

## P-Channel Enhancement Mode Power MOSFET

### Description

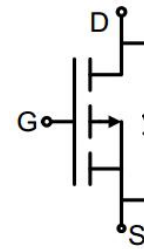
The G040P04M uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge. It can be used in a wide variety of applications.

### General Features

- $V_{DS}$  -40V
- $I_D$  (at  $V_{GS} = -10V$ ) -222A
- $R_{DS(ON)}$  (at  $V_{GS} = -10V$ ) < 3.5m $\Omega$
- $R_{DS(ON)}$  (at  $V_{GS} = -4.5V$ ) < 4.5m $\Omega$
- 100% Avalanche Tested
- RoHS Compliant

### Application

- Power switch
- DC/DC converters



Schematic diagram



TO-263

### Ordering Information

Device	Package	Marking	Packaging
G040P04M	TO-263	G040P04	800pcs/Reel

### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ , unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	-40	V
Continuous Drain Current	$I_D$	-222	A
Pulsed Drain Current (note1)	$I_{DM}$	-888	A
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Power Dissipation	$P_D$	312	W
Single pulse avalanche energy (note2)	$E_{AS}$	625	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 To 150	$^\circ\text{C}$

### Thermal Resistance

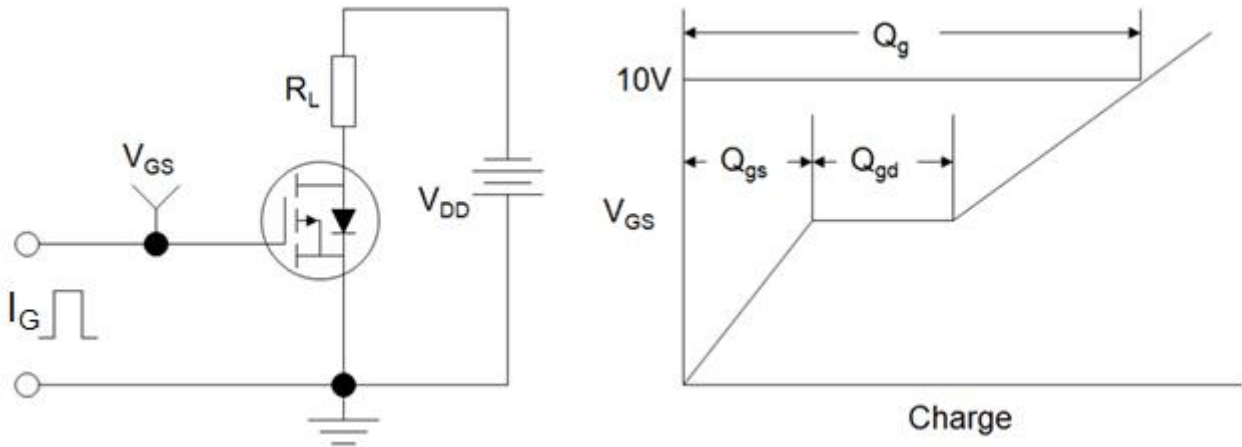
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Ambient	$R_{thJA}$	50	$^\circ\text{C/W}$
Maximum Junction-to-Case	$R_{thJC}$	0.4	$^\circ\text{C/W}$

Specifications $T_J = 25^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
<b>Static Parameters</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-40	--	--	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -40V, V_{GS} = 0V$	--	--	-1	$\mu A$
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 20V$	--	--	$\pm 100$	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-1.0	-1.6	-2.5	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = -10V, I_D = -15A$	--	2.9	3.5	m $\Omega$
		$V_{GS} = -4.5V, I_D = -15A$	--	3.7	4.5	
Forward Transconductance	$g_{FS}$	$V_{DS} = -5V, I_D = -15A$	--	44	--	S
<b>Dynamic Parameters</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0V,$ $V_{DS} = -20V,$ $f = 1.0MHz$	--	14983	--	pF
Output Capacitance	$C_{oss}$		--	2060	--	
Reverse Transfer Capacitance	$C_{rss}$		--	1391	--	
Total Gate Charge	$Q_g$	$V_{DD} = -20V,$ $I_D = -15A,$ $V_{GS} = -10V$	--	206	--	nC
Gate-Source Charge	$Q_{gs}$		--	41	--	
Gate-Drain Charge	$Q_{gd}$		--	26	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = -20V,$ $I_D = -15A,$ $R_G = 1.6\Omega$	--	44	--	ns
Turn-on Rise Time	$t_r$		--	49	--	
Turn-off Delay Time	$t_{d(off)}$		--	138	--	
Turn-off Fall Time	$t_f$		--	44	--	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Body Diode Current	$I_S$	$T_C = 25^\circ\text{C}$	--	--	-222	A
Body Diode Voltage	$V_{SD}$	$T_J = 25^\circ\text{C}, I_{SD} = -15A, V_{GS} = 0V$	--	--	-1.2	V
Reverse Recovery Charge	$Q_{rr}$	$I_F = -15A, V_{GS} = 0V$ $di/dt = -100A/\mu s$	--	198	--	nC
Reverse Recovery Time	$T_{rr}$		--	77	--	ns

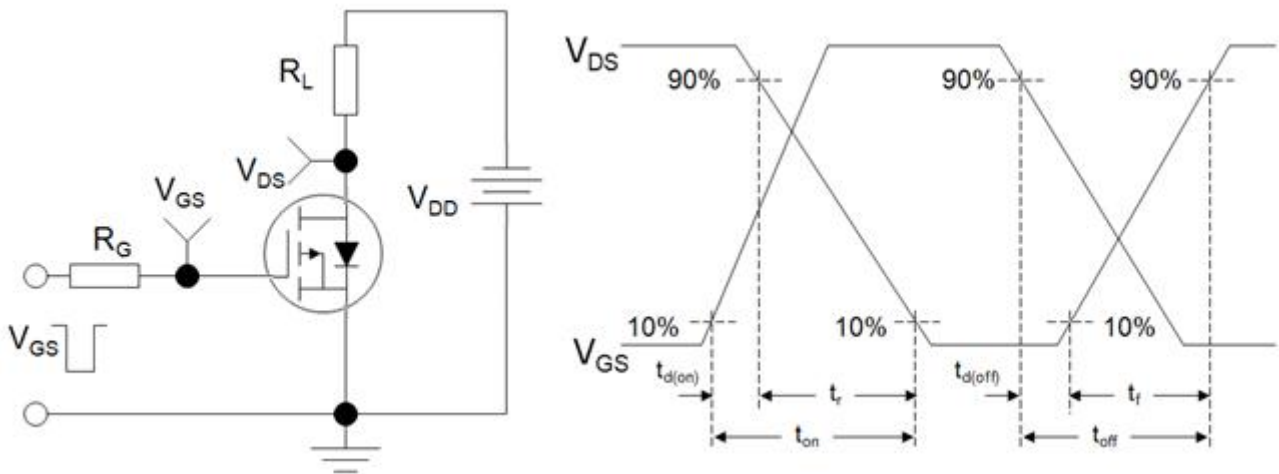
## Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition :  $T_J = 25^\circ\text{C}, V_{DD} = -40V, V_{GS} = -10V, L = 0.5mH, R_G = 25\Omega$
3. Identical low side and high side switch with identical  $R_G$

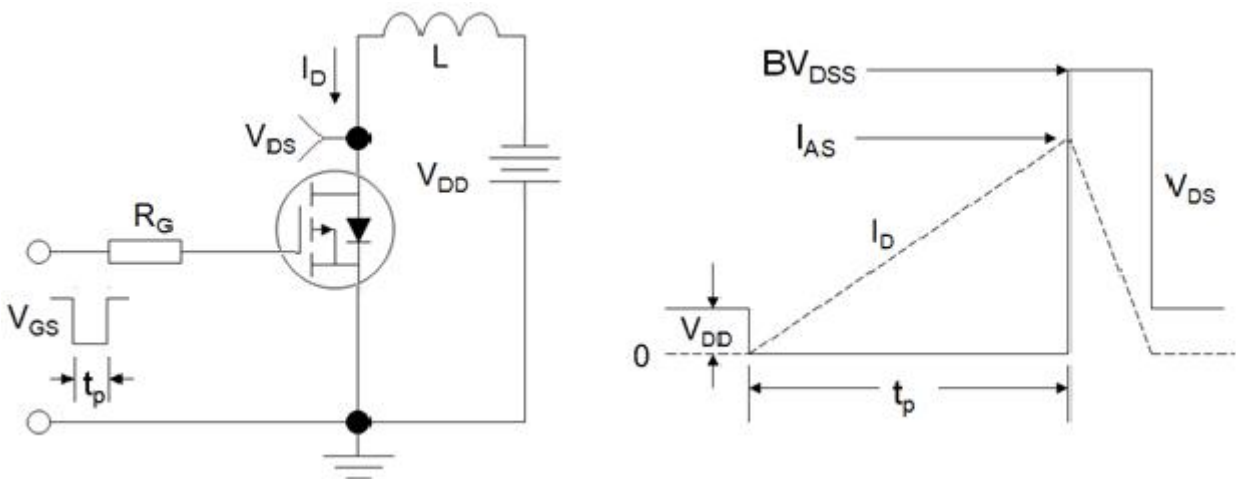
### Gate Charge Test Circuit



### Switch Time Test Circuit

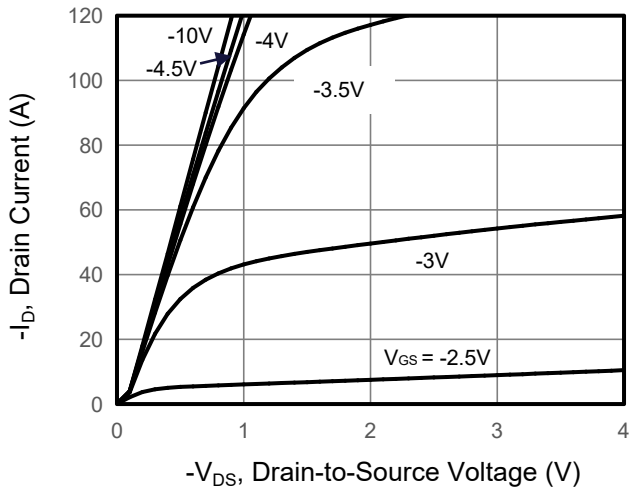


### EAS Test Circuit

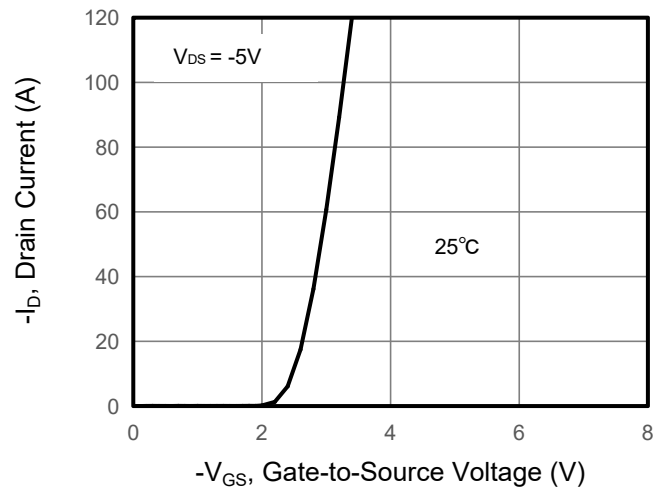


Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

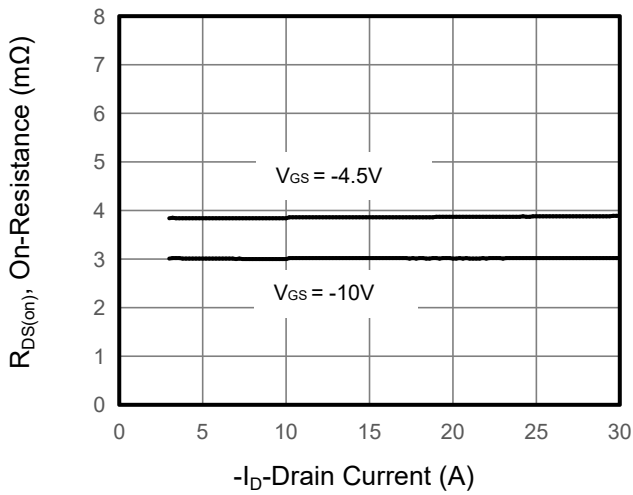
**Figure 1. Output Characteristics**



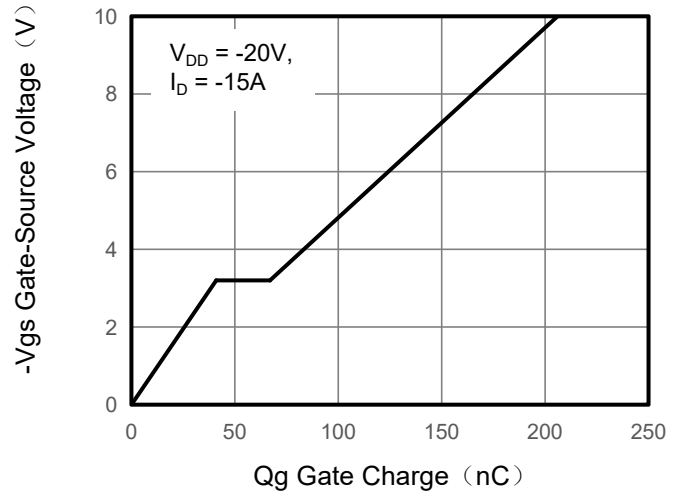
**Figure 2. Transfer Characteristics**



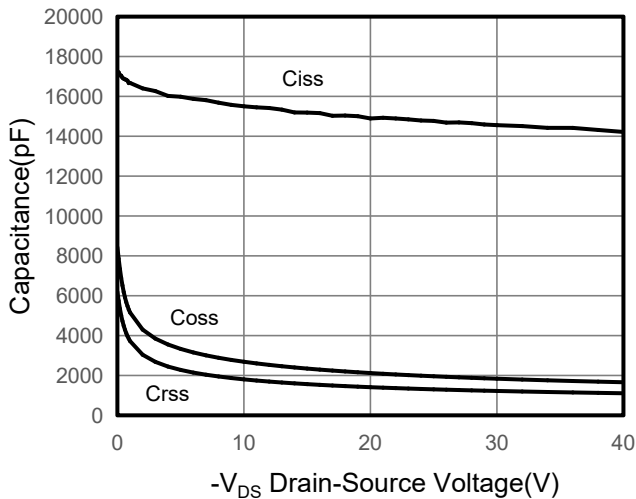
**Figure 3. Drain Source On Resistance**



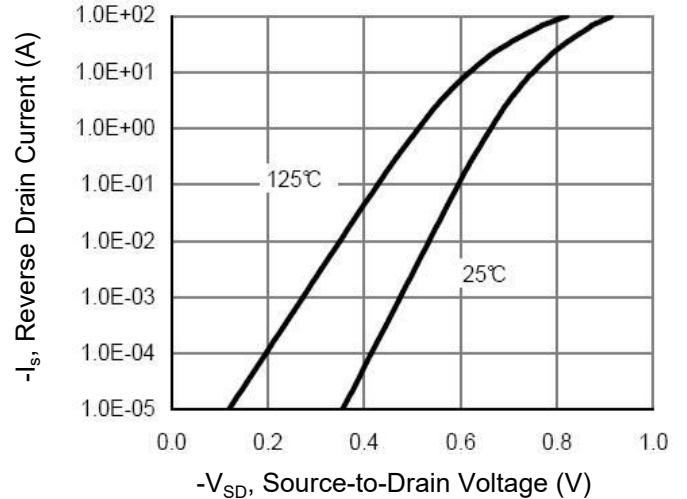
**Figure 4. Gate Charge**



**Figure 5. Capacitance**



**Figure 6. Source-Drain Diode Forward**



Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Figure 7. Drain-Source On-Resistance

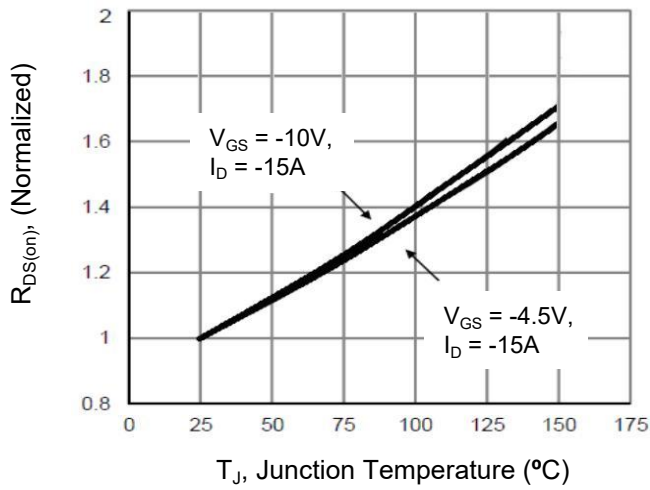


Figure 10. Safe Operation Area

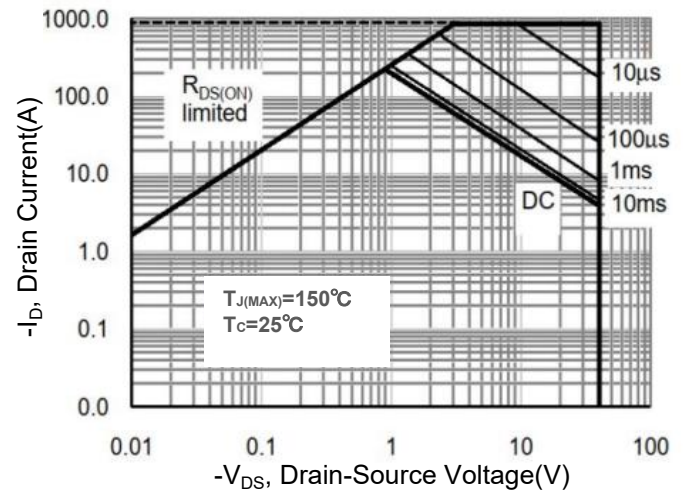
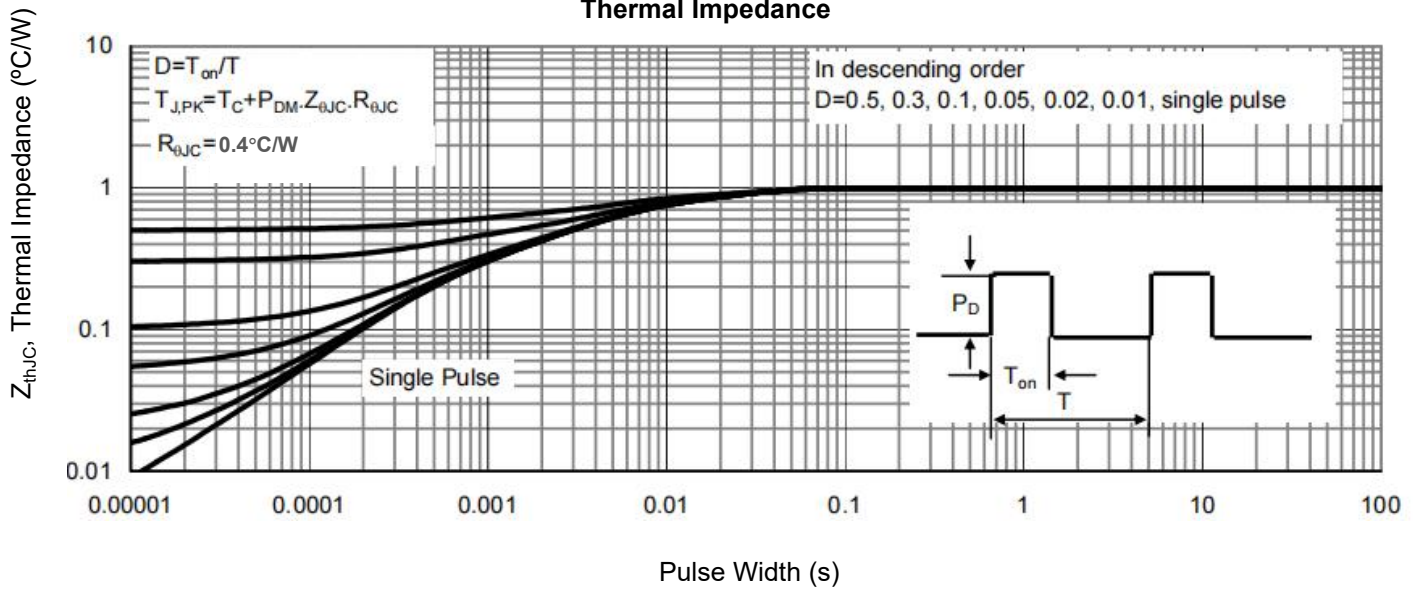
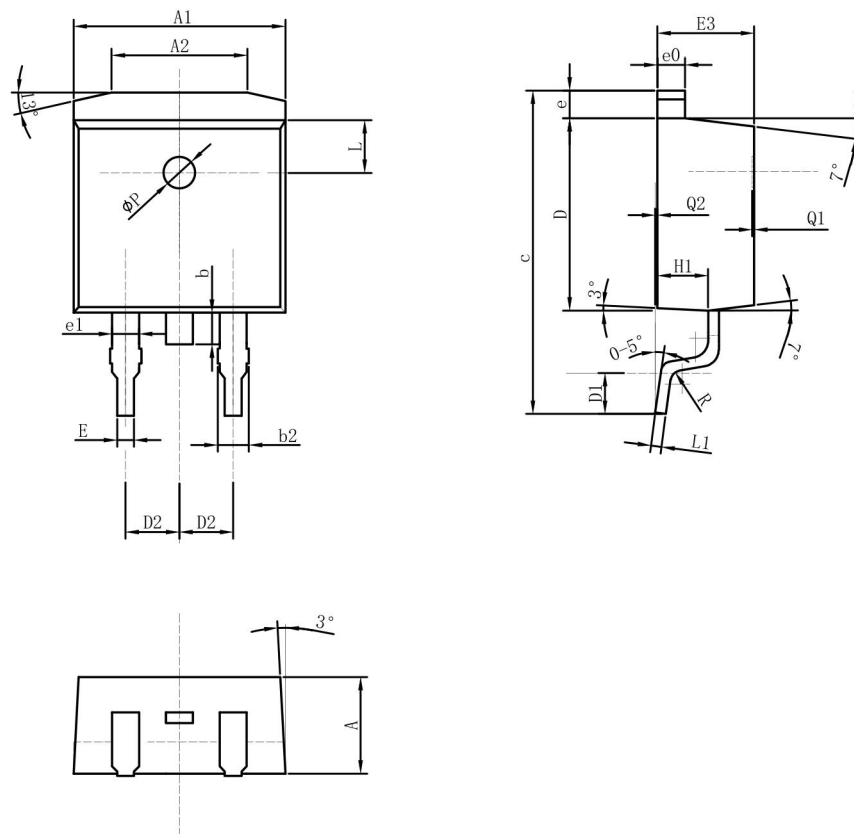


Figure 9. Normalized Maximum Transient Thermal Impedance



## TO-263 Package Information



### COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	4.52	4.57	4.62
A1	9.95	10.00	10.05
A2	6.30	6.40	6.50
b	1.30	1.50	1.70
b2	1.17	1.27	1.37
c	14.80	15.00	15.20
D	9.05	9.10	9.15
D1	1.90	2.10	2.30
D2	-	2.54	-
E	-	0.80	-
E3	-	4.57	-
e	-	1.30	-
e0	-	1.30	-
e1	1.73	3	-
H1	-	2.40	-
L	-	2.50	-
L1	-	0.50	-
$\phi P$	-	1.50	-
R	-	0.50	-
Q1	0.10	-	0.15
Q2	0	-	0.02

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