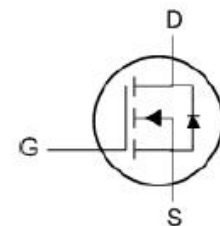
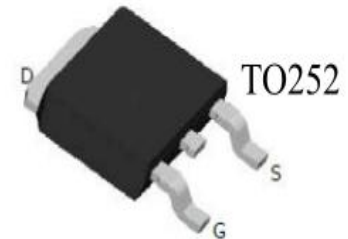


## 30V N-Channel Fast Switching MOSFET

### Features

- $V_{DS}=30V$   $I_D=55A$
- $R_{DS(ON)}=8.5m\Omega(max.)@V_{GS}=10V$
- $R_{DS(ON)}=14m\Omega(max.)@V_{GS}=4.5V$
- Excellent  $CdV/dt$  effect decline
- Super Low Gate Charge
- 100% EAS Guaranteed
- Green Device Available
- Advanced high cell density Trench technology

### Pin Description



### Applications

- The SI3004D is the high cell density trenched N-ch MOSFETs, which provide excellent  $R_{DS(ON)}$  and gate charge for most of the synchronous buck converter applications.
- The SI3004D meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

Part Number	Package	Marking	ROHS Status	Packing
SI3004D	TO-252	D3004	Halogen-Free	Tape&Reel

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

Symbol	Parameter	Ratings	Unit	
$V_{DS}$	Drain-Source Voltage	30	V	
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V	
$I_D$	Continuous Drain Current, $V_{GS}=10V$	$T_c=25^\circ C$	55	A
		$T_c=100^\circ C$	40	A
$I_{DM}$	Pulsed Drain Current	110	A	
$I_{AS}$	Avalanche Current	34	A	
EAS	Single Pulse Avalanche Energy	57.8	mJ	
$T_J, T_{stg}$	Operating Junction and Storage Temperature Range	-55 to 170	$^\circ C$	
$P_D$	Total Power Dissipation	$T_c=25^\circ C$	41	W
		$T_A=25^\circ C$	2.42	W

### THERMAL Data

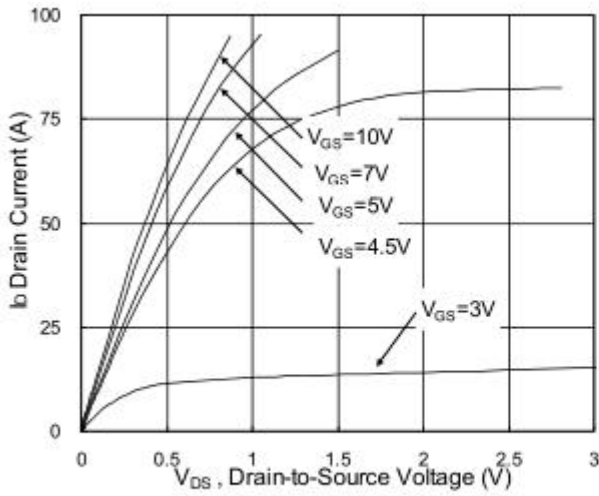
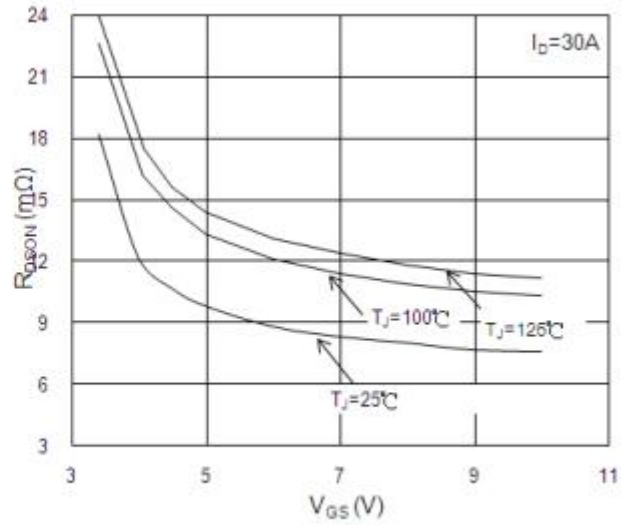
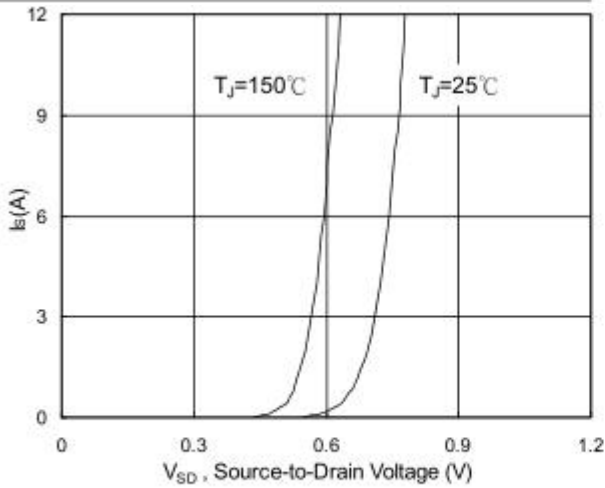
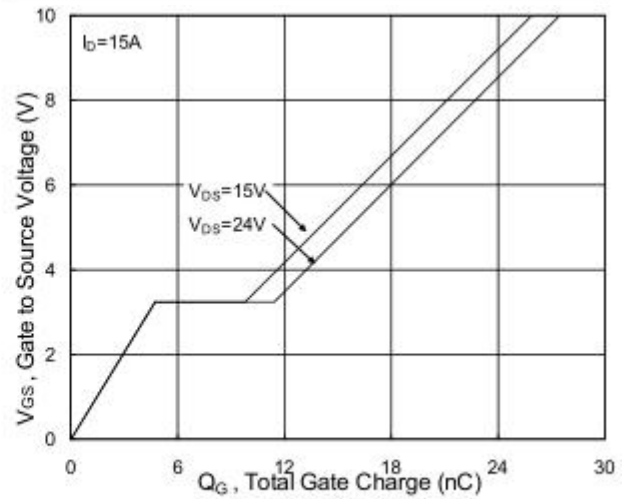
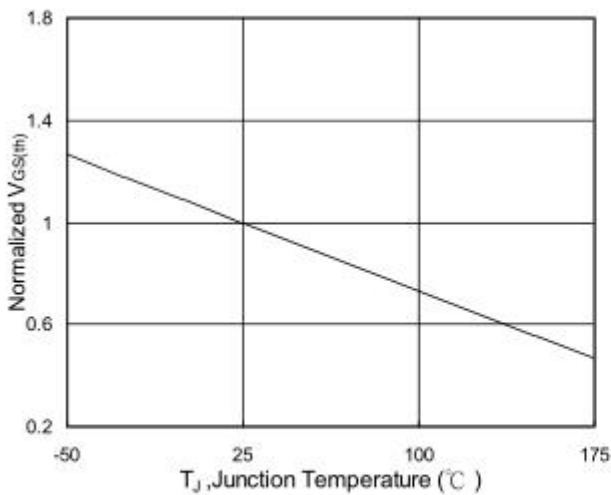
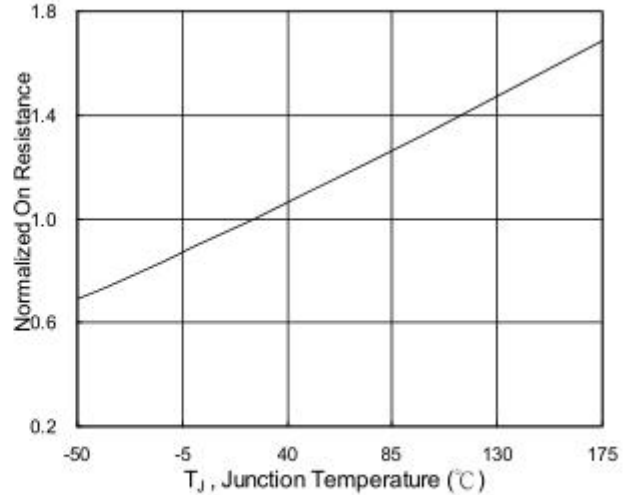
Symbol	Parameter	Typical	Max	Unit
$R_{\theta JA}$	Maximum Junction-to-Ambient	-	62	$^\circ C/W$
$R_{\theta JC}$	Maximum Junction-to-Case	-	3.6	

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

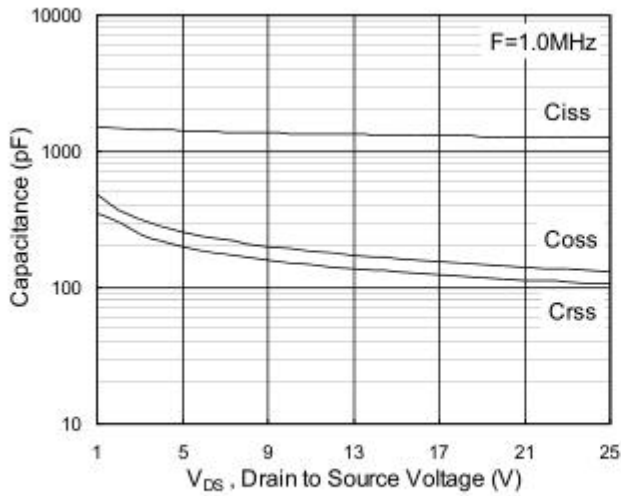
Symbol	Parameter	Test Conditions	Min.	TYP.	Max.	Unit
<b>Static Characteristics</b>						
BV <sub>DSS</sub>	Drain-source breakdown voltage	V <sub>GS</sub> =0V, I <sub>DS</sub> =250uA	30	-	-	V
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250uA	1.2	-	2.5	V
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =24V, V <sub>GS</sub> =0V T <sub>j</sub> =25°C	-	-	1	uA
		V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>j</sub> =55°C	-	-	5	uA
I <sub>GSS</sub>	Gate-source leakage current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
R <sub>DS(on)</sub>	Drain-source on-state resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =30A	-	-	8.5	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A	-	-	14	mΩ
G <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =30A	-	38	-	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	-	2.2	3.5	Ω
<b>Dynamic Characteristic</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =15V I <sub>D</sub> =15A	-	12.6	17.6	nC
Q <sub>gs</sub>	Gate-Source Charge		-	4.2	5.9	nC
Q <sub>gd</sub>	Gate-Drain Charge		-	5.1	7.1	nC
T <sub>d(on)</sub>	Turn-on delay time	I <sub>D</sub> =15A, V <sub>GS</sub> =10V V <sub>DD</sub> =15V, R <sub>G</sub> =3.3Ω	-	4.6	9.2	nS
T <sub>r</sub>	Rise time		-	12.2	22	nS
T <sub>d(off)</sub>	Turn-off delay time		-	26.6	53	nS
T <sub>f</sub>	Fall time		-	8	16	nS
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V f=1.0MHz	-	1317	1843	pF
C <sub>oss</sub>	Output Capacitance		-	163	228	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	131	183	pF
<b>Source-Drain Diode</b>						
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =1A	-	-	1.2	V
I <sub>SM</sub>	Pulsed Source Current	V <sub>G</sub> =V <sub>D</sub> =0V Force Current	-	-	110	A
I <sub>S</sub>	Continuous Source Current		-	-	55	A
trr	Reverse Recovery Time	I <sub>F</sub> =30A dI/dt=100A/μs, T <sub>J</sub> =25°C	-	9.2	-	nS
Q <sub>rr</sub>	Reverse Recovery Charge		-	2	-	nC

**Notes:**

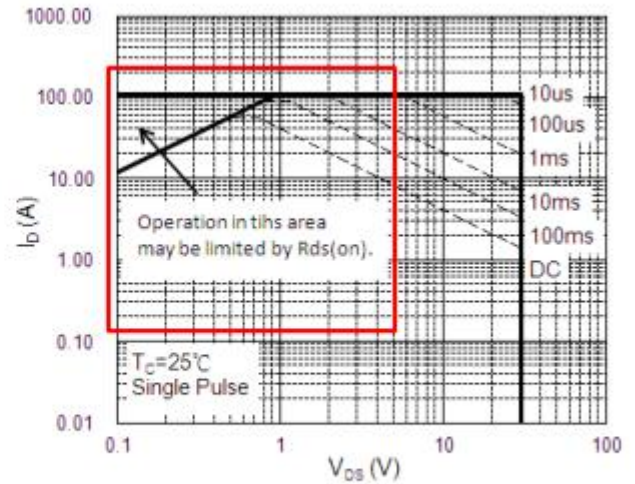
1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
3. The E<sub>AS</sub> data shows Max.rating. The test condition is V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.1mH, I<sub>AS</sub>=34A
4. The power dissipation is limited by 150 °C junction temperature
5. The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

**Typical Performance Characteristics**

**Fig.1 Typical Output Characteristics**

**Fig.2 On-Resistance vs. G-S Voltage**

**Fig.3 Forward Characteristics of Reverse**

**Fig.4 Gate-Charge Characteristics**

**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$** 

**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**

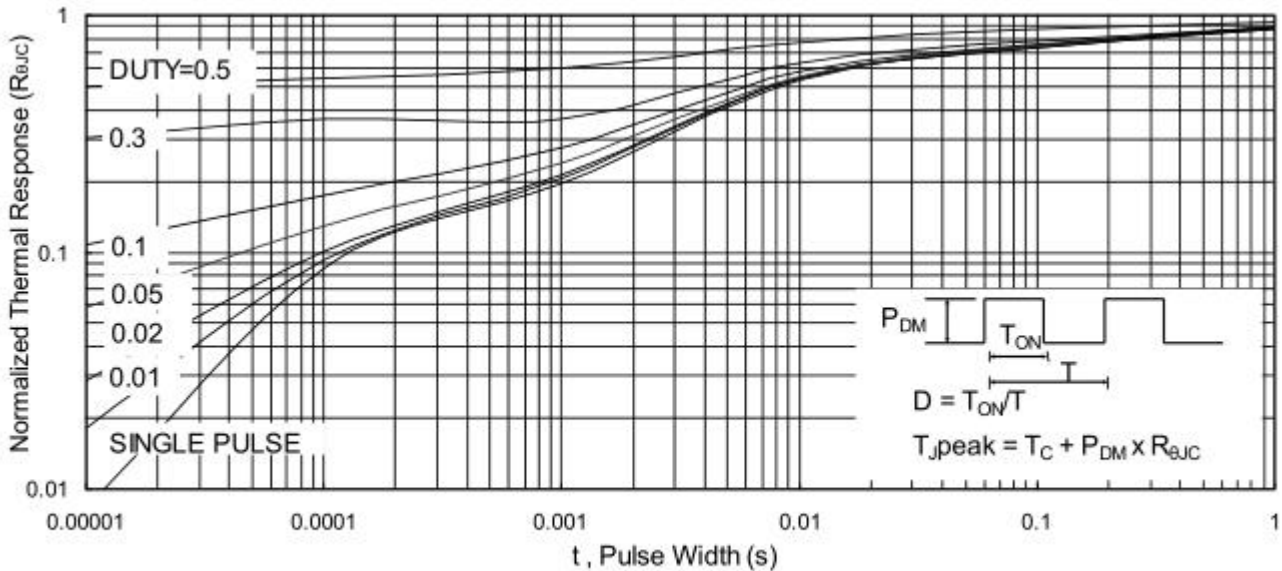
## Typical Performance Characteristics (Cont.)



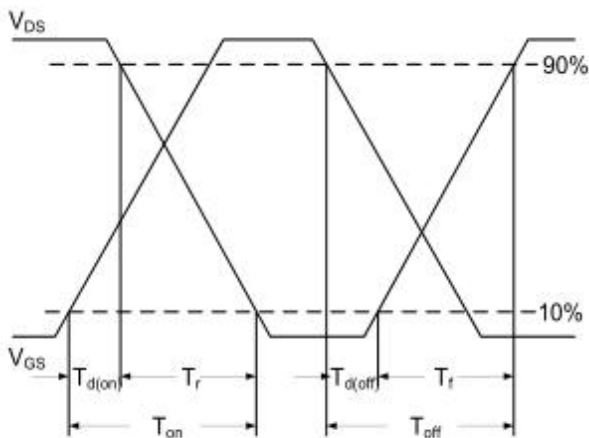
**Fig.7 Capacitance**



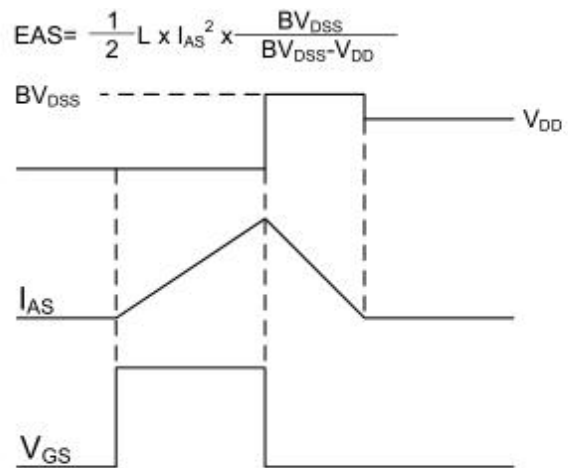
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**



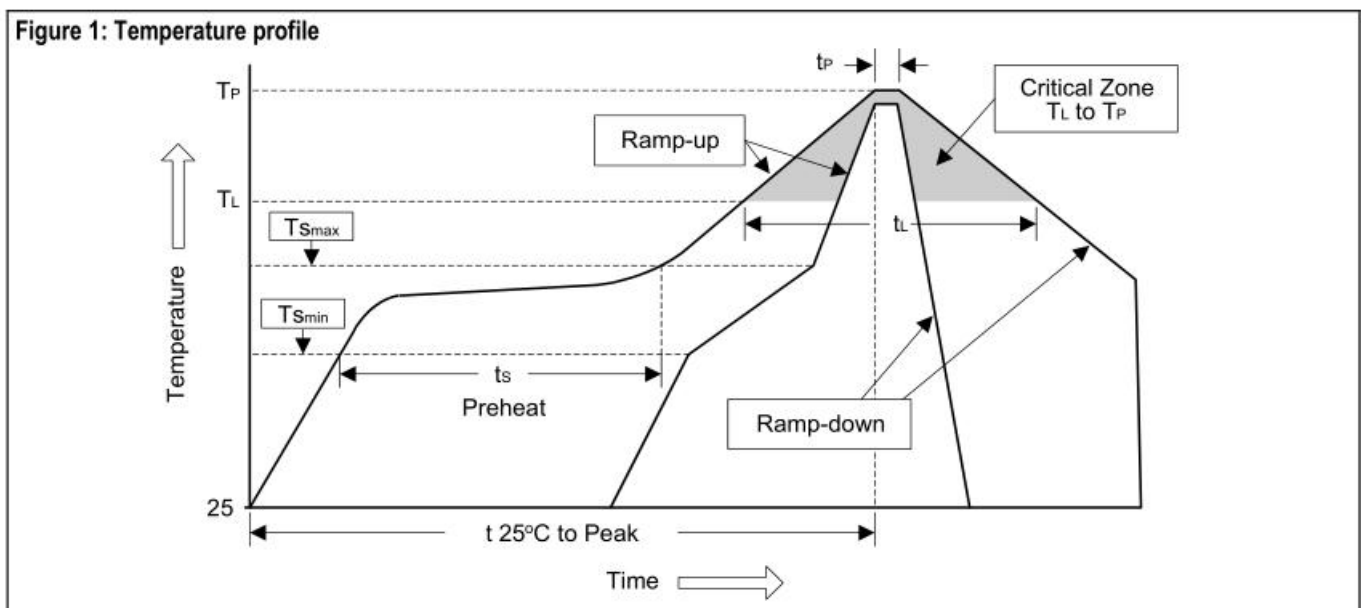
**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**

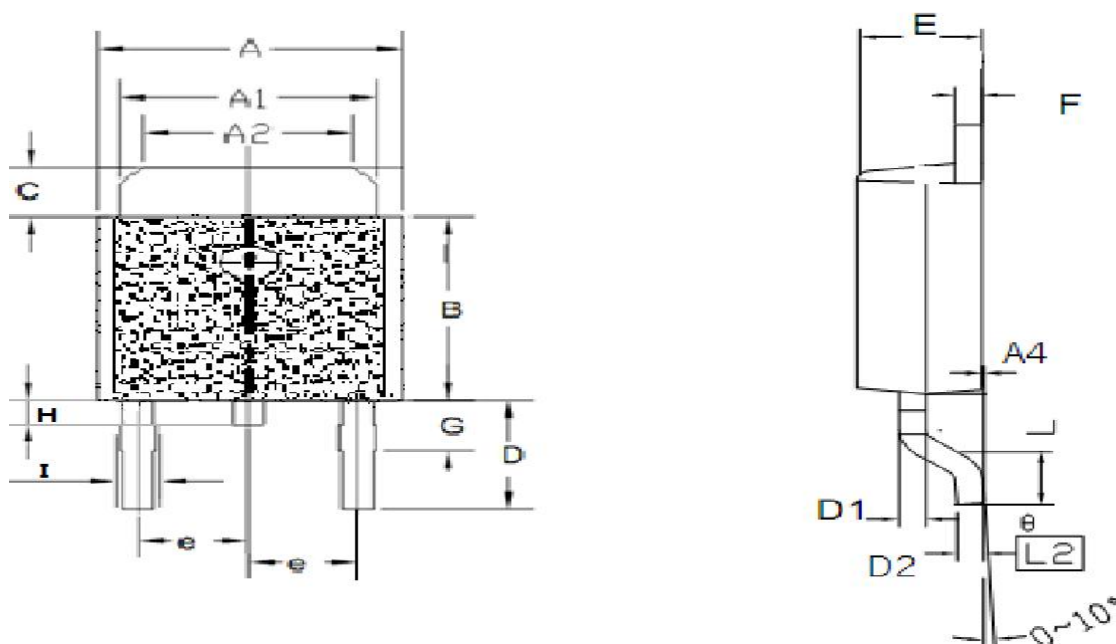
**Soldering Methods for Products**

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate(TL to TP)	<3°C/sec	<3°C/sec
Preheat -Temperature Min(Ts min) -Temperature Max(Ts max) -Time(min to max)(ts)	- 100°C 150°C 60 to 120 sec	- 150°C 200°C 60 to 180 sec
Ts max to TL - ramp-up rate	<3°C/sec	<3°C/sec
Time maintained above: -Temperature(TL) -Time(TL)	183°C 60 to 150 sec	217°C 60 to 150 sec
Peak Temperature(TP)	240°C+0/-5°C	250°C+0/-5°C
Time within 5°C of actual Peak Temperature	10 to 30 sec	20 to 40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25 °C to Peak Temperature	<6 minutes	<8 minutes



- Note :**
- 1.Storage environment: Temperature=10°C to 35@Humidity=45%±15%
  - 2.Reflow soldering of surface-mount devices
  - 3.Flow(wave) soldering(solder dipping)

Products	Peak Temperature	Dipping Time
Pb devices	245°C±5°C	5sec±1sec
Pb-free devices	250°C+0/-5°C	5sec±1sec

**Package Outline**


unit: mm					
Symbol	Min	Max	Symbol	Min	Max
A	6.40	6.60	D	2.90	3.10
A1	5.20	5.40	D1	0.45	0.55
A2	4.40	4.60	D2	0.45	0.55
A3	4.40	4.60	e	2.3BSC	
A4	0.00	0.15	E	2.20	2.40
A5	4.65	4.95	F	0.49	0.59
B	6.00	6.20	G	1.7BSC	
B1	1.57	1.77	L	1.40	1.60
C	0.90	0.96	$\theta$ (度)	0.00	10.00
I	0.80	0.85	H	0.49	0.52

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