

## P-Channel 60-V (D-S) MOSFET

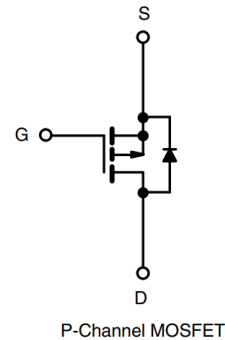
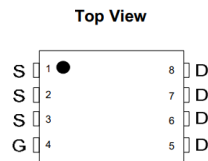
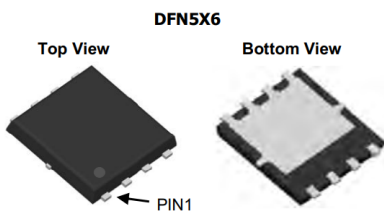
PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (mΩ)(TYP.)	I <sub>D</sub> (A) <sup>a, e</sup>	Q <sub>g</sub> (Typ.)
-60	12 at V <sub>GS</sub> = -10V	-60	121 nC
	20 at V <sub>GS</sub> = -4.5 V		

### FEATURES

- DT-Trench Power MOSFET
- 100 % R<sub>g</sub> and UIS Tested

### APPLICATIONS

- Notebook
- Load Switch



ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted)				
PARAMETER	SYMBOL	Limit	UNIT	
Drain-Source Voltage	V <sub>DS</sub>	-60	V	
Gate-Source Voltage	V <sub>GS</sub>	±20		
Continuous Drain Current (T <sub>J</sub> = 150 °C) <sup>a</sup>	I <sub>D</sub>	T <sub>A</sub> = 25 °C	-60	
		T <sub>A</sub> = 70 °C	-50	
Pulsed Drain Current	I <sub>DM</sub>	-240	A	
Continuous Source Current (Diode Conduction) <sup>a</sup>	I <sub>S</sub>	-60		
Avalanche Current	I <sub>AS</sub>	-62		
Single Pulse Avalanche Energy	E <sub>AS</sub>	225	mJ	
Maximum Power Dissipation <sup>a</sup>	P <sub>D</sub>	T <sub>A</sub> = 25 °C	43	
		T <sub>A</sub> = 70 °C	38	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C
Soldering Recommendations (Peak Temperature) <sup>b, c</sup>			260	

THERMAL RESISTANCE RATINGS					
PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT	
Maximum Junction-to-Ambient <sup>a</sup>	R <sub>thJA</sub>	t ≤ 10 s	15	23	°C/W
		Steady State	22	35	
Maximum Junction-to-Case (Drain)	R <sub>thJC</sub>	1	1.3		

### Notes

- Surface mounted on 1" x 1" FR4 board.
- The DFN5x6 is a lead less package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure a dequate bottom side solder interconnection.
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.

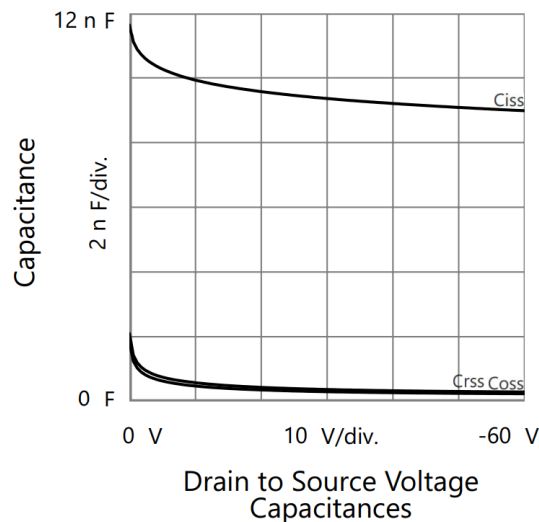
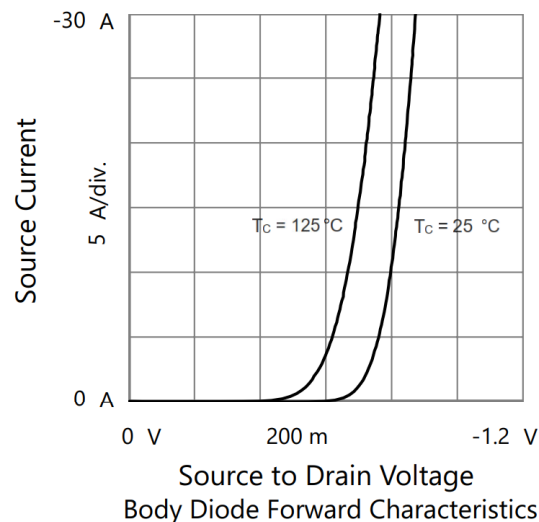
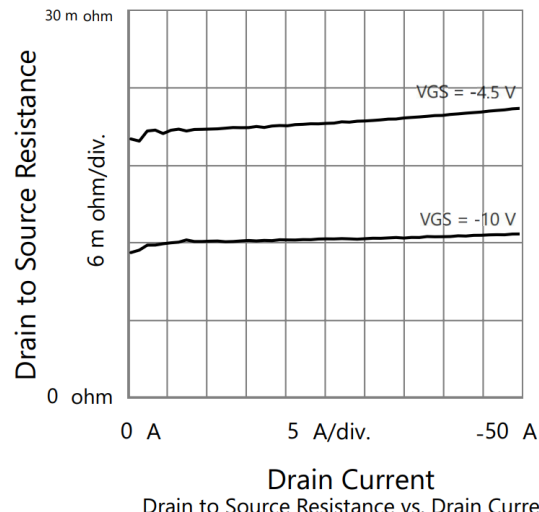
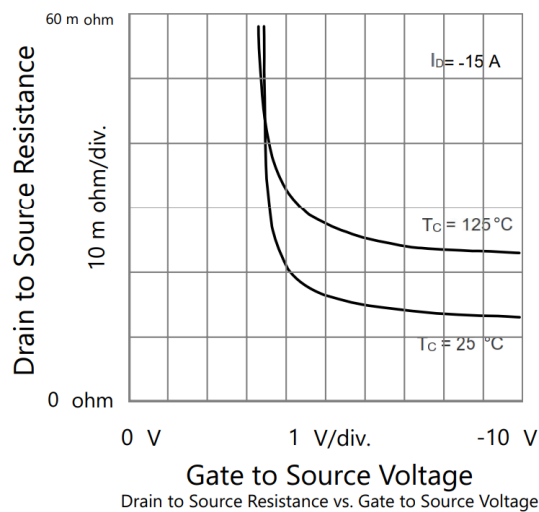
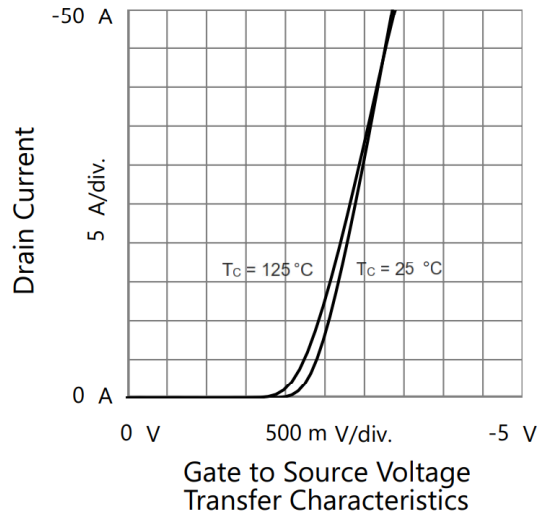
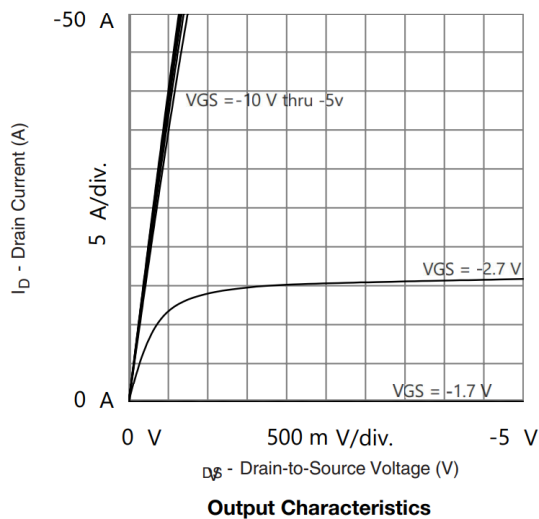
<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	-1	-	-3	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\ \text{V}, V_{GS} = \pm 20\ \text{V}$	-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -48\ \text{V}, V_{GS} = 0\ \text{V}$	-	-	-1	$\mu\text{A}$
		$V_{DS} = -48\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 70\text{ }^\circ\text{C}$	-	-	-10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \leq -5\ \text{V}, V_{GS} = -10\ \text{V}$	-60	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -10\ \text{V}, I_D = -15\ \text{A}$	-	12	14.5	m $\Omega$
		$V_{GS} = -4.5\ \text{V}, I_D = -10\ \text{A}$	-	20	25	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -15\ \text{V}, I_D = -15\ \text{A}$	-	31	-	S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = -1\ \text{A}, V_{GS} = 0\ \text{V}$	-	-	-1	V
<b>Dynamic <sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = -30\ \text{V}, V_{GS} = 0\ \text{V}, f = 1\ \text{MHz}$	-	9360	-	$\mu\text{F}$
Output Capacitance	$C_{oss}$		-	368	-	
Reverse Transfer Capacitance	$C_{rss}$		-	300	-	
Total Gate Charge	$Q_g$	$V_{DS} = -30\ \text{V}, V_{GS} = -10\ \text{V}, I_D = -15\ \text{A}$	-	121	190	nC
Gate-Source Charge	$Q_{gs}$		-	20	-	
Gate-Drain Charge	$Q_{gd}$		-	32	-	
Gate Resistance	$R_g$		-	3.5	-	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -30\ \text{V}, R_L = 30\ \Omega$ $I_D \cong -15\ \text{A}, V_{GEN} = -10\ \text{V}, R_g = 6\ \Omega$	-	20	-	ns
Rise Time	$t_r$		-	20	-	
Turn-Off Delay Time	$t_{d(off)}$		-	205	-	
Fall Time	$t_f$		-	90	-	
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = -4.5\ \text{A}, dI/dt = 100\ \text{A}/\mu\text{s}$	-	45	-	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$			- 60	A
Pulse Diode Forward Current	$I_{SM}$				- 240	
Body Diode Voltage	$V_{SD}$	$I_S = -1\ \text{A}, V_{GS} = 0\ \text{V}$		- 0.6	- 1	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 15\ \text{A}, dI/dt = 100\ \text{A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		39		nS
Body Diode Reverse Recovery Charge	$Q_{rr}$			40		nC
Reverse Recovery Fall Time	$t_a$			19		nS
Reverse Recovery Rise Time	$t_b$			25		

**Notes**

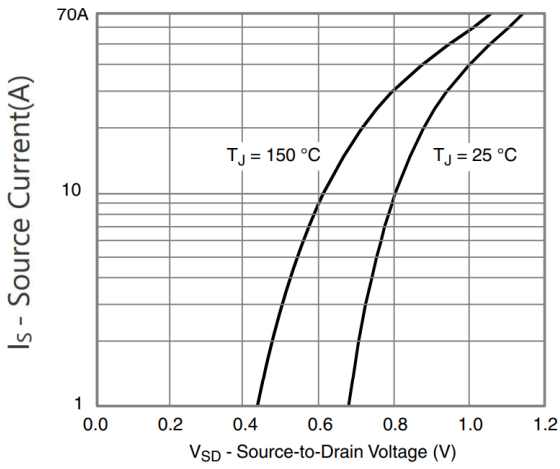
- a. Pulse test; pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .
- b. Guaranteed by design, not subject to production testing.

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.

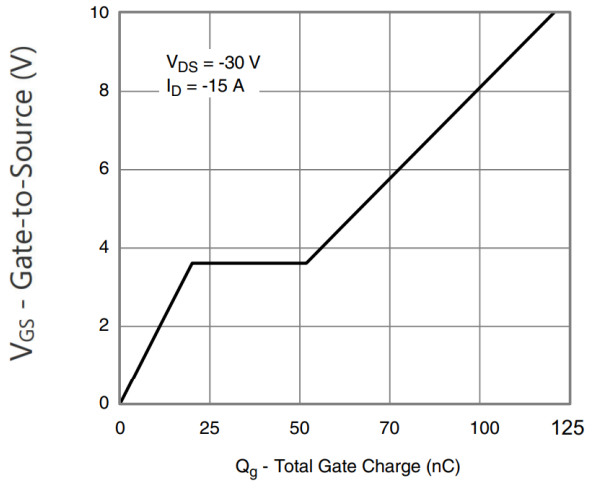
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



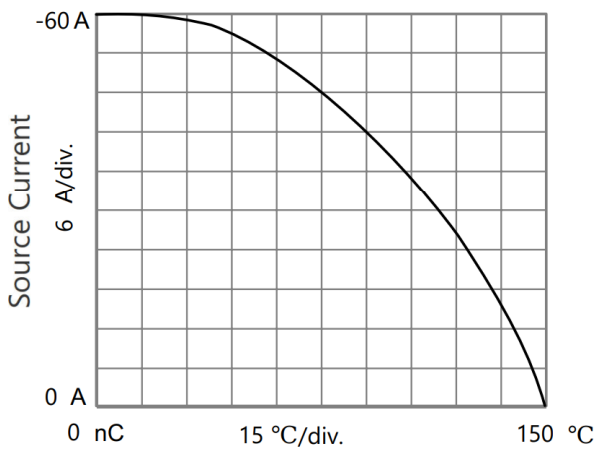
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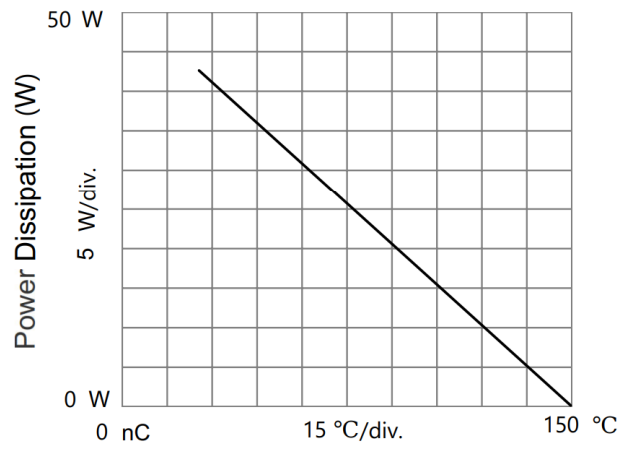
Source-Drain Diode Forward Voltage



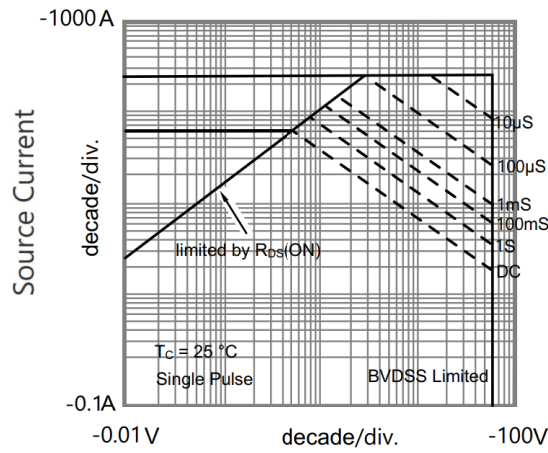
Gate Charge



$T_C$  - Case Temperature  
Current Derating

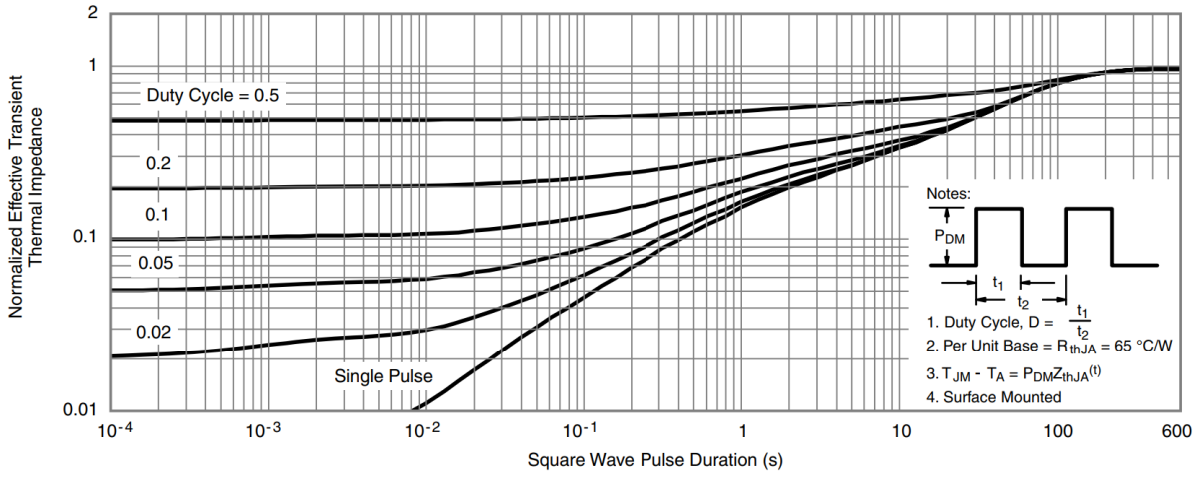


$T_C$  - Case Temperature  
Power Derating

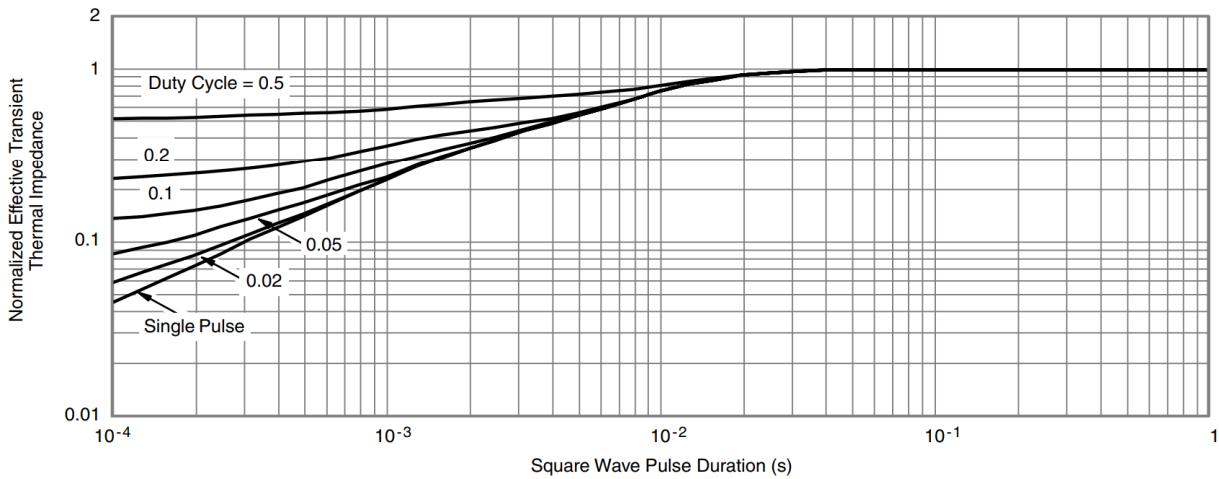


Source to Drain Voltage  
Safe Operating Area, Junction-to-Ambient

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

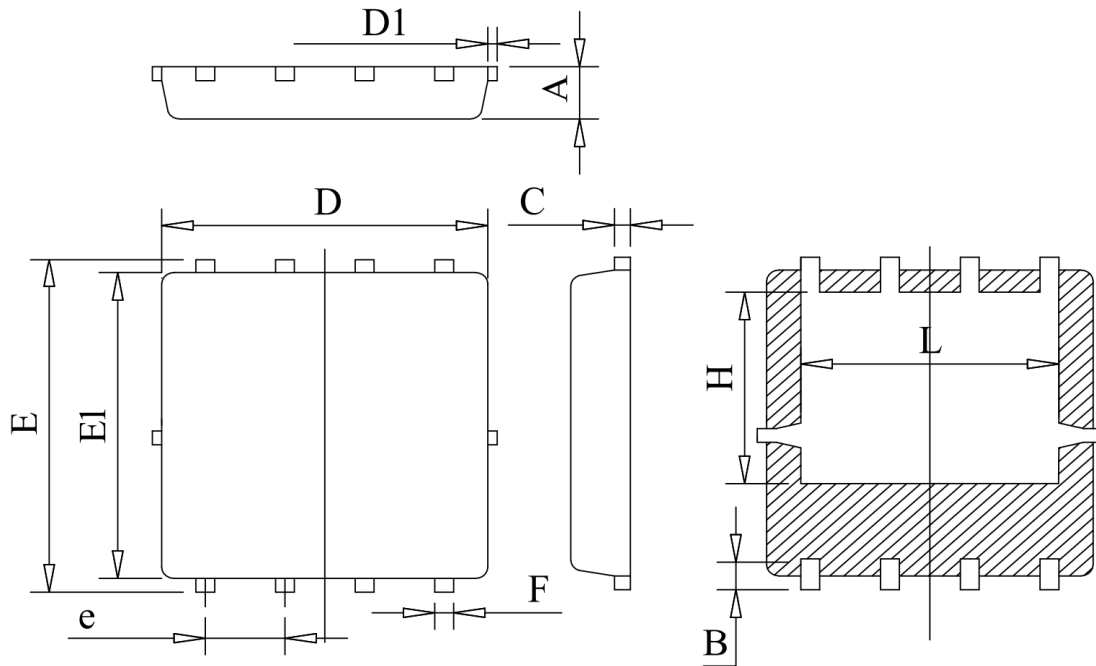


**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**Normalized Thermal Transient Impedance, Junction-to-Case**

DFN5X6-8L PACKAGE OUTLINE



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

Unit : mm

Symbol	Min	Typ	Max
A	0.78	0.95	1.12
B	0.45	0.58	0.78
C	0.18	0.254	0.36
D	4.70	5.20	5.45
D1			0.18
E	5.85	6.05	6.25
E1	5.38	5.55	5.98
e	1.15	1.27	1.40
F	0.18	0.30	0.52
H	3.25	3.47	3.70
L	3.75	4.00	4.25

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