

**30V Complementary Enhancement Mode MOSFET****■ DESCRIPTION**

The 4606 is the complementary enhancement mode power field effect transistor is produced using high cell density advanced trench technology to provide excellent  $R_{DS(ON)}$ .

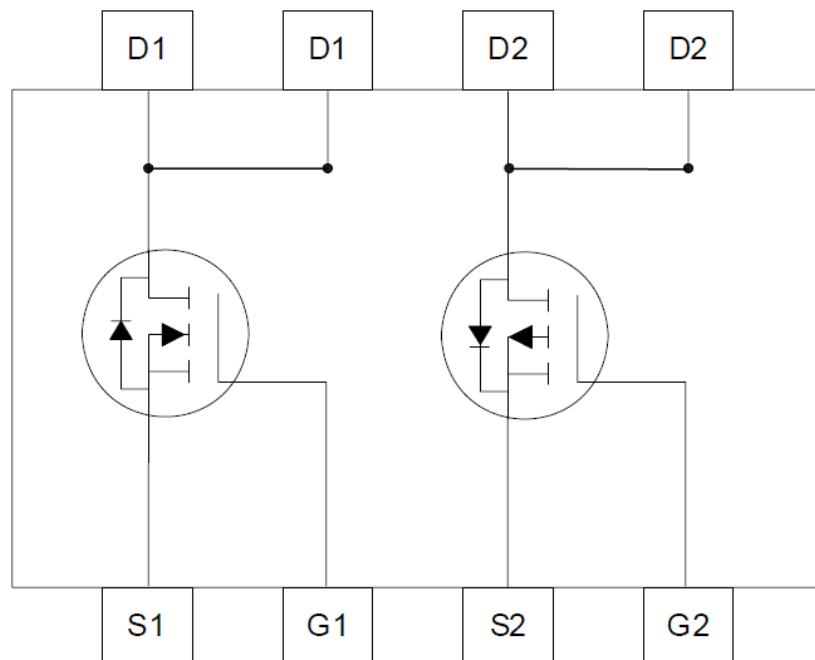
This device is suitable for use as a load switch or in PWM and gate charge for most of the synchronous buck converter applications

**■ FEATURE**

- ◆ 30V/7.0A,  $R_{DS(ON)}=18m\Omega$  @ $V_{GS}=10V$  N\_CH
- ◆ -30V/-6.0A,  $R_{DS(ON)}=45m\Omega$  @ $V_{GS}=-10V$  P\_CH
- ◆ 30V/5.0A,  $R_{DS(ON)}=30m\Omega$  @ $V_{GS}=4.5V$  N\_CH
- ◆ -30V/-5.0A,  $R_{DS(ON)}=60m\Omega$  @ $V_{GS}=-4.5V$  P\_CH
- ◆ Super high design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and Maximum DC current capability
- ◆ Full RoHS compliance
- ◆ SOP8 package design

**■ APPLICATIONS**

- ◆ High Frequency Point-of-Load Synchronous
- ◆ New working DC-DC Power System
- ◆ Load Switch

**■ PIN CONFIGURATION**



Desemicore

D4606

## ■ PART NUMBER INFORMATION

4606 <u>A</u> - <u>BB</u> <u>C</u>	A= Package Code S: SOP BB=Handing Code TR: Tape&Reel C=Lead Plating Code G: Green Product
------------------------------------	--

## ■ ORDERING INFORMATION

Part Number	Package Code	Package	Shipping
4606S-TR	S	SOP8	2500EA / T&R

- ※ Year Code : 0~9
- ※ Week Code : A~Z
- ※ G : Green Product. This product is RoHS compliant.

## ■ ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ Unless otherwise noted)

Symbol	Parameter		N-Channel	P-Channel	Unit
$V_{DSS}$	Drain-Source Voltage		30	-30	V
$V_{GSS}$	Gate-Source Voltage		$\pm 20$	$\pm 20$	V
$I_D$	Continuous Drain Current ( $T_A=25^\circ\text{C}$ )		7.0	-6	A
	Continuous Drain Current ( $T_A=70^\circ\text{C}$ )		6.5	-5.0	A
$I_{DM}$	Pulsed Drain Current		30	-30	A
$P_D$	Power Dissipation	$T_A=25^\circ\text{C}$	1	1	W
		$T_A=70^\circ\text{C}$	0.8	0.8	
$T_J$	Operation Junction Temperature		-55~150	-55~150	°C
$T_{STG}$	Storage Temperature Range		-55~150	-55~150	°C

**Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.**

**Absolute maximum ratings are stress rating only and functional device operation is not implied**



Desemicore

D4606

■ **N Channel ELECTRICAL CHARACTERISTICS ( $T_A=25^\circ C$  Unless otherwise noted)**

Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Static Parameters</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30			V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	3.0	V
$I_{GSS}$	Gate Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=24V, V_{GS}=0$			1	uA
		$V_{DS}=24V, V_{GS}=0$ $T_J=55^\circ C$			30	
$R_{DS(ON)}$	Drain-Source On-Resistance	$V_{GS}=10V, I_D=7A$		20	30	mΩ
		$V_{GS}=4.5V, I_D=5A$		30	45	
$g_{FS}$	Forward Transconductance	$V_{DS}=5V, I_D=5A$		7.3		S
<b>Source-Drain Diode</b>						
$V_{SD}$	Diode Forward Voltage	$I_S=1.7A, V_{GS}=0V$		0.76	1.0	V
<b>Dynamic Parameters</b>						
$Q_g$	Total Gate Charge	$V_{DS}=15V$ $V_{GS}=5V$ $I_D=7A$		7.58		nC
$Q_{gs}$	Gate-Source Charge			1.26		
$Q_{gd}$	Gate-Drain Charge			1.66		
$C_{iss}$	Input Capacitance	$V_{DS}=15V$ $V_{GS}=0V$ $f=1MHz$		390		pF
$C_{oss}$	Output Capacitance			86		
$C_{rss}$	Reverse Transfer Capacitance			60		
$T_{d(on)}$	Turn-On Time	$V_{DS}=15V$ $V_{GS}=10V$ $R_G=6\Omega$ $R_L=15\Omega$		10.12		nS
				3.12		
$T_f$	Turn-Off Time			22.16		
				2.96		

**Note: 1. Pulse test: pulse width<=300uS, duty cycle<=2%**

**2. Static parameters are based on package level with recommended wire bonding**



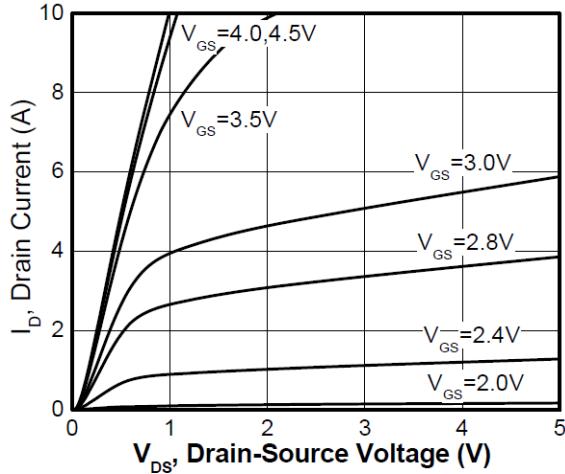
Desemicore

D4606

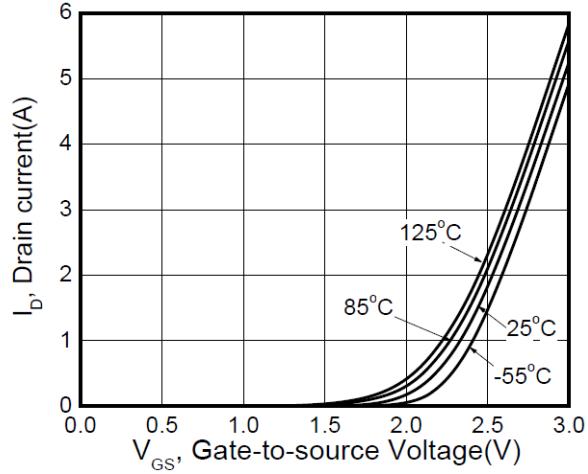
■ **P Channel ELECTRICAL CHARACTERISTICS ( $T_A=25^\circ C$  Unless otherwise noted)**

Symbol	Parameter	Condition	Min	Typ	Max	Unit	
<b>Static Parameters</b>							
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-30			V	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	-1.4	-3.0	V	
$I_{GSS}$	Gate Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA	
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-24V, V_{GS}=0$			-1	uA	
		$V_{DS}=-24V, V_{GS}=0$ $T_J=55^\circ C$			-30		
$R_{DS(ON)}$	Drain-Source On-Resistance	$V_{GS}=-10V, I_D=-6A$		45	60	mΩ	
		$V_{GS}=-4.5V, I_D=-5A$		60	80		
$g_{FS}$	Forward Transconductance	$V_{DS}=-5V, I_D=-4A$		21.7		S	
<b>Source-Drain Diode</b>							
$V_{SD}$	Diode Forward Voltage	$I_S=-1.0A, V_{GS}=0V$		-0.77	-1.0	V	
<b>Dynamic Parameters</b>							
$Q_g$	Total Gate Charge	$V_{DS}=-15V$ $V_{GS}=-10V$ $I_D=-5.0A$		9.0		nC	
$Q_{gs}$	Gate-Source Charge			2.2			
$Q_{gd}$	Gate-Drain Charge			1.8			
$C_{iss}$	Input Capacitance	$V_{DS}=-15V$ $V_{GS}=0V$ $f=1MHz$		486		pF	
$C_{oss}$	Output Capacitance			66			
$C_{rss}$	Reverse Transfer Capacitance			50			
$T_{d(on)}$	Turn-On Time	$V_{DS}=-15V$ $V_{GS}=-10V$ $R_G=6\Omega$ $R_L=15\Omega$		9.1		nS	
$T_r$				2.8			
$T_{d(off)}$	Turn-Off Time			19.2			
$T_f$				4.9			

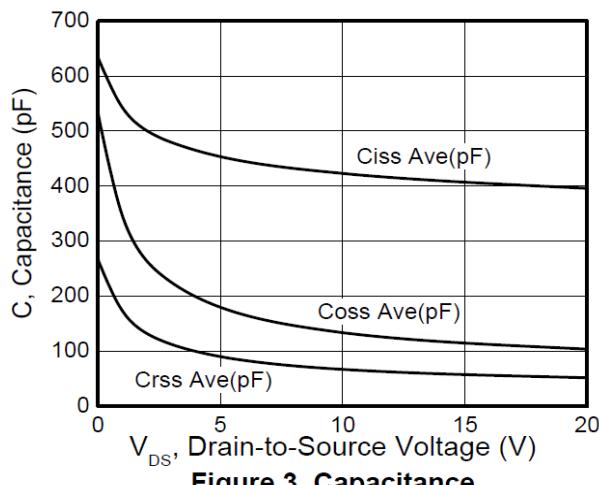
■ **N Channel TYPICAL CHARACTERISTICS (25°C Unless Note)**



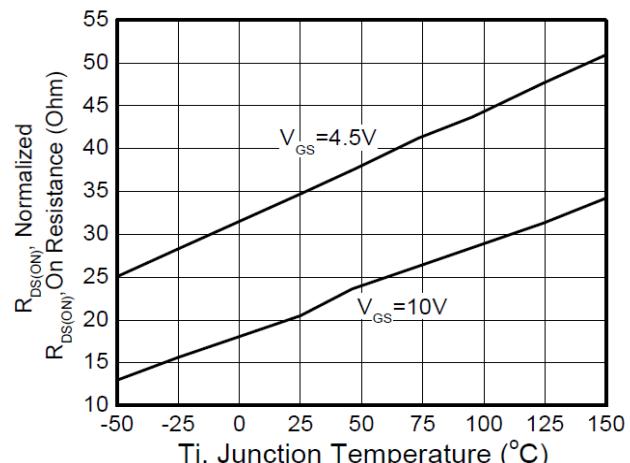
**Figure 1. Output Characteristics**



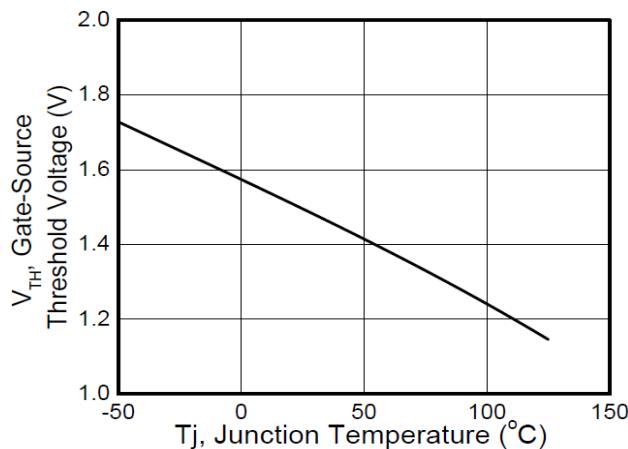
**Figure 2. Transfer Characteristics**



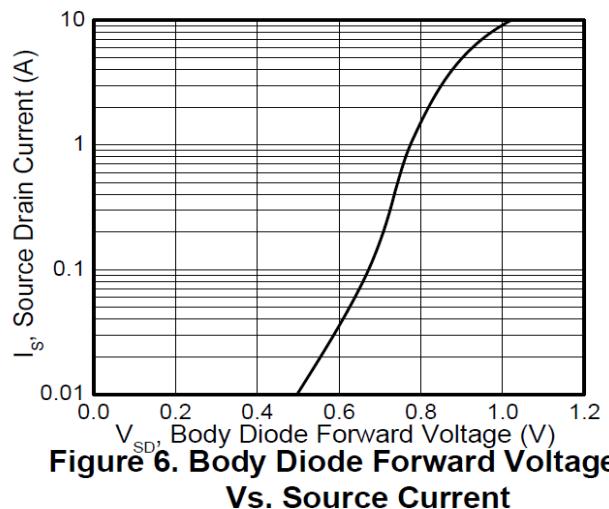
**Figure 3. Capacitance**



**Figure 4. On Resistance Vs. Temperature**

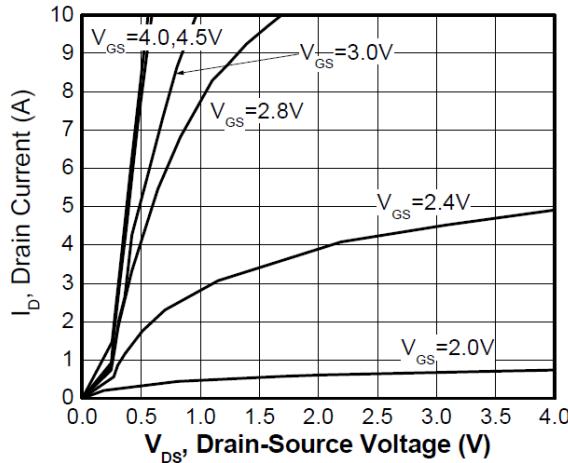


**Figure 5. Gate Thersholt Vs. Temperature**

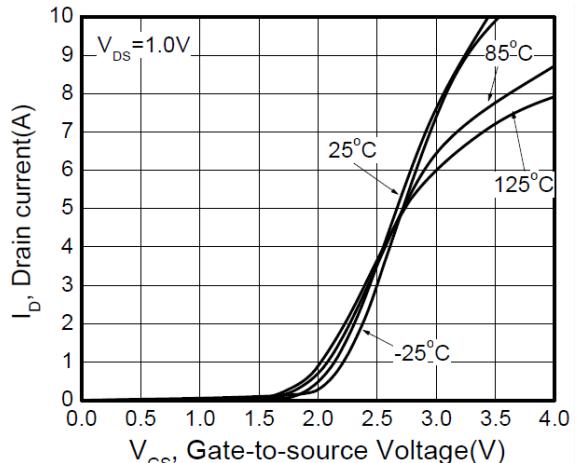


**Figure 6. Body Diode Forward Voltage Vs. Source Current**

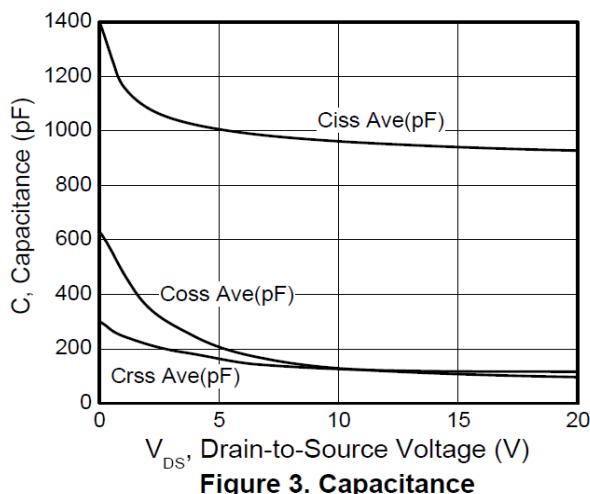
■ **P Channel TYPICAL CHARACTERISTICS (25°C Unless Note)**



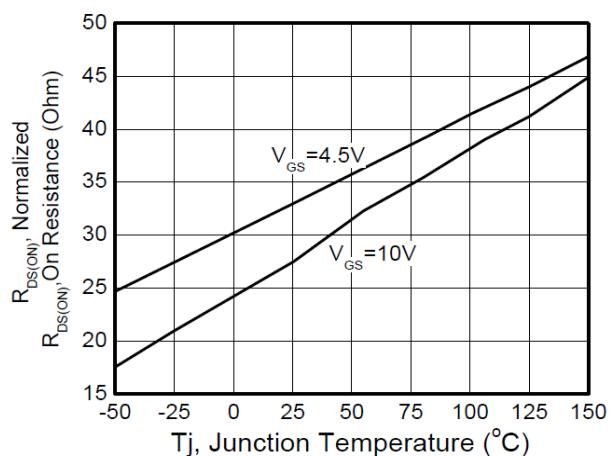
**Figure 1. Output Characteristics**



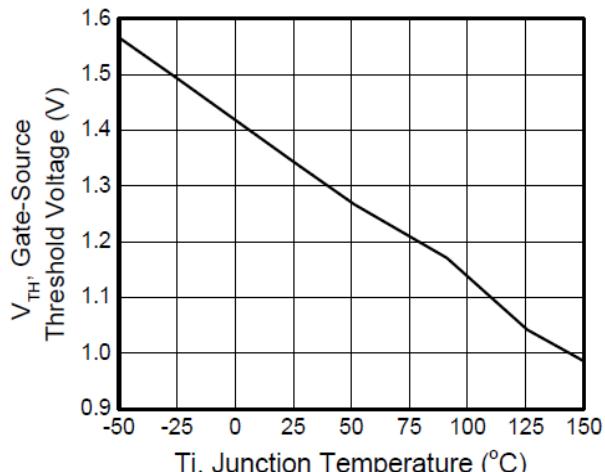
**Figure 2. Transfer Characteristics**



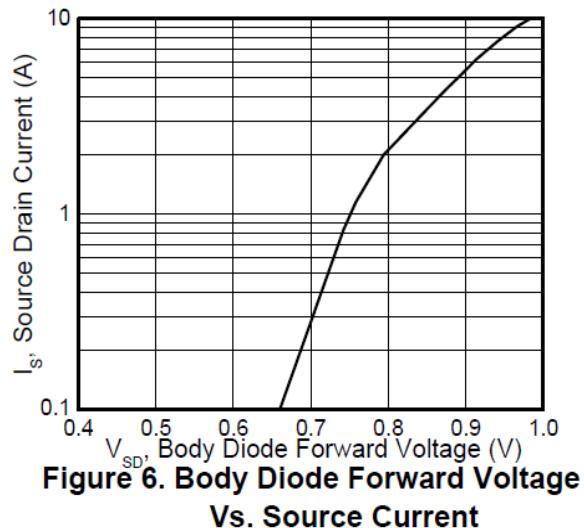
**Figure 3. Capacitance**



**Figure 4. On Resistance Vs. Temperature**

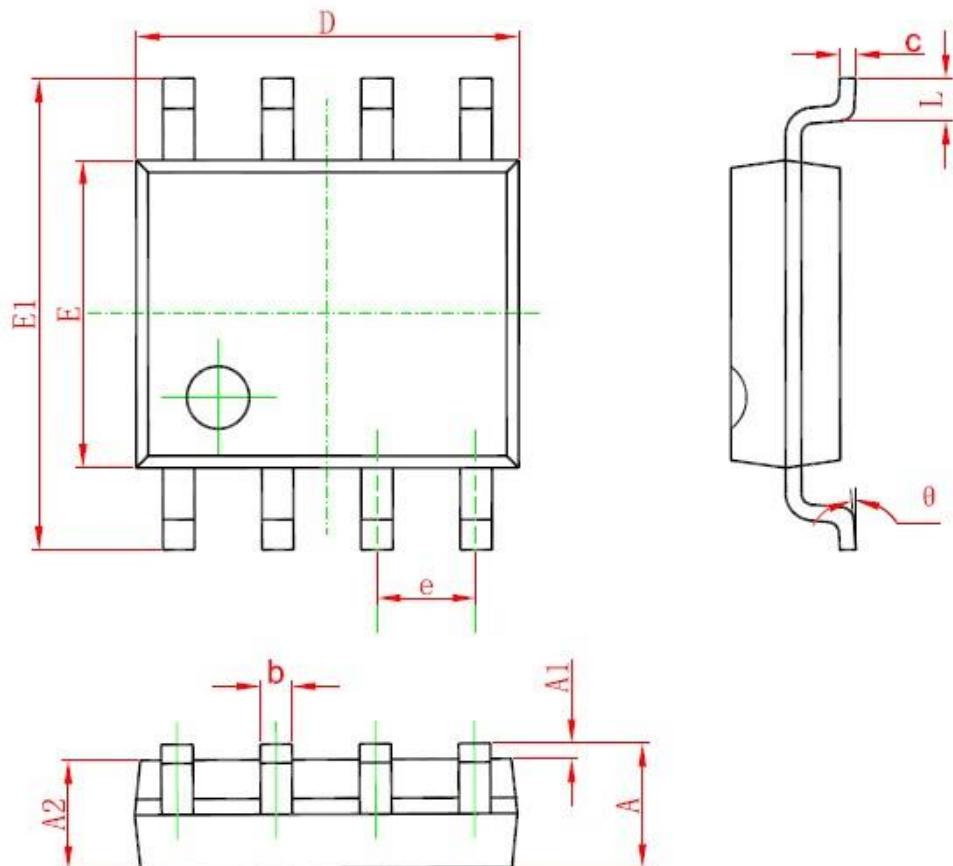


**Figure 5. Gate Thersholt Vs. Temperature**



**Figure 6. Body Diode Forward Voltage Vs. Source Current**

## ■ SOP8 PACKAGE OUTLINE DIMENSIONS

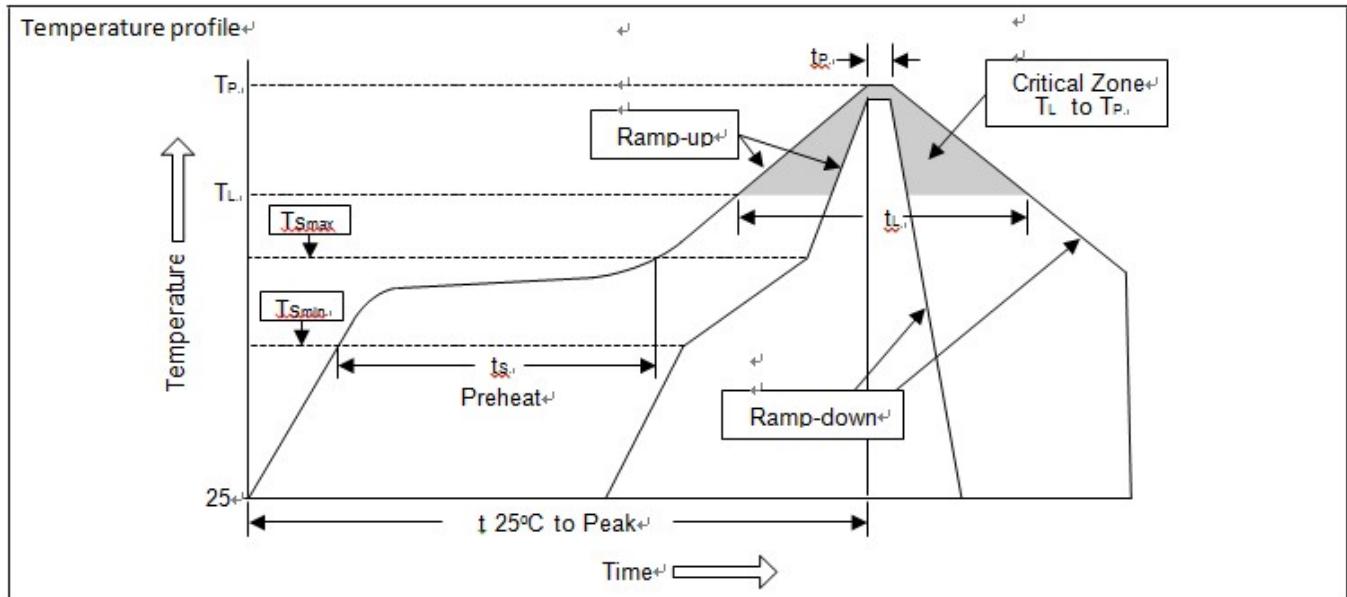


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

## ■ SOLDERING METHODS FOR UNIVERCHIP

Storage environment Temperature=10°C~35°C Humidity=65%±15%

Reflow soldering of surface mount device



Profile Feature	Sn-Pb Eutectic Assembly	Pb free Assembly
Average ramp-up rate ( $T_L$ to $T_P$ )	<3°C/sec	<3°C/sec
Preheat		
-Temperature Min ( $T_{S_{min}}$ )	100°C	150°C
-Temperature Max ( $T_{S_{max}}$ )	150°C	200°C
-Time (min to max) ( $t_s$ )	60~120 sec	60~180 sec
$T_{S_{max}}$ to $T_L$	<3°C/sec	<3°C/sec
-Ramp-up Rate		
Time maintained above		
-Temperature ( $T_L$ )	183°C	217°C
-Time ( $t_L$ )	60~150 sec	60~150 sec
Peak Temperature ( $T_P$ )	240°C+0/-5°C	260°C+0/-5°C
Time within 5°C of actual Peak Temperature ( $t_P$ )	10~30 sec	20~40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25°C to Peak Temperature	<6 minutes	<6 minutes



Desemicore

D4606

Flow (wave) soldering (solder dipping)

Product	Peak Temperature	Dipping Time
Pb device	245°C±5°C	5sec±1sec
Pb-Free device	260°C +0/-5°C	5sec±1sec



This integrated circuit can be damaged by ESD. UniverChip Corporation recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedure can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.