

IPG20N06S4-15-VB Datasheet

Dual N-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
60	0.011 at $V_{GS} = 10$ V	40	15 nC
	0.017 at $V_{GS} = 4.5$ V	36	

FEATURES

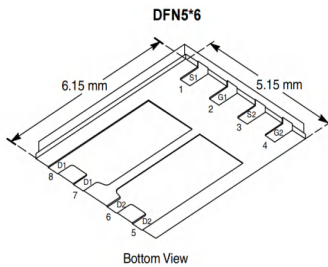
- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFET
- 100 % UIS Tested
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



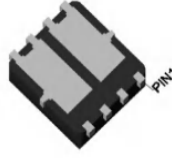
RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

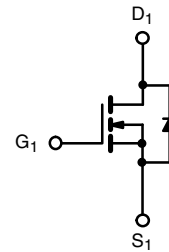
- Set Top Box
- Low Current DC/DC



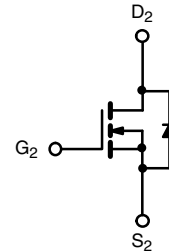
Top View



Bottom View



N-Channel MOSFET



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	I_D	$T_C = 25^\circ\text{C}$ 40 ^a	A
		$T_C = 70^\circ\text{C}$ 28	
		$T_A = 25^\circ\text{C}$ 30 ^{b,c}	
		$T_A = 70^\circ\text{C}$ 21 ^{b, c}	
Pulsed Drain Current	I_{DM}	120	mJ
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$ 2.25	
		$T_A = 25^\circ\text{C}$ 1.48 ^{b, c}	
Single Pulse Avalanche Current	I_{AS}	23	mJ
Single Pulse Avalanche Energy	E_{AS}	132	
Maximum Power Dissipation	P_D	$T_C = 25^\circ\text{C}$ 2.7	W
		$T_C = 70^\circ\text{C}$ 4.77	
		$T_A = 25^\circ\text{C}$ 2.78 ^{b, c}	
		$T_A = 70^\circ\text{C}$ 1.14 ^{b, c}	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{a, c, d}	R_{thJA}	58	70	$^\circ\text{C/W}$
Maximum Junction-to-Foot (Drain)	R_{thJF}	38	45	

Notes:

a. Package limited, $T_C = 25^\circ\text{C}$.

b. Surface Mounted on 1" x 1" FR4 board.

c. $t = 10$ s.

d. Maximum under Steady State conditions is 110 $^\circ\text{C/W}$.

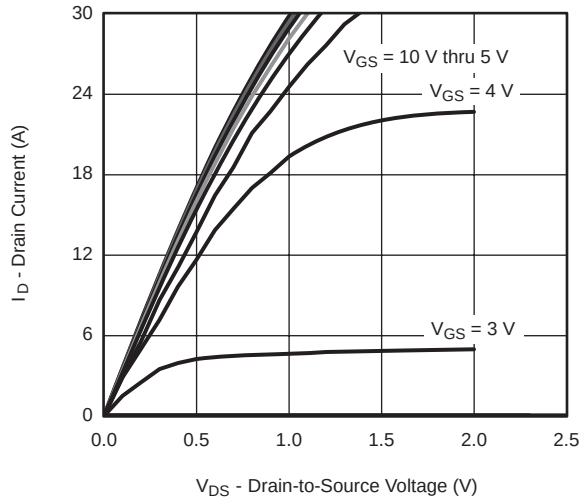
SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60			V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		32		mV/ $^{\circ}\text{C}$	
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5.0			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0		2.5	V	
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$			1	μA	
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^{\circ}\text{C}$			10		
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	10			A	
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 5\text{ A}$		0.011		Ω	
		$V_{GS} = 4.5\text{ V}, I_D = 4\text{ A}$		0.017			
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 5\text{ A}$		16		S	
Dynamic ^b							
Input Capacitance	C_{iss}	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		3100		pF	
Output Capacitance	C_{oss}			217			
Reverse Transfer Capacitance	C_{rss}			155			
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 5\text{ A}$		15	25	nC	
Gate-Source Charge	Q_{gs}	$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$		6.7	9.6		
Gate-Drain Charge	Q_{gd}			4.4	6.0		
Gate Resistance	R_g			3.05	4.0		
Turn-On Delay Time	$t_{d(on)}$	$f = 1\text{ MHz}$	0.8	4.3	8.6	Ω	
Rise Time	t_r		$V_{DD} = 15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		12	24	ns
Turn-Off Delay Time	$t_{d(off)}$				55	100	
Fall Time	t_f				11	22	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$			8	16	
Rise Time	t_r			4	8		
Turn-Off Delay Time	$t_{d(off)}$			9	18		
Fall Time	t_f			10	20		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$			40	A	
Pulse Diode Forward Current	I_{SM}				120		
Body Diode Voltage	V_{SD}	$I_S = 2\text{ A}, V_{GS} = 0\text{ V}$		0.8	1.2	V	
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^{\circ}\text{C}$		11	20	ns	
Body Diode Reverse Recovery Charge	Q_{rr}			4	8	nC	
Reverse Recovery Fall Time	t_a			7		ns	
Reverse Recovery Rise Time	t_b			4			

Notes:

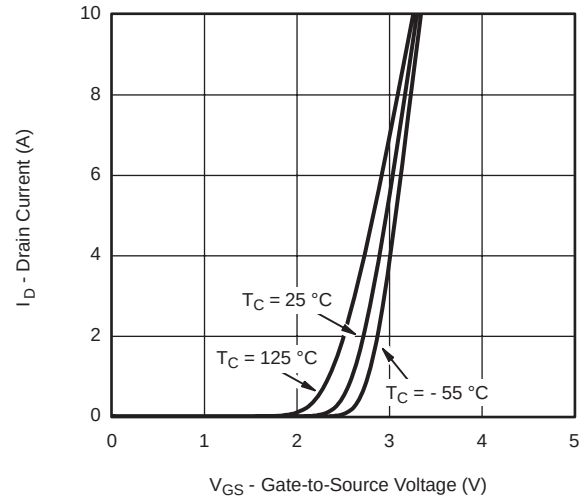
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

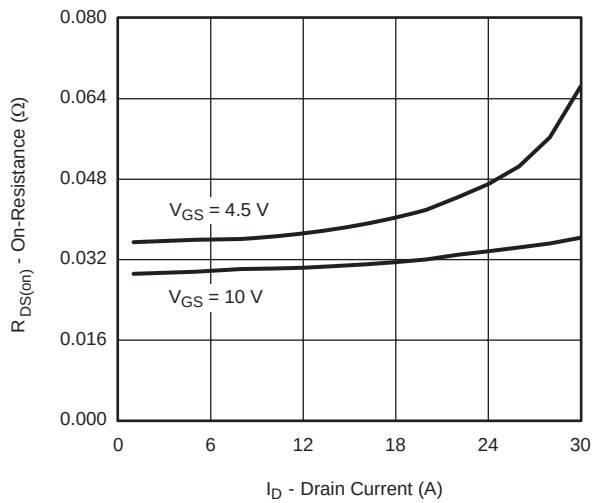
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



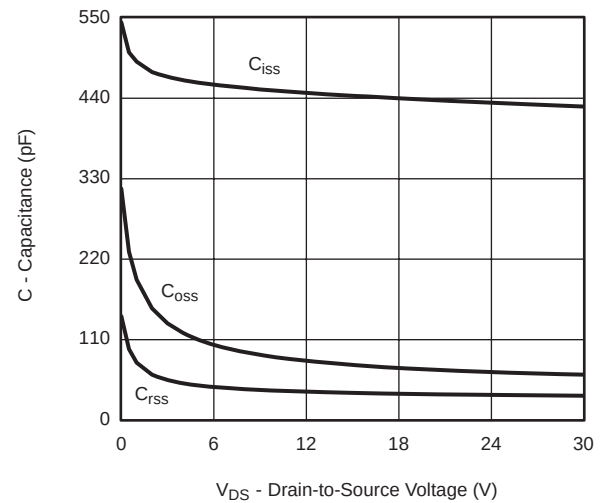
Output Characteristics



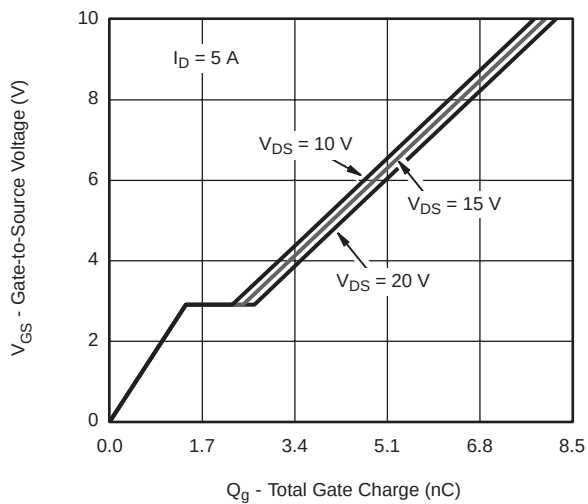
Transfer Characteristics



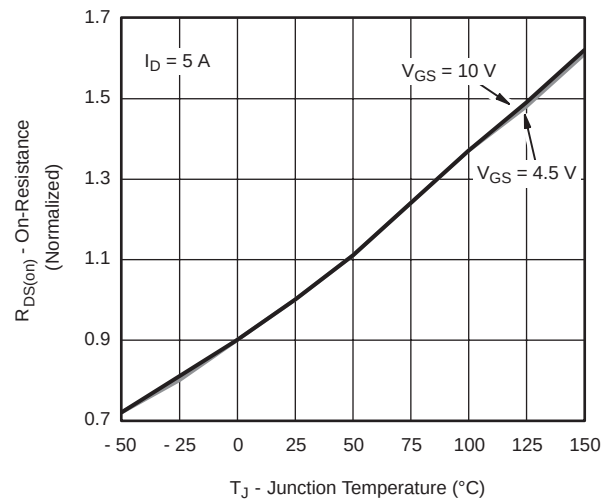
On-Resistance vs. Drain Current



Capacitance



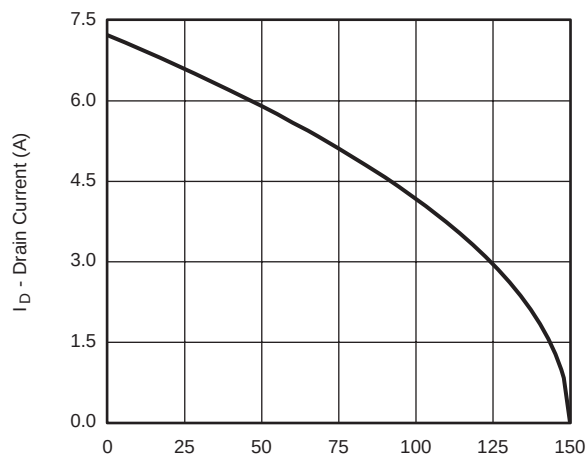
Gate Charge



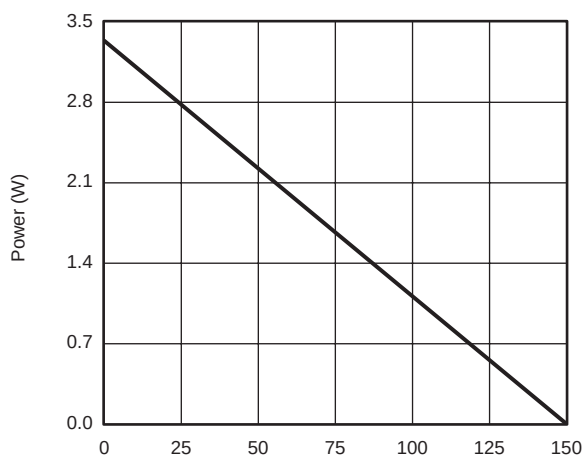
On-Resistance vs. Junction Temperature

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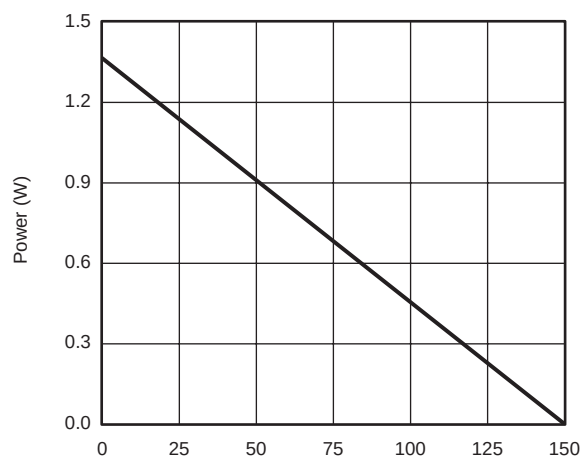
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



T_C - Case Temperature (°C)
Current Derating*



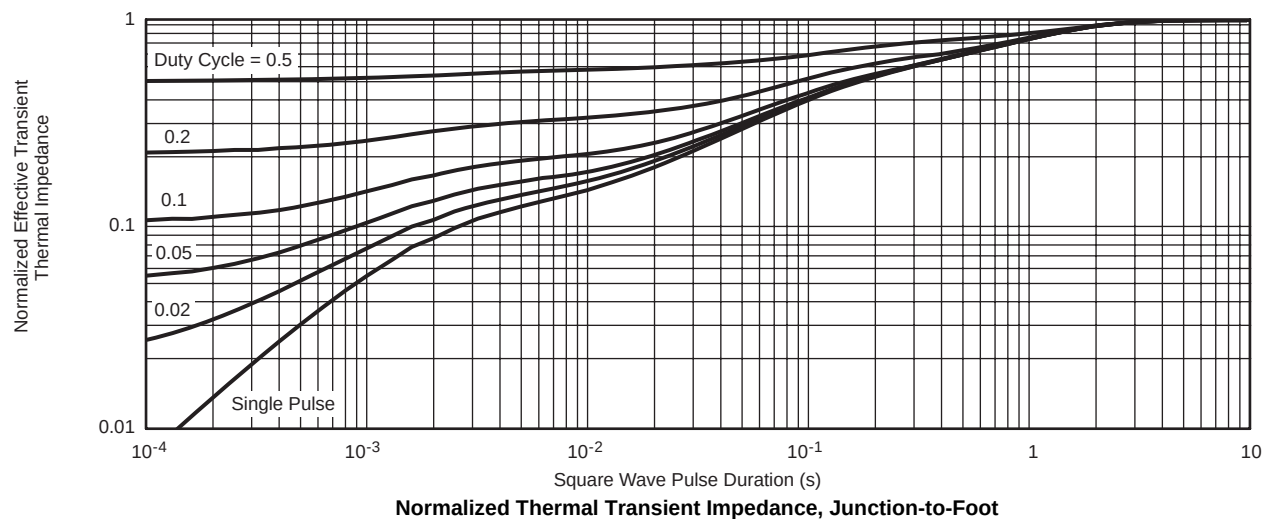
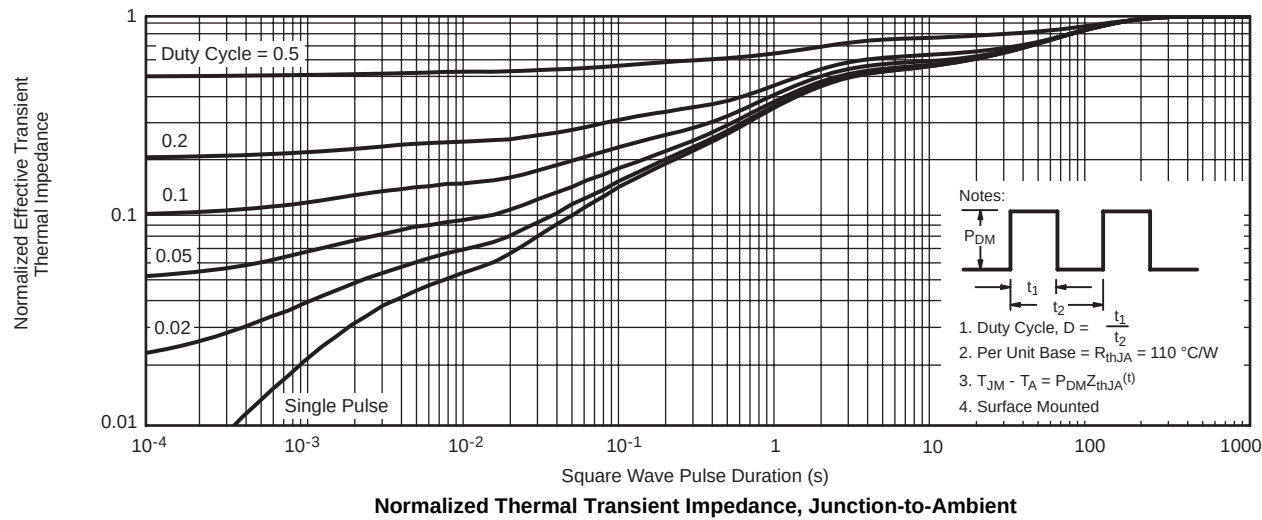
T_C - Case Temperature (°C)
Power, Junction-to-Foot



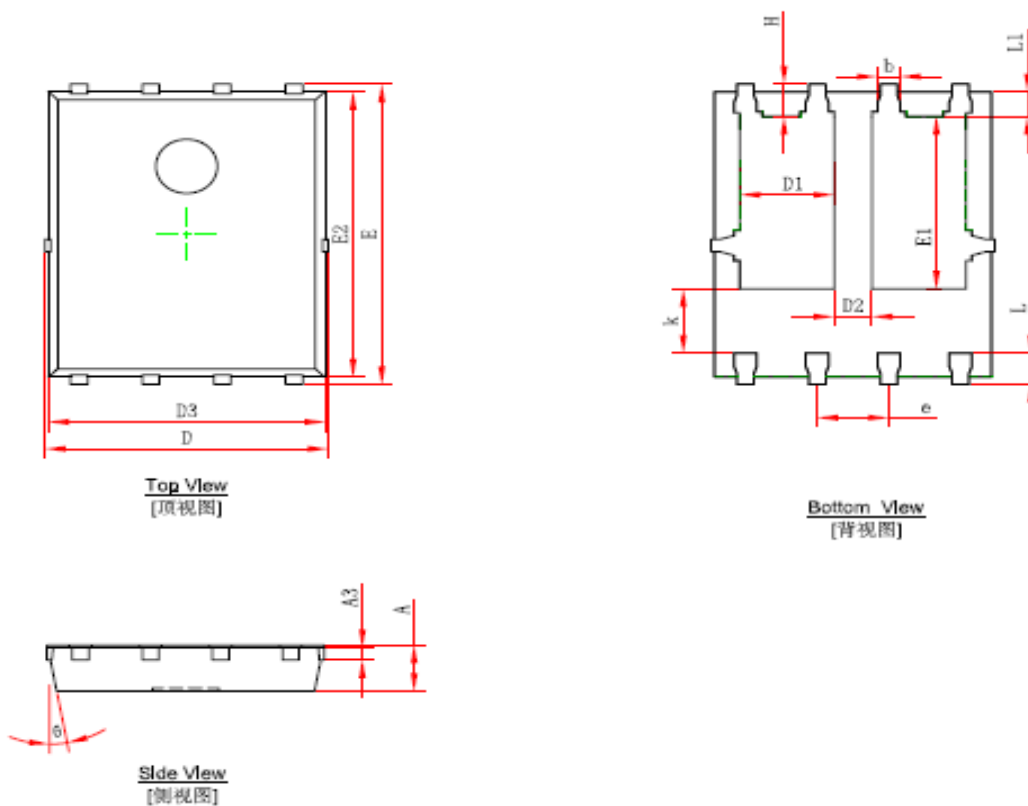
T_A - Ambient Temperature (°C)
Power, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



PDFNWB5×6-8L-A PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254 REF.		0.010 REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	1.470	1.870	0.058	0.074
D2	0.470	0.870	0.019	0.034
E1	3.375	3.575	0.133	0.141
D3	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270 TYP.		0.050 TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	10°	12°	10°	12°

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