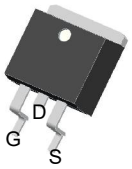
40V N-ch Power MOSFET

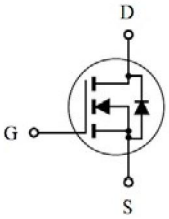
General Featu res

- Proprietary New Trench Technology
- $R_{DS(ON),typ.}$=1.7mΩ@V_{GS}=10V
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

BV_{DSS}	$R_{DS(ON),max.}$	I_D[2]
40V	2.0mΩ	262A

TO-263-2L





Applicati ons

- High efficiency DC/DC Converters
- Synchronous Rectification
- UPS Inverter

Ordering Informat ion

Part Number	Package	Markin g
MXP4002AFL	TO-263	MXP4002AFL

Absolute Maximu m Ratings

T_C=25℃ unless otherwise specified

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-to-Source Voltage[1]	40	V
V_{GSS}	Gate-to-Source Voltage	±20	
I_D	Continuous Drain Current[2]	262	A
	Continuous Drain Current[3]	192	
	Continuous Drain Current at T_C=100℃[2]	185	
I_{DM}	Pulsed Drain Current at V_{GS}=10V[2,4]	1064	
E_{AS}	Single Pulse Avalanche Energy (V_{DD}=30V, V_{GS}=10V, R_G=25Ω, L=1mH)	528	mJ
P_D	Power Dissipation	253	W
	Derating Factor above 25℃	1.7	W/℃
T_L	Soldering Temperature Distance of 1.6mm from case for 10 seconds	300	℃
T_J& T_{STG}	Operating and Storage Temperature Range	-55 to 175	

Caution: Stresses greater than those listed in the “Absolute Maximum Ratings” may cause permanent damage to the device.

Thermal Characte ristics

Symbol	Parameter	Min.	Typ.	Max.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case			0.59	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient			62	

Electrical Characteristics

OFF Characteristics

T_J =25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	40			V	V_{GS}=0V, I_D=250uA
I_{DSS}	Drain-to-Source Leakage Current			1	uA	V_{DS}=32V, V_{GS}=0V
I_{GSS}	Gate-to-Source Leakage Current			±100	nA	V_{GS}=±20V, V_{DS}=0V

ON Characteristics

T_J =25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	1.7	2.0	mΩ	V_{GS}=10V, I_D=192A[5]
			2.1	2.7	mΩ	V_{GS}=4.5V, I_D=96A[5]
$V_{GS(TH)}$	Gate Threshold Voltage	1.0	--	3.0	V	V_{DS} = V_{GS}, I_D=250uA

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance		7.3		nF	V_{GS}=0V, V_{DS}=25V, f=1.0MHz
C_{rss}	Reverse Transfer Capacitance		0.3			
C_{oss}	Output Capacitance		1.2			
R_g	Gate Series Resistance		2.6		Ω	f=1.0MHz
Q_g	Total Gate Charge		135		nC	V_{DD}=20V, I_D=120A, V_{GS}=10V
Q_{gs}	Gate-to-Source Charge		23			
Q_{gd}	Gate-to-Drain (Miller) Charge		33			

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(on)}$	Turn-on Delay Time		15		ns	V_{DD}=20V I_D=120A V_{GS}=10V R_G=2.5Ω
t_{rise}	Rise Time		23			
$t_{d(off)}$	Turn-off Delay Time		104			
t_{fall}	Fall Time		24			

Source-Drain Body Diode Characteristics

T_J=25℃ unless otherwise specified

Symbol	Parameter	Min	Typ.	Max.	Unit	Test Conditions
I_{SD}	Continuous Source Current[2]			262	A	Maximum Ratings
V_{SD}	Diode Forward Voltage		0.9	1.2	V	I_S=120A, V_{GS}=0V
t_{rr}	Reverse Recovery Time		58		ns	V_{GS}=0V I_F=20A,di/dt=100A/μs
Q_{rr}	Reverse Recovery Charge		77		nC	

Note:

[1] T_J=+25℃ to +175℃
[2] Silicon limited current only
[3] Package limited current
[4] Repetitive rating, pulse width limited by both maximum junction temperature.
[5] Pulse width≤380μs; duty cycle≤2%.

Typical Characteristics

Figure 1. Maximum Effective Thermal Impedance, Junction-to-Case

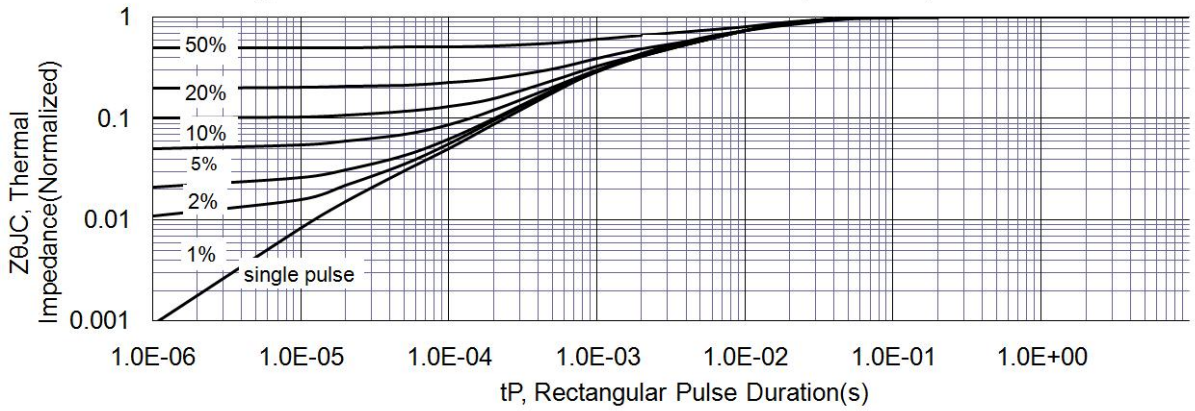


Figure 2. Maximum Power Dissipation vs. Case Temperature

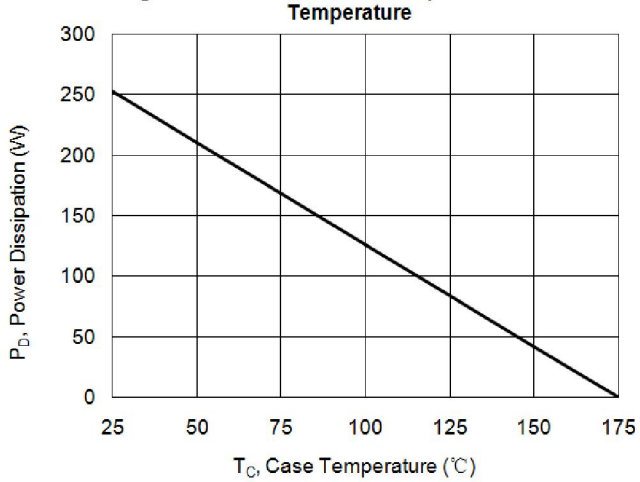


Figure 3. Maximum Continuous Drain Current vs Case Temperature

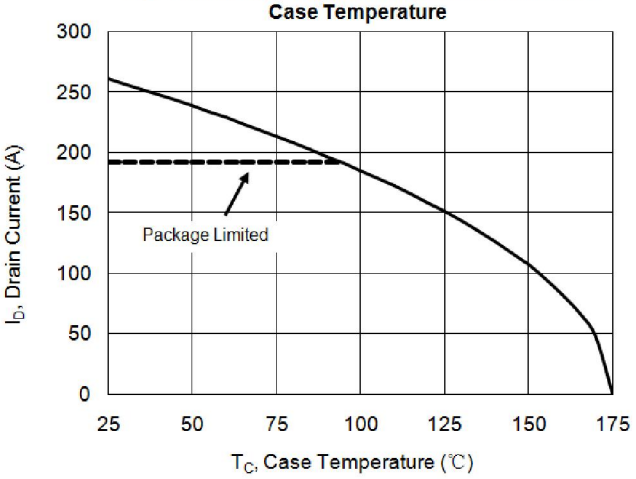


Figure 4. Typical Output Characteristics

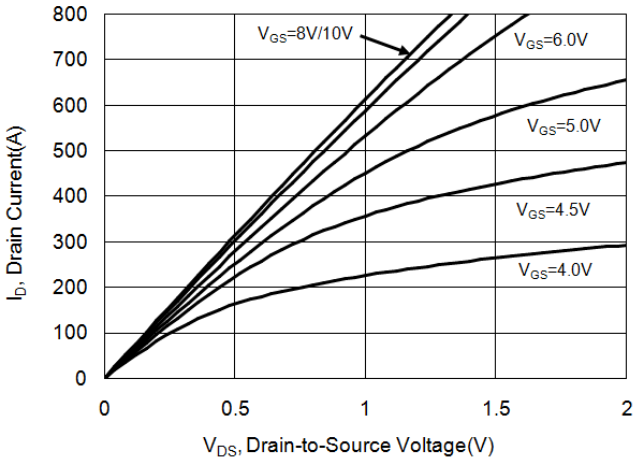


Figure 5. Typical Drain-to-Source ON Resistance vs. Gate Voltage

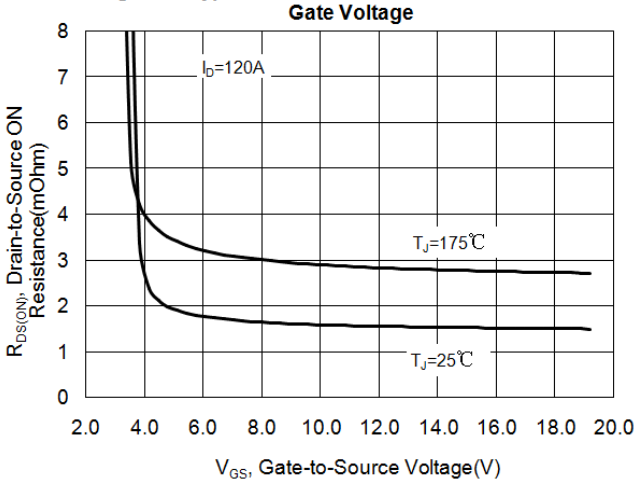


Figure 6. Maximum Peak Current Capability

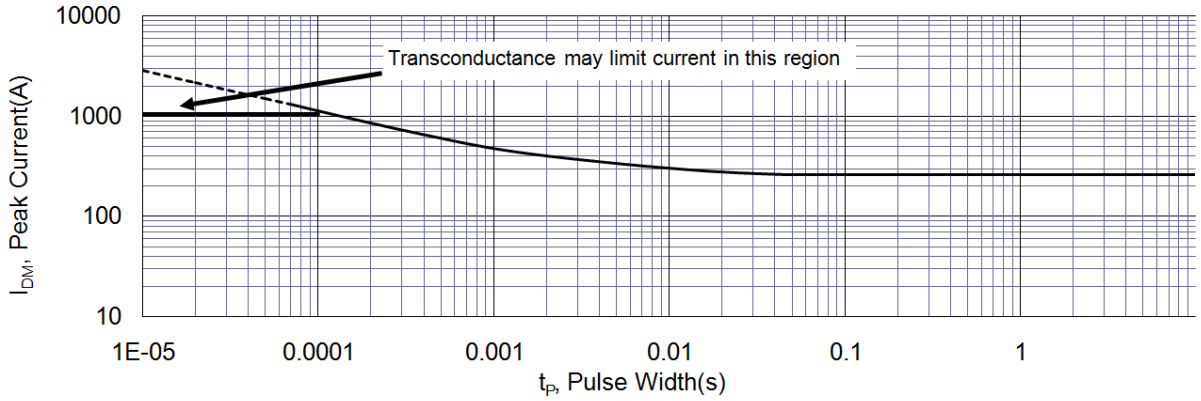


Figure 7. Typical Transfer Characteristics

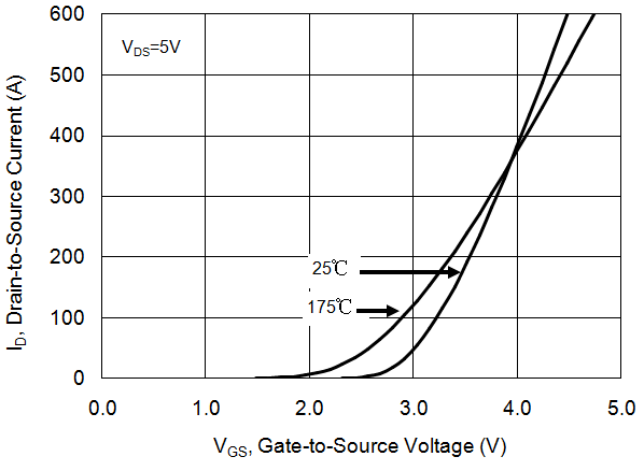


Figure 8. Unclamped Inductive Switching Capability

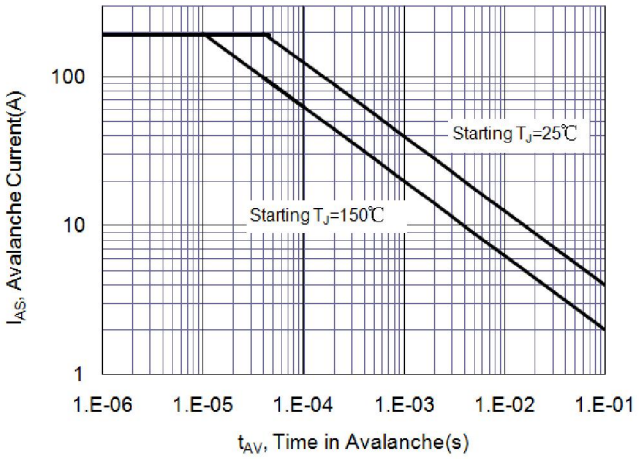


Figure 9. Typical Drain-to-Source ON Resistance

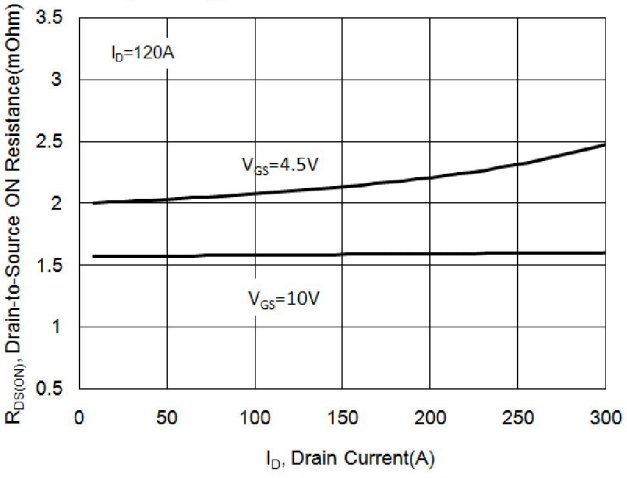


Figure 10. Typical Drain-to-Source On Resistance vs. Junction Temperature

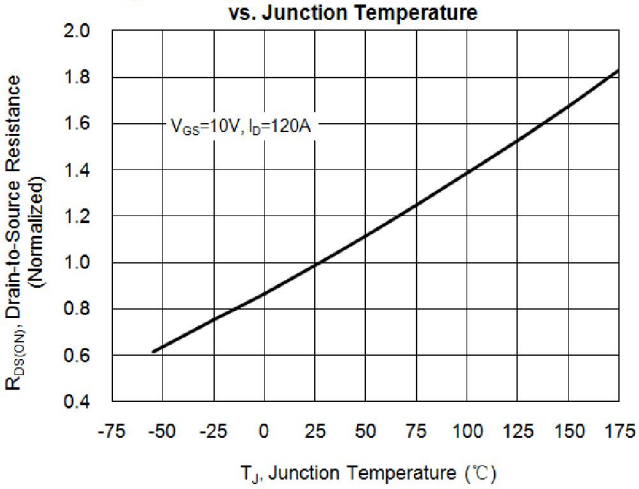


Figure 11.Typical Breakdown Voltage vs. Junction Temperature

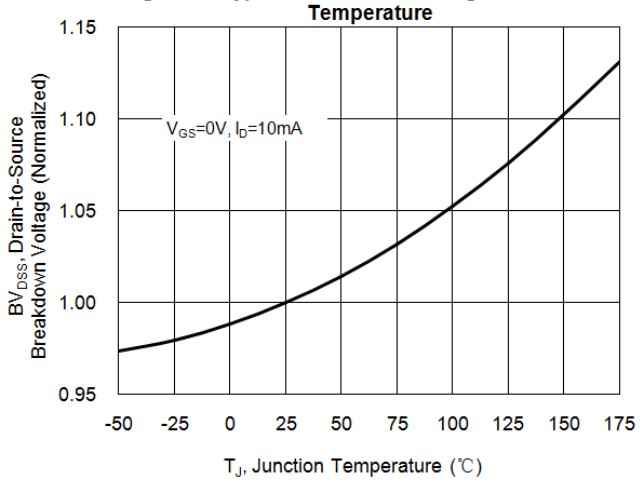


Figure 12.Typical Threshold Voltage vs. Junction Temperature

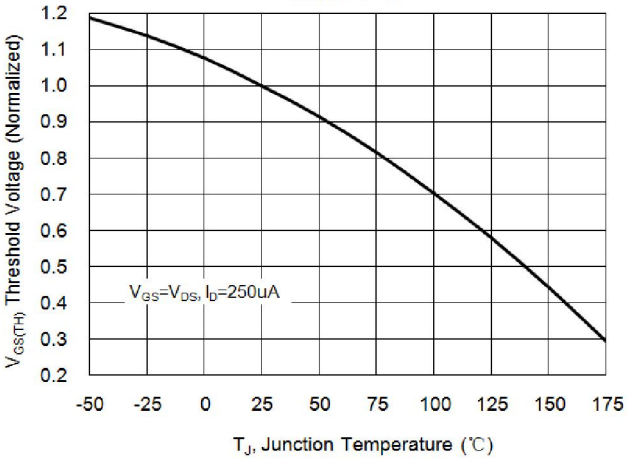


Figure 13. Maximum Forward Safe Operation Area

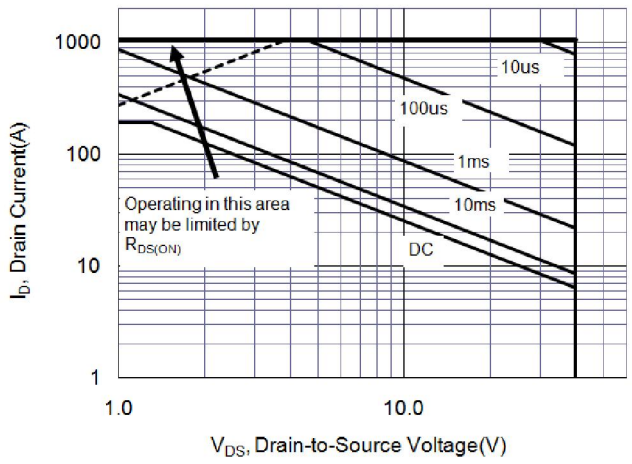


Figure 14. Typical Capacitance vs. Drain-to-Source Voltage

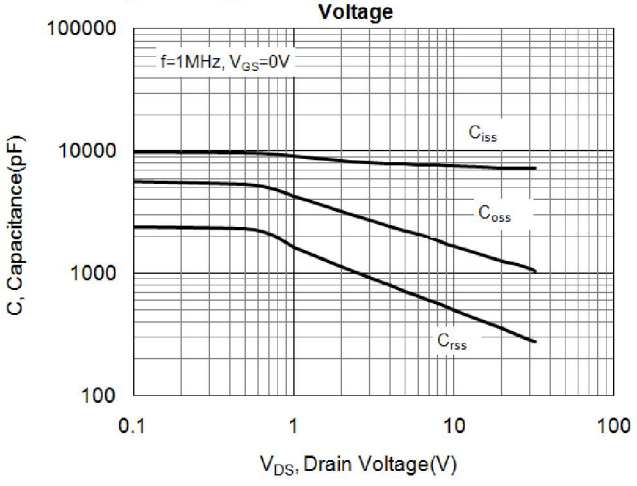


Figure 15. Typical Gate Charge vs. Gate-to-Source Voltage

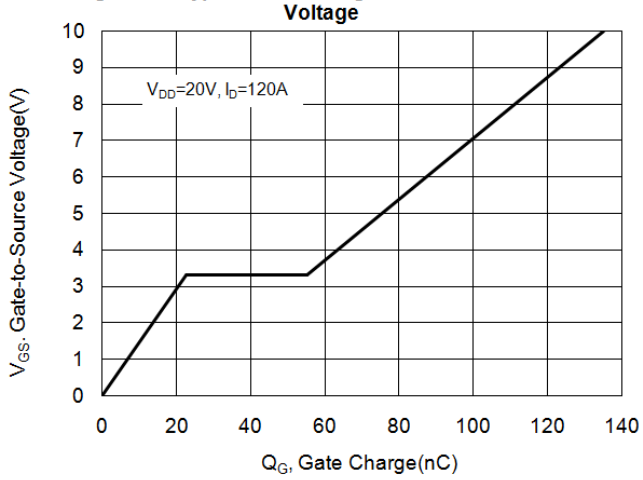
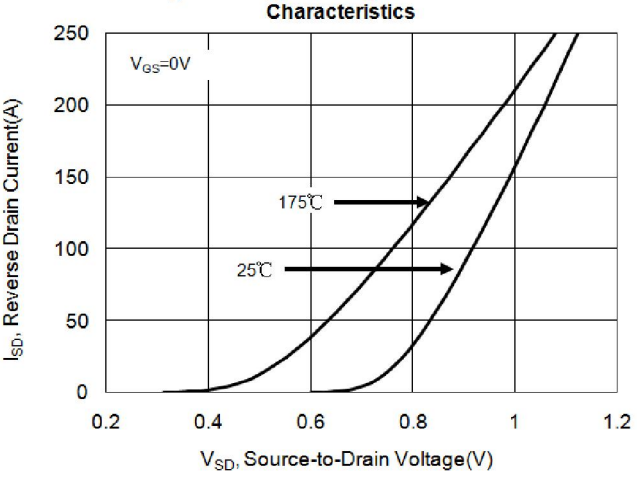


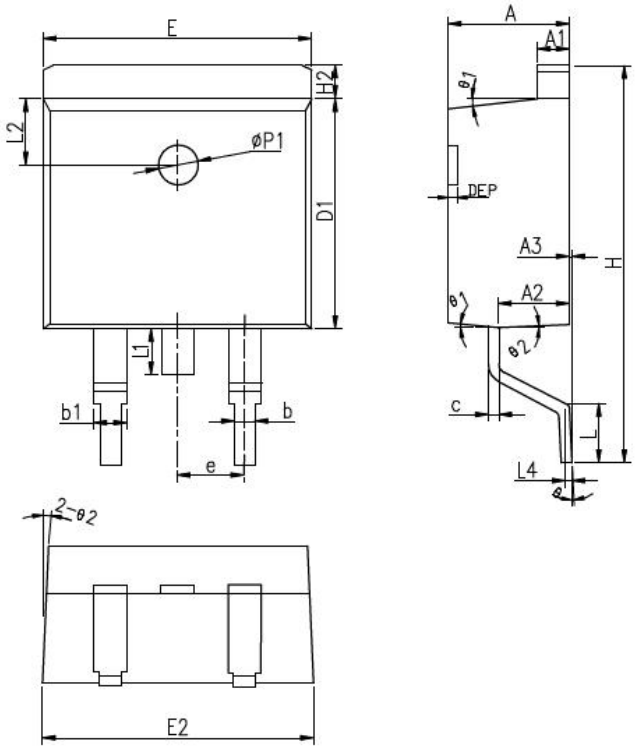
Figure 16. Typical Body Diode Transfer Characteristics



Package

Dimensions

TO-2**63-2L**



COMMON DIMENSIONS

SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	1.22	1.27	1.32	0.048	0.050	0.052
A2	2.59	2.69	2.79	0.102	0.106	0.110
A3	0.00	0.10	0.20	0.000	0.004	0.008
b	0.77	0.813	0.90	0.030	0.032	0.035
b1	1.20	1.270	1.36	0.047	0.050	0.054
c	0.34	0.381	0.47	0.013	0.015	0.019
D1	8.60	8.70	8.80	0.339	0.343	0.346
E	10.00	10.16	10.26	0.394	0.400	0.404
E2	10.00	10.10	10.20	0.394	0.398	0.402
e		2.54 BSC			0.100 BSC	
H	14.70	15.10	15.50	0.579	0.594	0.610
H2	1.17	1.27	1.40	0.046	0.050	0.055
L	2.00	2.30	2.60	0.079	0.091	0.102
L1	1.45	1.55	1.70	0.057	0.061	0.067
L2		2.50 REF			0.098 REF	
L4		0.25 BSC			0.010 BSC	
θ	0°	5°	8°	0°	5°	8°
θ1	5°	7°	9°	5°	7°	9°
θ2	1°	3°	5°	1°	3°	5°
ΦP1	1.40	1.50	1.60	0.055	0.059	0.063
DEP	0.05	0.10	0.20	0.002	0.004	0.008

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