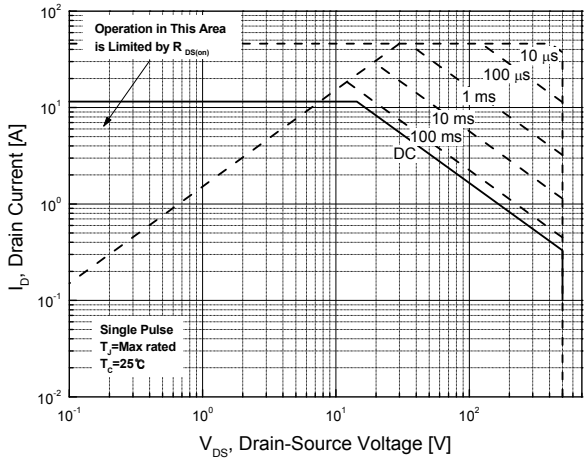


Fig.9 Maximum Safe Operating Area MDP12N50B (TO-220)

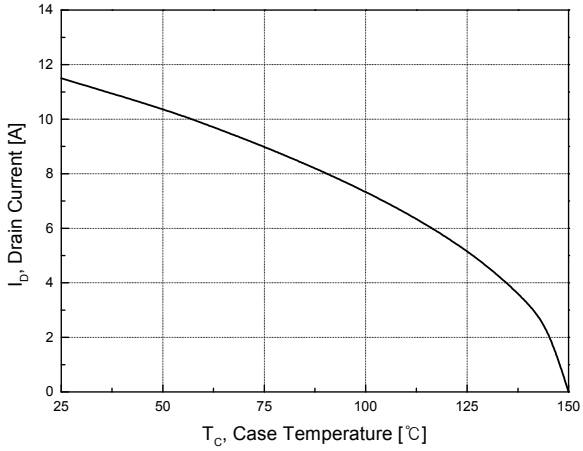


Fig.10 Maximum Drain Current vs. Case Temperature

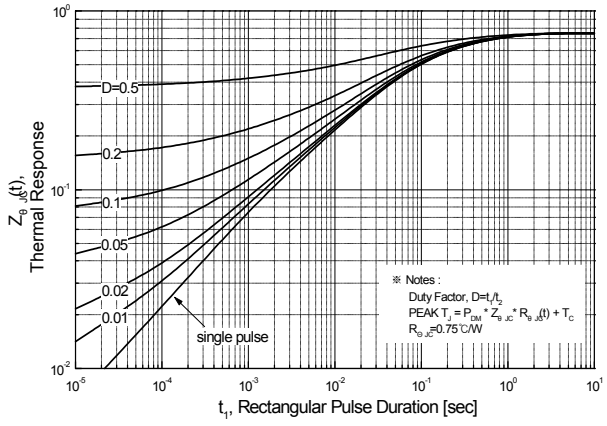


Fig.11 Transient Thermal Response Curve MDP12N50B (TO-220)

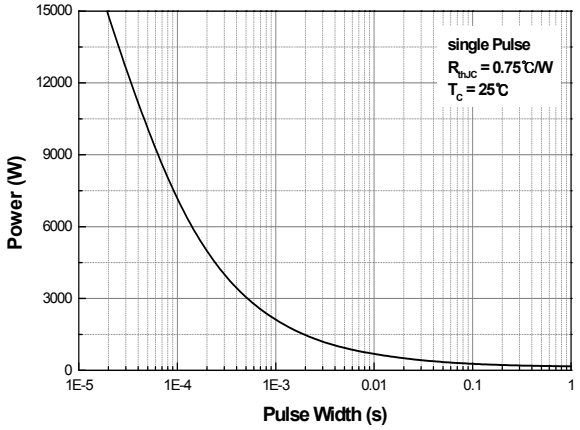


Fig.12 Single Pulse Maximum Power Dissipation – MDP12N50B (TO-220)

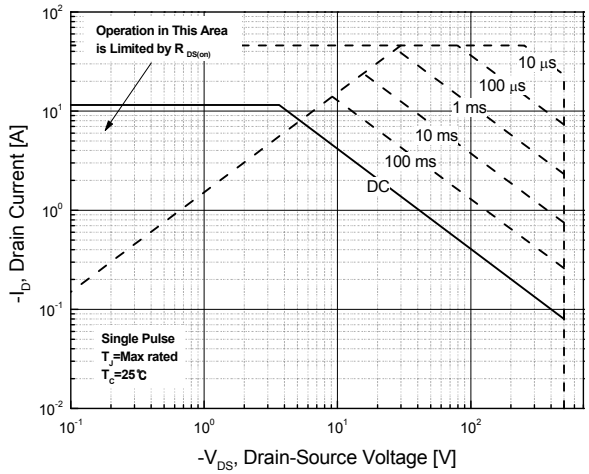


Fig.13 Maximum Safe Operating Area MDF12N50B (TO-220F)

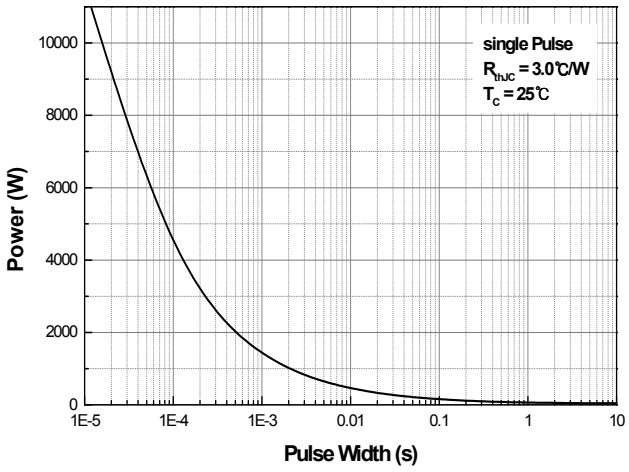


Fig.14 Single Pulse Maximum Power Dissipation – MDF12N50B (TO-220F)

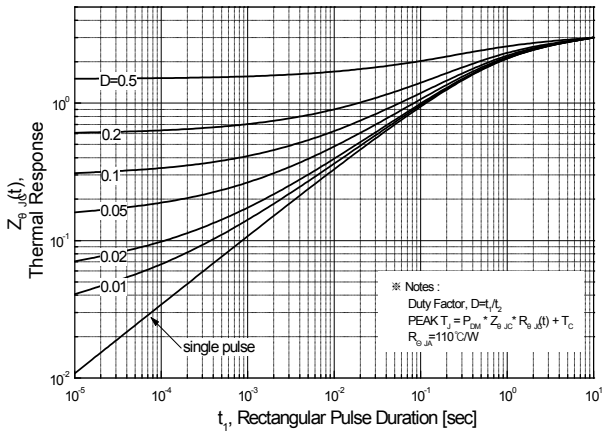
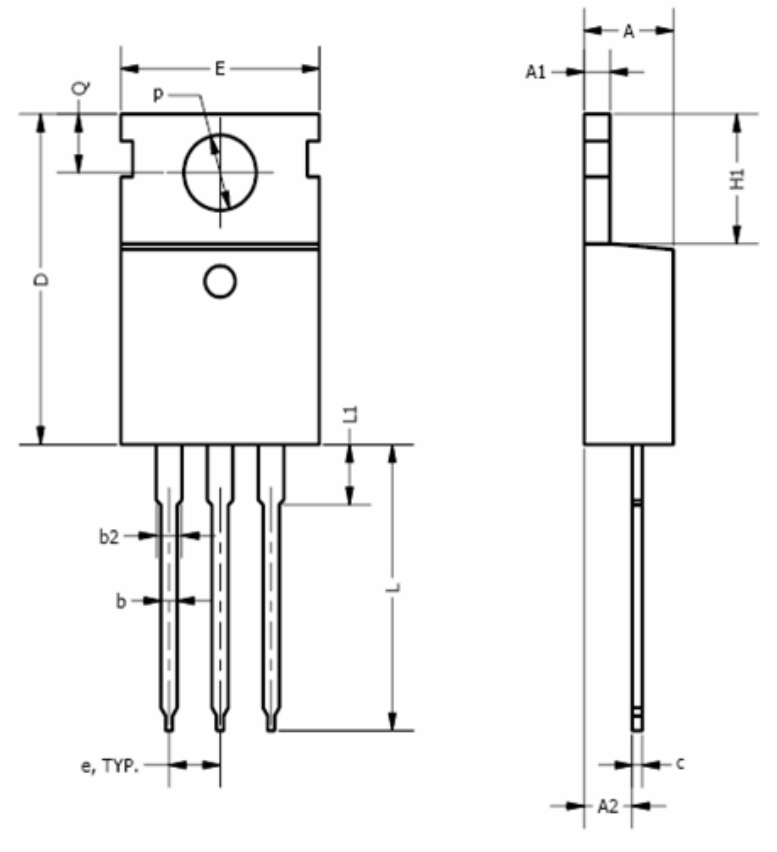


Fig.15 Transient Thermal Response Curve MDF12N50B (TO-220F)

Physical Dimensions

3 Leads, TO-220

Dimensions are in millimeters unless otherwise specified

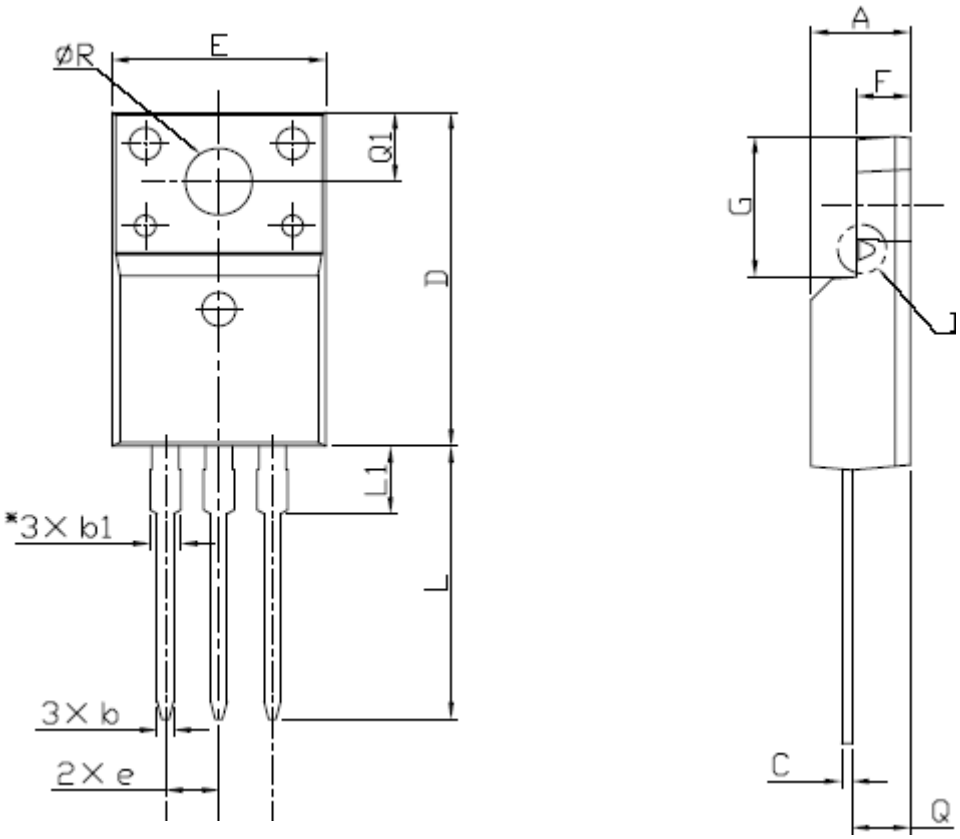


Symbol	Min	Nom	Max
A	3.56		4.83
A1	0.50		1.40
A2	2.03		2.92
b	0.38	0.69	1.02
b2	1.14	1.45	1.78
c	0.36		0.61
D	14.22		16.51
e	2.54 TYP		
E	9.65		10.67
H1	5.84		6.86
L	12.70		14.73
L1			6.35
ΦP	3.53		4.09
Q	2.54		3.43

Physical Dimension

3 Leads, TO-220F

Dimensions are in millimeters unless otherwise specified



Symbol	Min	Nom	Max
A	4.50		4.93
b	0.63		0.91
b1	1.15		1.47
C	0.33		0.63
D	15.47		16.13
E	9.60		10.71
e		2.54	
F	2.34		2.84
G	6.48		6.90
L	12.24		13.72
L1	2.79		3.67
Q	2.52		2.96
Q1	3.10		3.50
ØR	3.00		3.55

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