Features

- Super Low Gate Charge
- Green Device Available
- Excellent Cdv/dt effect decline
- Advanced high cell density Trench technology
- 100% EAS Guaranteed

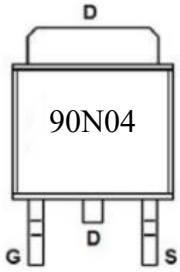
Bvdss	Rdson	ID
40V	4.5mΩ	90A

Application

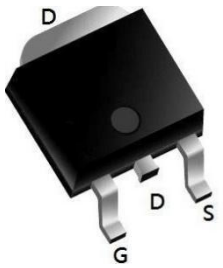
- PWM applications
- Load Switch
- Power management

RoHS

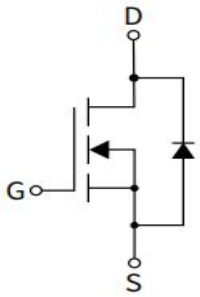
Package



Marking and pin assignment



TO252 top view



Schematic diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Quantity
90N04	90N04	TO252	2500

Absolute Maximum Ratings

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_C = 25℃	I_D	90	A
	T_C = 100℃		44	A
Pulsed Drain Current[1]		I_{DM}	280	A
Single Pulse Avalanche Energy[2]		E_{AS}	121	mJ
Total Power Dissipation[4]	T_C = 25℃	P_D	60	W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	℃

Thermal Resistance Ratings

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance, Junction to Ambient[3]	$R_{\theta JA}$	--	34	℃/W
Thermal Resistance Junction-case	$R_{\theta JC}$	--	2.1	℃/W

Ordering Information

Ordering Number	Package	Pin Assignment			Packing
Halogen Free		G	D	S	
HL90N04	TO252	1	2	3	Tape Reel

Electrical Characteristics (T_J=25℃unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	B_{VDSS}	I_D=250uA,V_{GS}=0V	40	---	---	V
Static Drain-Source On-Resistance[4]	$R_{DS(ON)}$	V_{GS}=10V , I_D=30A	---	4.5	5.9	mΩ
		V_{GS}=4.5V , I_D=20A	---	6.6	8.6	
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS} , I_D =250uA	1.3	1.8	2.3	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=40V, V_{GS}=0V	---	---	1.0	uA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
Total Gate Charge	Q_G	V_{GS}=10V, V_{DS}=20V, I_D=30A	---	59	---	nC
Gate-Source Charge	Q_{GS}		---	12	---	
Gate-Drain Charge	Qgd		---	12	---	
Turn-On Delay Time	$T_{D(ON)}$	V_{GS}=10V, V_{DS}=20V, I_D=30A, R_{GEN}=3Ω	---	11	---	ns
Turn-On Rise Time	T_R		---	32	---	
Turn-Off Delay Time	$T_{D(OFF))}$		---	52	---	
Turn-Off Fall Time	T_F		---	13	---	
Input Capacitance	C_{ISS}	V_{DS}=20V , V_{GS}=0V , f=1MHz	---	3031	---	pF
Output Capacitance	C_{OSS}		---	213	---	
Reverse Transfer Capacitance	C_{RSS}		---	179	---	
Maximum Continuous Drain to Source Diode Forward Current		I_S	-	-	90	A
Maximum Pulsed Drain to Source Diode Forward Current		I_{SM}	-	-	280	A
Drain to Source Diode Forward Voltage	V_{GS} = 0V,I_S = 30A	V_{SD}	-	-	1.2	V
Body Diode Reverse Recovery Time	I_F = 20A, di/dt = 100A/us	T_{rr}	-	13	-	ns
Body Diode Reverse Recovery Charge		Q_{rr}	-	7	-	nC

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.

2. EAS condition: Starting T_J=25C, V_{DD}=20V, V_G=10V, R_G=25ohm, L=0.5mH, I_{AS}=22A

3. $R_{\theta JA}$ is measured with the device mounted on a 1inch^2 pad of 2oz copper FR4 PCB

4. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%.

Typical Performance Characteristics

Figure 1: Output Characteristics

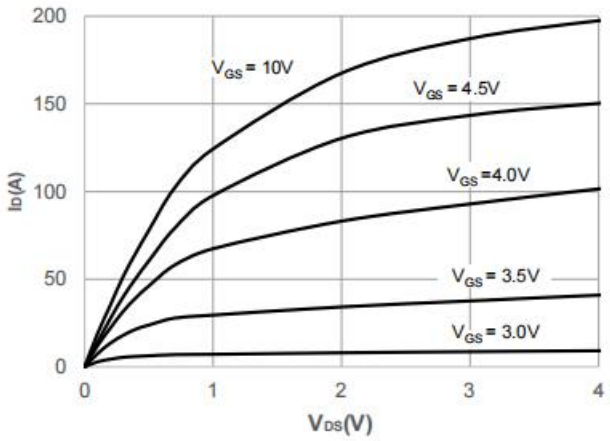


Figure 2: Typical Transfer Characteristics

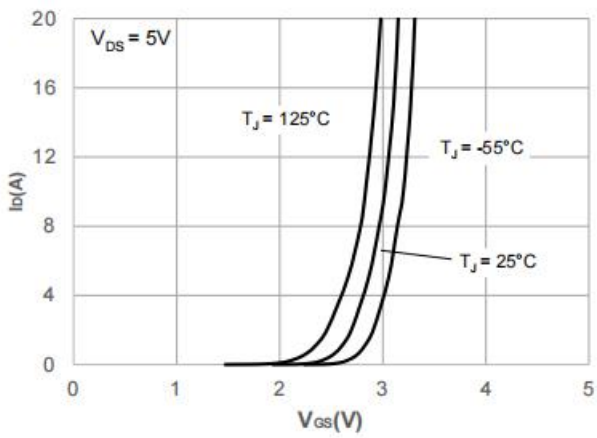


Figure 3: On-resistance vs. Drain Current

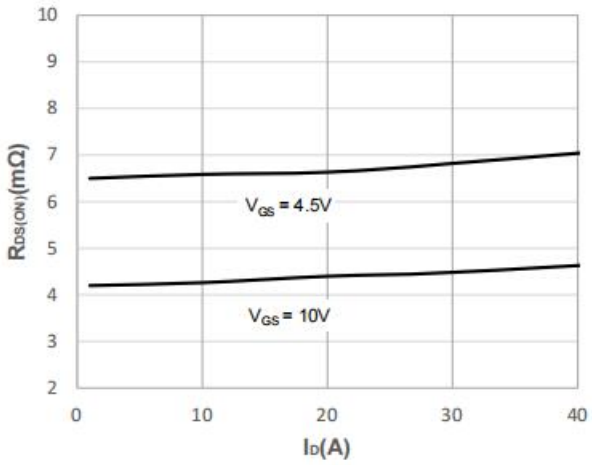


Figure 4: Body Diode Characteristics

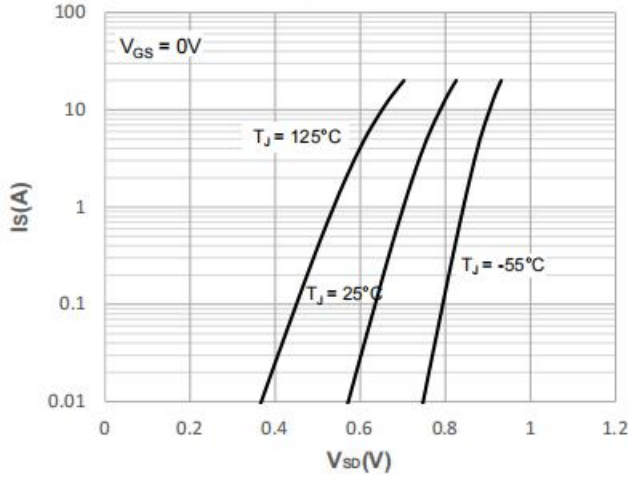


Figure 5: Gate Charge Characteristics

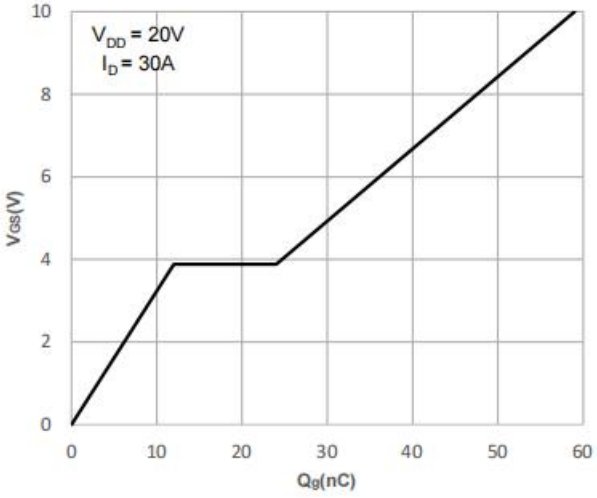


Figure 6: Capacitance Characteristics

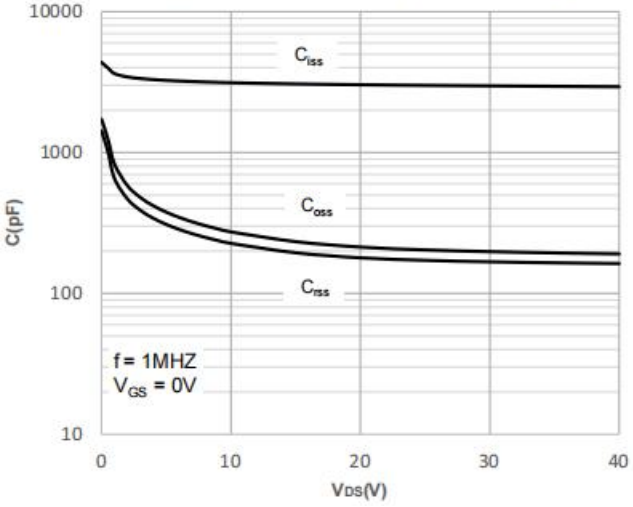


Figure 7: Normalized Breakdown voltage vs. Junction Temperature

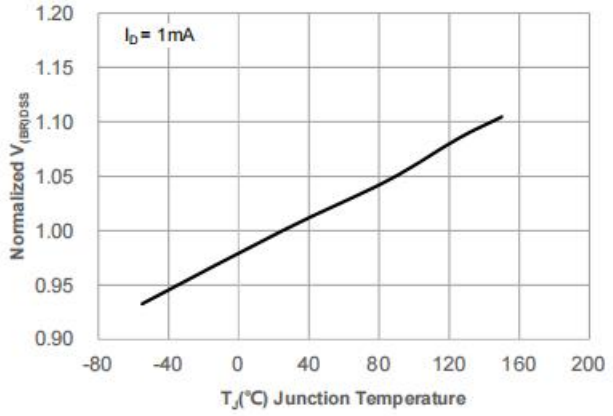


Figure 8: Normalized on Resistance vs. Junction Temperature

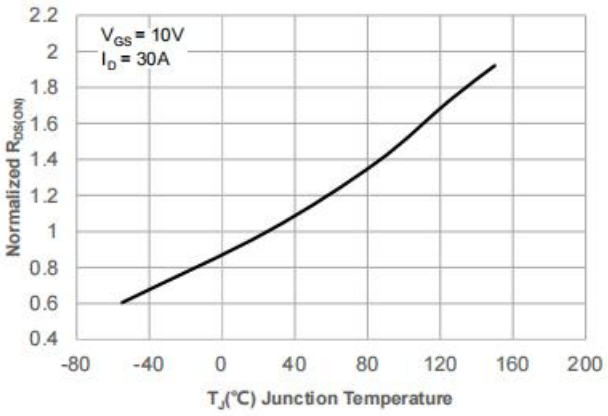


Figure 9: Maximum Safe Operating Area

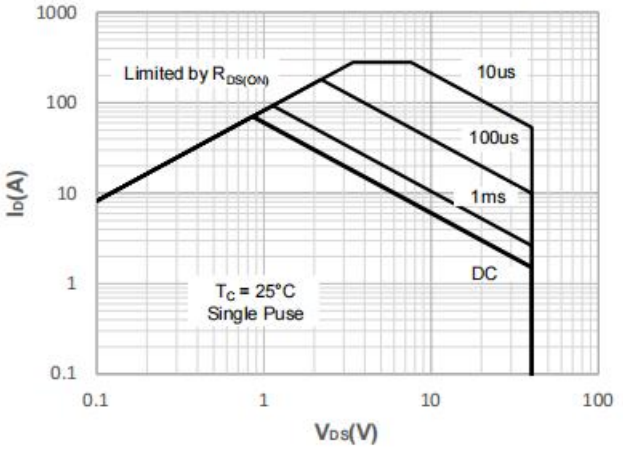


Figure 10: Maximum Continuous Drian Current vs. Case Temperature

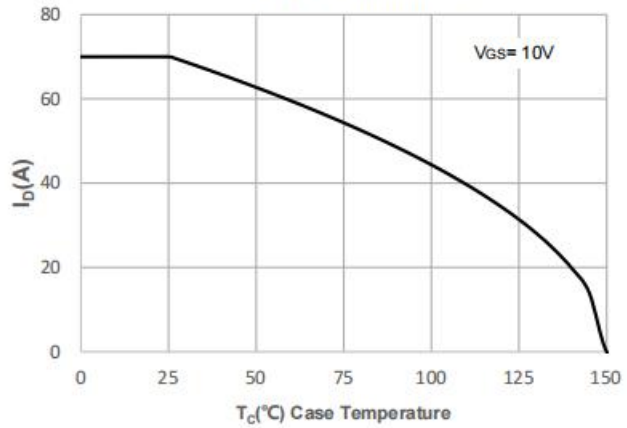


Figure 11: Normalized Maximum Transient Thermal Impedance

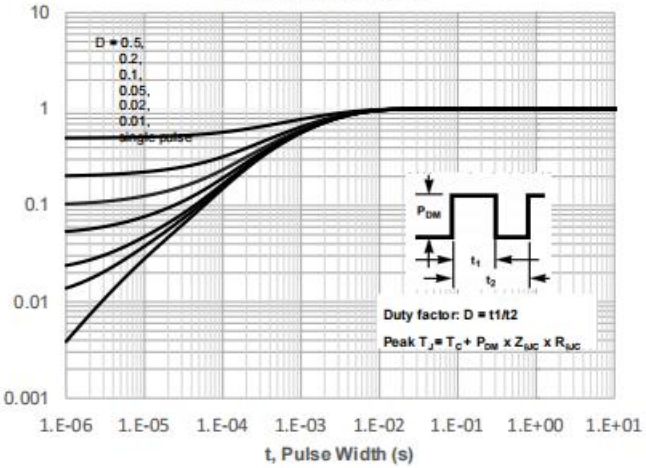
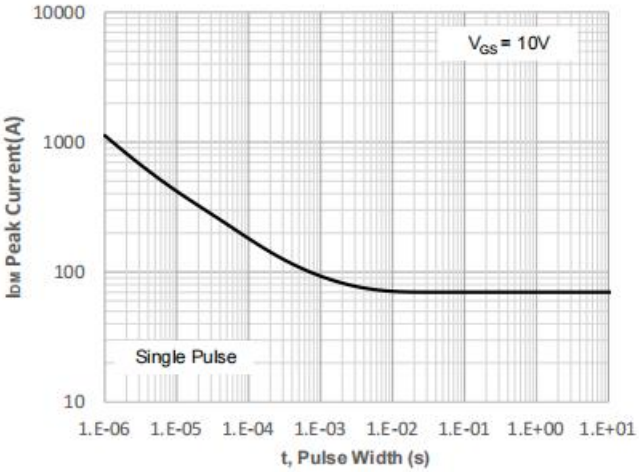


Figure 12: Peak Current Capacity



Test Circuit

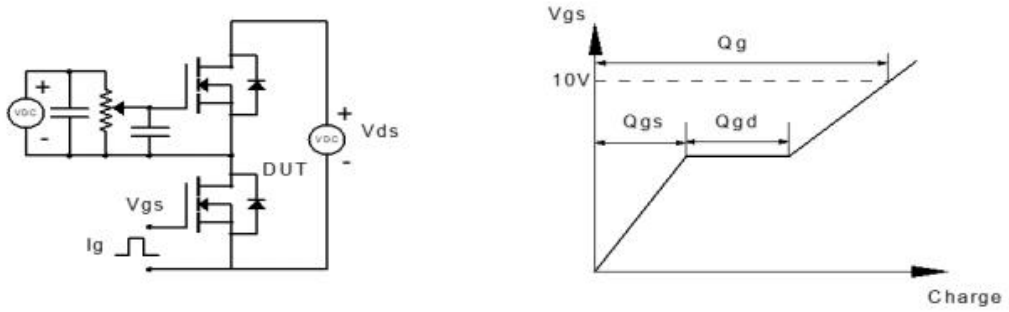


Figure 1: Gate Charge Test Circuit & Waveform

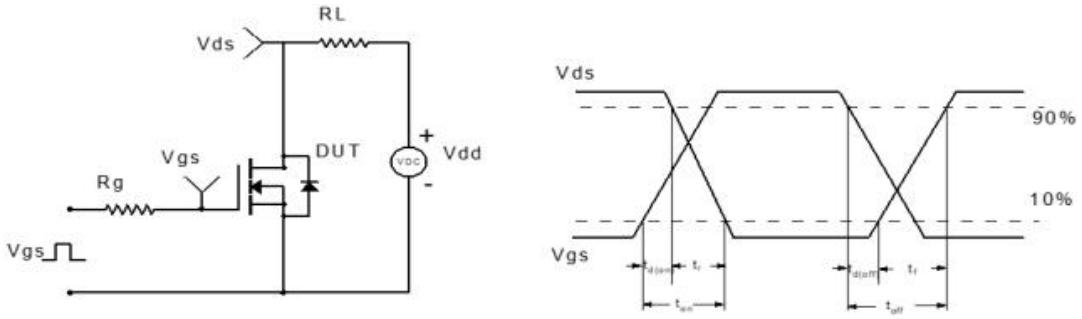


Figure 2: Resistive Switching Test Circuit & Waveform

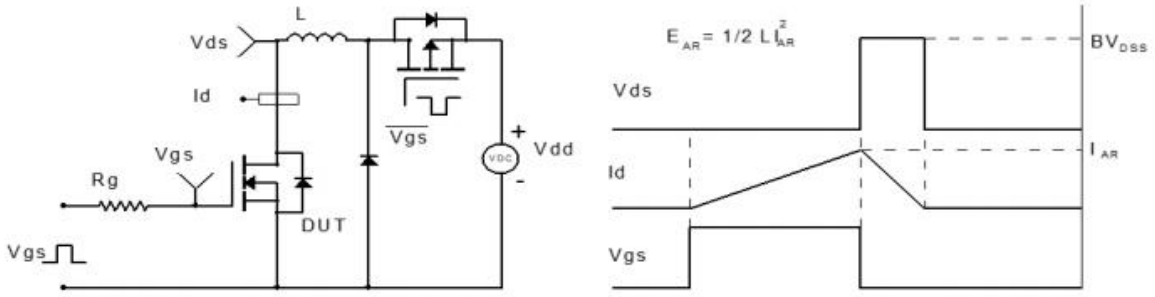


Figure 3: Unclamped Inductive Switching Test Circuit& Waveform

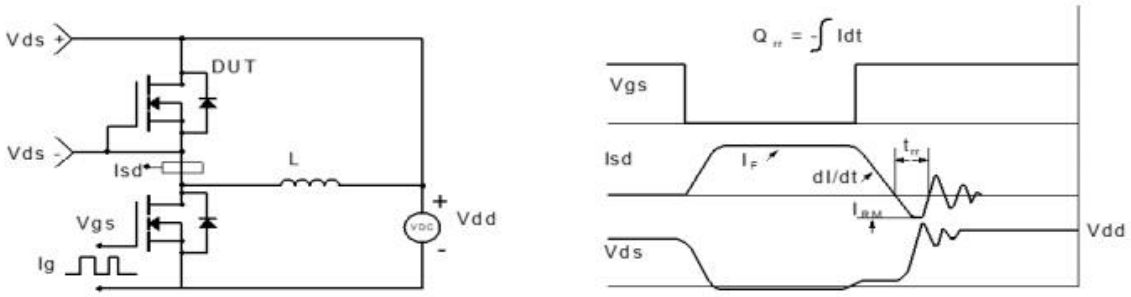
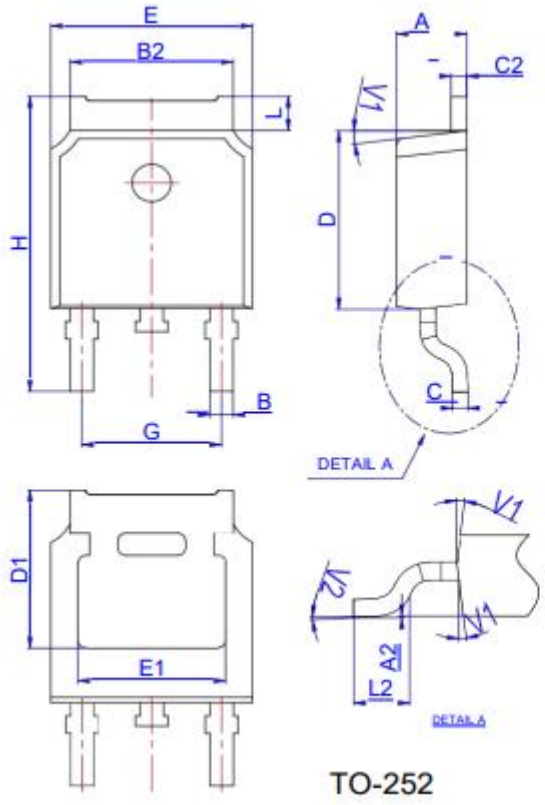


Figure 4: Diode Recovery Test Circuit & Waveform

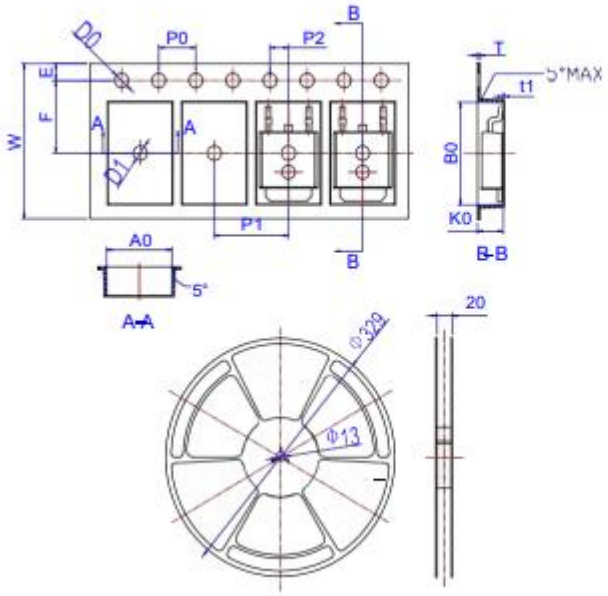
Package Mechanical Data TO252



TO-252

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°

Reel Specification-TO-252



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
W	15.90	16.00	16.10	0.626	0.630	0.634
E	1.65	1.75	1.85	0.065	0.069	0.073
F	7.40	7.50	7.60	0.291	0.295	0.299
D0	1.40	1.50	1.60	0.055	0.059	0.063
D1	1.40	1.50	1.60	0.055	0.059	0.063
P0	3.90	4.00	4.10	0.154	0.157	0.161
P1	7.90	8.00	8.10	0.311	0.315	0.319
P2	1.90	2.00	2.10	0.075	0.079	0.083
A0	6.85	6.90	7.00	0.270	0.271	0.276
B0	10.45	10.50	10.60	0.411	0.413	0.417
K0	2.68	2.78	2.88	0.105	0.109	0.113
T	0.24		0.27	0.009		0.011
t1	0.10			0.004		
10P0	39.80	40.00	40.20	1.567	1.575	1.583

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