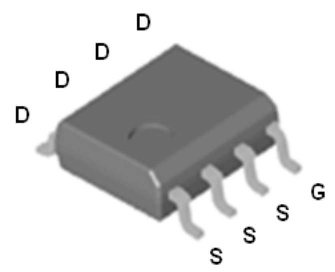
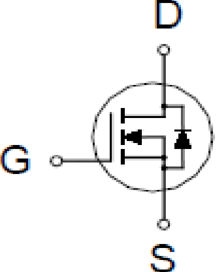
P1406BV

N-Channel Enhancement Mode MOSFET

PRODUCT SUMMARY

$V_{(BR)DSS}$	$R_{DS(ON)}$	I_D
60V	12.5mΩ @V_{GS} = 10V	12A





ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C Unless Otherwise Noted)

PARAMETERS/TEST CONDITIONS		SYMBOL	LIMITS	UNITS
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_A = 25 °C	I_D	12	A
	T_A = 70 °C		10	
Pulsed Drain Current[1]		I_{DM}	40	
Avalanche Current		I_{AS}	39	
Avalanche Energy	L = 0.1mH	E_{AS}	76	mJ
Power Dissipation[3]	T_A= 25 °C	P_D	4	W
	T_A =70 °C		2.6	
Junction & Storage Temperature Range		T_j, T_{stg}	-55 to 150	°C

THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE		SYMBOL	TYPICAL	MAXIMUM	UNITS
Junction-to-Ambient[2]	t ≦10s	$R_{\theta JA}$		30	°C / W
Junction-to-Ambient	Steady-State	$R_{\theta JA}$		56	
Junction-to-Case	Steady-State	$R_{\theta JC}$		25	

[1]Pulse width limited by maximum junction temperature.

[2]The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25° C.

[3]The Power dissipation is based on $R_{\theta JA}$ t ≦10s value.

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ELECTRICAL CHARACTERISTICS (T_J = 25 °C, Unless Otherwise Noted)

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS MIN	LIMITS TYP	LIMITS MAX	UNITS
STATIC						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	60			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	1.3	1.8	2.3	V
Gate-Body Leakage	I_{GSS}	V_{DS} = 0V, V_{GS} = ±20V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 48V, V_{GS} = 0V			1	μA
		V_{DS} = 40V, V_{GS} = 0V, T_J = 55 °C			10	
Drain-Source On-State Resistance[1]	$R_{DS(ON)}$	V_{GS} = 4.5V, I_D = 10A		11	16	mΩ
		V_{GS} = 10V, I_D = 10A		9.8	12.5	
Forward Transconductance[1]	g_{fs}	V_{DS} = 5V, I_D = 10A		50		S
DYNAMIC						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 50V, f = 1MHz		1901		pF
Output Capacitance	C_{oss}			239		
Reverse Transfer Capacitance	C_{rss}			177		
Gate Resistance	R_g	V_{GS} = 0V, V_{DS} = 0V, f = 1MHz		0.7		Ω
Total Gate Charge[2]	$Q_{g(VGS=10V)}$	V_{DS} = 30V , I_D = 10A		48		nC
	$Q_{g(VGS=4.5V)}$			27		
Gate-Source Charge[2]	Q_{gs}			5		
Gate-Drain Charge[2]	Q_{gd}			15		
Turn-On Delay Time[2]	$t_{d(on)}$	V_{DS} = 30V, I_D ≅ 10A, V_{GS} = 10V, R_{GEN} = 6Ω		20		nS
Rise Time[2]	t_r			12		
Turn-Off Delay Time[2]	$t_{d(off)}$			58		
Fall Time[2]	t_f			10		
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (T_J = 25 °C)						
Continuous Current	I_S				3	A
Forward Voltage[1]	V_{SD}	I_F = 10A, V_{GS} = 0V			1.3	V
Diode Reverse Recovery Time	t_{rr}	I_F = 10A, dl/dt = 100A /μS		26		nS
Diode Reverse Recovery Charge	Q_{rr}			17		nC

[1]Pulse test : Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.

[2]Independent of operating temperature.

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Output Characteristics

VGS=10V
VGS=9V
VGS=8V
VGS=7V
VGS=6V
VGS=5V
VGS=4.5V
VGS=4V
VGS=3.5V
VGS=3V

I_D, Drain-To-Source Current(A)

V_{DS}, Drain-To-Source Voltage(V)

Transfer Characteristics

25℃
125℃
-20℃

I_D, Drain-To-Source Current(A)

V_{GS}, Gate-To-Source Voltage(V)

Gate charge Characteristics

VDS=30V
ID=10A

V_{GS} , Gate-To-Source Voltage(V)

Qg , Total Gate Charge(nC)

Capacitance Characteristic

CISS
COSS
CRSS

C , Capacitance(pF)

V_{DS}, Drain-To-Source Voltage(V)

On-Resistance VS Gate-To-Source

ID=10A

$R_{DS(ON)}$ON-Resistance(OHM)

V_{GS}, Gate-To-Source Voltage(V)

On-Resistance VS Drain Current

VGS=4.5V
VGS=10V

$R_{DS(ON)}$ON-Resistance(OHM)

I_D , Drain-To-Source Current(A)

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On-Resistance VS Temperature

Normalized Drain to Source ON-Resistance

2.4, 2.2, 2.0, 1.8, 1.6, 1.4, 1.2, 1.0, 0.8, 0.6, 0.4

-50, -25, 0, 25, 50, 75, 100, 125, 150

VGS=10V
ID=10A

T_J , Junction Temperature(°C)

Source-Drain Diode Forward Voltage

I_S , Source Current(A)

100, 10, 1, 0.1

150℃
25℃

0.0, 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4

V_{SD}, Source-To-Drain Voltage(V)

Safe Operating Area

I_D , Drain Current(A)

100, 10, 1, 0.1, 0.01

Operation in This Area is Limited by RDS(ON)

1ms
10ms
100ms
DC

NOTE :
1.VGS= 10V
2.TA=25°C
3.RθJA = 56°C/W
4.Single Pulse

0.1, 1, 10, 100

V_{DS}, Drain-To-Source Voltage(V)

Single Pulse Maximum Power Dissipation

Power(W)

80, 64, 48, 32, 16, 0

Single Pulse
RθJA = 56°C/W
TA=25°C

0.001, 0.01, 0.1, 1, 10, 100

Single Pulse Time(s)

Transient Thermal Response Curve

r(t) , Normalized Effective Transient Thermal Resistance

10, 1, 0.1, 0.01

Duty cycle=0.5
0.2
0.1
0.05
0.02
0.01

single pulse

Notes
P_{DM}
t1
t2
1.Duty cycle, D= t1 / t2
2.RthJA = 56 ℃/W
3.TJ-TA = P*RthJA(t)
4.RthJA(t) = r(t)*RthJA

0.0001, 0.001, 0.01, 0.1, 1, 10, 100

T_1 , Square Wave Pulse Duration[sec]

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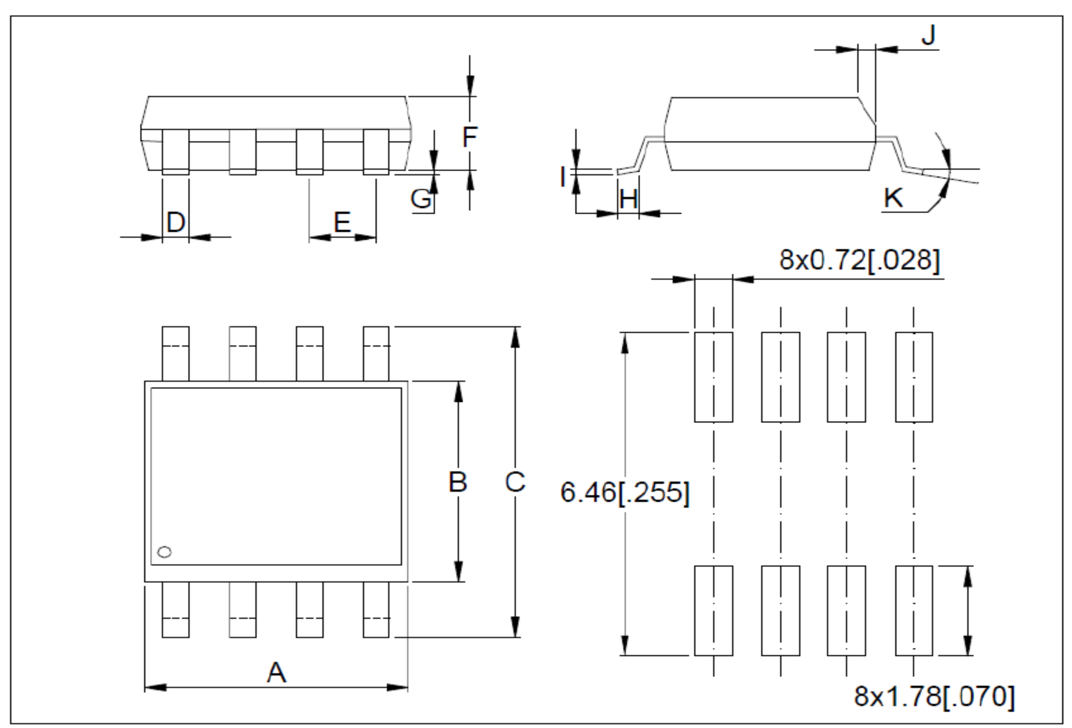
Package Dimension

SOP-8 MECHANICAL DATA

Dimension	mm			Dimension	mm		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.8	4.9	5.0	H	0.4	0.6	0.93
B	3.8	3.9	4.0	I	0.19	0.21	0.25
C	5.79	6.0	6.2	J	0.25	0.375	0.5
D	0.33	0.4	0.51	K	0°	3°	18°
E	1.25	1.27	1.29				
F	1.1	1.3	1.65				
G	0.05	0.15	0.25				



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A. Marking Information

D D D D

XXX — Logo

XXXXXXX — Part.NO.

XXXXXXXXX — LOT.NO.

S S S G

B. Tape&Reel Information:2500pcs/Reel

1.50+0.1 -0.0

8.00±0.10

2.00±0.05

4.00±0.10

5.50±0.05

1.75±0.1

12.00±0.3

1.6+1.0 -0.1

R0.3 MAX

6.40±0.10

FEED DIRECTION

R159

R165±0.5

2.2

13

97.0±1.0

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C. Lot No.&Date Code rule

1.Lot No.

M N XXXXX XX

- M → Assembly site
- N → Foundry site
- XXXXX → Order series no.
- XX → Sub-lot No

2.Date Code

D Y M X XXX

- D → Assembly site
- Y → Year (N:2011 ,O:2013 ,P:2014 ,R:2015 , S:2016 ,T:2017 ,U:2018…etc)
- M → Month (A:Jan ,B:Feb ,C:Mar ,D:Apr ,E:May, F:Jun,G:Jul,H:Aug,I:Sep,J:Oct,K:Nov,L:Dec)
- X → Week
- XXX → Order series no.& Sub-lot No

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D.Label rule

标签内容(Label content)

1	Label Size	30 * 90 mm
2	Font style	Times New Roman or Arial (或可区分英文”O”和数字”0”，”G和”Q”的字型即可)
3	U-NIKC	Height: 4 mm
4	Package	Height: 2 mm
5	Date	Height: 2 mm Shipping date: YYYY/MM/DD, ex. 2008/09/12
6	Device	Height: 3 mm (Max: 16 Digit)
7	Lot	Height: 3 mm (Max: 9 Digit) Sub lot
8	D/C	Height: 3 mm (Max: 7 Digit)
9	QTY	Height: 3 mm (Max: 6 Digit) Thousand mark is no needed
10	RoHS label	RoHS long axis: 12 mm minor axis:6 mm bottom color: White Font color: Black Font style: Arial
11	Halogen Free label	G Diameter: 10 mm bottom color: Green Font color: Black Font style: Arial
12	Scan information	Device / Lot / D/C / QTY , Insert “ / “ between every parts. for example: P3055LDG/G12345601/GGG2301/2000 DPI (Dots per inch): Over 300 dpi Code : Code 128 Height: 6 mm at least