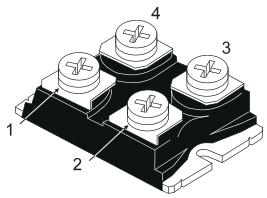
STGE50NB60HD

N-CHANNEL 50A - 600V - ISOTOP
PowerMESH™ IGBT

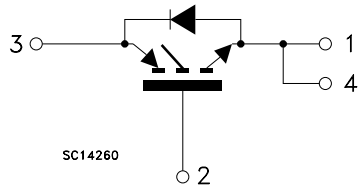
TYPE	V_{CES}	$V_{CE(sat)}$	I_C
STGY50NB60HD	600 V	< 2.8 V	50 A

- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V_{cesat})
- OFF LOSSES INCLUDE TAIL CURRENT
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- CO-PACKAGED WITH TURBOSWITCH™ ANTIPARALLEL DIODE



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



DESCRIPTION

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding perfomances.

The suffix "H" identifies a family optimized for high frequen-cy applications (up to 120kHz)in order to achieve very high switching performances (reduced tfall) mantaining a low voltage drop.

APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- SMPS AND PFC IN BOTH HARD SWITCH AND RESONANT TOPOLOGIES

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage (V_{GS} = 0)	600	V
V_{GE}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current (continuous) at T_C = 25°C	100	A
I_C	Collector Current (continuous) at T_C = 100°C	50	A
I_{CM} (▪)	Collector Current (pulsed)	400	A
P_{TOT}	Total Dissipation at T_C = 25°C	300	W
	Derating Factor	2.4	W/°C
T_{stg}	Storage Temperature	–65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(▪) PULSE WIDTH LIMITED BY SAFE OPERATING AREA

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.416	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	30	°C/W
Rthc-h	Thermal Resistance Case-heatsink Typ	0.1	°C/W

ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collectro-Emitter Breakdown Voltage	I_C = 250 µA, V_{GE} = 0	600			V
I_{CES}	Collector cut-off (V_{GE} = 0)	V_{CE} = Max Rating, T_C = 25 °C			250	µA
		V_{CE} = Max Rating, T_C = 125 °C			1000	µA
I_{GES}	Gate-Emitter Leakage Current (V_{CE} = 0)	V_{GE} = ± 20V , V_{CE} = 0			± 100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	V_{CE} = V_{GE}, I_C = 250µA	3		5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE} = 15V, I_C = 50 A		2.3	2.8	V
		V_{GE} = 15V, I_C = 50 A, Tj =125°C		1.9		V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	V_{CE} = 25 V , I_C = 50 A		22		S
C_{ies}	Input Capacitance	V_{CE} = 25V, f = 1 MHz, V_{GE} = 0		4500		pF
C_{oes}	Output Capacitance			450		pF
C_{res}	Reverse Transfer Capacitance			90		pF
Q_g	Total Gate Charge	V_{CE} = 480V, I_C = 50 A,		260		nC
Q_{ge}	Gate-Emitter Charge	V_{GE} = 15V		28		nC
Q_{gc}	Gate-Collector Charge			15		nC
I_{CL}	Latching Current	V_{clamp} = 480 V Tj = 150°C , R_G = 10 Ω	200			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 480 V, I_C = 50 A		20		ns
t_r	Rise Time	R_G = 10Ω , V_{GE} = 15 V		70		ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{CC}= 480 V, I_C = 50 A,		350		A/µs
Eon	Turn-on Switching Losses	R_G=10Ω V_{GE} = 15 V, Tj = 125°C		950		µJ

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING OFF

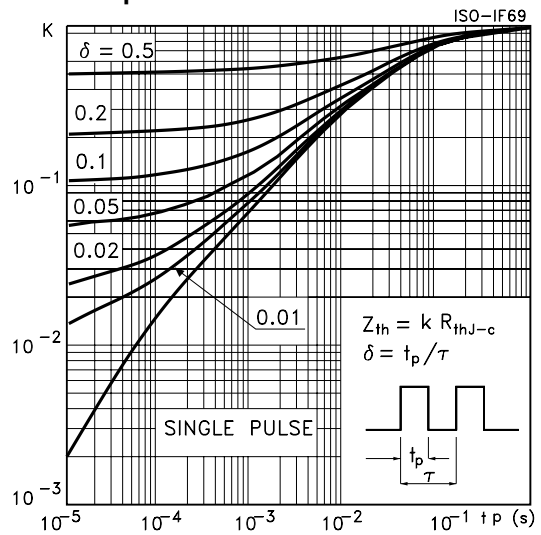
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	V_{cc} = 480 V, I_C = 50 A, R_{GE} = 10 Ω , V_{GE} = 15 V		166		ns
$t_r(V_{off})$	Off Voltage Rise Time			48		ns
$t_d(_{off})$	Delay Time			326		ns
t_f	Fall Time			90		ns
E_{off}(**)	Turn-off Switching Loss			2.1		mJ
E_{ts}	Total Switching Loss			3		mJ
t_c	Cross-over Time	V_{cc} = 480 V, I_C = 50 A, R_{GE} = 10 Ω , V_{GE} = 15 V Tj = 125 °C		270		ns
$t_r(V_{off})$	Off Voltage Rise Time			75		ns
$t_d(_{off})$	Delay Time			340		ns
t_f	Fall Time			200		ns
E_{off}(**)	Turn-off Switching Loss			2.9		mJ
E_{ts}	Total Switching Loss			3.85		mJ

COLLECTOR-EMITTER DIODE

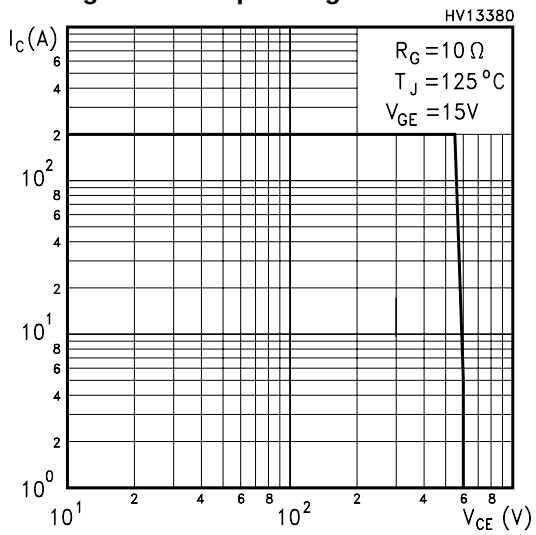
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f I_{fm}	Forward Current Forward Current pulsed				50 400	A A
V_f	Forward On-Voltage	I_f = 50 A I_f = 50 A , Tj = 125 °C		1.65 2	2	V V
t_{rr} Q_{rr} I_{rrm}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_f = 50 A ,V_R = 100 V, Tj =125°C, di/dt = 100A/µs		135 500 7.5		ns nC A

Note: 1. Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %.
2. Pulse width limited by max. junction temperature.
(**)Losses include Also the Tail (Jedec Standardization)

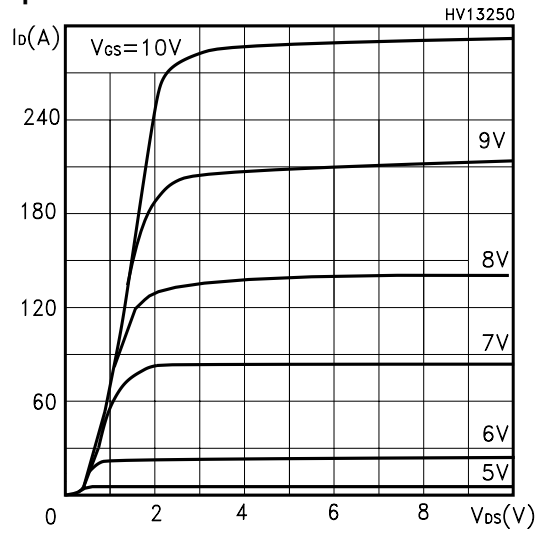
Thermal Impedance



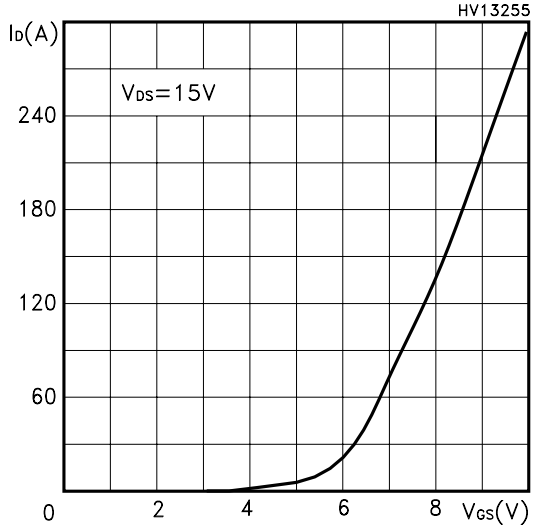
Switching Off Safe Operating Area



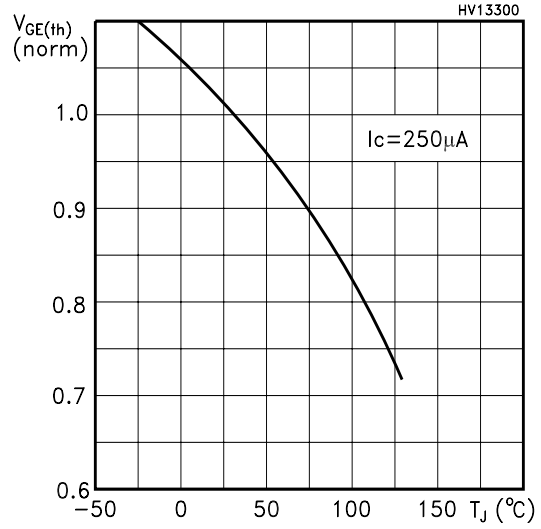
Output Characteristics



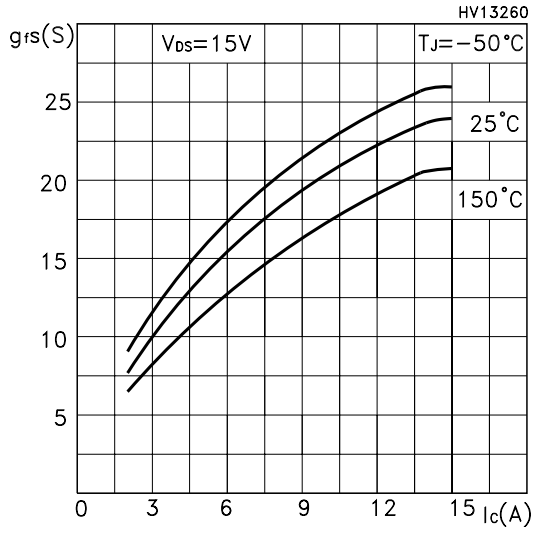
Transfer Characteristics



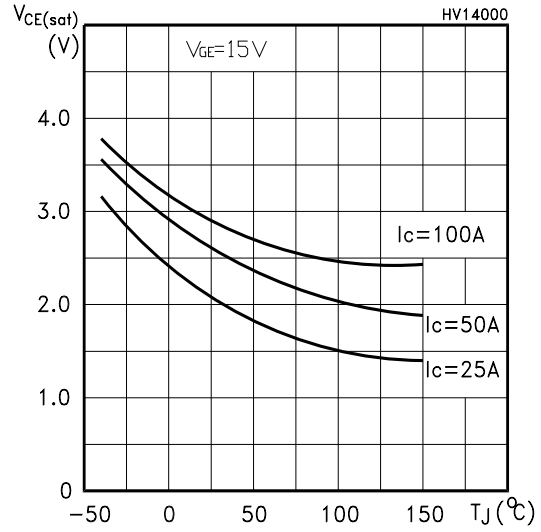
Normalized Gate Threshold Voltage vs Temp.



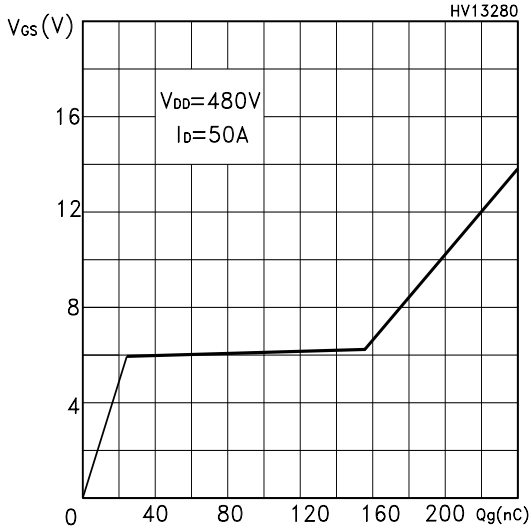
Transconductance



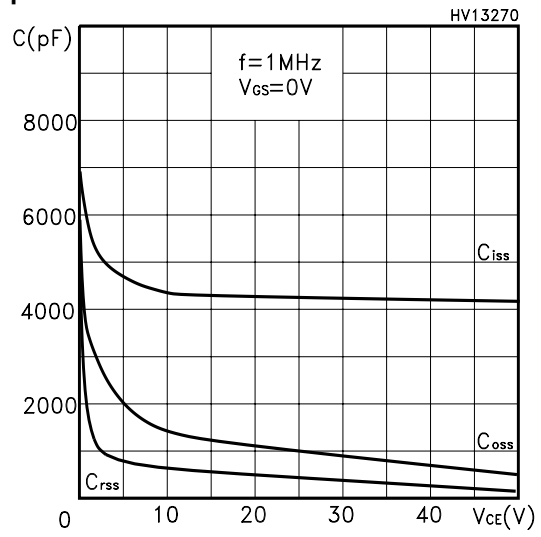
Collector-Emitter On Voltage vs Temperature



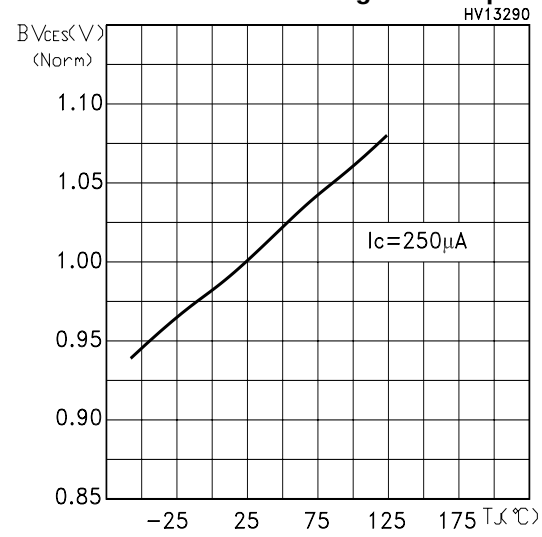
Gate-Charge vs Gate-Emitter Voltage



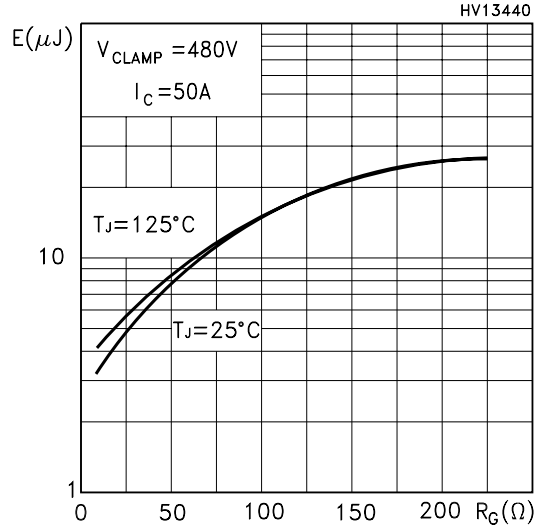
Capacitance Variations



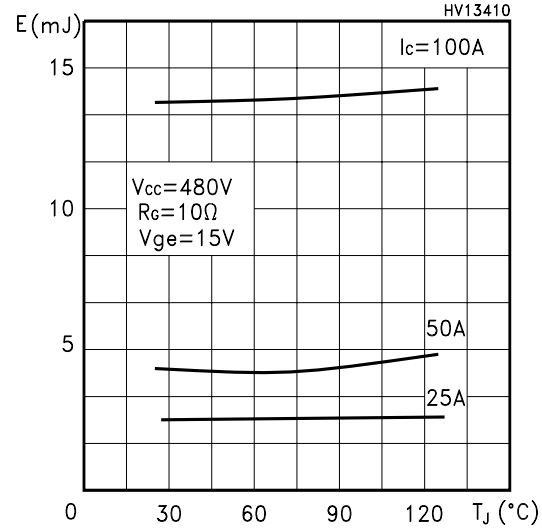
Normalized Break-down Voltage vs Temp.



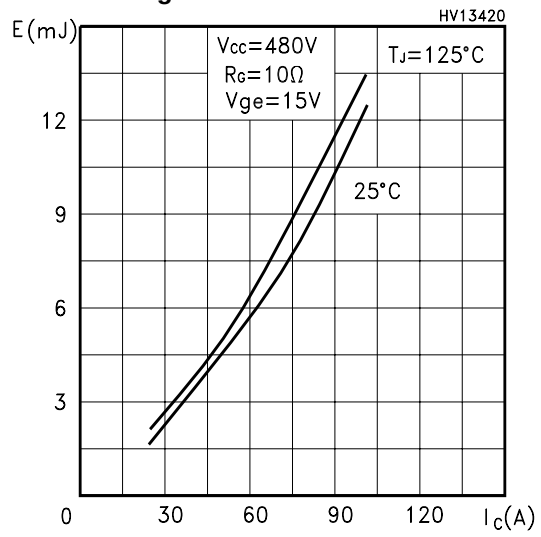
Total Switching losses vs Gate Resistance



Total Switching losses vs Temperature



Total Switching losses vs Ic



Diode Forward Voltage

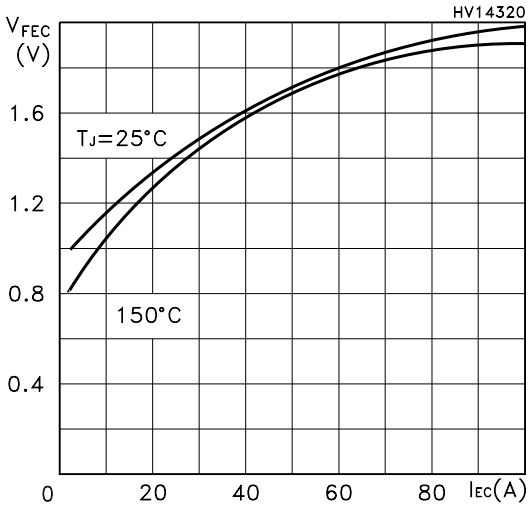


Fig. 1: Gate Charge test Circuit

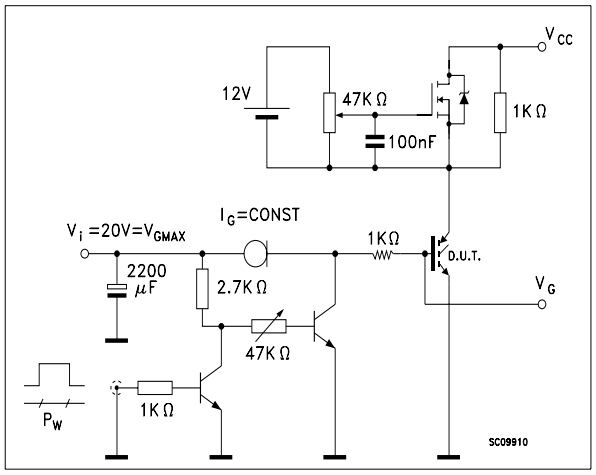
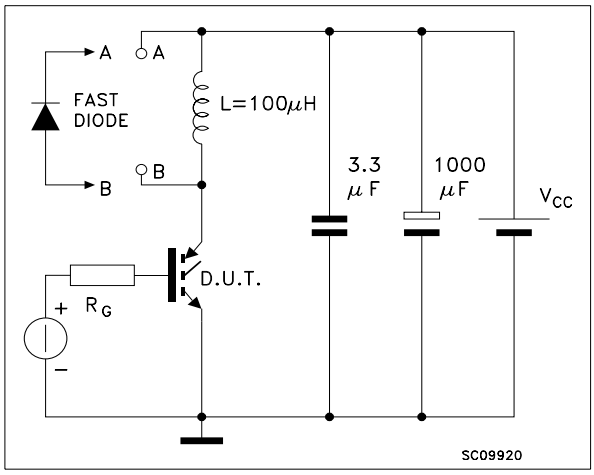
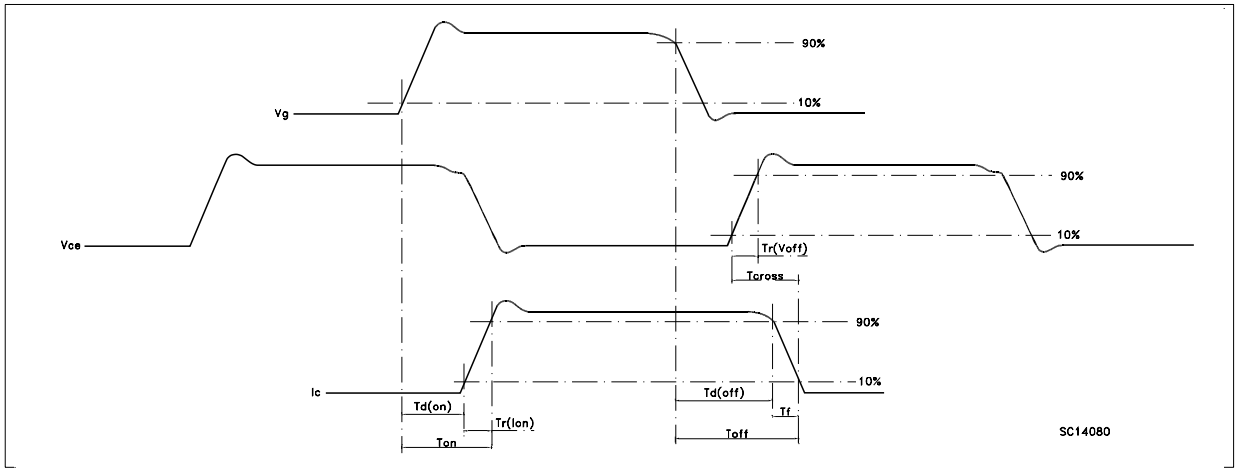


Fig. 2: Test Circuit For Inductive Load Switching





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