

## 30V P-Channel Fast Switching MOSFET

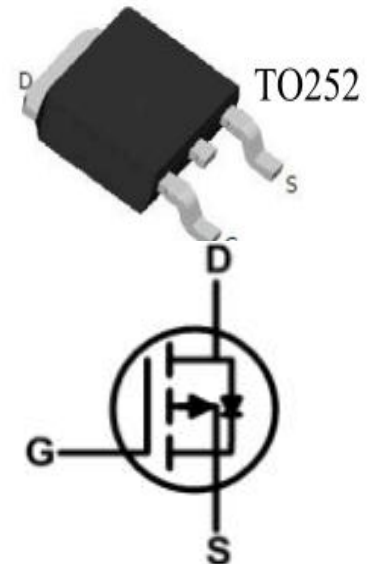
### Features

- $V_{DSS} = -30V$   $I_D = -57A$
- $R_{DS(ON)} = 9.8m\Omega(\text{max.}) @ V_{GS} = -10V$
- $R_{DS(ON)} = 15m\Omega(\text{max.}) @ V_{GS} = -4.5V$
- Excellent  $CdV/dt$  effect decline
- Super Low Gate Charge
- 100% EAS Guaranteed
- Green Device Available
- Advanced high cell density Trench technology

### Applications

- The SI3115D is the high cell density trenched P-ch MOSFETS, which provide excellent  $R_{DS(ON)}$  and gate charge for most of the synchronous buck converter applications.
- The SI3115D meet the ROHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

### PIN DESCRIPTION



Part Number	Package	Marking	ROHS Status	Packing
SI3115D	TO-252	D3115	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	$\pm 25$	V	
$I_D$	Continuous Drain Current, $V_{GS} = -10V$	$T_c = 25^\circ C$	-57	A
		$T_c = 100^\circ C$	-36	A
$I_{DM}$	Pulsed Drain Current	-180	A	
$I_{AS}$	Avalanche Current	-55.4	A	
$E_{AS}$	Single Pulse Avalanche Energy	153	mJ	
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ C$	
$P_D$	Total Power Dissipation	$T_c = 25^\circ C$	52.1	W
		$T_A = 25^\circ C$	2	W

### THERMAL RESISTANCE RATINGS

Symbol	Parameter	Typical	Max	Unit
$R_{\theta JA}$	Maximum Junction-to-Ambient	-	62	$^\circ C/W$
	Maximum Junction-to-Ambient ( $t \leq 10S$ )	-	25	
$R_{\theta JC}$	Maximum Junction-to-Case	-	2.4	

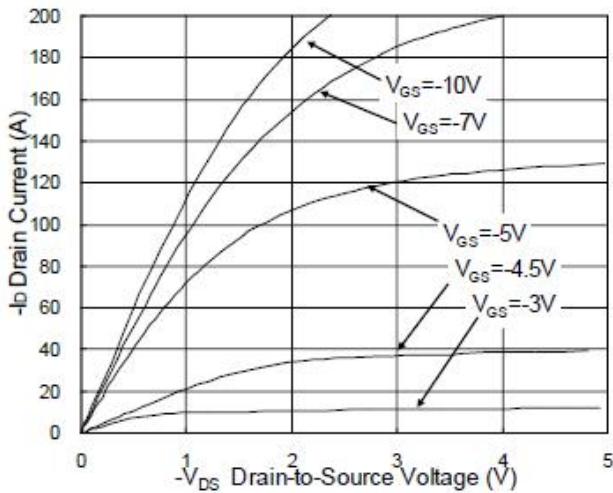
**Electrical Characteristics** (T<sub>J</sub>=25°C unless otherwise Ratings )

Symbol	Parameter	Test Conditions	Min.	TYP.	Max.	Unit
<b>Static Characteristics</b>						
B <sub>V</sub> DSS	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	-1.0	-	-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> =±25V, 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	-	-	9.8	mΩ
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> =-15A	-	-	15	mΩ
Gfs	Forward Transconductance	V <sub>DS</sub> =-5V , I <sub>D</sub> =-30A	-	26.4	-	S
<b>Dynamic Characteristic</b>						
Qg	Total Gate Charge	V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-15V I <sub>D</sub> =-15A	-	33	-	nC
Qgs	Gate-Source Charge		-	10.7	-	nC
Qgd	Gate-Drain Charge		-	12.8	-	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	-	8	-	nS
T <sub>r</sub>	Rise time		-	17.8	-	nS
T <sub>d(off)</sub>	Turn-off delay time		-	78.4	-	nS
T <sub>f</sub>	Fall time		-	43.6	-	nS
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V f=1.0MHz	-	3440	-	pF
C <sub>oss</sub>	Output Capacitance		-	508	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	421	-	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>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V Force Current	-	-	-57	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,5</sup>		-	-	-180	A
T <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =-15A, T <sub>J</sub> =25°C dI/dt=100A/μs	-	29	-	nS
Q <sub>rr</sub>	Reverse Recovery Charge		-	15	-	nC

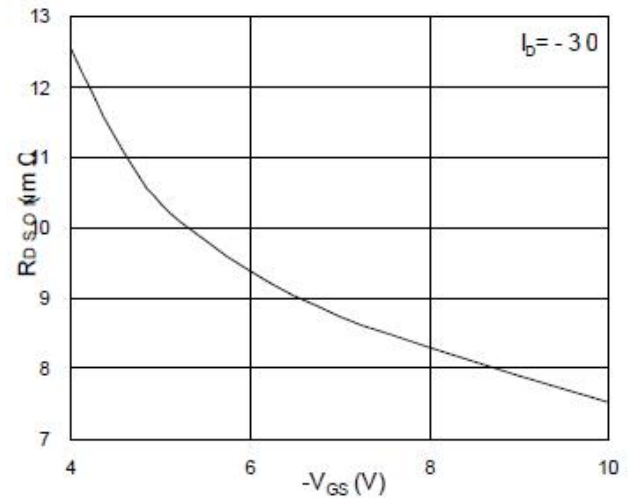
**Notes:**

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- The data tested by pulsed , pulse width ≅ 300us , duty cycle ≅ 2%
- 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>=-55.4A
- The power dissipation is limited by 150 °C junction temperature
- 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.

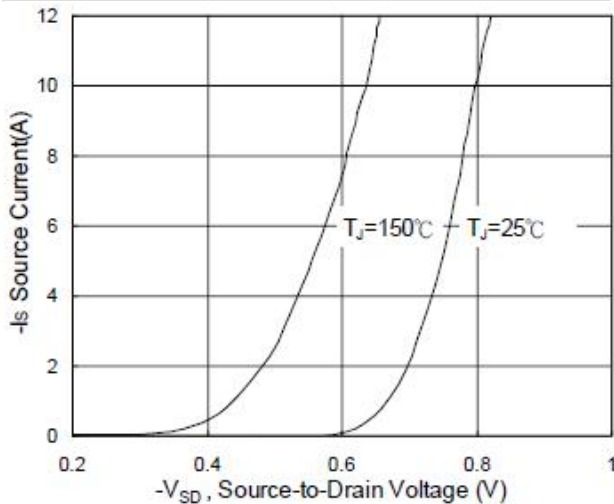
## Typical Performance Characteristics



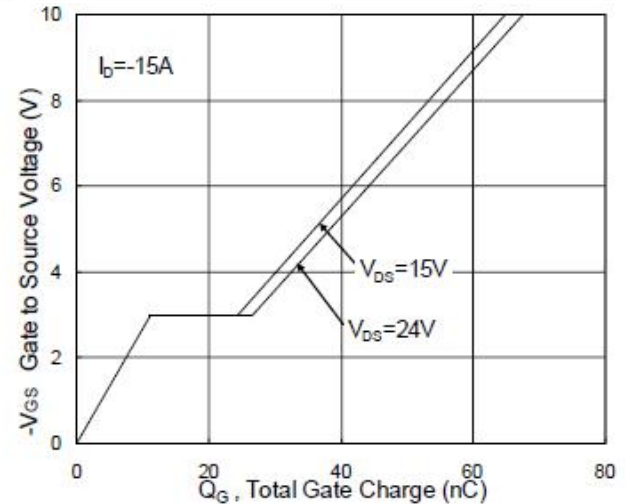
**Fig.1 Typical Output Characteristics**



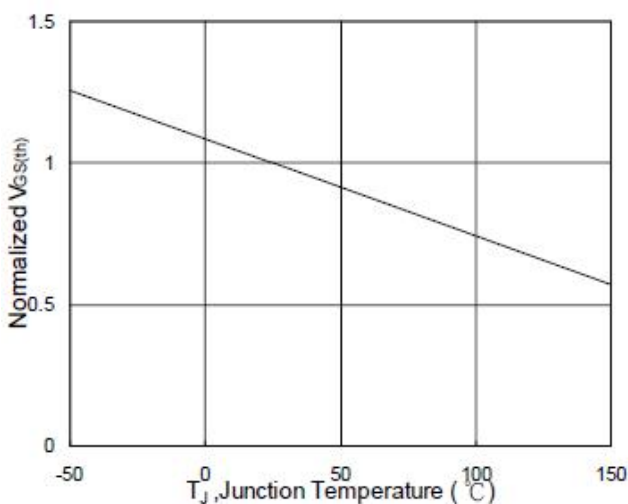
**Fig.2 On-Resistance v.s Gate-Source**



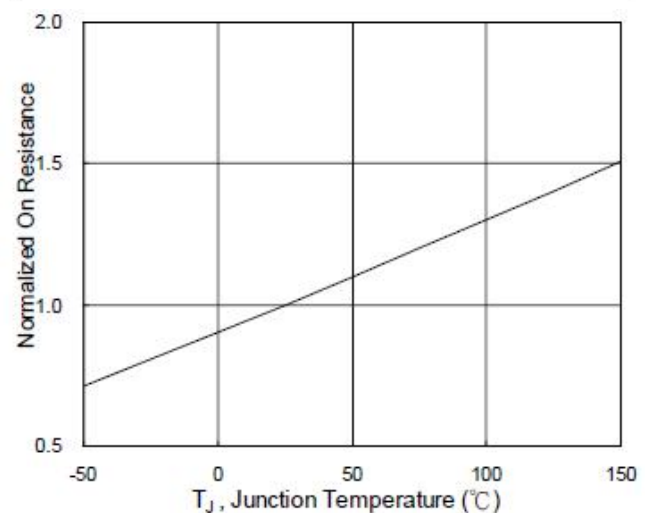
**Fig.3 Forward Characteristics Of Reverse**



**Fig.4 Gate-Charge Characteristics**



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



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

## Typical Performance Characteristics (Cont.)

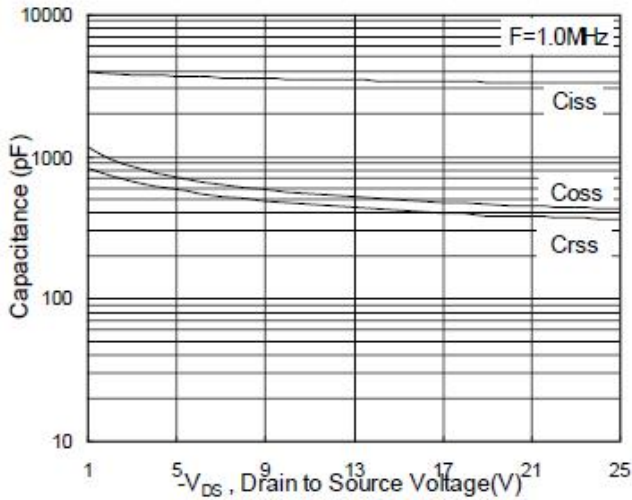


Fig.7 Capacitance

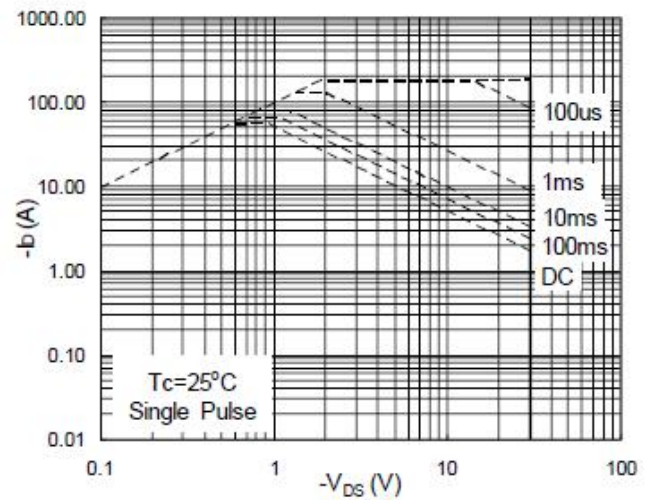


Fig.8 Safe Operating Area

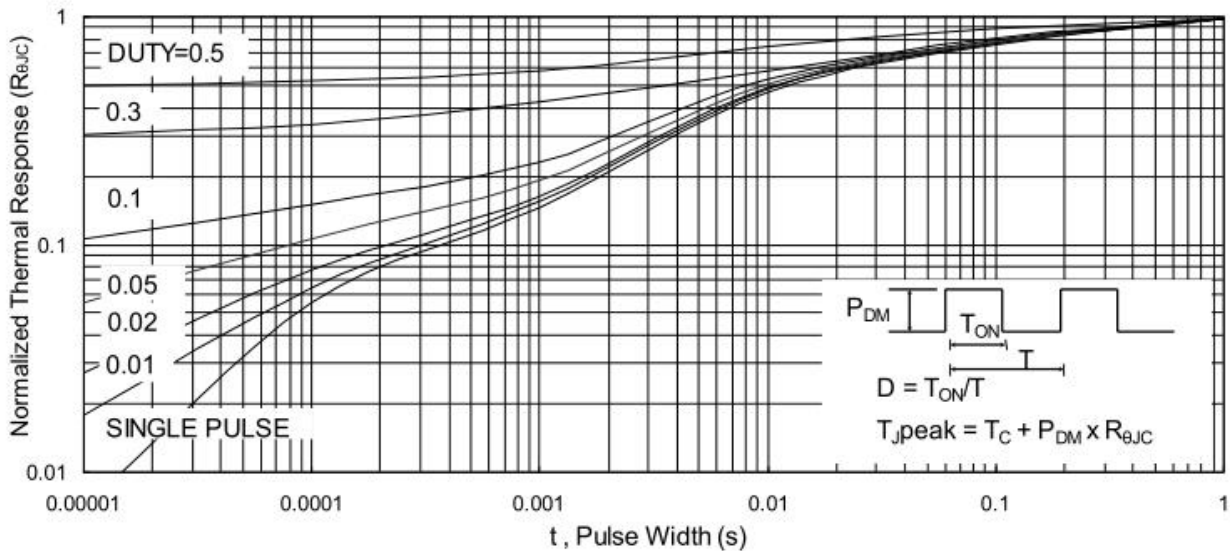


Fig.9 Normalized Maximum Transient Thermal Impedance

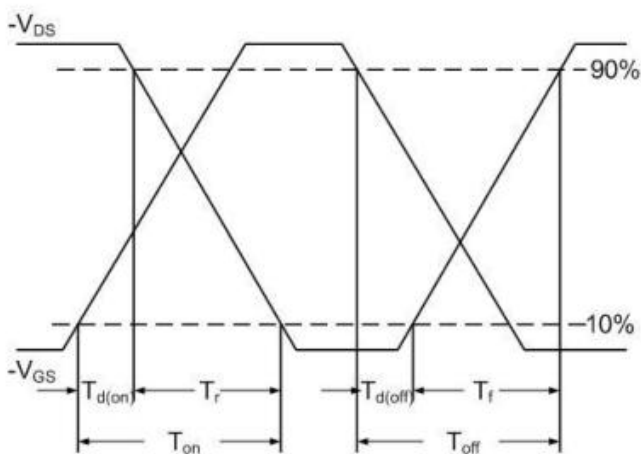


Fig.10 Switching Time Waveform

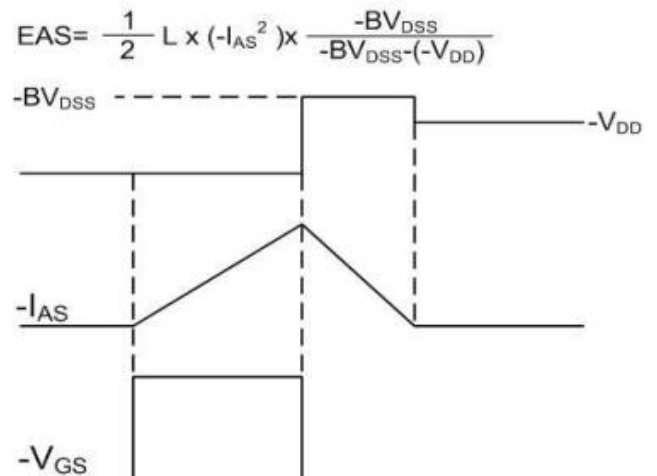
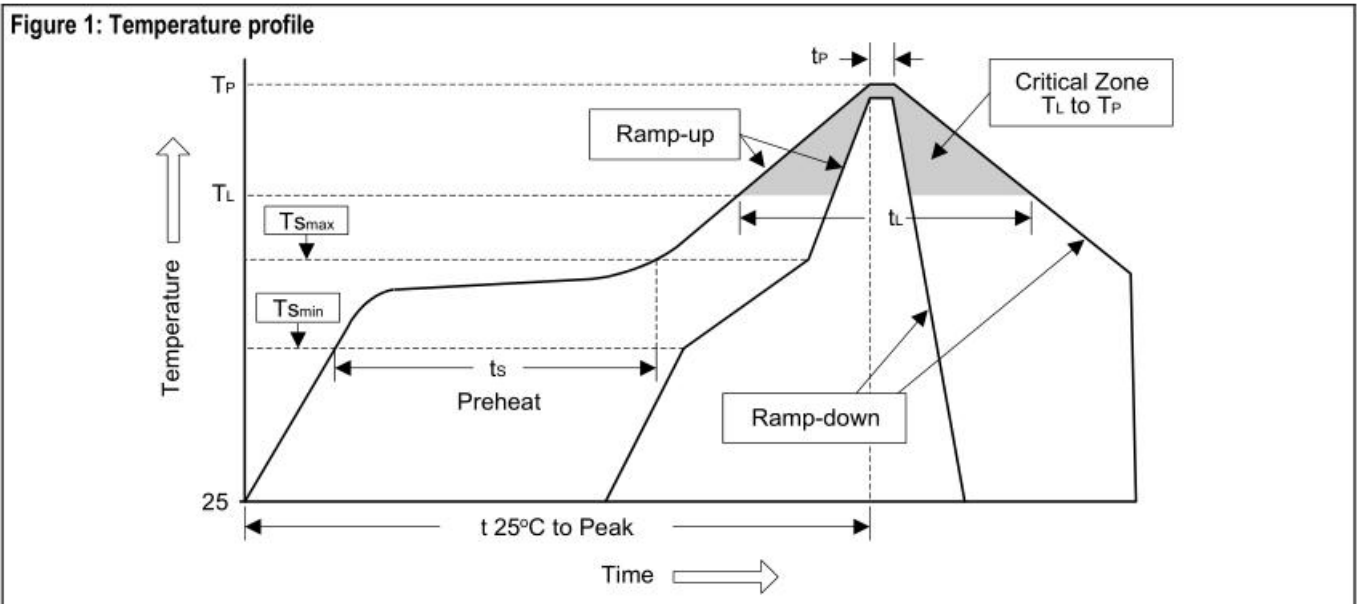


Fig.11 Unclamped Inductive Waveform

**Soldering Methods for Products**

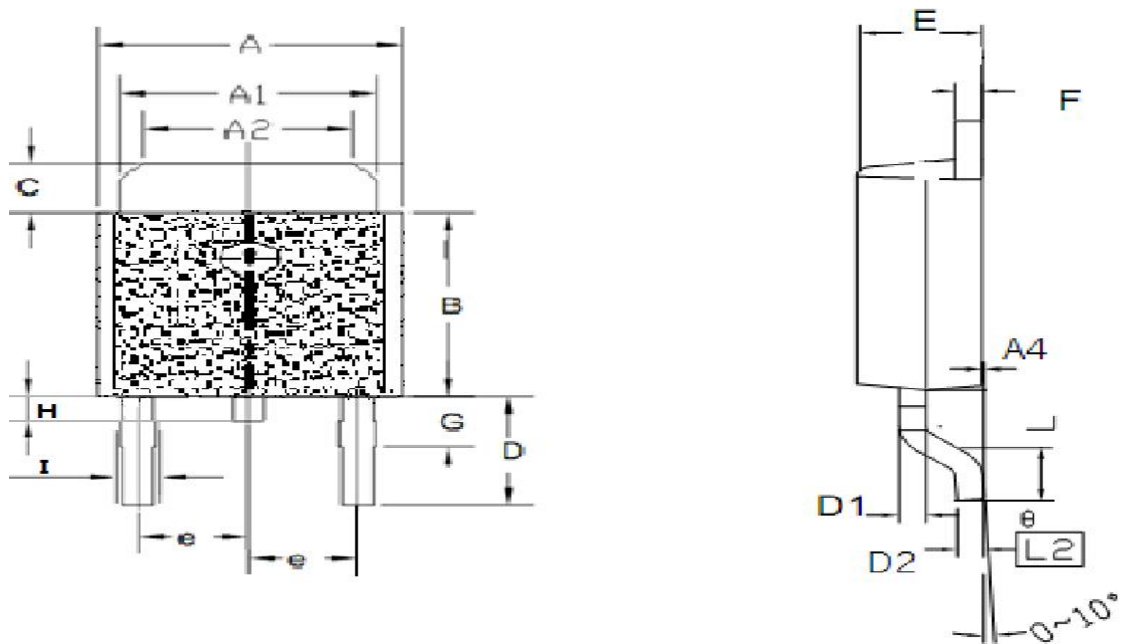
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate(TL to TP)	<3°C/sec	<3°C/sec
Preheat -Temperature Min(Ts min) -Temperature Max(Ts max) -Time(min to max)(ts)	- 100°C 150°C 60 to 120 sec	- 150°C 200°C 60 to 180 sec
Ts max to TL - ramp-up rate	<3°C/sec	<3°C/sec
Time maintained 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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**■ Modify record**

Date	Version	Description	Pagination
20160115	A.0	original	7