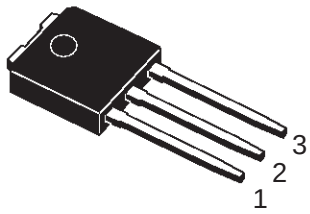
STGD7NB60H-1

N-CHANNEL 7A - 600V IPAK PowerMESH™ IGBT

TYPE	V_{CES}	$V_{CE(sat)}$	I_C
STGD7NB60H-1	600 V	< 2.8 V	7 A

- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V_{cesat})
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- OFF LOSSES INCLUDE TAIL CURRENT
- THROUGH-HOLE IPAK (TO-251) POWER PACKAGE IN TUBE (SUFFIX"-1")



IPAK
TO-251
(Suffix "-1")

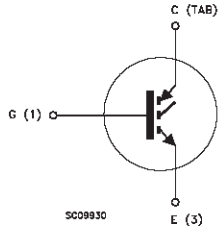
DESCRIPTION

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 to achieve very low switching times for high frequency applications (<120kHz).

APPLICATIONS

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

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage (V_{GS} = 0)	600	V
V_{ECR}	Emitter-Collector Voltage	20	V
V_{GE}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current (continuous) at T_c = 25 °C	14	A
I_C	Collector Current (continuous) at T_c = 100 °C	7	A
I_{CM}(•)	Collector Current (pulsed)	56	A
P_{tot}	Total Dissipation at T_c = 25 °C	55	W
	Derating Factor	0.44	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

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.27	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	100	°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	1.5	°C/W

ELECTRICAL CHARACTERISTICS (T_j = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-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_j = 25 °C V_{CE} = Max Rating T_j = 125 °C			10 100	µA µA
I_{GES}	Gate-Emitter Leakage Current (V_{CE} = 0)	V_{GE} = ± 20 V V_{CE} = 0			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	V_{CE} = V_{GE} I_C = 250 µA	3		5	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	V_{GE} = 15 V I_C = 7 A V_{GE} = 15 V I_C = 7 A T_j = 125 °C		2.3 1.9	2.8	V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	V_{CE} =25 V I_C = 7 A	3.5	5		S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{CE} = 25 V f = 1 MHz V_{GE} = 0	390 45 10	560 68 15	730 90 20	pF pF pF
Q_G Q_{GE} Q_{GC}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	V_{CE} = 480 V I_C = 7 A V_{GE} = 15 V		42 7.9 17.6	55	nC nC nC
I_{CL}	Latching Current	V_{clamp} = 480 V R_G=10Ω T_j = 150 °C	28			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Delay Time Rise Time	V_{CC} = 480 V I_C = 7 A V_{GE}= 15 V R_G = 10Ω		15 48		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{CC} = 480 V I_C = 7 A R_G = 10 Ω V_{GE} = 15 V		160		A/µs
E_{on}	Turn-on Switching Losses	T_j = 125 °C		70		µJ

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

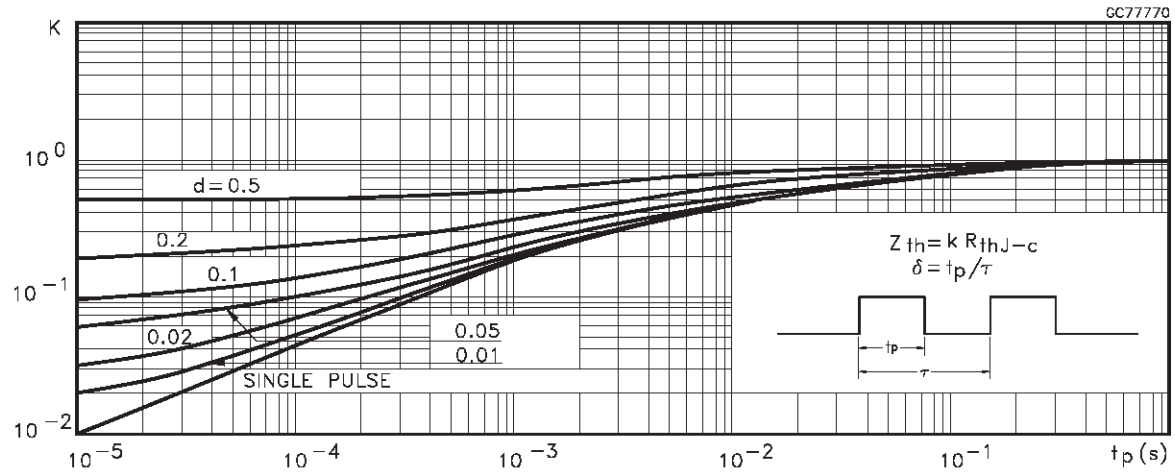
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-Over Time	VCC = 480 V, I_C = 7 A		85		ns
$t_r(v_{off})$	Off Voltage Rise Time	R_{GE} = 10 Ω, V_{GE} = 15 V		20		ns
$t_d(off)$	Delay Time			75		ns
t_f	Fall Time			70		ns
E_{off}(**)	Turn-off Switching Loss			85		µJ
E_{ts}	Total Switching Loss			130		µJ
t_c	Cross-Over Time	VCC = 480 V, I_C = 7 A		150		ns
$t_r(v_{off})$	Off Voltage Rise Time	R_{GE} = 10 Ω, V_{GE} = 15 V		50		ns
$t_d(off)$	Delay Time	T_j = 125 °C		110		ns
t_f	Fall Time			110		ns
E_{off}(**)	Turn-off Switching Loss			220		µJ
E_{ts}	Total Switching Loss			290		µJ

(•) Pulse width limited by max. junction temperature

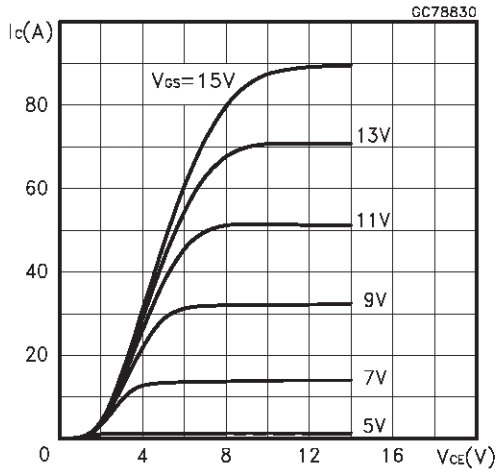
(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

(**)Losses Include Also The Tail (Jedec Standardization)

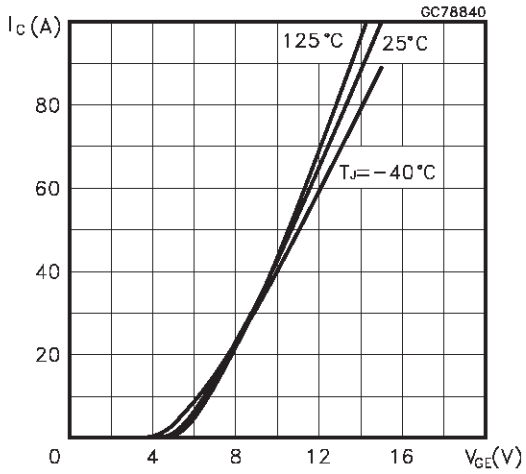
Thermal Impedance



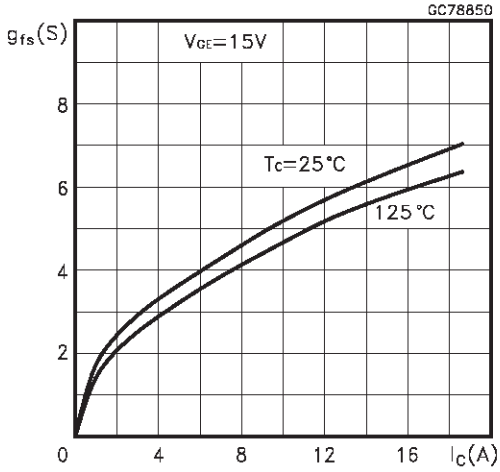
Output Characteristics



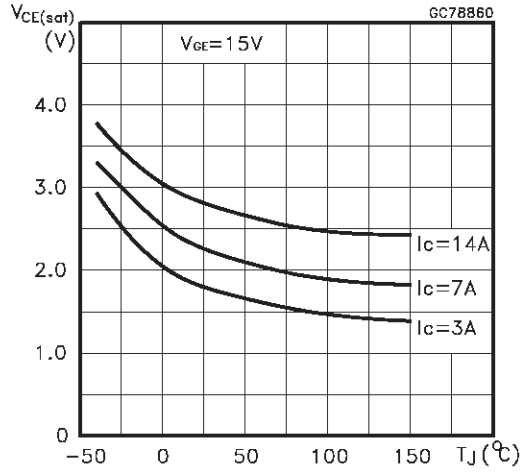
Transfer Characteristics



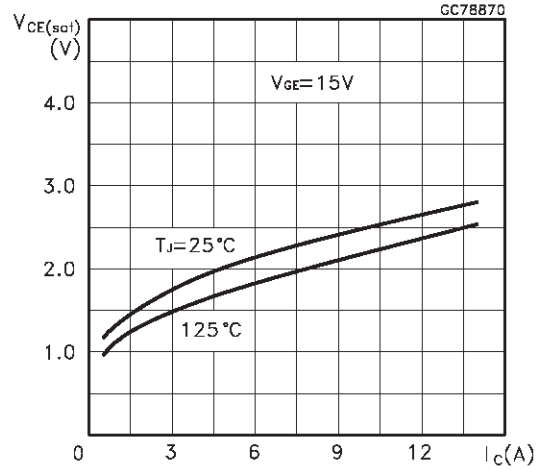
Transconductance



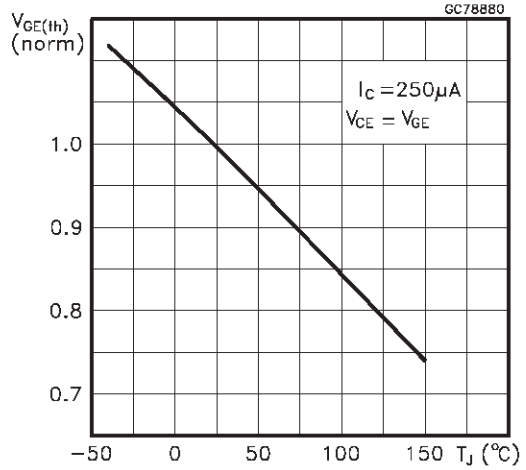
Collector-Emitter On Voltage vs Temperature



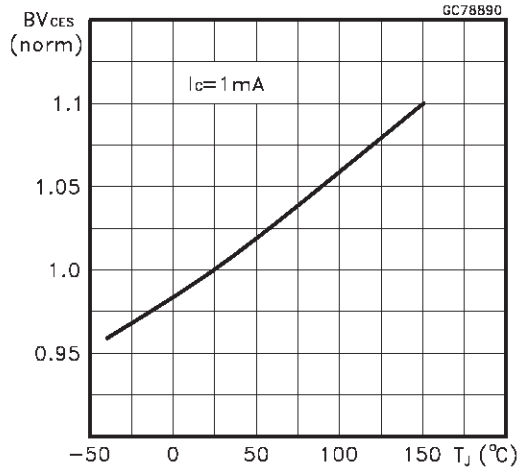
Collector-Emitter On Voltage vs Collector Current



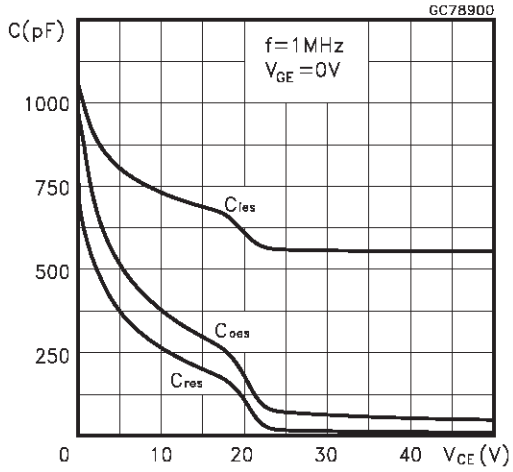
Gate Threshold vs Temperature



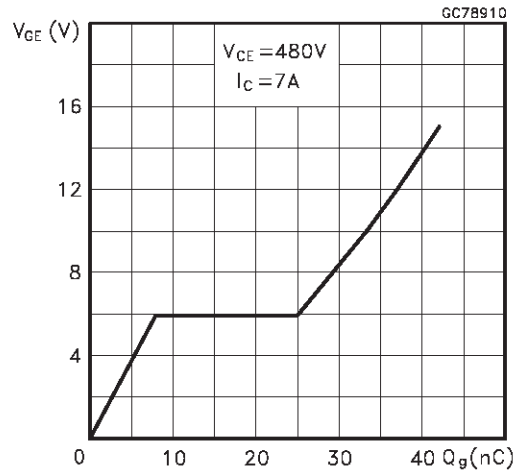
Normalized Breakdown Voltage vs Temperature



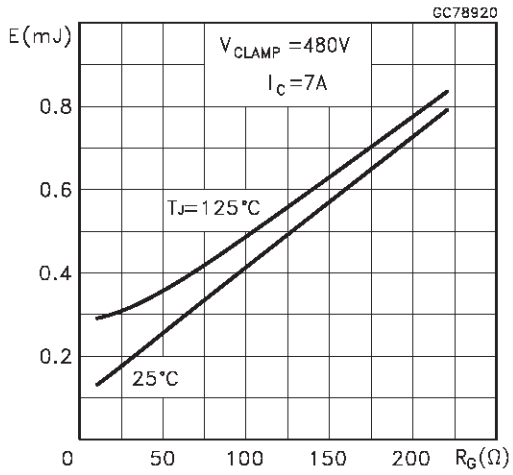
Capacitance Variations



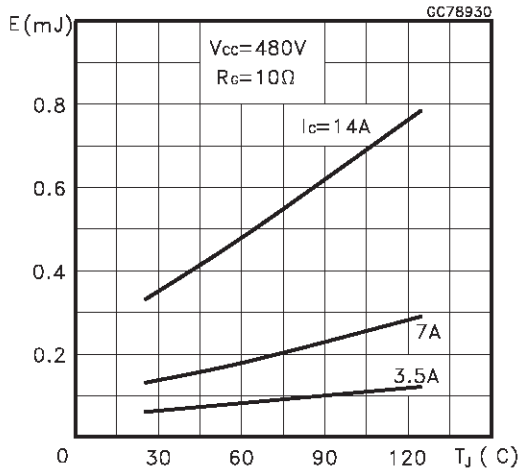
Gate Charge vs Gate-Emitter Voltage



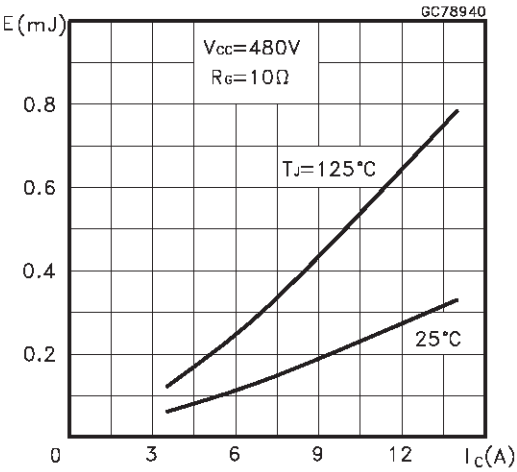
Total Switching Losses vs Gate Resistance



Total Switching Losses vs Temperature



Total Switching Losses vs Collector Current



Switching Off Safe Operating Area

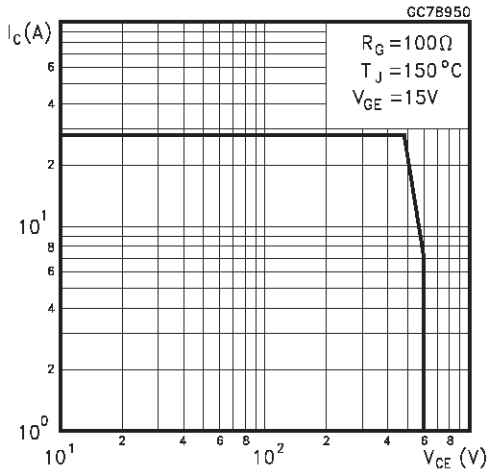


Fig. 1: Gate Charge test Circuit

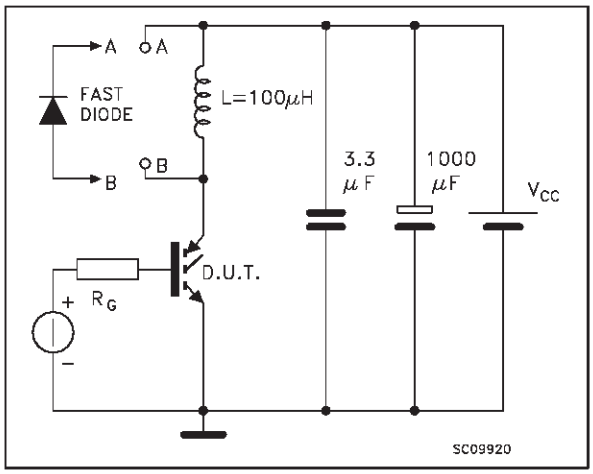


Fig. 2: Test Circuit For Inductive Load Switching

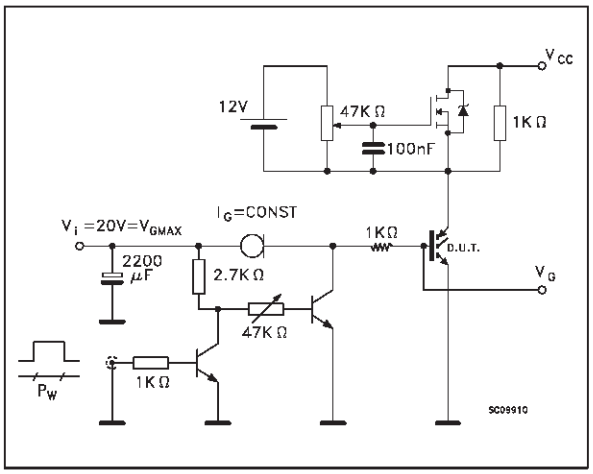
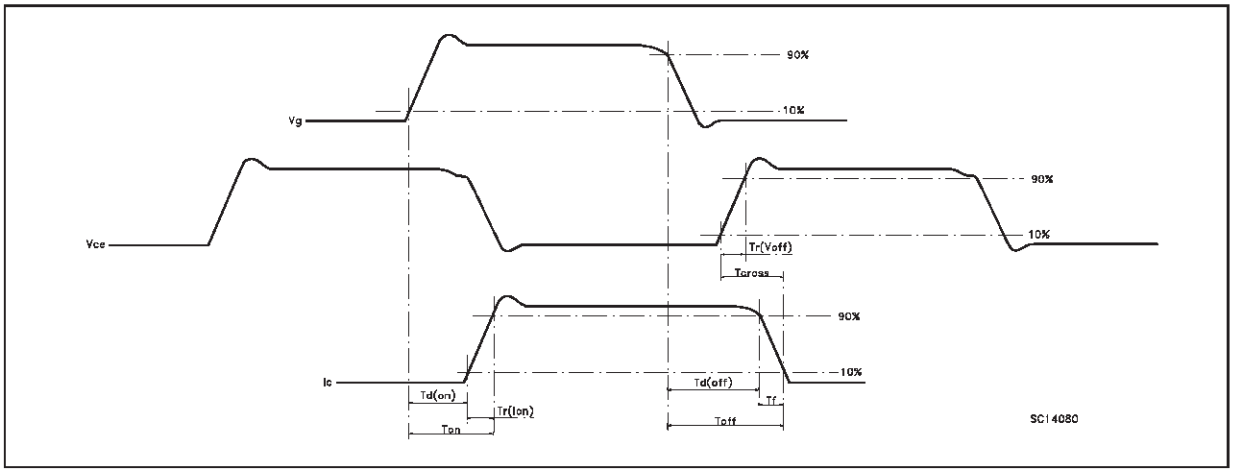
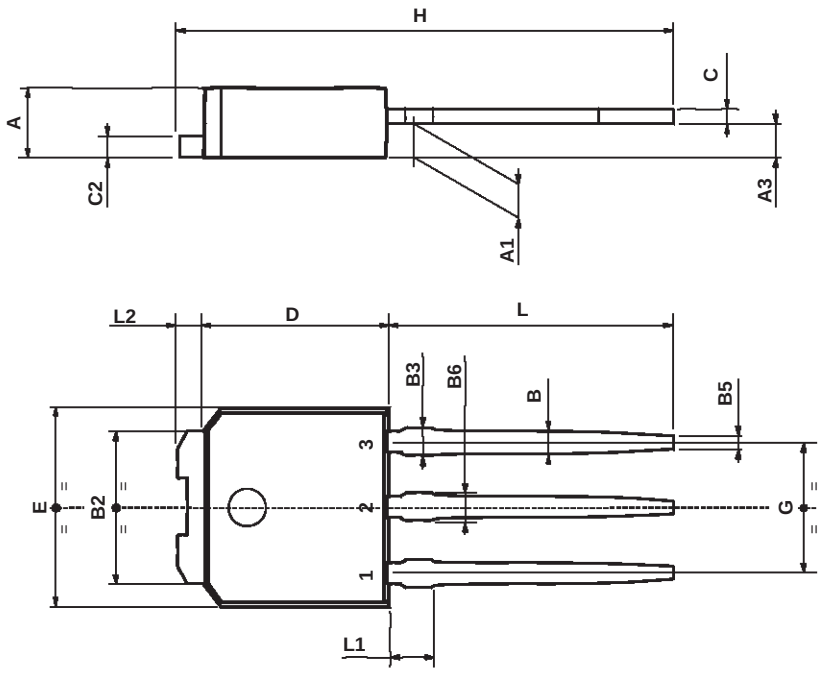


Fig. 3: Switching Waveforms



TO-251 (IPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039



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