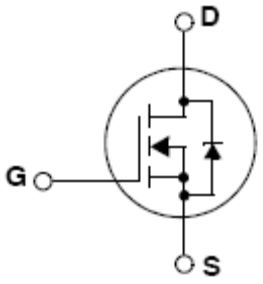
BYD Microelectronics Co., Ltd.

BF94N60/BF94N60L

600V N-Channel MOSFET

General Description

The N-Channel enhancement mode power field effect transistor is produced using DMOS technology.
This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction, electronic lamp ballasts based on half bridge topology.



Features

- V_{DS} =600 V
- I_D =4A
- $R_{DS(ON)}$ =1.9 Ω TYP(V_{GS}=10V ,I_D=2A)
- Low C_{RSS} (typical 7.0pF)
- Fast switching

Absolute Maximum Ratings

Symbol	Parameter		BF94N60L	BF94N60	Unit
V_{DS}	Drain-Source Voltage		600		V
I_D	Drain Current(continuous)at Tc=25°C		4		A
I_{DM}	Drain Current (pulsed)	(Note1)	16		A
V_{GS}	Gate-Source Voltage		±30		V
E_{AS}	SinglePulseAvalanche Energy	(Note2)	170		mJ
I_{AR}	Avalanche Current	(Note1)	4		A
E_{AR}	RepetitiveAvalancheEnergy	(Note1)	10		mJ
dv/dt	PeakDiodeRecoverydv/dt	(Note3)	5		V/ns
P_D	Power Dissipation (T_C = 25°C)		62	37	W
Tstg	Storage Temperature Range		-55 to +150		°C
T_L	Maximum Lead Temperature for Soldering Purpose		300		°C

Ordering Information

Part Number	Package	Packaging
BF94N60	TO-220F	Tube
BF94N60L	TO-220	Tube

Thermal Data

Symbol	Parameter	TO-220F	TO-220	Unit
Rthj-case	Thermal Resistance Junction-case	3.3	2.0	°C /W
Rthj-amb	Thermal Resistance Junction-ambient	62.5	62.5	°C /W

Electrical Characteristics(T_c = 25℃)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	I_D=250uA ,V_{GS}=0	600			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=600V ,V_{GS}=0V			1	uA
		V_{DS}=600V ,V_{GS}=0V,Tc=125℃			10	uA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±30V ,V_{DS}=0V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} ,I_D=250uA	2.0		4.0	V
$R_{DS(on)}$	Static Drain-Source On Resistance	V_{GS}=10V ,I_D=2A		1.9	2.2	Ω
C_{iss}	Input Capacitance	V_{DS}=25V,f=1MHZ,V_{GS}=0V		550		pF
C_{oss}	Output Capacitance			60		pF
C_{rss}	Reverse Transfer Capacitance			7.0		pF
$t_{d(on)}$	Turn-On Delay Time	V_{DD}=300V I_D=2A V_{GS}=10V ,R_G=4.7Ω (Note4, 5)		20		ns
t_r	Rise Time			17		ns
$t_{d(off)}$	Turn-Off Delay Time			47		ns
t_f	Fall Time			18		ns
Q_g	Total Gate Charge	V_{DD}=480V, I_D=4A V_{GS}=10V (Note4, 5)		20		nC
Q_{gs}	Gate-Source Charge			5.0		nC
Q_{gd}	Gate-Drain Charge			5.7		nC
V_{SD}(*)	Forward On Voltage	I_F=4A V_{GS}=0V		0.8	1.2	V
T_{rr}	Reverse Recovery Time	V_{DD}=300V,I_F=4A,di/dt=100A/us (Note4)		280		ns

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 20mH, I_{AS} = 4A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ 4 A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

(*).Pulsed:Pulse duration

Typical characteristics (25℃ unless noted)

Figure 1 Output Characteristics

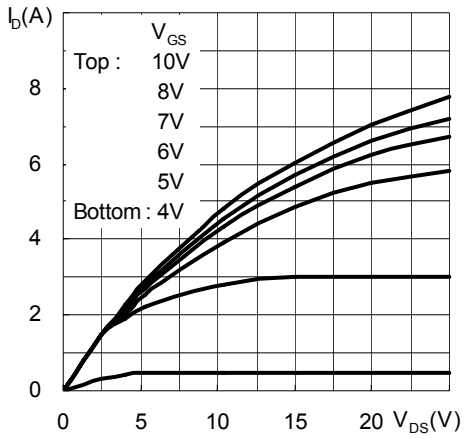


Figure 2 Transfer Characteristics

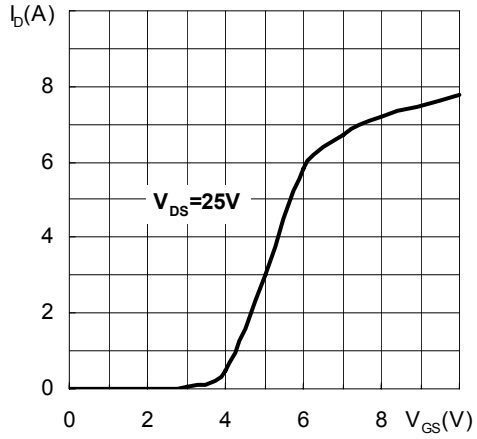


Figure 3 Normalized Threshold Voltage vs.Temperature

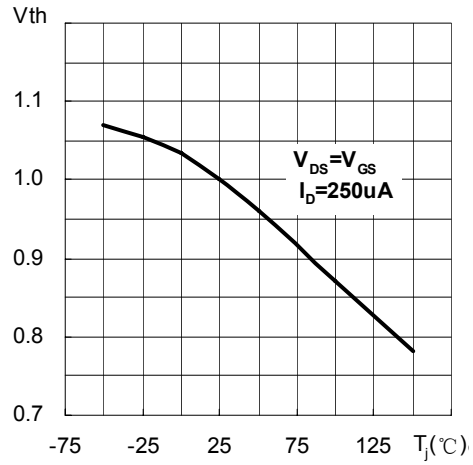


Figure 4 Normalized BV_{DSS} vs.Temperature

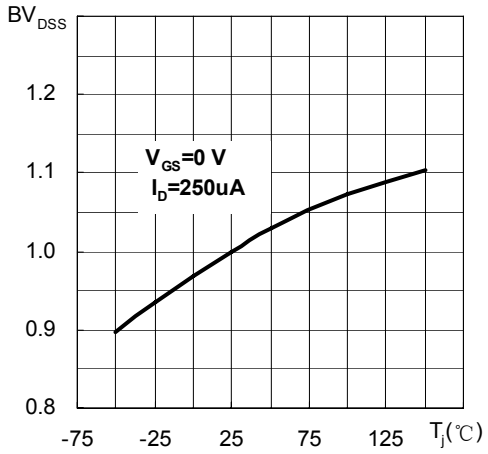


Figure 5 Normalized on Resistance vs Temperature

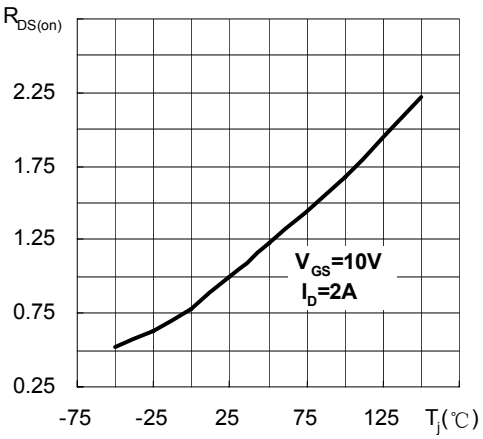


Figure 6 Source-Drain Diode Forward Characteristics

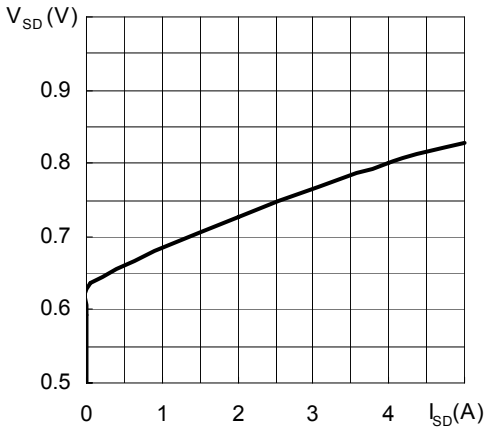


Figure 7 Capacitance

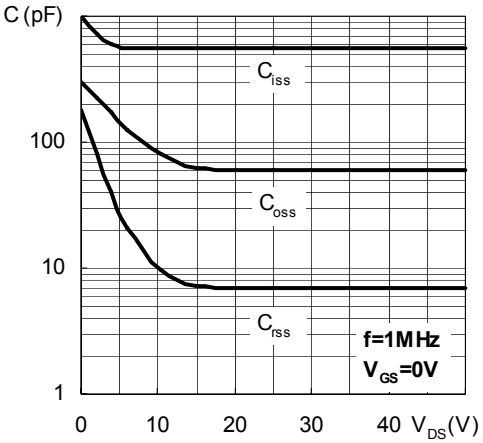


Figure 8 Gate Charge

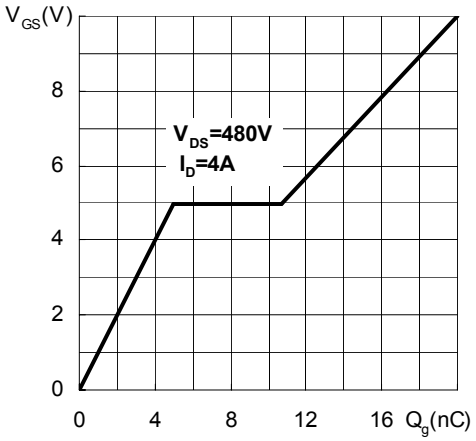


Figure 9-1 Safe Operating Area For BF94N60

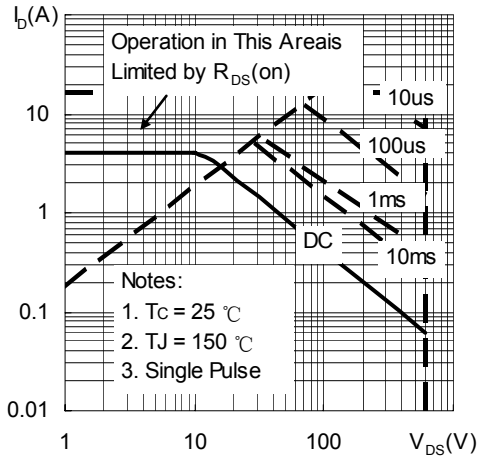


Figure 9-2 Maximum Safe Operating Area For BF94N60L

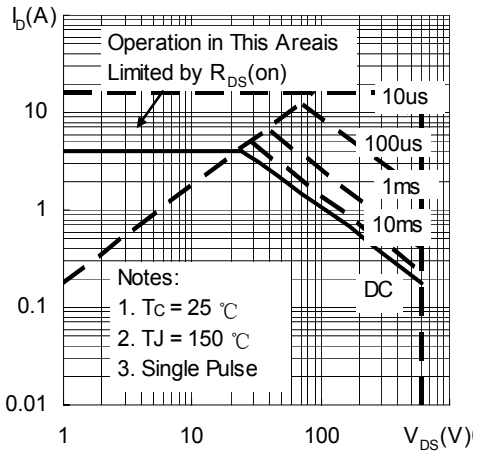


Figure 10 Maximum Drain Current vs Case Temperature

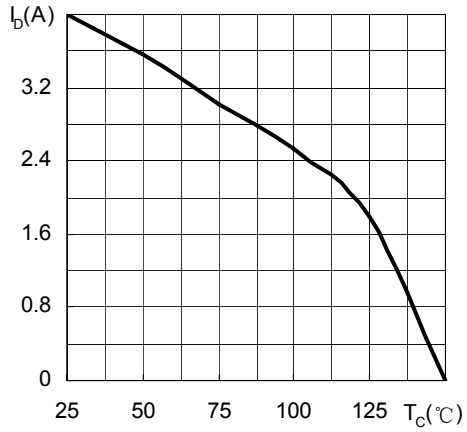


Figure 11-1 Maximum Transient Thermal Impedance For BF94N60

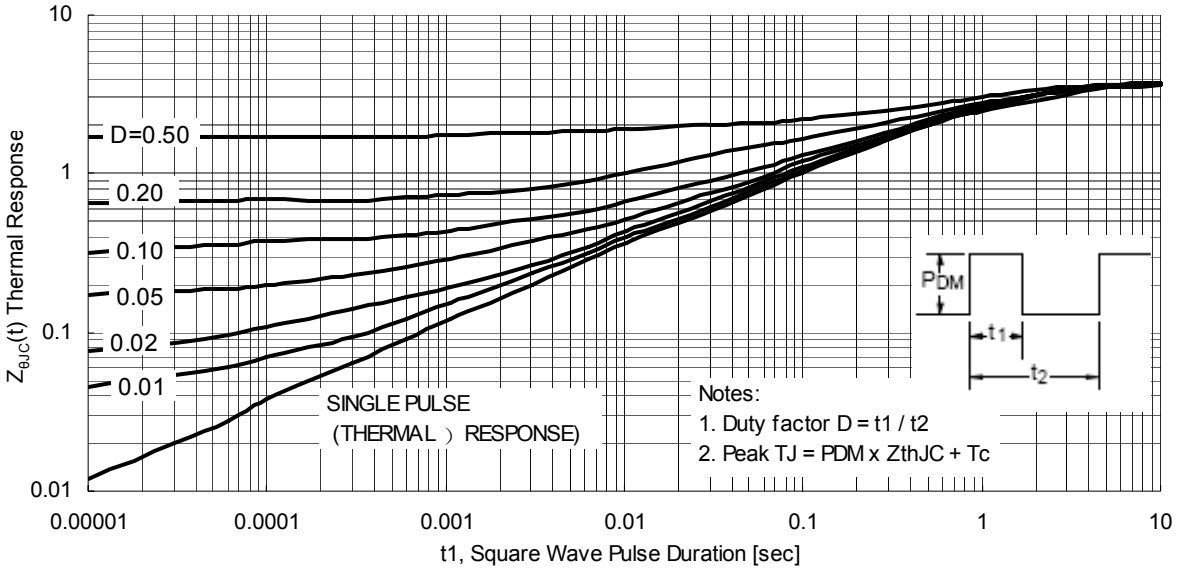
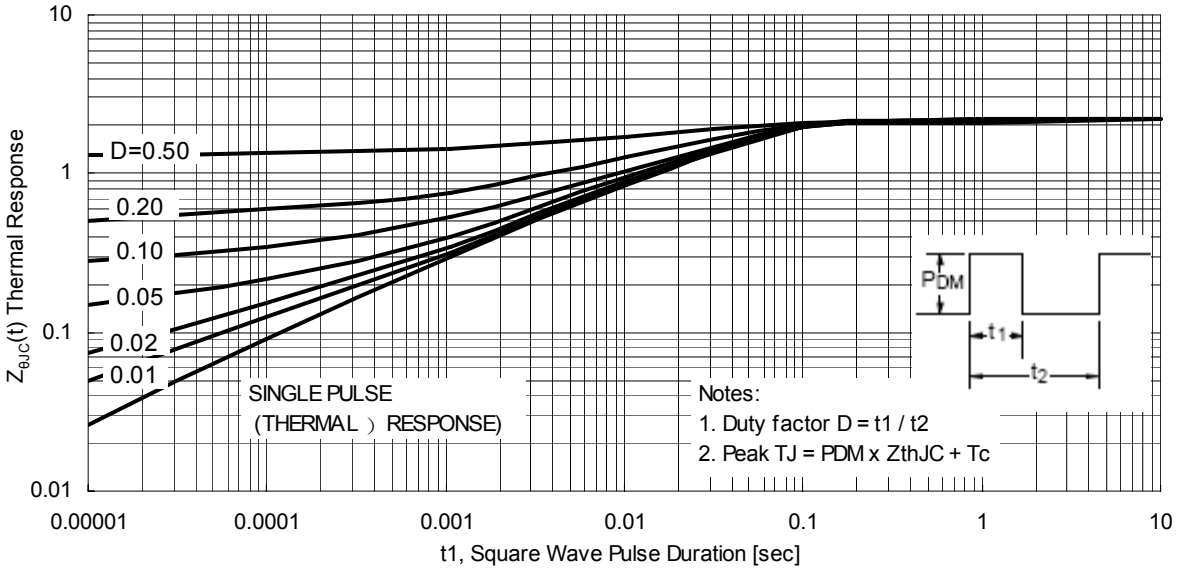
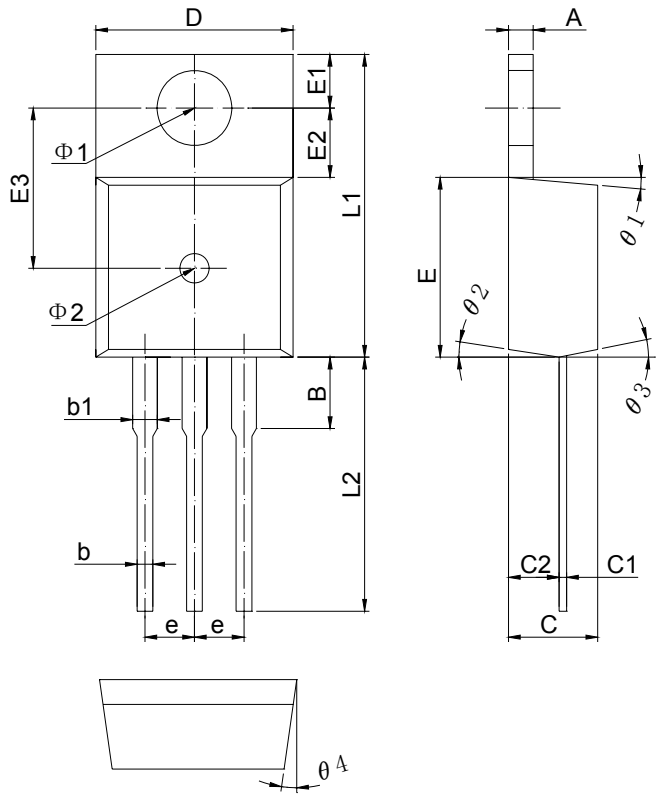


Figure 11-2 Maximum Transient Thermal Impedance For BF94N60L

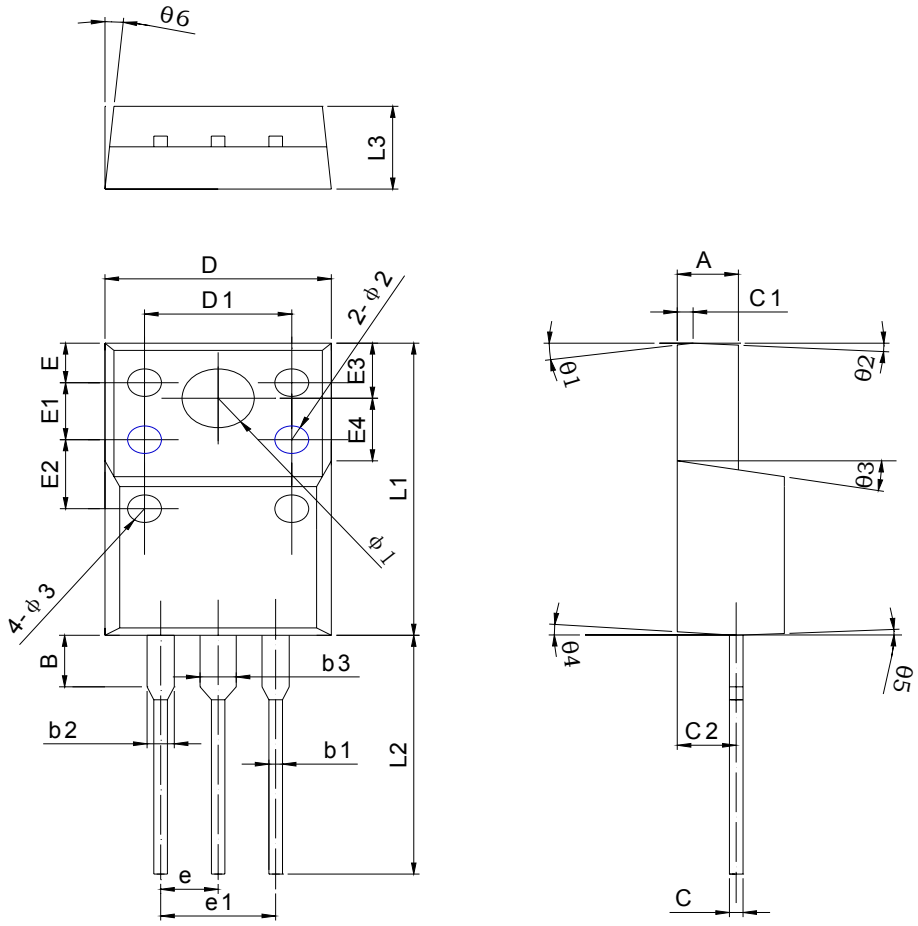


Package Drawing
TO-220



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	-	1.27	-	-	0.050	-
B	-	3.65	-	-	0.144	-
b	-	0.81	-	-	0.032	-
b1	-	1.27	-	-	0.050	-
C	-	4.58	-	-	0.180	-
C1	-	0.38	-	-	0.015	-
C2	-	2.60	-	-	0.102	-
D	10.10	10.12	10.14	0.398	0.398	0.399
E	-	9.20	-	-	0.362	-
E1	-	2.74	-	-	0.108	-
E2	-	3.55	-	-	0.140	-
E3	-	8.20	-	-	0.323	-
e	2.515	2.54	2.565	0.099	0.100	0.101
L1	15.47	15.49	15.51	0.609	0.610	0.611
L2	13.00	-	-	0.512	-	-
Θ1	3°			3°		
Θ2	3°			3°		
Θ3	3°			3°		
Θ4	3°			3°		
φ1	3.84			0.151		
φ2	1.5			0.059		

TO-220F


θ6
L3
D
D1
2-φ2
E
E1
E2
E3
E4
L1
φ1
4-φ3
B
b3
b2
b1
L2
e
e1
A
C1
θ1
θ2
θ3
θ4
θ5
C2
C

Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	2.50	2.70	2.90	0.098	0.106	0.114
B	2.60	2.80	3.00	0.102	0.110	0.118
b1	0.50	0.60	0.70	0.020	0.024	0.028
b2	1.10	1.20	1.30	0.043	0.047	0.051
b3	-	1.60	-	-	0.063	-
C	0.55	0.60	0.65	0.022	0.024	0.026
C1	-	0.60	-	-	0.024	-
C2	2.40	2.60	2.80	0.094	0.102	0.110
D	9.80	10.00	10.20	0.386	0.394	0.402
D1	-	6.50	-	-	0.256	-
E	-	2.15	-	-	0.085	-
E1	-	3.10	-	-	0.122	-
E2	-	3.75	-	-	0.148	-
E3	2.90	3.00	3.10	0.114	0.118	0.122
E4	3.30	3.40	3.50	0.130	0.134	0.138
e	-	2.54	-	-	0.100	-
e1	4.98	5.08	5.18	0.196	0.200	0.204
L1	14.80	15.00	15.20	0.583	0.591	0.598
L2	13.00	13.20	13.40	0.512	0.520	0.528
L3	4.30	4.50	4.70	0.169	0.177	0.185
Θ1	5°			5°		
Θ2	3°			3°		
Θ3	10°			10°		
Θ4	5°			5°		
Θ5	3°			3°		
Θ6	5°			5°		
φ1	3.00	3.20	3.40	0.118	0.126	0.134
φ2	1.50 深 1.2 头部 160°			1.50 深 1.2 头部 160°		
φ3	1.50 深 0.1			1.50 深 0.1		

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