SGS-THOMSON MICROELECTRONICS

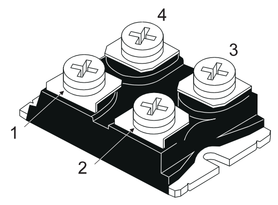
ESM4045DV

NPN DARLINGTON POWER MODULE

- HIGH CURRENT POWER BIPOLAR MODULE
- VERY LOW R_{th} JUNCTION CASE
- SPECIFIED ACCIDENTAL OVERLOAD AREAS
- ULTRAFAST FREEWHEELING DIODE
- ISOLATED CASE (2500V RMS)
- EASY TO MOUNT
- LOW INTERNAL PARASITIC INDUCTANCE

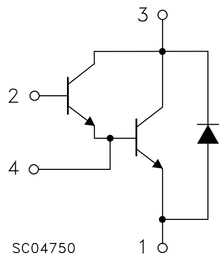
APPLICATIONS:

- MOTOR CONTROL
- SMPS & UPS
- DC/DC & DC/AC CONVERTERS
- WELDING EQUIPMENT



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CEV}	Collector-Emitter Voltage (V_{BE} = -5 V)	600	V
$V_{CEO(sus)}$	Collector-Emitter Voltage (I_B = 0)	450	V
V_{EBO}	Emitter-Base Voltage (I_C = 0)	7	V
I_C	Collector Current	42	A
I_{CM}	Collector Peak Current (t_p = 10 ms)	63	A
I_B	Base Current	4	A
I_{BM}	Base Peak Current (t_p = 10 ms)	8	A
P_{tot}	Total Dissipation at T_c = 25 ^oC	150	W
T_{stg}	Storage Temperature	-55 to 150	^oC
T_j	Max. Operating Junction Temperature	150	^oC
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	^oC

THERMAL DATA

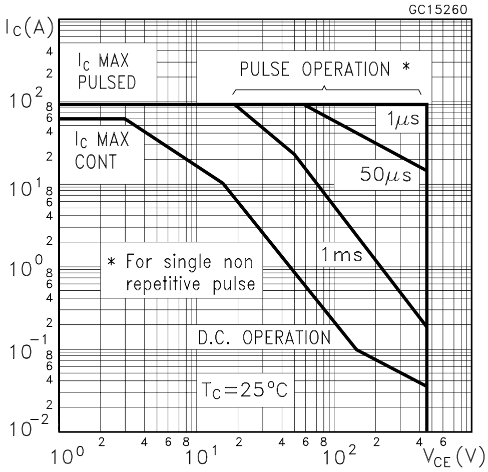
$R_{thj-case}$ $R_{thj-case}$ R_{thc-h}	Thermal Resistance Junction-case (transistor) Thermal Resistance Junction-case (diode) Thermal Resistance Case-heatsink With Conductive Grease Applied	Max Max Max	0.83 1.5 0.05	$^oC/W$ $^oC/W$ $^oC/W$

ELECTRICAL CHARACTERISTICS (T_{case} = 25 ^oC unless otherwise specified)

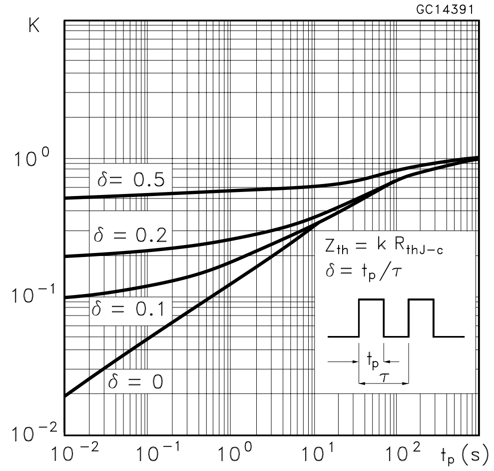
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CER} #	Collector Cut-off Current (R_{BE} = 5 Ω)	$V_{CE} = V_{CEV}$ $V_{CE} = V_{CEV}$ T_j = 100 ^oC			1.5 20	mA mA
I_{CEV} #	Collector Cut-off Current (V_{BE} = -5)	$V_{CE} = V_{CEV}$ $V_{CE} = V_{CEV}$ T_j = 100 ^oC			1 13	mA mA
I_{EBO} #	Emitter Cut-off Current (I_C = 0)	V_{EB} = 5 V			1	mA
$V_{CEO(SUS)}$*	Collector-Emitter Sustaining Voltage	I_C = 0.2 A L = 25 mH V_{clamp} = 450 V	450			V
h_{FE}*	DC Current Gain	I_C = 35 A V_{CE} = 5 V		220		
$V_{CE(sat)}$*	Collector-Emitter Saturation Voltage	I_C = 25 A I_B = 0.5 A I_C = 25 A I_B = 0.5 A T_j = 100 ^oC I_C = 35 A I_B = 2 A I_C = 35 A I_B = 2 A T_j = 100 ^oC		1.15 1.3 1.4 1.5	 2 2	V V V V
$V_{BE(sat)}$*	Base-Emitter Saturation Voltage	I_C = 35 A I_B = 2 A I_C = 35 A I_B = 2 A T_j = 100 ^oC		2.3 2.3	 3	V V
di_C/dt	Rate of Rise of On-state Collector	V_{CC} = 300 V R_C = 0 t_p = 3 μs I_{B1} = 0.75 A T_j = 100 ^oC	200	250		A/μs
V_{CE}(3 μs)	Collector-Emitter Dynamic Voltage	V_{CC} = 300 V R_C = 12 Ω I_{B1} = 0.75 A T_j = 100 ^oC		4.5	8	V
V_{CE}(5 μs)	Collector-Emitter Dynamic Voltage	V_{CC} = 300 V R_C = 12 Ω I_{B1} = 0.75 A T_j = 100 ^oC		2.5	4.5	V
t_s t_f t_c	Storage Time Fall Time Cross-over Time	I_C = 25A V_{CC} = 50 V V_{BB} = -5 V R_{BB} = 0.6 Ω V_{clamp} = 450 V I_{B1} = 0.5 A L = 0.1 mH T_j = 100 ^oC		3.2 0.25 0.75	5 0.5 1.5	μs μs μs
V_{CEW}	Maximum Collector Emitter Voltage Without Snubber	I_{CWoff} = 42 A I_{B1} = 2 A V_{BB} = -5 V V_{CC} = 50 V L = 0.06 mH R_{BB} = 0.6 Ω T_j = 125 ^oC	450			V
V_F*	Diode Forward Voltage	I_F = 35 A T_j = 100 ^oC		1.5	1.85	V
I_{RM}	Reverse Recovery Current	V_{CC} = 200 V I_F = 35 A di_F/dt = -200 A/μs L < 0.05 μH T_j = 100 ^oC		20	24	A

∗ Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
To evaluate the conduction losses of the diode use the following equations:
$V_F = 1.5 + 0.001\ I_F$ $P = 1.5\ I_{F(AV)} + 0.001\ I^2_{F(RMS)}$
See test circuits in databook introduction

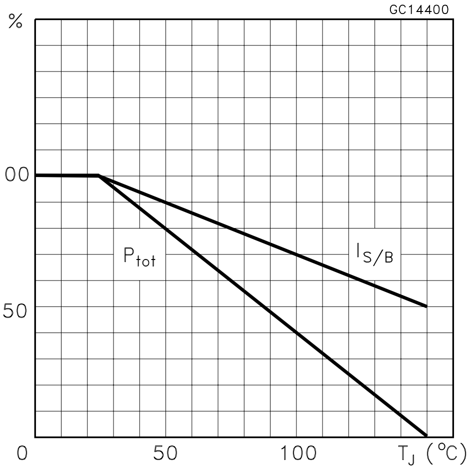
Safe Operating Areas



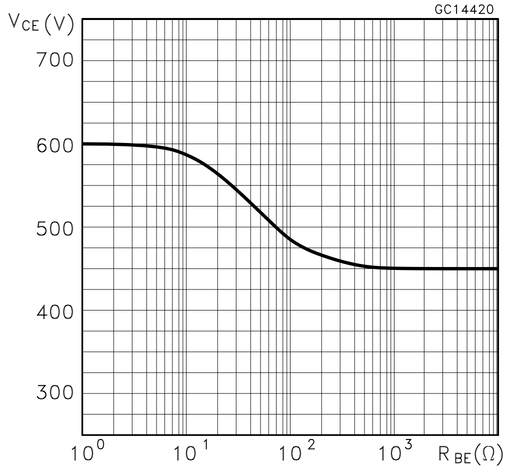
Thermal Impedance



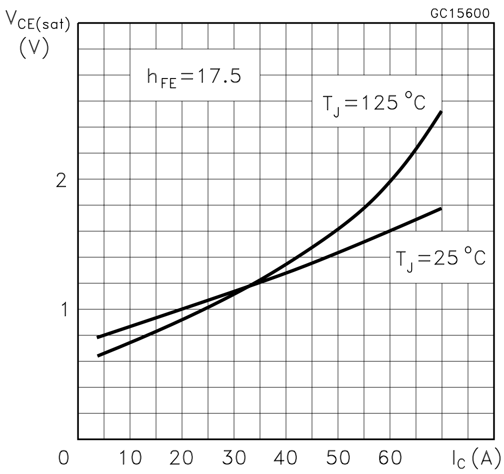
Derating Curve



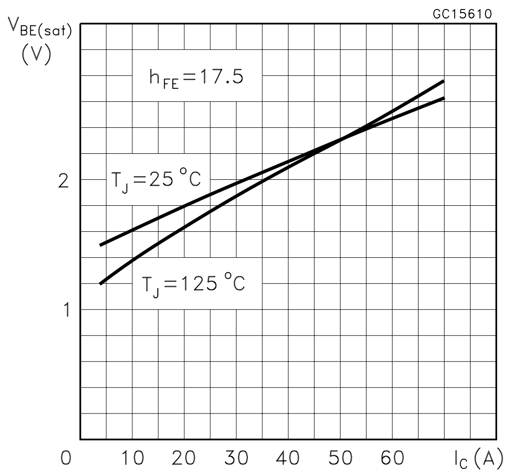
Collector-emitter Voltage Versus base-emitter Resistance



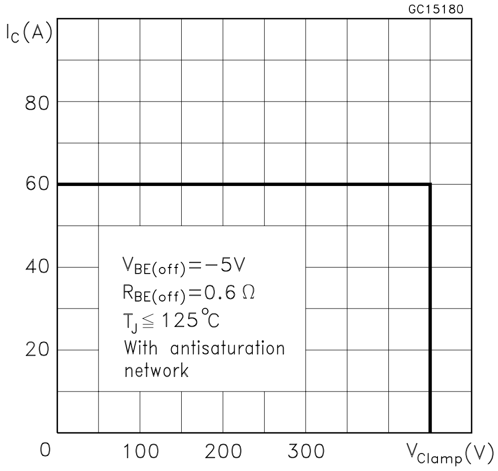
Collector Emitter Saturation Voltage



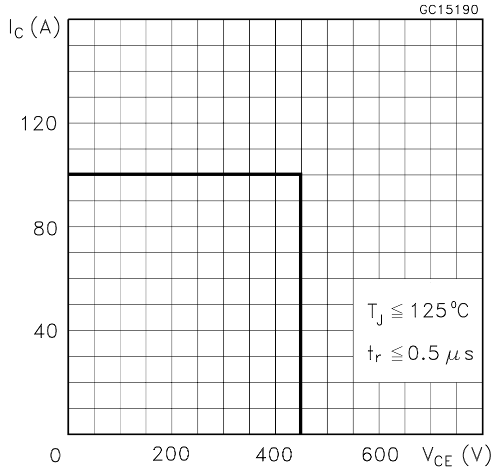
Base-Emitter Saturation Voltage



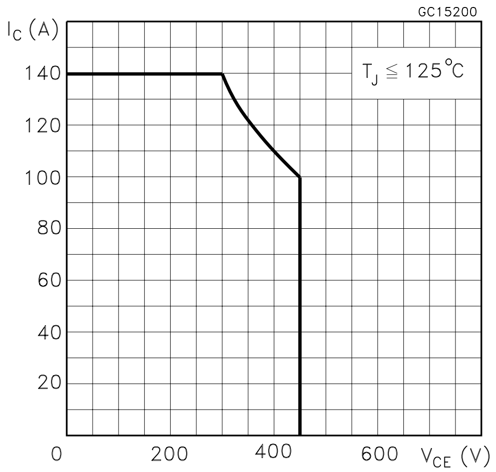
Reverse Biased SOA



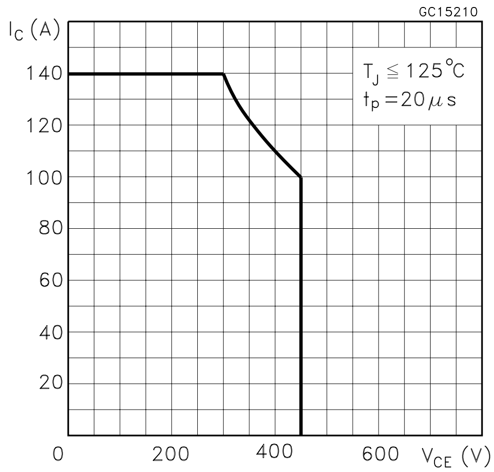
Foward Biased SOA



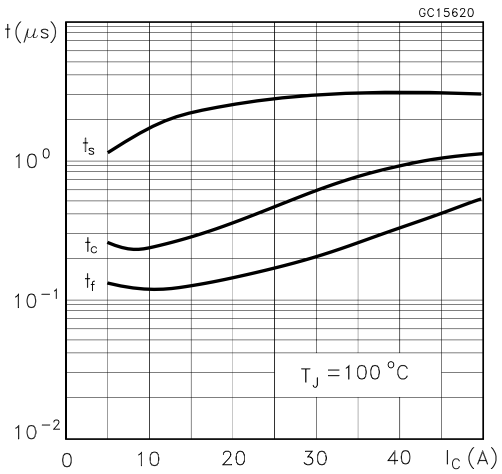
Reverse Biased AOA



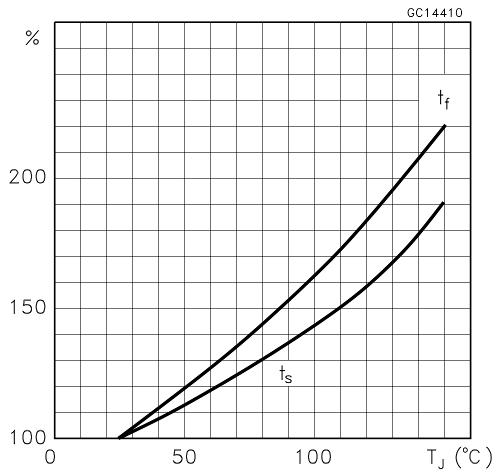
Forward Biased AOA



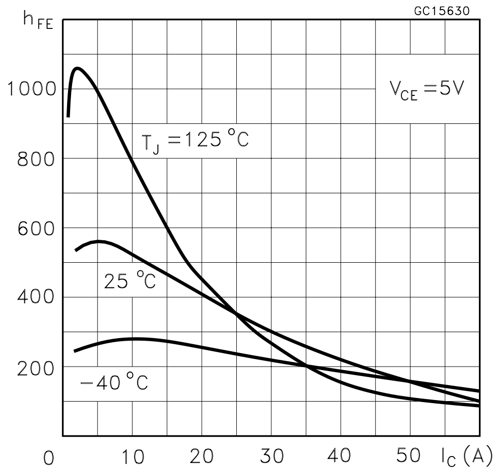
Switching Times Inductive Load



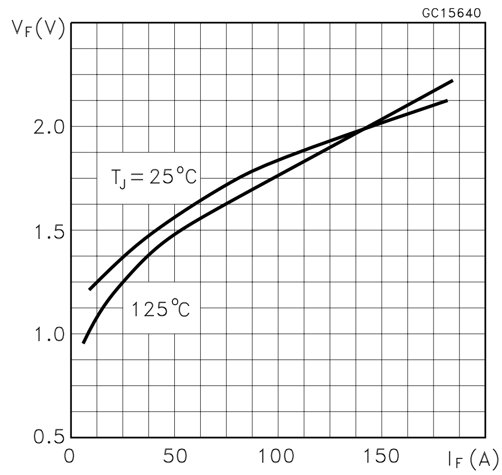
Switching Times Inductive Load Versus Temperature



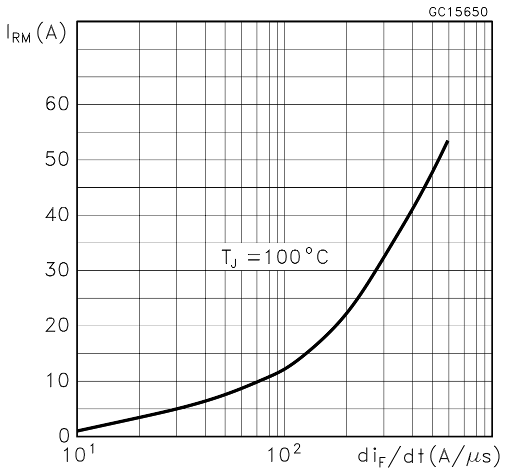
Dc Current Gain



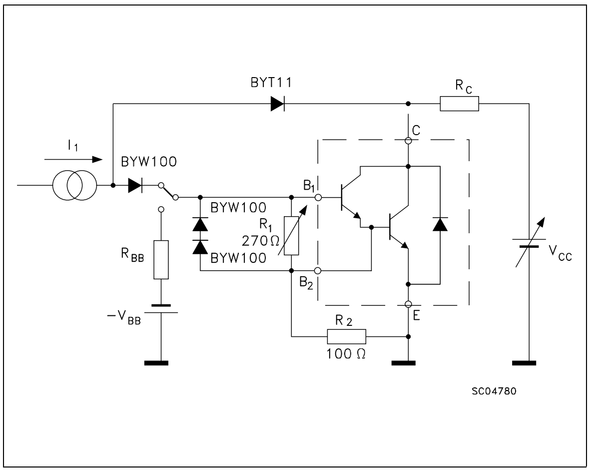
Typical V_F Versus I_F



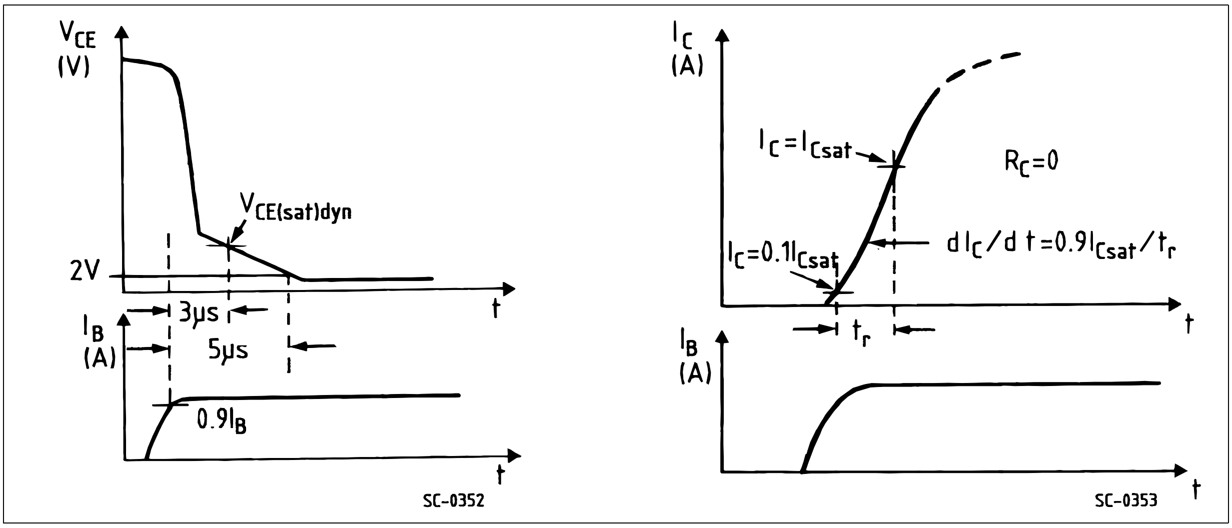
Peak Reverse Current Versus di_F/dt



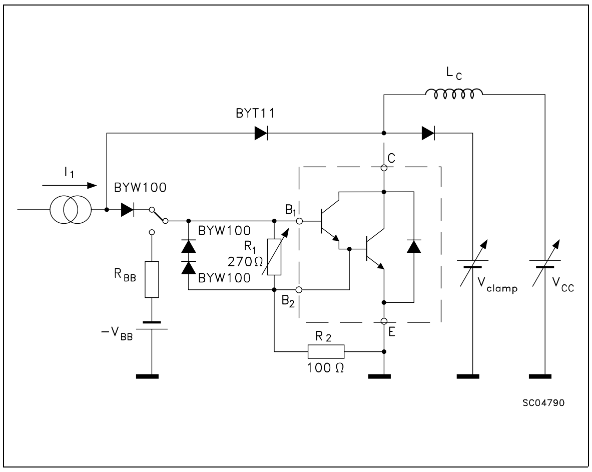
Turn-on Switching Test Circuit



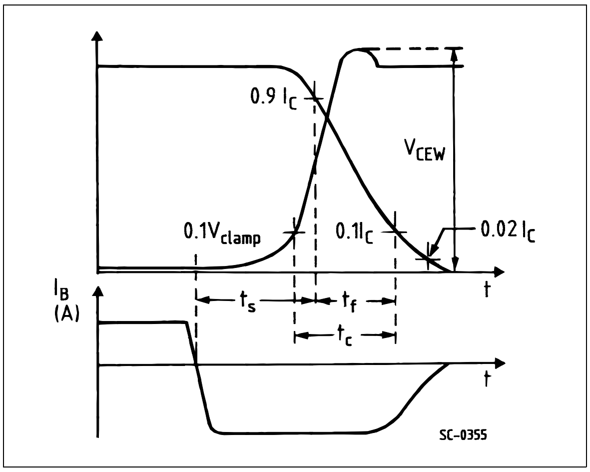
Turn-on Switching Waveforms



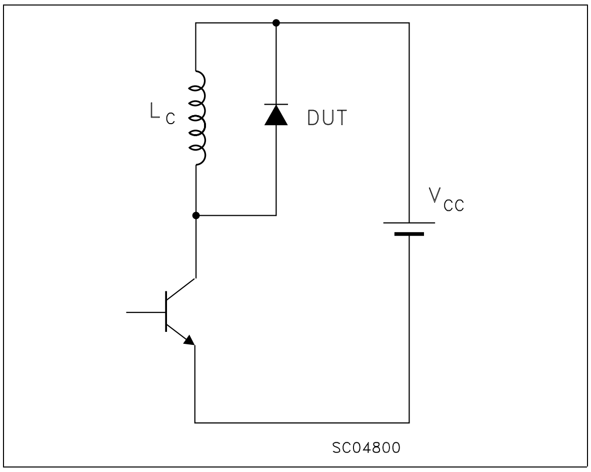
Turn-on Switching Test Circuit



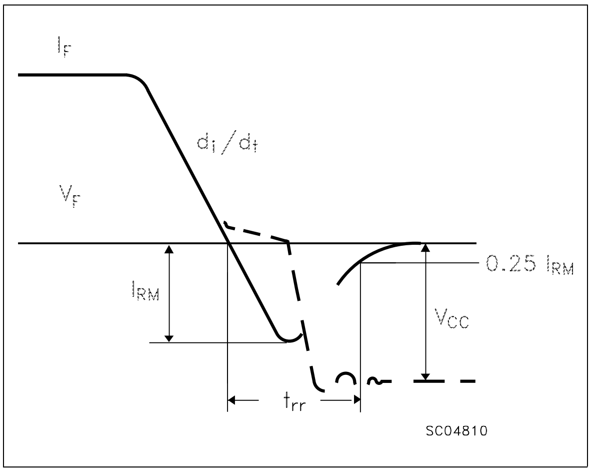
Turn-off Switching Waveforms



Turn-off Switching Test Circuit of Diode



Turn-off Switching Waveform of Diode



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