



## STE24NA100

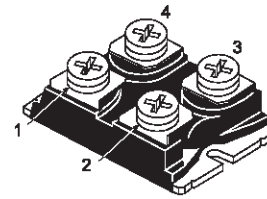
### N - CHANNEL 1000V - 0.35Ω - 24A - ISOTOP FAST POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STE24NA100	1000 V	< 0.385 Ω	24 A

- TYPICAL R<sub>DS(on)</sub> = 0.35 Ω
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- LOW INTRINSIC CAPACITANCE
- GATE CHARGE MINIMIZED
- REDUCED VOLTAGE SPREAD

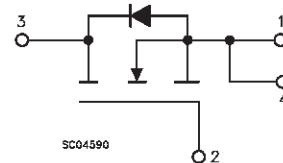
#### APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLY (SMPS)
- DC-AC CONVERTER FOR WELDING EQUIPMENT AND UNINTERRUPTABLE POWER SUPPLY AND MOTOR DRIVE



ISOTOP

#### INTERNAL SCHEMATIC DIAGRAM



#### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	1000	V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	1000	V
V <sub>GS</sub>	Gate-source Voltage	± 30	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	24	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	15	A
I <sub>DM</sub> (•)	Drain Current (pulsed)	96	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	450	W
	Derating Factor	3.6	W/°C
T <sub>stg</sub>	Storage Temperature	-55 to 150	°C
T <sub>j</sub>	Max. Operating Junction Temperature	150	°C
V <sub>ISO</sub>	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

October 1998

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**STE24NA100****THERMAL DATA**

$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.27	°C/W
$R_{thc-h}$	Thermal Resistance Case-heatsink With Conductive Grease Applied	Max	0.05	°C/W

**AVALANCHE CHARACTERISTICS**

Symbol	Parameter	Max Value	Unit
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max)	12	A
$E_{AS}$	Single Pulse Avalanche Energy (starting $T_j = 25\text{ °C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ )	2000	mJ

**ELECTRICAL CHARACTERISTICS** ( $T_{case} = 25\text{ °C}$  unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 500\text{ }\mu\text{A}$ $V_{GS} = 0$	1000			V
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ $T_c = 125\text{ °C}$			50 250	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate-body Leakage Current ( $V_{DS} = 0$ )	$V_{GS} = \pm 30\text{ V}$			$\pm 400$	nA

ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 1\text{ mA}$	2.25	3	3.75	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{ V}$ $I_D = 12\text{ A}$		0.35	0.385	$\Omega$
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10\text{ V}$	24			A

**DYNAMIC**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$ (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 12\text{ A}$	15			S
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$		14000	19000	pF
$C_{oss}$	Output Capacitance			1200	1600	pF
$C_{rss}$	Reverse Transfer Capacitance			300	390	pF

**ELECTRICAL CHARACTERISTICS** (continued)**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 500\text{ V}$ $I_D = 12\text{ A}$		40	56	ns
$t_r$	Rise Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		55	77	ns
$Q_g$	Total Gate Charge	$V_{DD} = 800\text{ V}$ $I_D = 24\text{ A}$ $V_{GS} = 10\text{ V}$		470	660	nC
$Q_{gs}$	Gate-Source Charge			43		nC
$Q_{gd}$	Gate-Drain Charge			226		nC

**SWITCHING OFF**

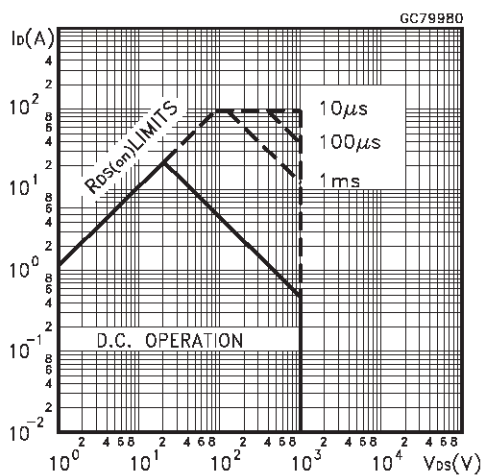
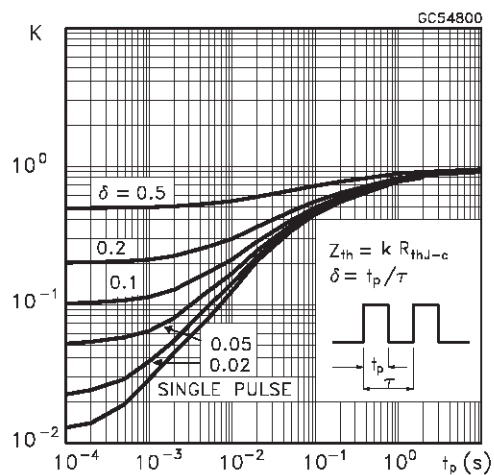
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 800\text{ V}$ $I_D = 24\text{ A}$		110	154	ns
$t_f$	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$		25	35	ns
$t_c$	Cross-over Time	(see test circuit, figure 5)		150	210	ns

**SOURCE DRAIN DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				24	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				96	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 24\text{ A}$ $V_{GS} = 0$			1.6	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 24\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		1.4		$\mu\text{s}$
$Q_{rr}$	Reverse Recovery Charge			41		$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current			60		A

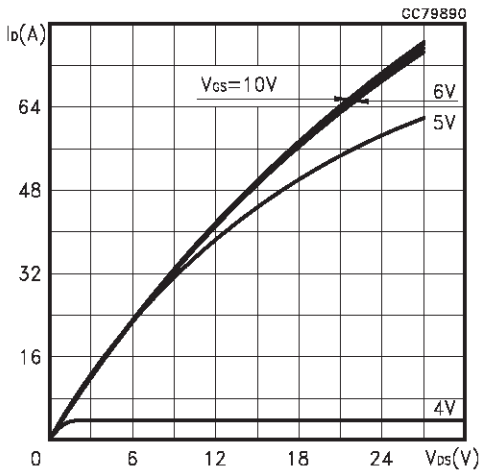
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

(•) Pulse width limited by safe operating area

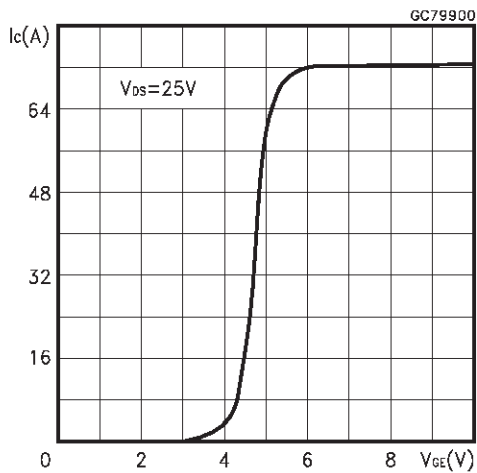
**Safe Operating Area****Thermal Impedance**

# STE24NA100

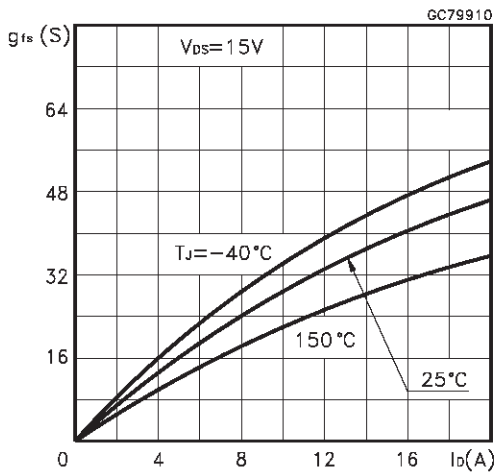
### Output Characteristics



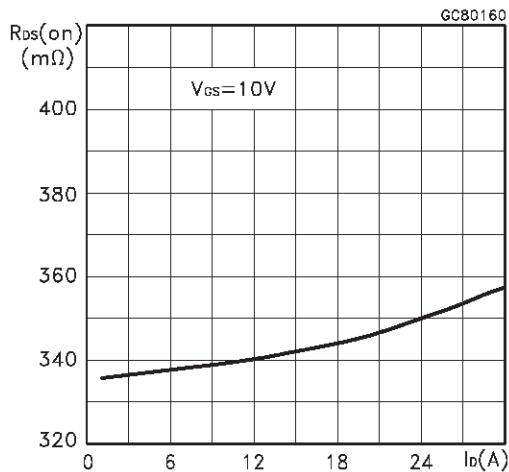
### Transfer Characteristics



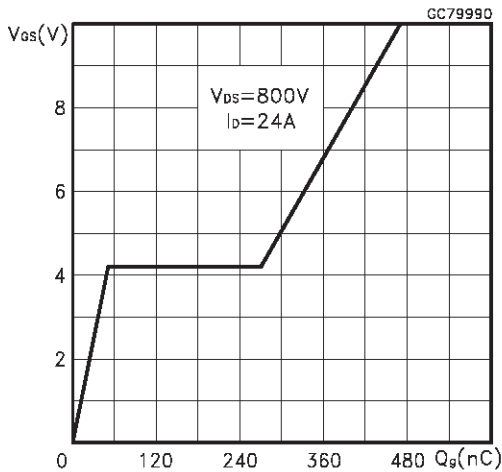
### Transconductance



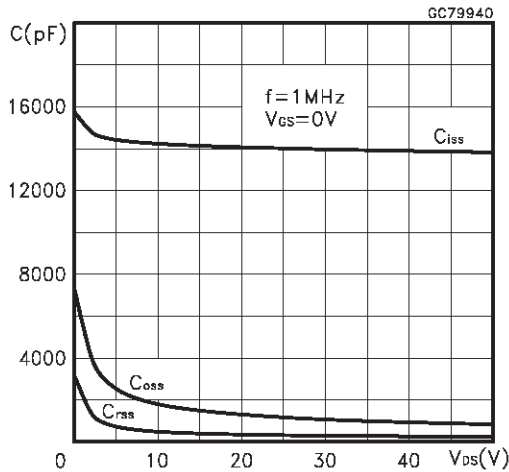
### Static Drain-source On Resistance



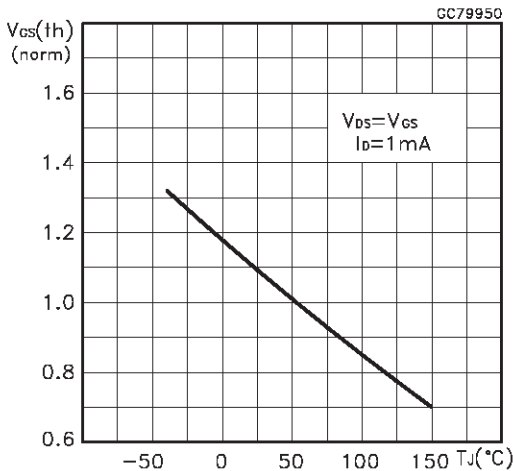
### Gate Charge vs Gate-source Voltage



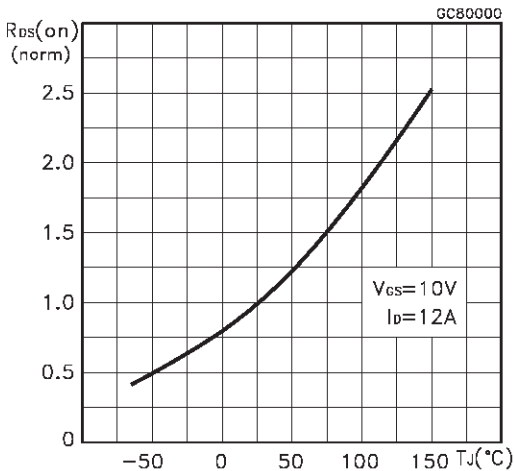
### Capacitance Variations



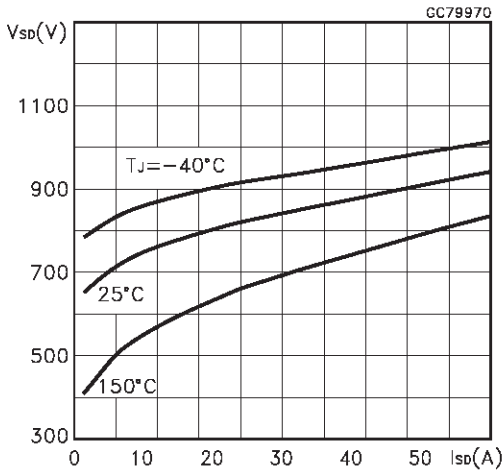
Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



STE24NA100

Fig. 1: Unclamped Inductive Load Test Circuit

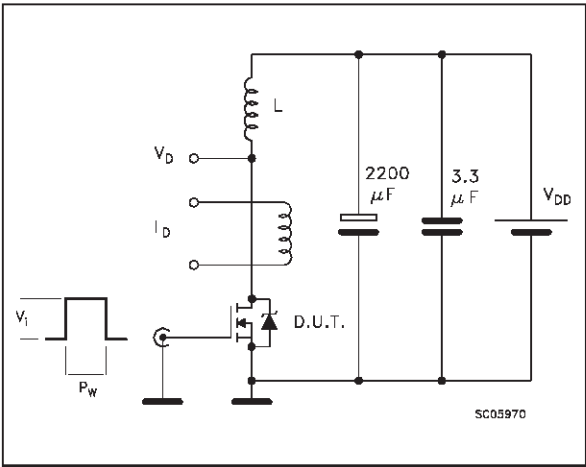


Fig. 2: Unclamped Inductive Waveform

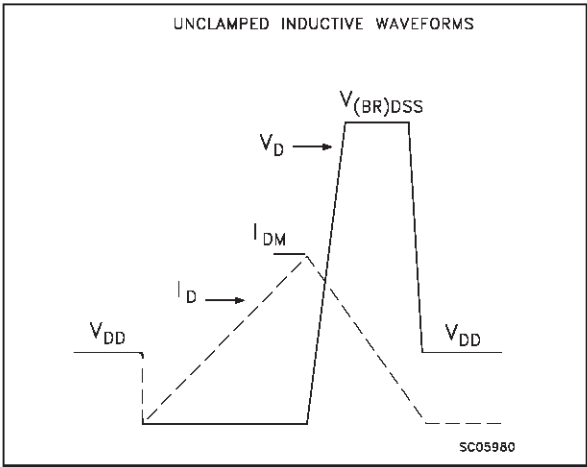


Fig. 3: Switching Times Test Circuits For Resistive Load

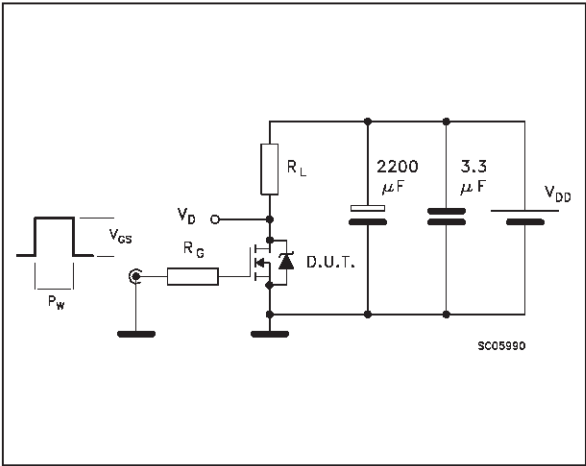


Fig. 4: Gate Charge test Circuit

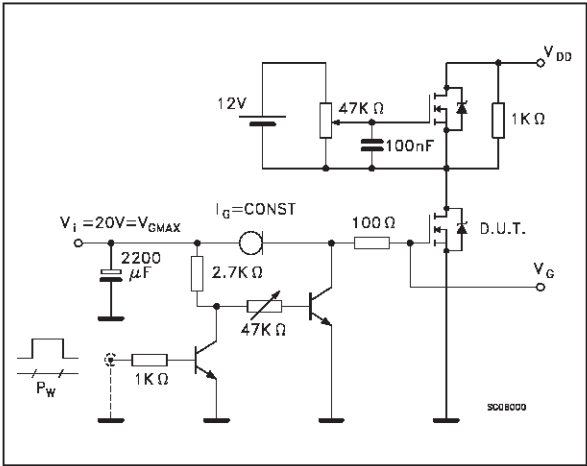
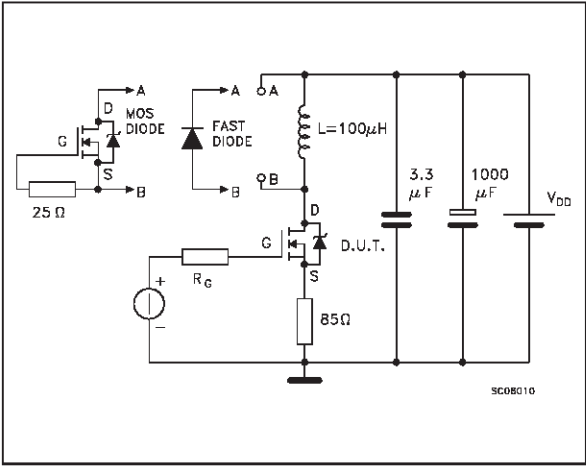
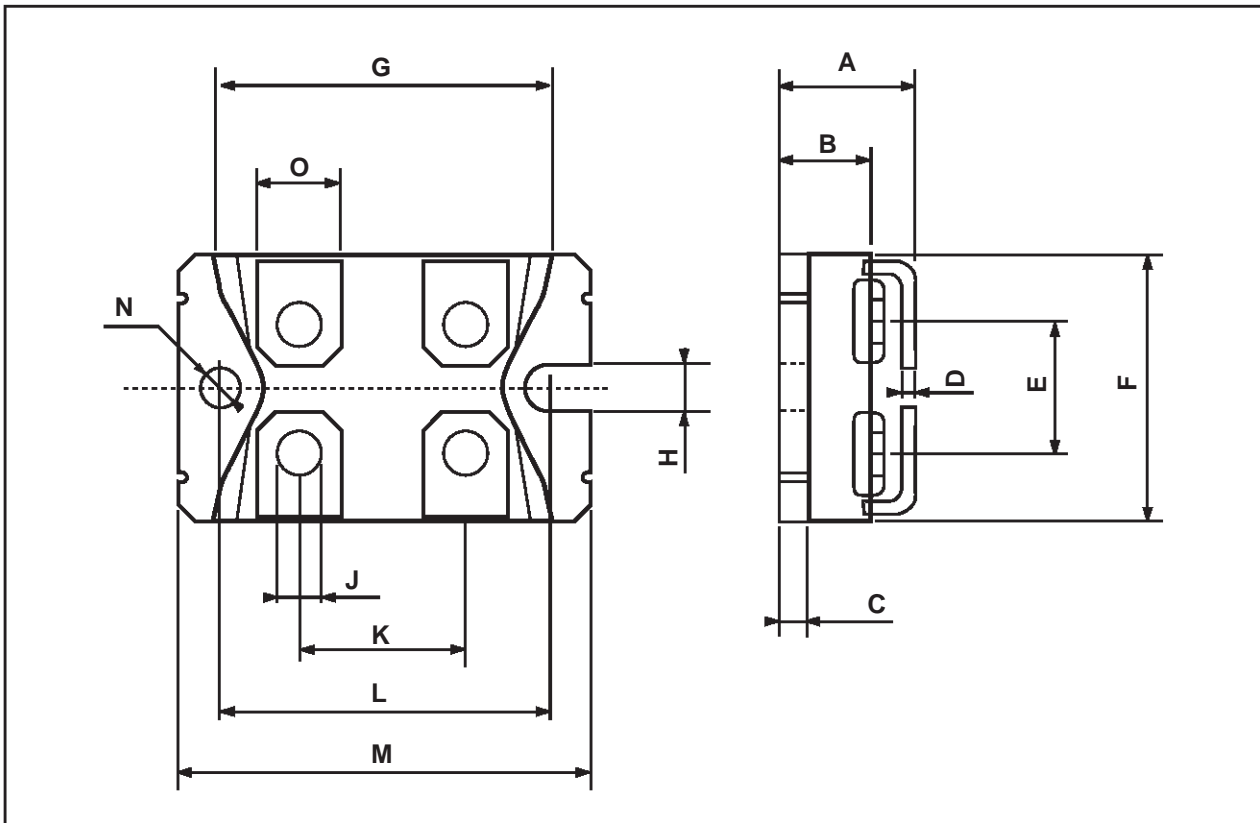


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



## ISOTOP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.8		12.2	0.466		0.480
B	8.9		9.1	0.350		0.358
C	1.95		2.05	0.076		0.080
D	0.75		0.85	0.029		0.033
E	12.6		12.8	0.496		0.503
F	25.15		25.5	0.990		1.003
G	31.5		31.7	1.240		1.248
H	4			0.157		
J	4.1		4.3	0.161		0.169
K	14.9		15.1	0.586		0.594
L	30.1		30.3	1.185		1.193
M	37.8		38.2	1.488		1.503
N	4			0.157		
O	7.8		8.2	0.307		0.322



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