

# MT36P25

## P-Channel Enhancement Mode Field Effect Transistor

### Product Summary

- $V_{DS} = -60V$
- $I_D = -25A$  ( $V_{GS} = -10V$ )
- $R_{DS(ON)} 39m\Omega$  @  $V_{GS} = -10V$

### Features

- Advanced Trench Process Technology.
- High Density Cell Design for Ultra Low On-Resistance.
- Lead free product is acquired.
- RoHS Compliant.

### Applications

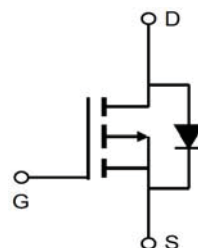
- High side switch for full bridge converter
- DC/DC converter for LCD display



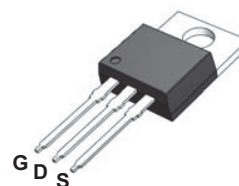
**MT Semiconductor®**

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### Simplified Schematic



### MARKING DIAGRAM & PIN ASSIGNMENT



TO-220FB-3L

### Absolute Maximum Ratings ( $T_A = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	-25	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	-17.7	A
Pulsed Drain Current	$I_{DM}$	-60	A
Maximum Power Dissipation	$P_D$	90	W
Derating factor		0.72	W/ $^\circ C$
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	300	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

### Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	1.4	$^\circ C/W$
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### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
MT36P25	MT36P25	TO-220FB-3L	-	-	50

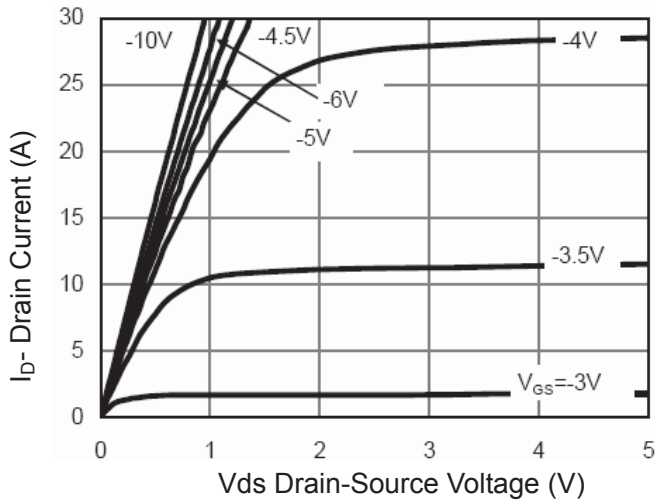
**Electrical Characteristics ( $T_C=25^{\circ}\text{C}$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-60	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-60V, V_{GS}=0V$	-	-	-1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
On Characteristics <small>(Note 3)</small>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-2	-2.9	-3.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-20A$	-	39	45	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=-10V, I_D=-10A$	-	25	-	S
Dynamic Characteristics <small>(Note4)</small>						
Input Capacitance	$C_{ISS}$	$V_{DS}=-30V, V_{GS}=0V,$ $F=1.0MHz$	-	3430	-	PF
Output Capacitance	$C_{OSS}$		-	391	-	PF
Reverse Transfer Capacitance	$C_{RSS}$		-	272	-	PF
Switching Characteristics <small>(Note 4)</small>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-30V, R_L=1.5\Omega,$ $V_{GS}=-10V, R_G=3\Omega$	-	12	-	nS
Turn-on Rise Time	$t_r$		-	15	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	38	-	nS
Turn-Off Fall Time	$t_f$		-	15	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=-30, I_D=-20A,$ $V_{GS}=-10V$	-	46		nC
Gate-Source Charge	$Q_{gs}$		-	9.5		nC
Gate-Drain Charge	$Q_{gd}$		-	10.5		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage <small>(Note 3)</small>	$V_{SD}$	$V_{GS}=0V, I_S=-10A$	-		-1.2	V
Diode Forward Current <small>(Note 2)</small>	$I_S$		-	-	-25	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^{\circ}C, I_F = -10A$ $di/dt = -100A/\mu s$ (Note3)	-	47		nS
Reverse Recovery Charge	$Q_{rr}$		-	53		nC
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

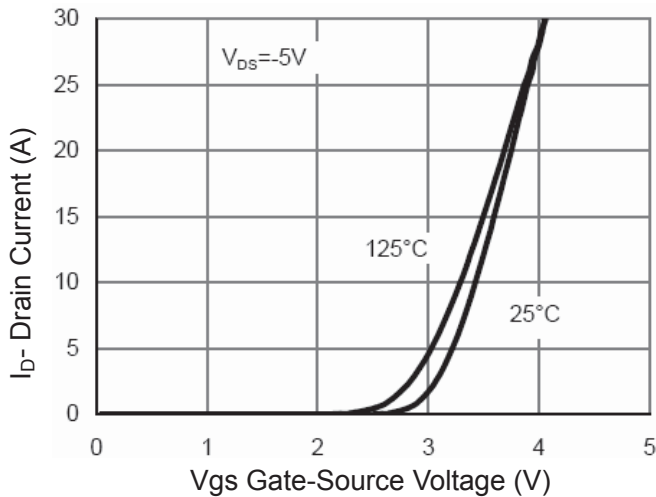
**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5.  $E_{AS}$  condition:  $T_J=25^{\circ}\text{C}, V_{DD}=-20V, V_G=-10V, L=1mH, R_g=25\Omega, I_{AS}=33A$

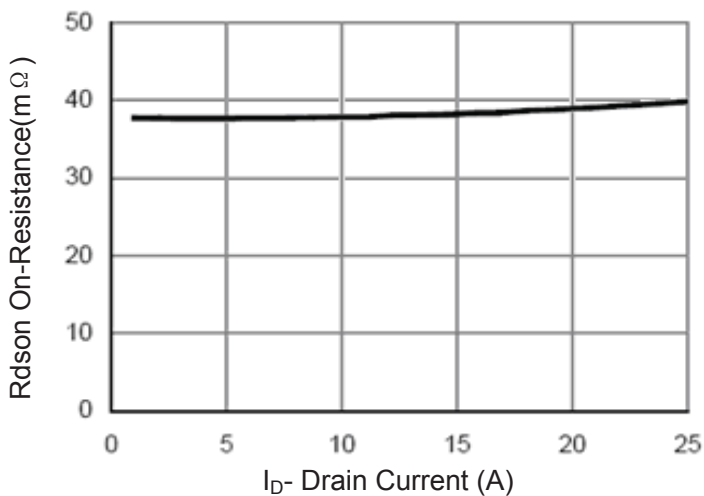
## Characteristics Curve



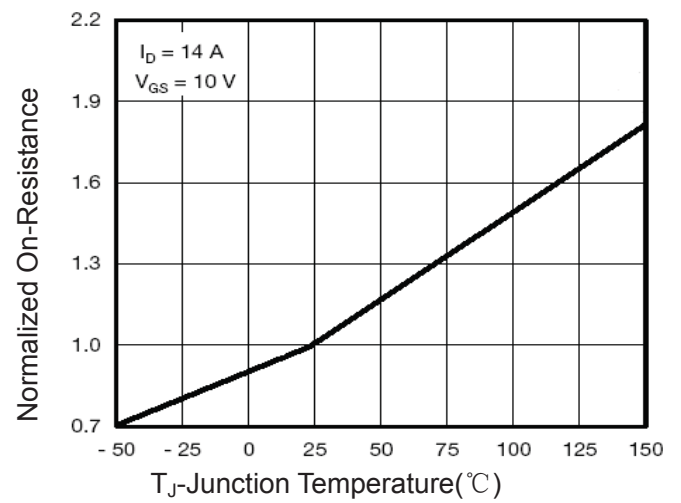
**Figure 1 Output Characteristics**



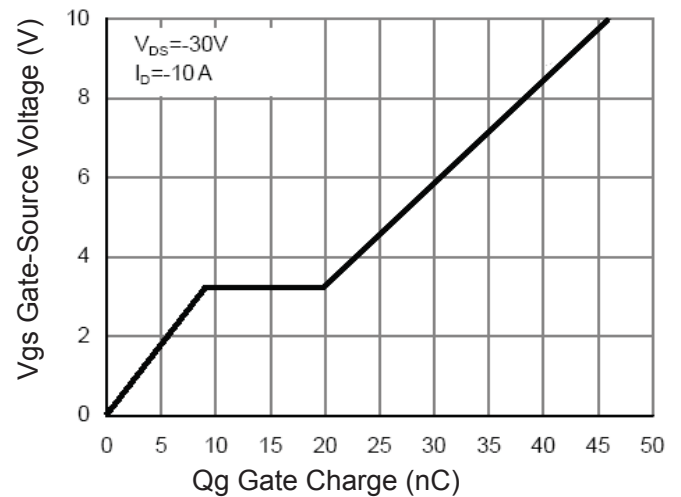
**Figure 2 Transfer Characteristics**



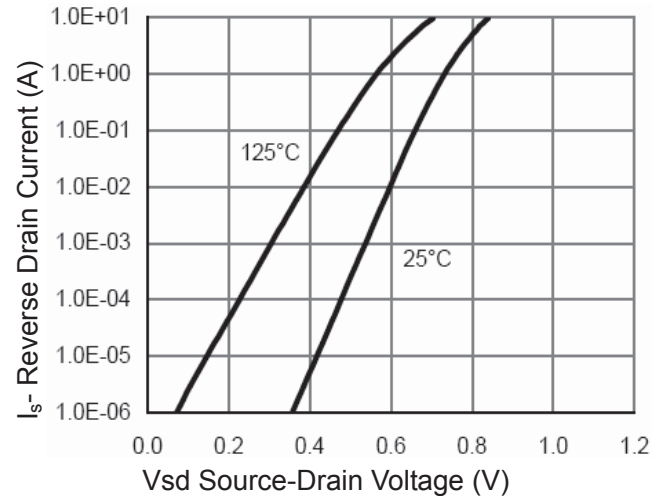
**Figure 3 Rdson- Drain Current**



**Figure 4 Rdson-Junction Temperature**

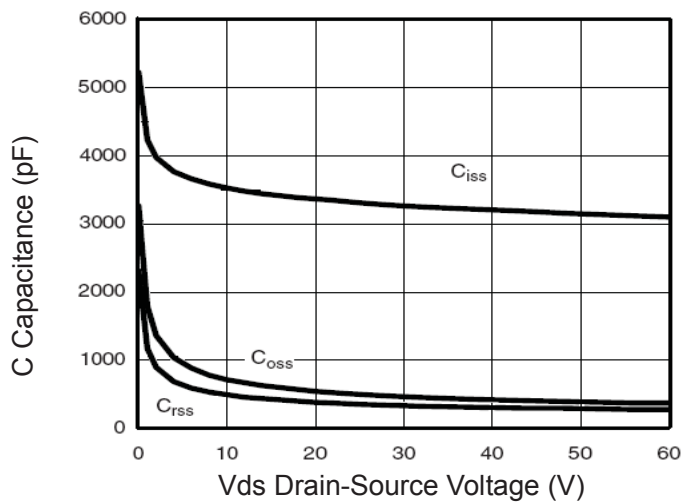


**Figure 5 Gate Charge**

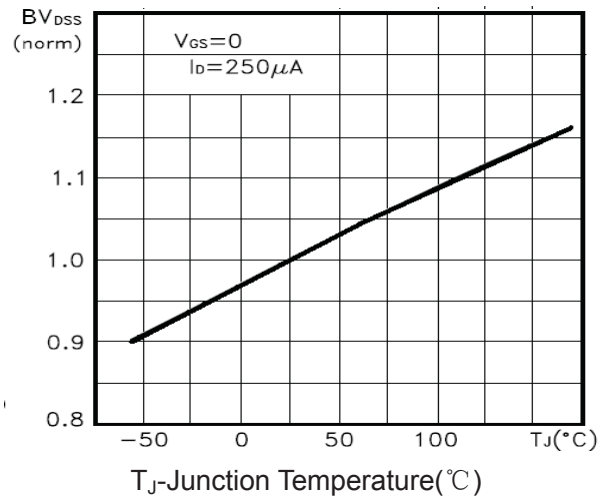


**Figure 6 Source- Drain Diode Forward**

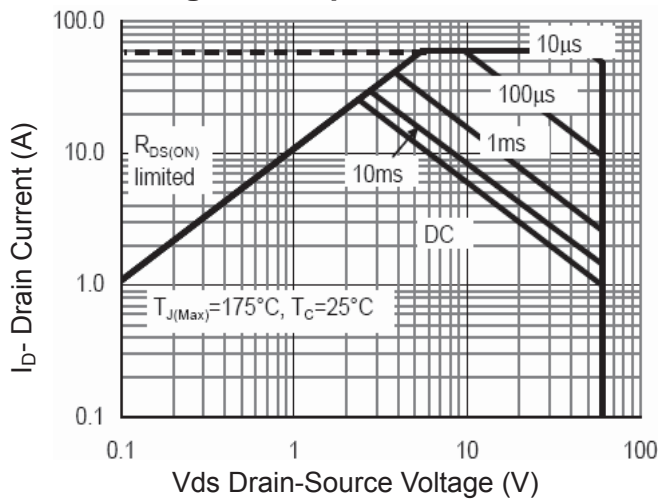
## Characteristics Curve



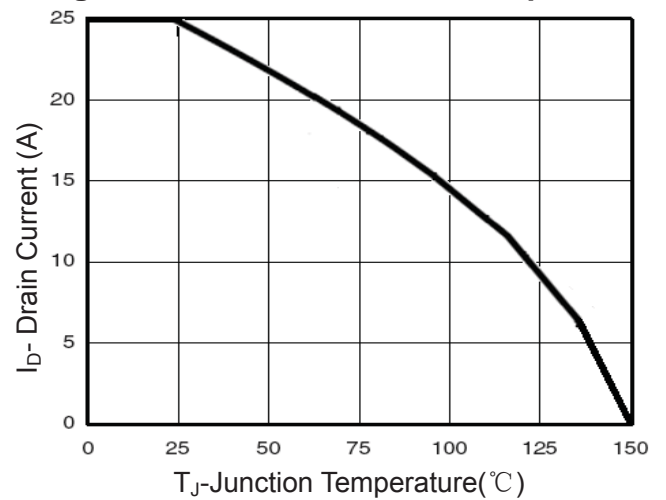
**Figure 7 Capacitance vs Vds**



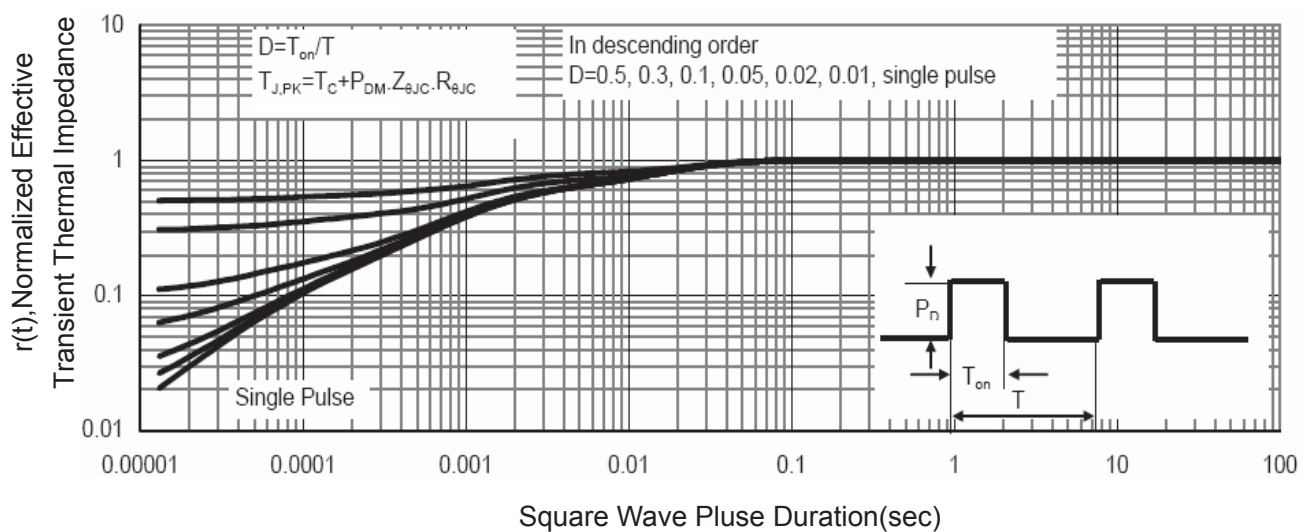
**Figure 9  $BV_{DSS}$  vs Junction Temperature**



**Figure 8 Safe Operation Area**



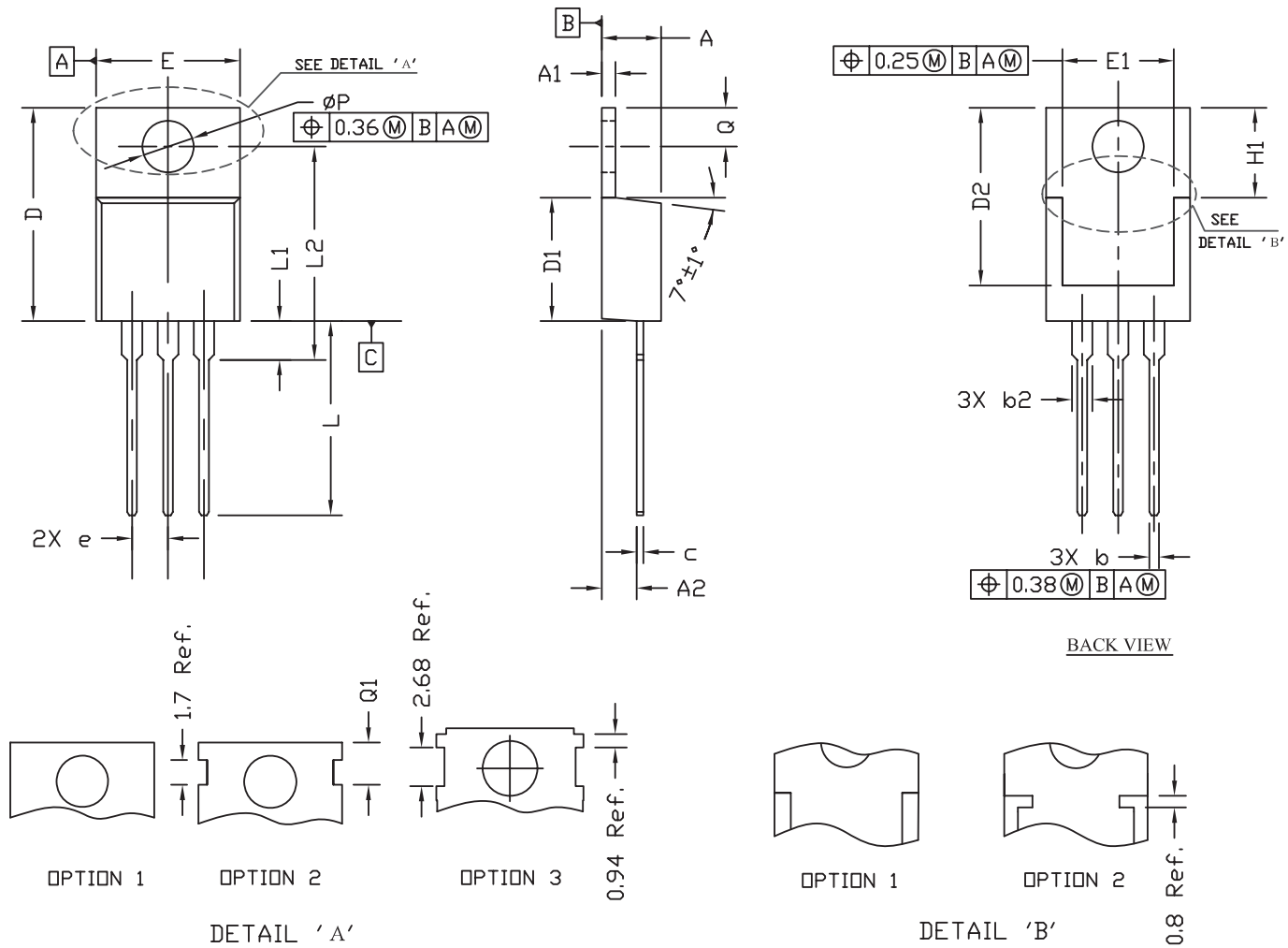
**Figure 10  $I_D$  Current De-rating**



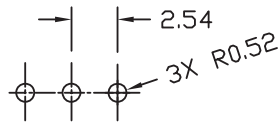
**Figure 11 Normalized Maximum Transient Thermal Impedance**

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# TO220 PACKAGE OUTLINE



## RECOMMENDATION OF HOLE PATTERN



UNIT: mm

- NOTE
1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS. MOLD FLASH SHOULD BE LESS THAN 6 MIL.
  2. TOLERANCE 0.100 MILLIMETERS UNLESS OTHERWISE SPECIFIED.
  3. CONTROLLING DIMENSION IS MILLIMETER.
- CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.30	4.45	4.72	0.169	0.175	0.186
A1	1.15	1.27	1.40	0.045	0.050	0.055
A2	2.20	2.67	2.90	0.087	0.105	0.114
b	0.69	0.81	0.95	0.027	0.032	0.037
b2	1.17	1.37	1.45	0.046	0.050	0.068
c	0.36	0.38	0.60	0.014	0.015	0.024
D	14.50	15.44	15.80	0.571	0.608	0.622
D1	8.59	9.14	9.65	0.338	0.360	0.380
D2	11.43	11.73	12.48	0.450	0.462	0.491
e	2.54 BSC			0.100 BSC		
E	9.66	10.03	10.54	0.380	0.395	0.415
E1	6.22	---	---	0.245	---	---
H1	6.10	6.30	6.50	0.240	0.248	0.256
L	12.27	12.82	14.27	0.483	0.505	0.562
L1	2.47	---	3.90	0.097	---	0.154
L2	---	---	16.70	---	---	0.657
Q	2.59	2.74	2.89	0.102	0.108	0.114
$\phi P$	3.50	3.84	3.89	0.138	0.151	0.153
Q1	2.70	---	2.90	0.106	---	0.114

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