
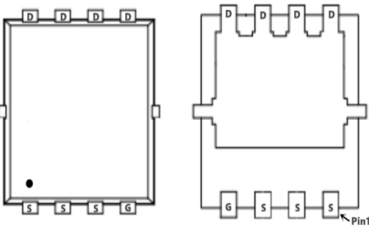


**TM60P03DF**

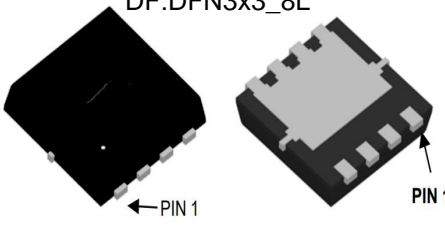
**P -Channel Enhancement Mosfet**

<p><b>General Description</b></p> <ul style="list-style-type: none"> <li>• Low <math>R_{DS(ON)}</math></li> <li>• RoHS and Halogen-Free Compliant</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>• Load switch</li> <li>• PWM</li> </ul>	<p><b>General Features</b></p> <p><math>V_{DS} = -30V</math> <math>I_D = -60A</math>  <math>R_{DS(ON)} = 7.5m\Omega</math> (typ.) @ <math>V_{GS} = -10V</math></p> <p>100% UIS Tested                  100% <math>R_g</math> Tested</p> 
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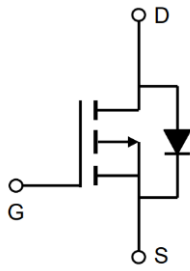


Marking:60P03D

DF:DFN3x3\_8L



PIN 1



D  
G  
S

**Absolute Maximum Ratings ( $T_A = 25^\circ C$ , unless otherwise noted)**

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	-30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C = 25^\circ C$	-60
		$T_C = 100^\circ C$	-30
Pulsed Drain Current <sup>1</sup>	$I_{DM}$	-168	A
Single Pulse Avalanche Energy <sup>2</sup>	<b>EAS</b>	45	mJ
Total Power Dissipation	$T_C = 25^\circ C$	$P_D$	37
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ C$

**Thermal Characteristics**

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction-to-Ambient <sup>3</sup>	$R_{\theta JA}$	75	$^\circ C/W$
Thermal Resistance from Junction-to-Case	$R_{\theta JC}$	3.36	$^\circ C/W$



# TM60P03DF

## P -Channel Enhancement Mosfet

Electrical Characteristics (T<sub>J</sub> = 25°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
<b>Static Characteristics</b>							
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA	-30	-	-	V	
Gate-body Leakage current	I <sub>GSS</sub>	V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±20V	-	-	±100	nA	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V	T <sub>J</sub> =25°C	-	-	-1	μA
			T <sub>J</sub> =100°C	-	-	-100	
Gate-Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA	-1.0	-1.5	-2.5	V	
Drain-Source On-Resistance <sup>4</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10V, I <sub>D</sub> = -30A	-	7.5	14	mΩ	
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -15A	-	10	22		
Forward Transconductance <sup>4</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -5V, I <sub>D</sub> = -30A	-	57	-	S	
<b>Dynamic Characteristics<sup>5</sup></b>							
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V, f = 1MHz	-	2396	-	pF	
Output Capacitance	C <sub>oss</sub>		-	325	-		
Reverse Transfer Capacitance	C <sub>rss</sub>		-	283	-		
Gate Resistance	R <sub>g</sub>	f = 1MHz	-	10.5	-	Ω	
<b>Switching Characteristics<sup>5</sup></b>							
Total Gate Charge	Q <sub>g</sub>	V <sub>GS</sub> = -10V, V <sub>DS</sub> = -15V, I <sub>D</sub> = -30A	-	30	-	nC	
Gate-Source Charge	Q <sub>gs</sub>		-	5	-		
Gate-Drain Charge	Q <sub>gd</sub>		-	7.5	-		
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = -10V, V <sub>DD</sub> = -15V, R <sub>G</sub> = 3Ω, I <sub>D</sub> = -30A	-	14.1	-	ns	
Rise Time	t <sub>r</sub>		-	20	-		
Turn-Off Delay Time	t <sub>d(off)</sub>		-	94	-		
Fall Time	t <sub>f</sub>		-	65	-		
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = -30A, di/dt = 100A/μs	-	19	-	ns	
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>		-	9	-	nC	
<b>Drain-Source Body Diode Characteristics</b>							
Diode Forward Voltage <sup>4</sup>	V <sub>SD</sub>	I <sub>S</sub> = -1A, V <sub>GS</sub> = 0V	-	-	-1.2	V	
Continuous Source Current	I <sub>S</sub>	T <sub>C</sub> =25°C	-	-	-60	A	

Note :

1. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150°C.
2. The EAS data shows Max. rating . The test condition is V<sub>DD</sub>= -25V, V<sub>GS</sub>= -10V, L= 0.1mH, I<sub>AS</sub>= -30A.
3. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
5. This value is guaranteed by design hence it is not included in the production test.

**Typical Characteristics**

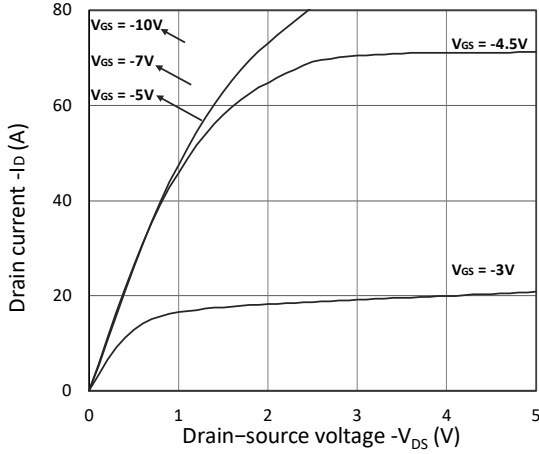


Figure 1. Output Characteristics

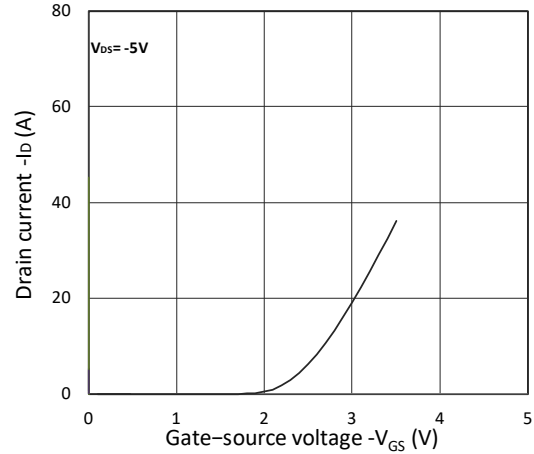


Figure 2. Transfer Characteristics

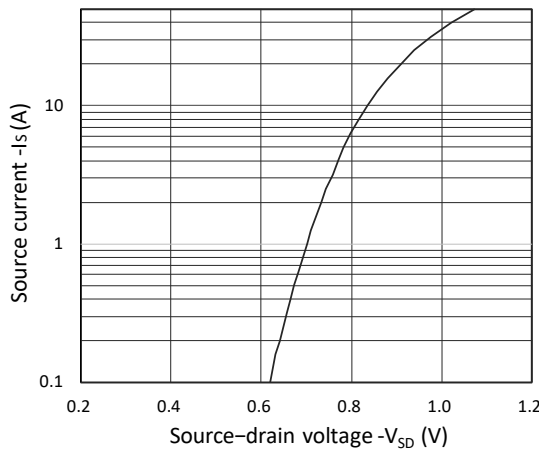


Figure 3. Forward Characteristics of Reverse

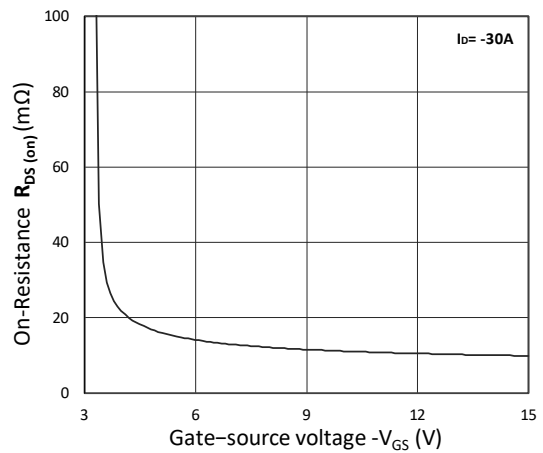


Figure 4.  $R_{DS(ON)}$  vs.  $V_{GS}$

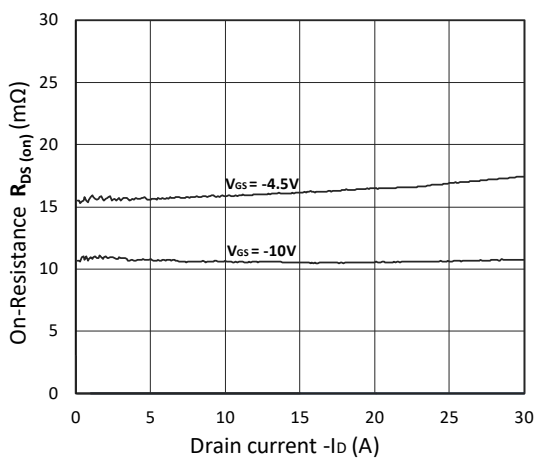


Figure 5.  $R_{DS(ON)}$  vs.  $I_D$

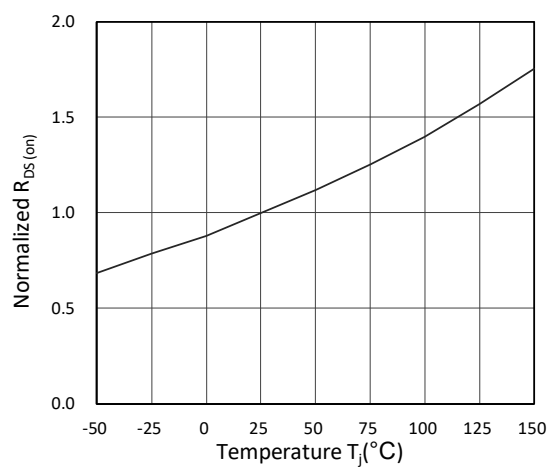


Figure 6. Normalized  $R_{DS(ON)}$  vs. Temperature



TM60P03DF

P -Channel Enhancement Mosfet

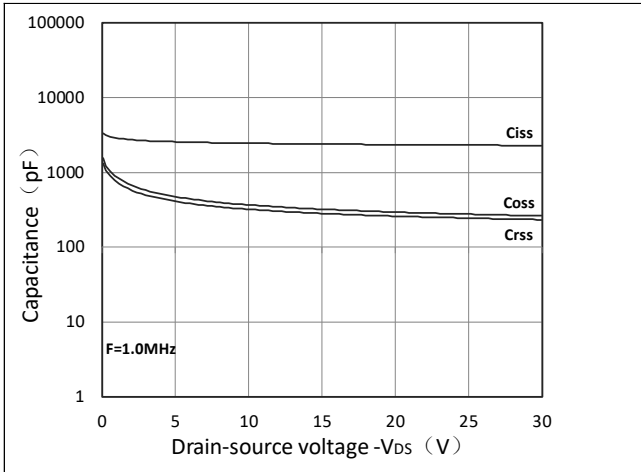


Figure 7. Capacitance Characteristics

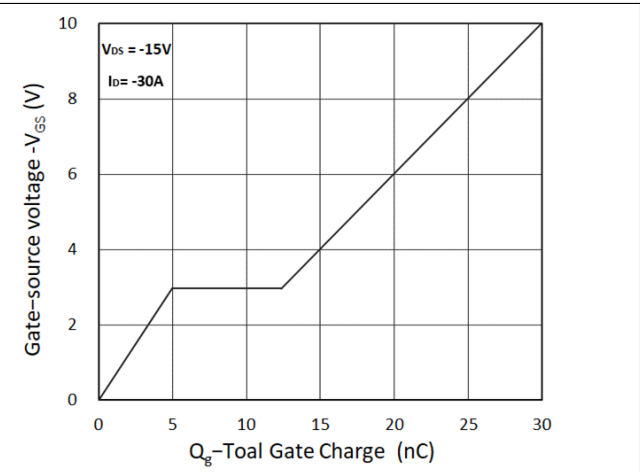


Figure 8. Gate Charge Characteristics

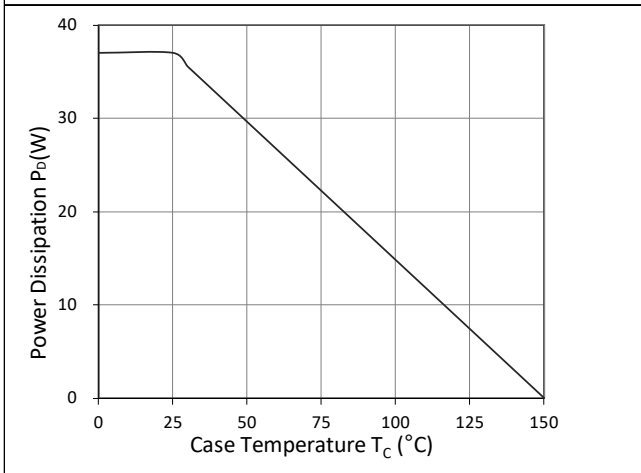


Figure 9. Power Dissipation

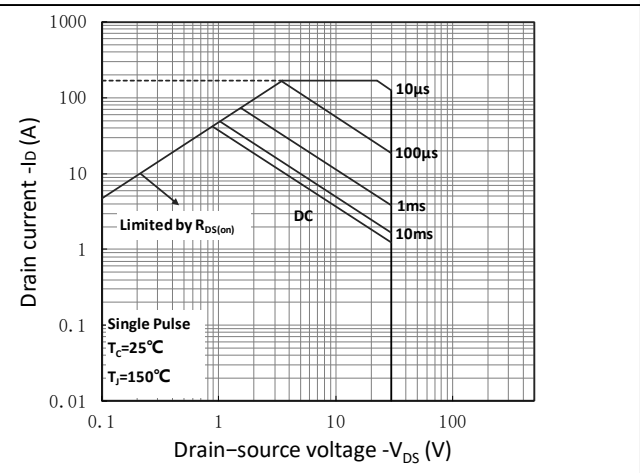


Figure 10. Safe Operating Area

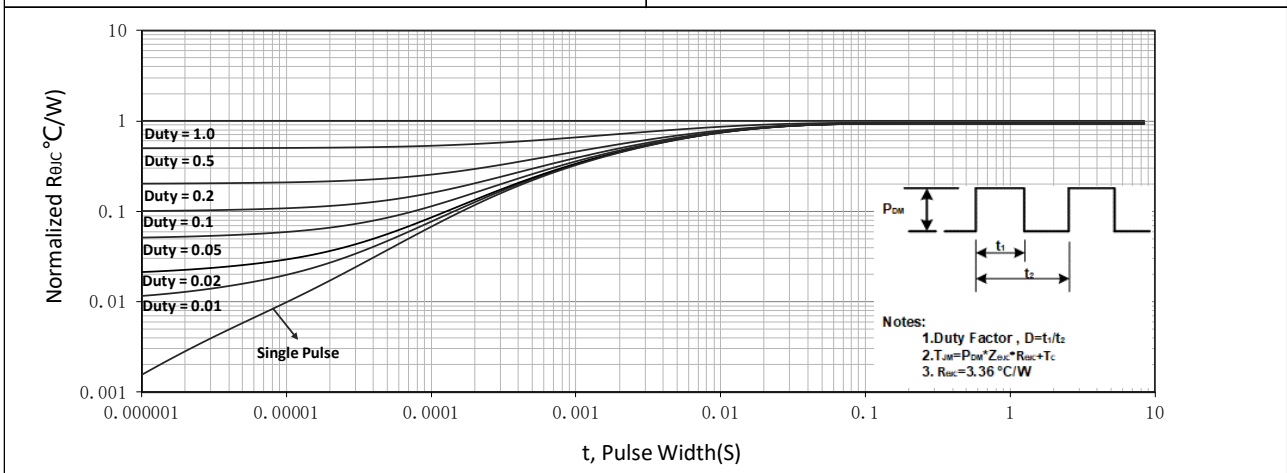


Figure 11. Normalized Maximum Transient Thermal Impedance

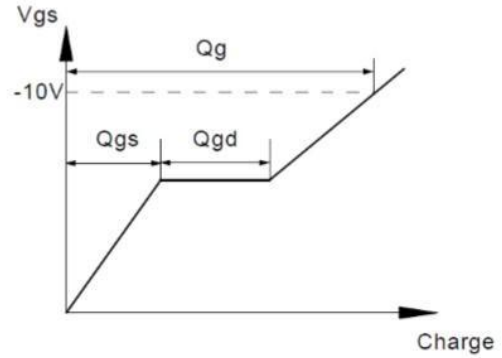
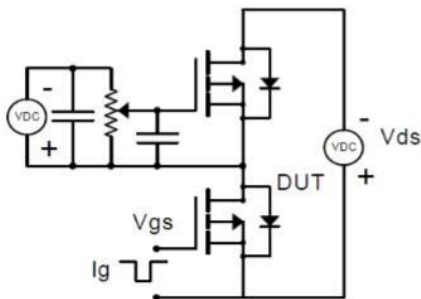


TM60P03DF

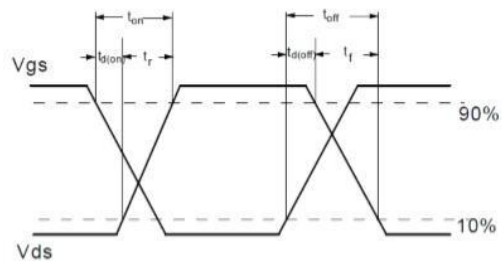
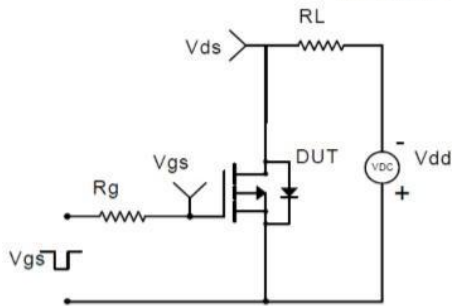
P -Channel Enhancement Mosfet

Test Circuit

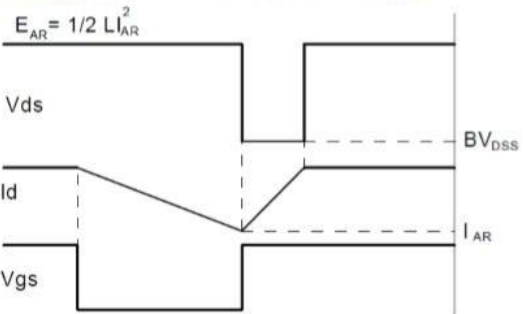
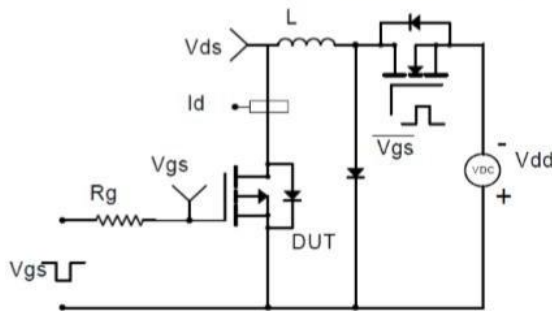
Gate Charge Test Circuit & Waveform



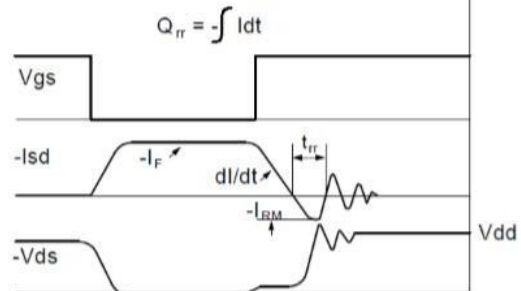
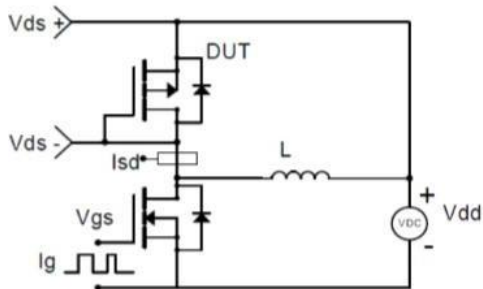
Resistive Switching Test Circuit & Waveforms



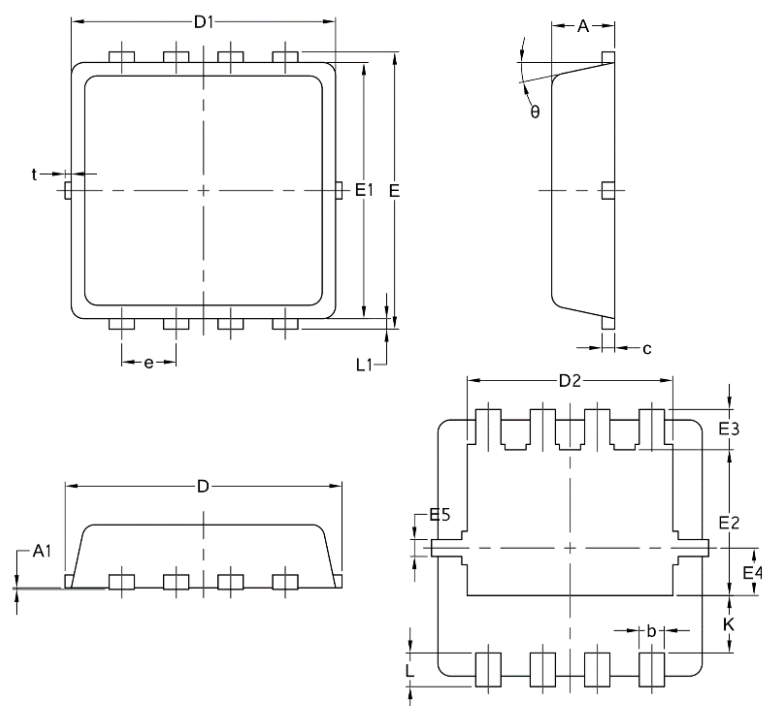
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



## Package Mechanical Data:DFN3x3-8L



Symbol	Common		
	mm		
	Mim	Nom	Max
A	0.70	0.75	0.85
A1	/	/	0.05
b	0.20	0.30	0.40
c	0.10	0.152	0.25
D	3.15	3.30	3.45
D1	3.00	3.15	3.25
D2	2.29	2.45	2.65
E	3.15	3.30	3.45
E1	2.90	3.05	3.20
E2	1.54	1.74	1.94
E3	0.28	0.48	0.65
E4	0.37	0.57	0.77
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.59	0.69	0.89
L	0.30	0.40	0.50
L1	0.06	0.125	0.20
t	0	0.075	0.13
Φ	10	12	14