

# P-Channel Logic Level Enhancement Mode MOSFET

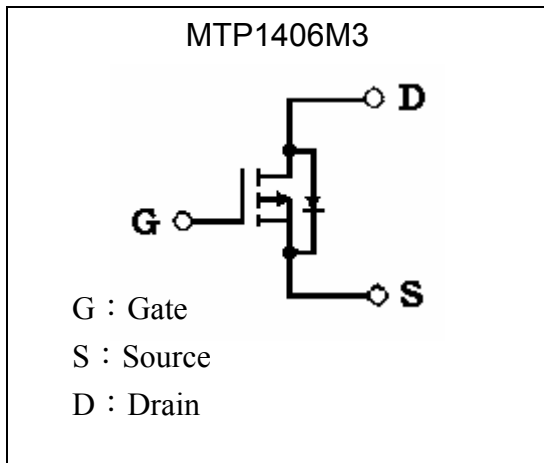
## MTP1406M3

$BV_{DSS}$	-60V
$I_D$	-4A
$R_{DS(ON)(MAX)}$	90.8m $\Omega$

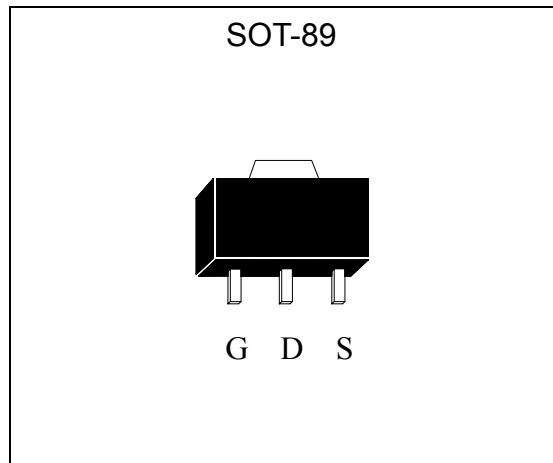
### Features

- Single Drive Requirement
- Low On-resistance,  $R_{DS(ON)}=90.8m\Omega @ V_{GS}=-10V, I_D=-4A$
- Ultra High Speed Switching
- Pb-free lead plated package

### Symbol



### Outline



### Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	$V_{DS}$	-60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current @ $T_C=25^\circ C$	$I_D$	-4	A
Continuous Drain Current @ $T_C=100^\circ C$	$I_D$	-2.4	
Pulsed Drain Current *1	$I_{DM}$	-16	
Total Power Dissipation @ $T_A=25^\circ C$	$P_d$	1.67	W
Total Power Dissipation @ $T_A=100^\circ C$		0.83	
Operating Junction and Storage Temperature	$T_j, T_{stg}$	-55~+175	$^\circ C$

Note : \*1. Pulse width limited by maximum junction temperature  
 \*2. Duty cycle $\leq 1\%$



**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-ambient, max	R <sub>th,j-a</sub>	90*	°C/W

\* Surface mounted on 1 in<sup>2</sup> copper pad of FR-4 board; 270 °C/W when mounted on min. copper pad

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

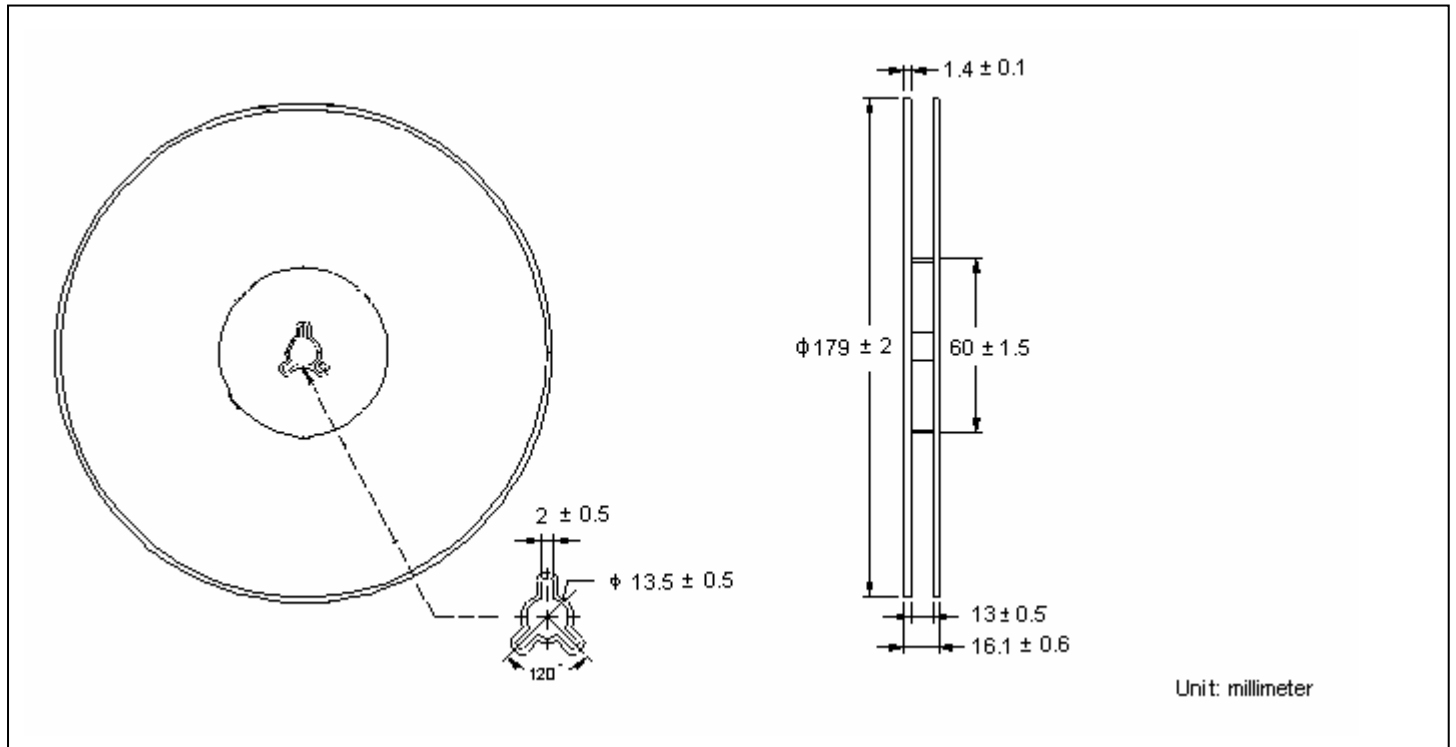
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	-60	-	-	V	V <sub>GS</sub> =0, I <sub>D</sub> =-250μA
V <sub>GS(th)</sub>	-1	-1.8	-3	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA
I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> =±20, V <sub>DS</sub> =0
I <sub>DSS</sub>	-	-	-1	μA	V <sub>DS</sub> =-32V, V <sub>GS</sub> =0
	-	-	-25	μA	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0, T <sub>J</sub> =125°C
I <sub>D(ON)</sub> *1	-4	-	-	A	V <sub>DS</sub> =-5V, V <sub>GS</sub> =-4.5V
R <sub>DS(ON)</sub> *1	-	82	90.8	mΩ	V <sub>GS</sub> =-10V, I <sub>D</sub> =-4A
	-	120	140	mΩ	V <sub>GS</sub> =-5V, I <sub>D</sub> =-3A
G <sub>FS</sub> *1	-	9	-	S	V <sub>DS</sub> =-5V, I <sub>D</sub> =-4A
<b>Dynamic</b>					
C <sub>iss</sub>	-	1980	-	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =-25V, f=1MHz
C <sub>oss</sub>	-	665	-		
C <sub>rss</sub>	-	645	-		
R <sub>g</sub>	-	6.8	-	Ω	V <sub>GS</sub> =15mV, V <sub>DS</sub> =0, f=1MHz
t <sub>d(ON)</sub> *1, 2	-	8	-	ns	V <sub>DS</sub> =-10V, I <sub>D</sub> =-1A, V <sub>GS</sub> =-10V, R <sub>G</sub> =6Ω
t <sub>r</sub> *1, 2	-	12	-		
t <sub>d(OFF)</sub> *1, 2	-	20	-		
t <sub>f</sub> *1, 2	-	12	-		
Q <sub>g</sub> *1, 2	-	16.2	-	nC	I <sub>D</sub> =-4A, V <sub>DS</sub> =-30V, V <sub>GS</sub> =-10V
Q <sub>gs</sub> *1, 2	-	2	-		
Q <sub>gd</sub> *1, 2	-	3.5	-		
<b>Source-Drain Diode</b>					
I <sub>S</sub> *1	-	-	-4	A	
I <sub>SM</sub> *3	-	-	-16		
V <sub>SD</sub> *1	-	-	-1.3	V	I <sub>F</sub> =I <sub>S</sub> , V <sub>GS</sub> =0V
*t <sub>rr</sub>	-	12	-	ns	I <sub>F</sub> =-4A, dI <sub>F</sub> /dt=100A/μs
*Q <sub>rr</sub>	-	9	-	nC	

Note : \*1.Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%  
 \*2.Independent of operating temperature  
 \*3.Pulse width limited by maximum junction temperature.

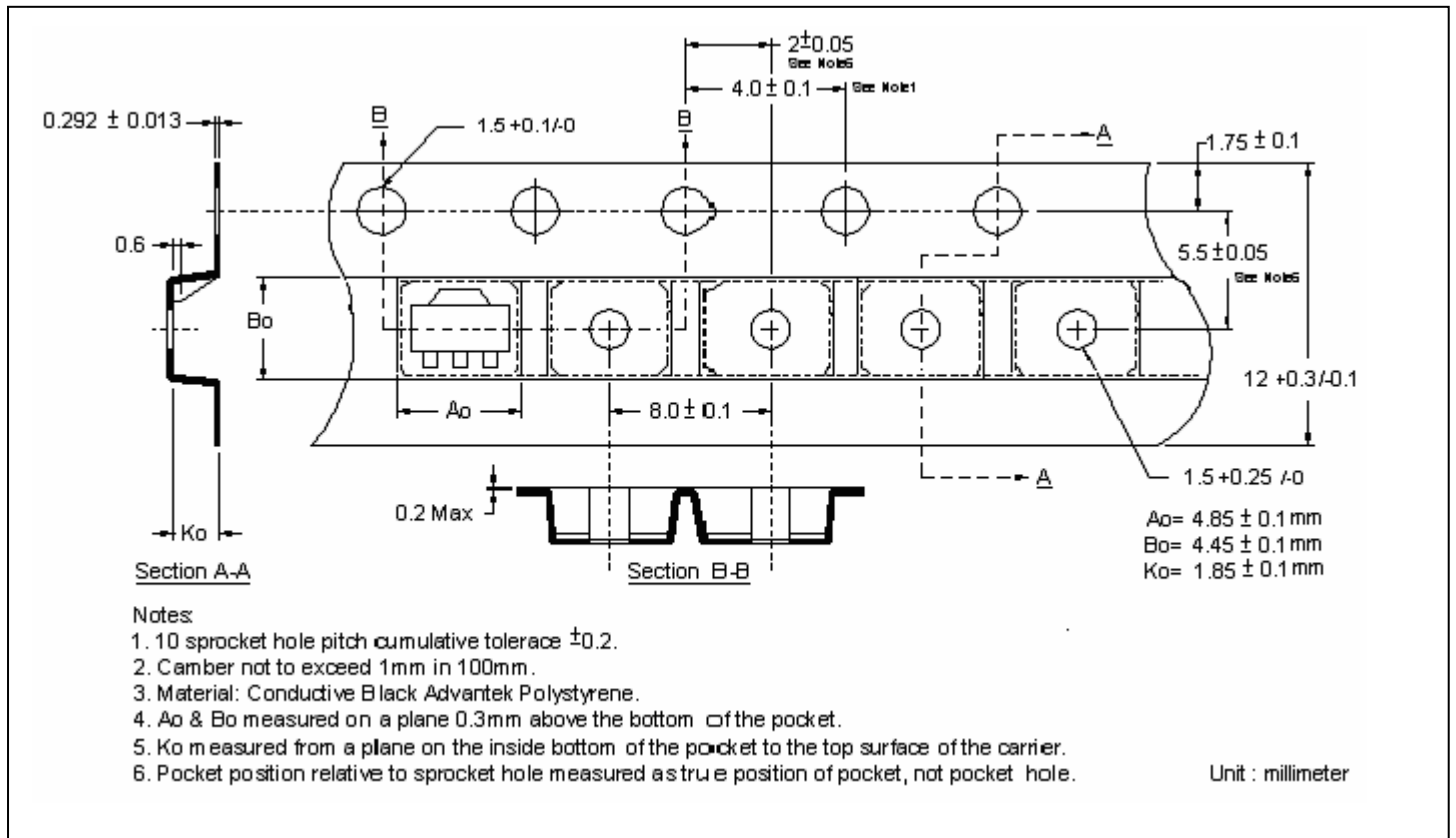
**Ordering Information**

Device	Package	Shipping	Marking
MTP1406M3	SOT-89 (Pb-free lead plating package)	1000 pcs / Tape & Reel	1406

**Reel Dimension**



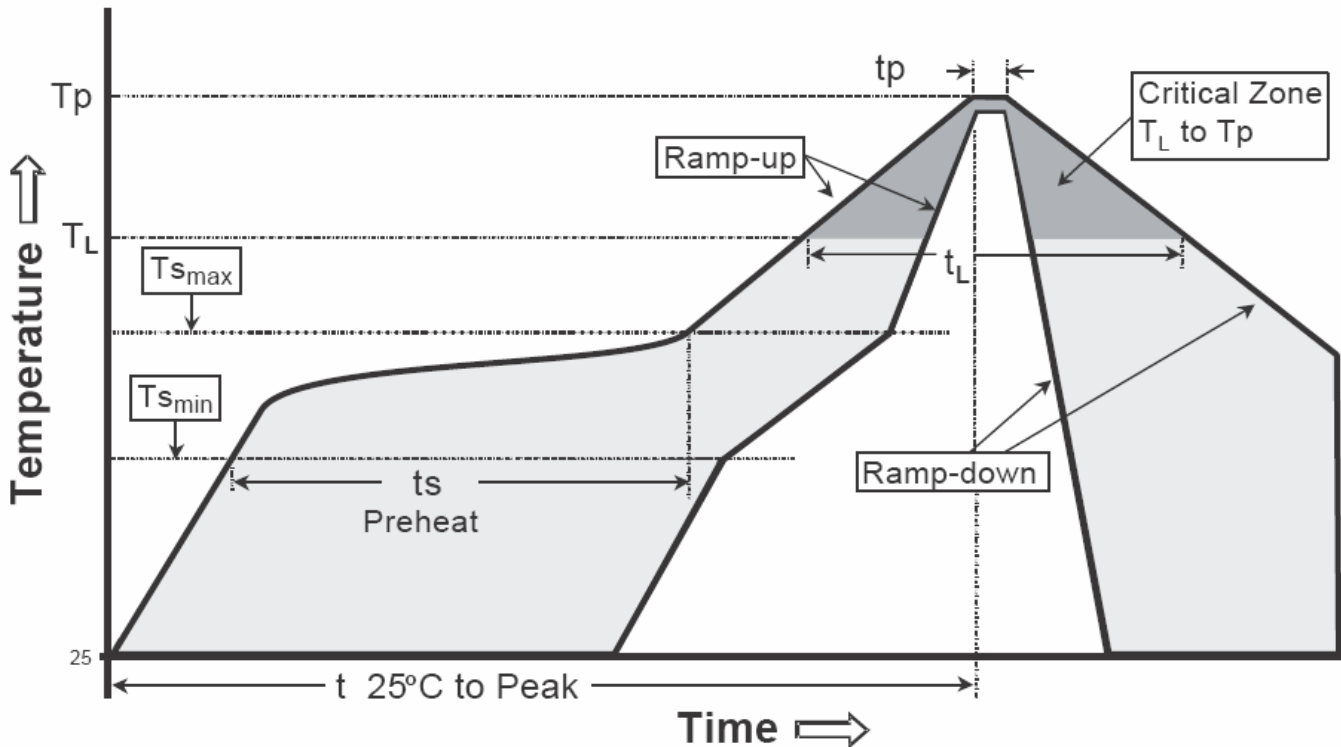
**Carrier Tape Dimension**



**Recommended wave soldering condition**

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

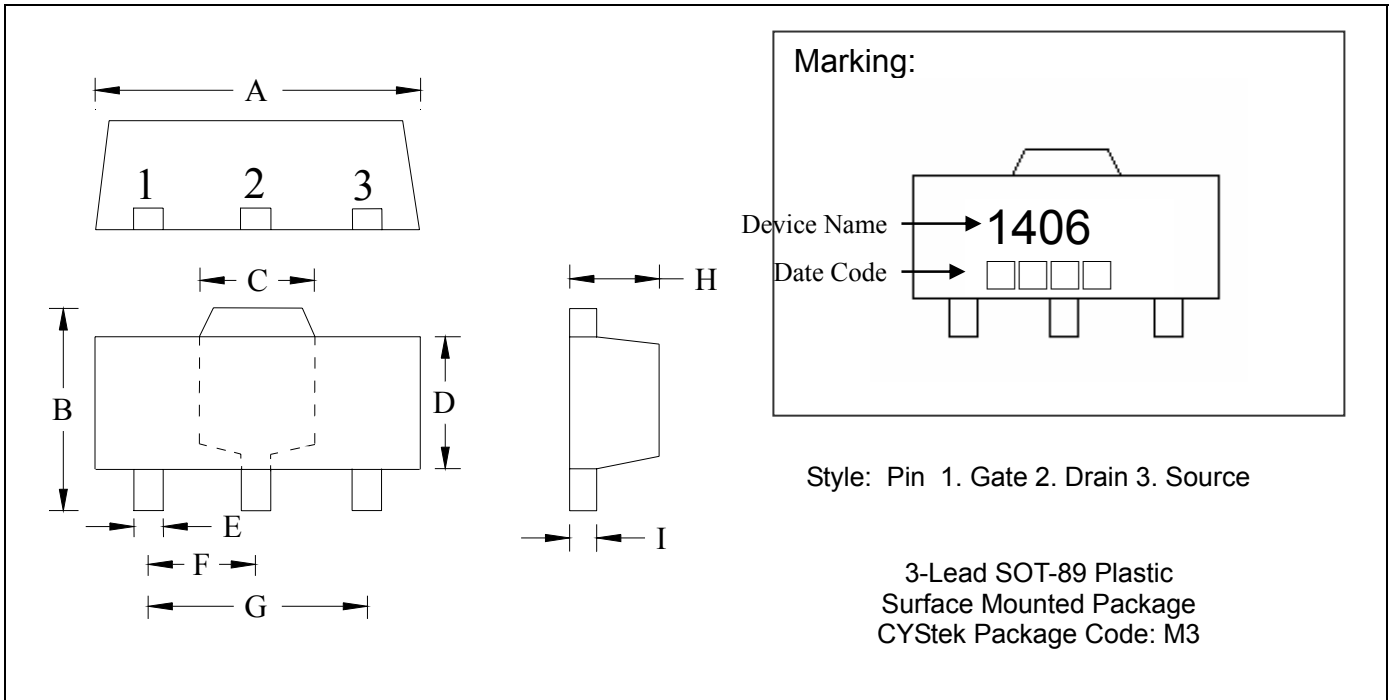
**Recommended temperature profile for IR reflow**



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(Ts min)	100°C	150°C
-Temperature Max(Ts max)	150°C	200°C
-Time(ts min to ts max)	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (TL)	183°C	217°C
- Time (tL)	60-150 seconds	60-150 seconds
Peak Temperature(TP)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

**SOT-89 Dimension**



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1732	0.1811	4.40	4.60	F	0.0591	TYP	1.50	TYP
B	0.1551	0.1673	3.94	4.25	G	0.1181	TYP	3.00	TYP
C	0.0610	REF	1.55	REF	H	0.0551	0.0630	1.40	1.60
D	0.0906	0.1024	2.30	2.60	I	0.0138	0.0173	0.35	0.44
E	0.0126	0.0205	0.32	0.52					

**Notes:** 1.Controlling dimension: millimeters.  
 2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.  
 3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

**Material:**

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

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