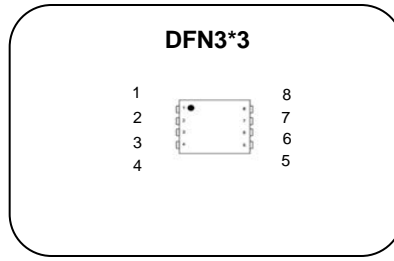


## N-channel Enhanced mode DFN3\*3 MOSFET

### Features

- High ruggedness
- Low  $R_{DS(ON)}$  (Typ 12.3m $\Omega$ )@ $V_{GS}=2.5V$   
(Typ 9.4m $\Omega$ )@ $V_{GS}=4.5V$
- Low Gate Charge (Typ 15.4nC)
- Improved dv/dt Capability
- 100% Avalanche Tested
- Application:DC-DC Converter, Inverter, Synchronous Rectification



DFN3\*3: 4.Gate 5,6,7,8.Drain 1,2,3.Source

$BV_{DSS}$ : 20V
$I_D$ : 16A
$R_{DS(ON)}$ : 12.3m $\Omega$ @ $V_{GS}=2.5V$ 9.4m $\Omega$ @ $V_{GS}=4.5V$

### General Description

This power MOSFET is produced with advanced technology of SAMWIN.

This technology enable the power MOSFET to have better characteristics, including fast switching time, low on resistance, low gate charge and especially excellent avalanche characteristics.



### Order Codes

Item	Sales Type	Marking	Package	Packaging
1	SW H 160R02VT	SW160R02V	DFN3*3	REEL

### Absolute maximum ratings

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain to source voltage	20	V
$I_D$	Continuous drain current (@ $T_C=25^\circ C$ )	16*	A
	Continuous drain current (@ $T_C=100^\circ C$ )	10*	A
$I_{DM}$	Drain current pulsed (note 1)	64	A
$V_{GS}$	Gate to source voltage	$\pm 10$	V
dv/dt	Peak diode recovery dv/dt (note 3)	5	V/ns
$P_D$	Total power dissipation (@ $T_C=25^\circ C$ )	2.97	W
	Derating factor above 25 $^\circ C$	0.02	W/ $^\circ C$
$T_{STG}, T_J$	Operating junction temperature & storage temperature	-55 ~ + 150	$^\circ C$

\*. Drain current is limited by junction temperature.

### Thermal characteristics

Symbol	Parameter	Value	Unit
$R_{thja}$	Thermal resistance, Junction to ambient	42	$^\circ C/W$

Note:  $R_{thja}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{thjc}$  is guaranteed by design while  $R_{thca}$  is determined by the user's board design. 42 $^\circ C/W$  on a 1 in<sup>2</sup> pad of 2oz copper.

## Electrical characteristic ( T<sub>C</sub> = 25°C unless otherwise specified )

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
<b>Off characteristics</b>						
BV <sub>DSS</sub>	Drain to source breakdown voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	20			V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown voltage temperature coefficient	I <sub>D</sub> =250uA, referenced to 25°C		0.01		V/°C
I <sub>DSS</sub>	Drain to source leakage current	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V			1	uA
		V <sub>DS</sub> =16V, T <sub>C</sub> =125°C			50	uA
I <sub>GSS</sub>	Gate to source leakage current, forward	V <sub>GS</sub> =10V, V <sub>DS</sub> =0V			15	uA
	Gate to source leakage current, reverse	V <sub>GS</sub> =-10V, V <sub>DS</sub> =0V			-15	uA
<b>On characteristics</b>						
V <sub>GS(TH)</sub>	Gate threshold voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	0.6		1.0	V
R <sub>DS(ON)</sub>	Drain to source on state resistance	V <sub>GS</sub> =2.5V, I <sub>D</sub> =2.5A		12.3	15.4	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =8A		9.4	11.8	mΩ
G <sub>fs</sub>	Forward transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =8A		42		S
<b>Dynamic characteristics</b>						
C <sub>iss</sub>	Input capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, f=1MHz		876		pF
C <sub>oss</sub>	Output capacitance			224		
C <sub>rss</sub>	Reverse transfer capacitance			213		
t <sub>d(on)</sub>	Turn on delay time	V <sub>DS</sub> =10V, I <sub>D</sub> =8A, R <sub>G</sub> =25Ω, V <sub>GS</sub> =4.5V (note 4,5)		5.7		ns
t <sub>r</sub>	Rising time			53		
t <sub>d(off)</sub>	Turn off delay time			92		
t <sub>f</sub>	Fall time			90		
Q <sub>g</sub>	Total gate charge	V <sub>DS</sub> =16V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =8A, I <sub>g</sub> =4mA (note 4,5)		15.4		nC
Q <sub>gs</sub>	Gate-source charge			1.0		
Q <sub>gd</sub>	Gate-drain charge			7.2		
R <sub>g</sub>	Gate resistance	V <sub>DS</sub> =0V, Scan F mode		3.9		Ω

## Source to drain diode ratings characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous source current	Integral reverse p-n Junction diode in the MOSFET			16	A
I <sub>SM</sub>	Pulsed source current				64	A
V <sub>SD</sub>	Diode forward voltage drop.	I <sub>S</sub> =16A, V <sub>GS</sub> =0V			1.4	V
t <sub>rr</sub>	Reverse recovery time	I <sub>S</sub> =8A, V <sub>GS</sub> =0V,		27		ns
Q <sub>rr</sub>	Reverse recovery charge	dI <sub>p</sub> /dt=100A/us		10		nC

### ※. Notes

1. Repeitative rating : pulse width limited by junction temperature.
2. I<sub>SD</sub> ≤ 8A, di/dt = 100A/us, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Staring T<sub>J</sub> = 25°C
3. Pulse Test : Pulse Width ≤ 300us, duty cycle ≤ 2%.
4. Essentially independent of operating temperature.

Fig. 1. On-state characteristics

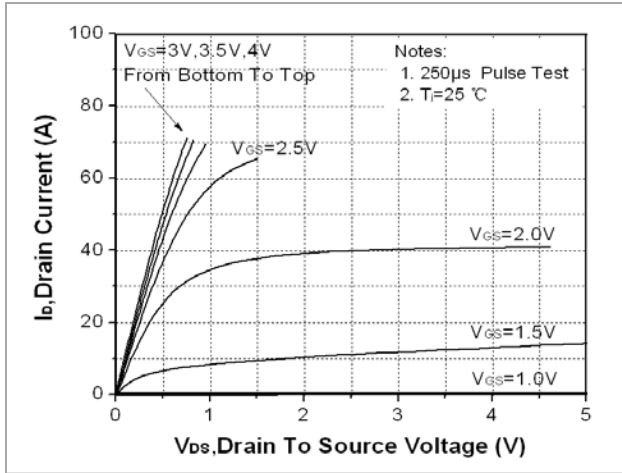


Fig. 2. On-state characteristics

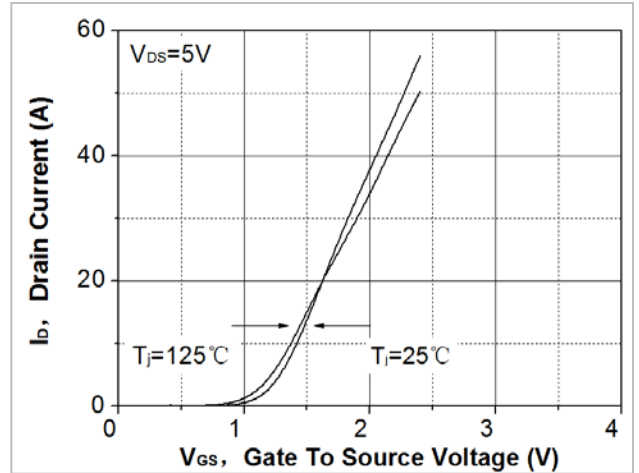


Fig. 3. On-resistance variation vs. drain current and gate voltage

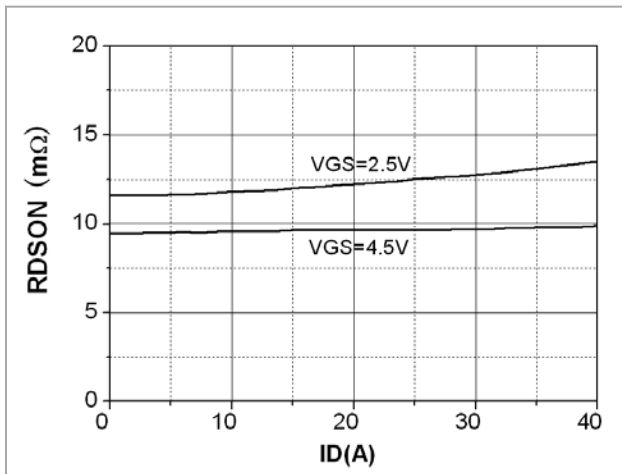


Fig. 4. On-state current vs. diode forward voltage

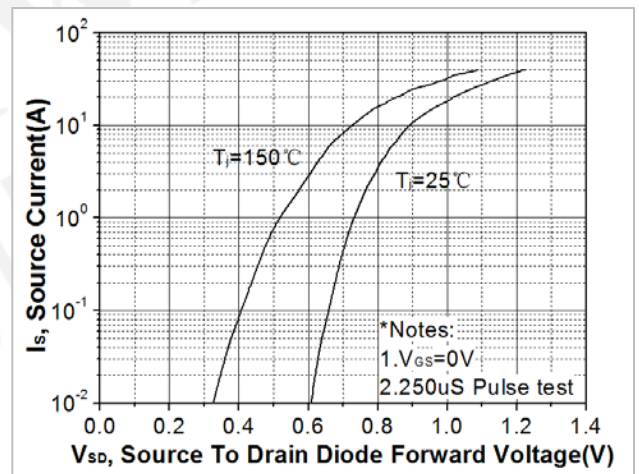


Fig. 5. Breakdown voltage variation vs. junction temperature

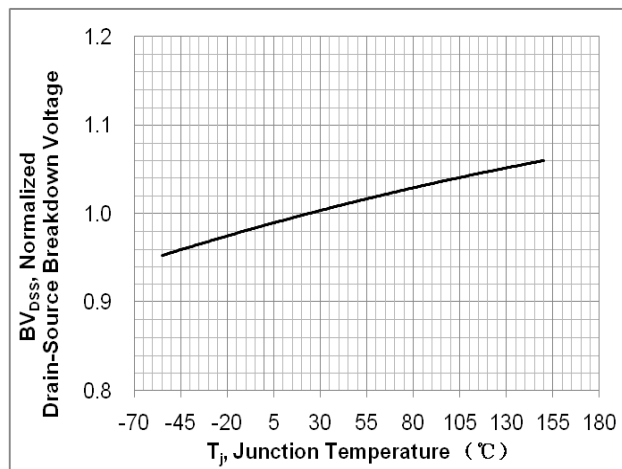


Fig. 6. On-resistance variation vs. junction temperature

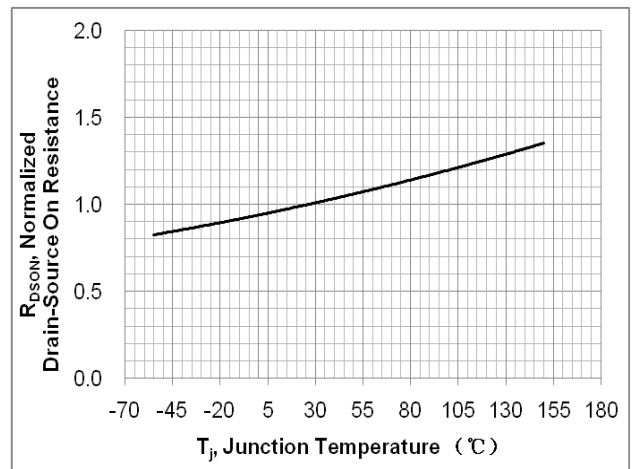


Fig. 7. Gate charge characteristics

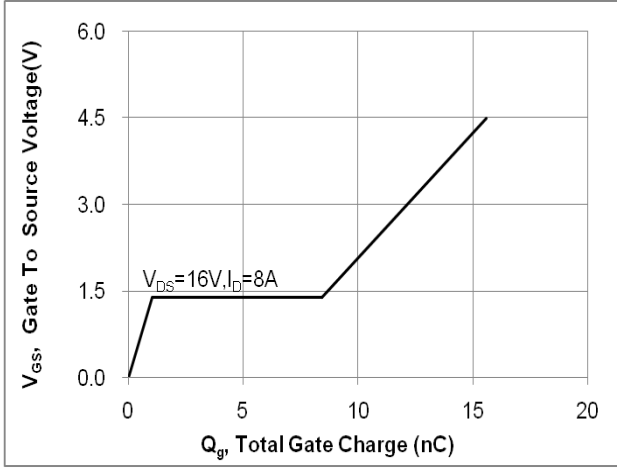


Fig. 8. Capacitance Characteristics

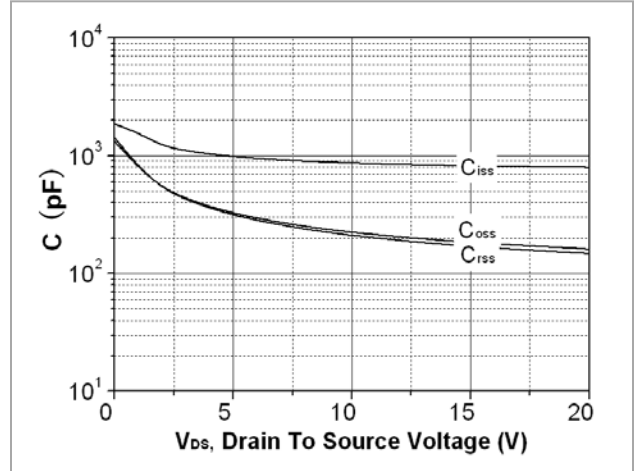


Fig. 9. Maximum safe operating area

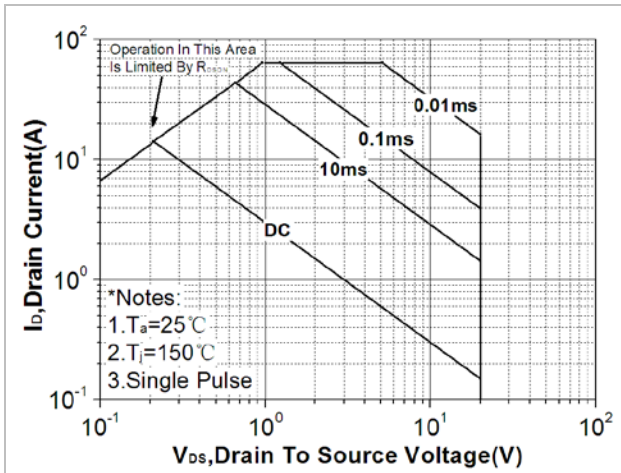
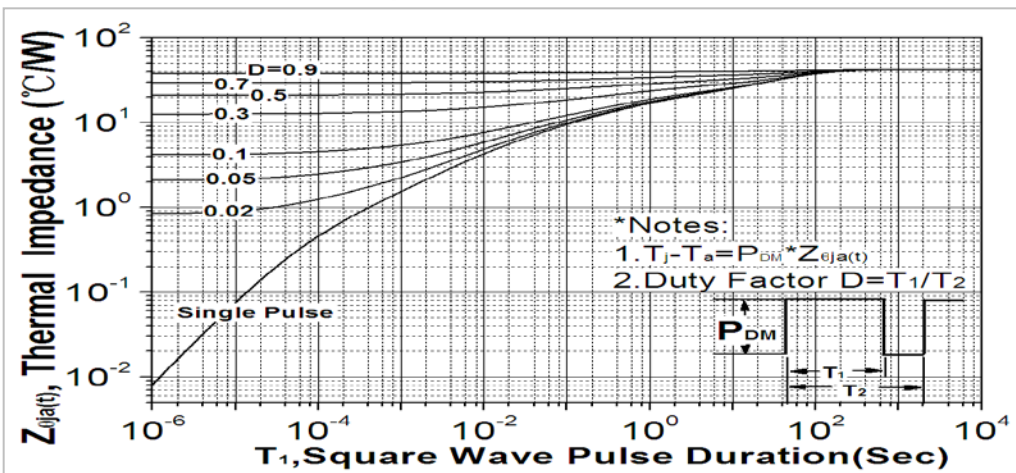
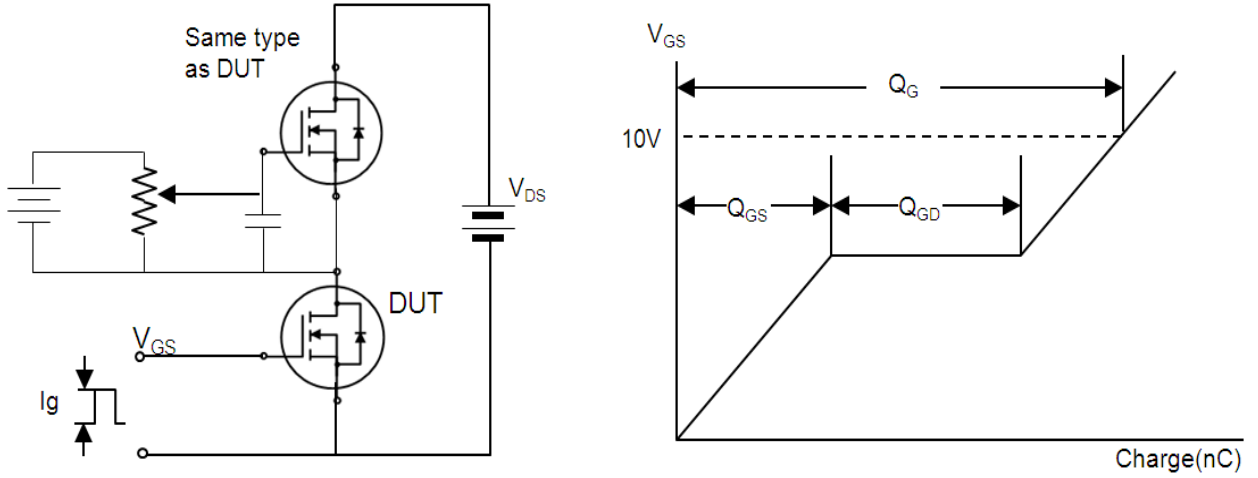


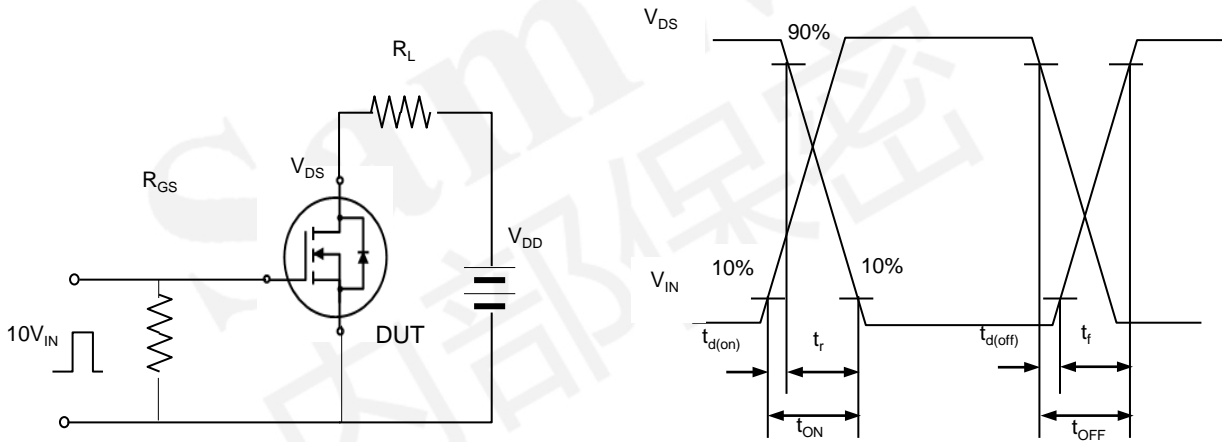
Fig. 10. Transient thermal response curve



**Fig. 11. Gate charge test circuit & waveform**



**Fig. 12. Switching time test circuit & waveform**



**Fig. 13. Unclamped Inductive switching test circuit & waveform**

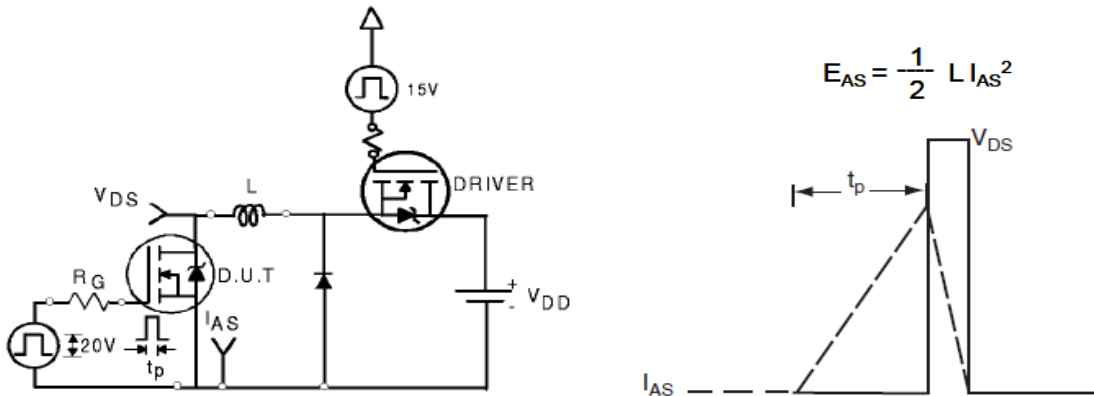
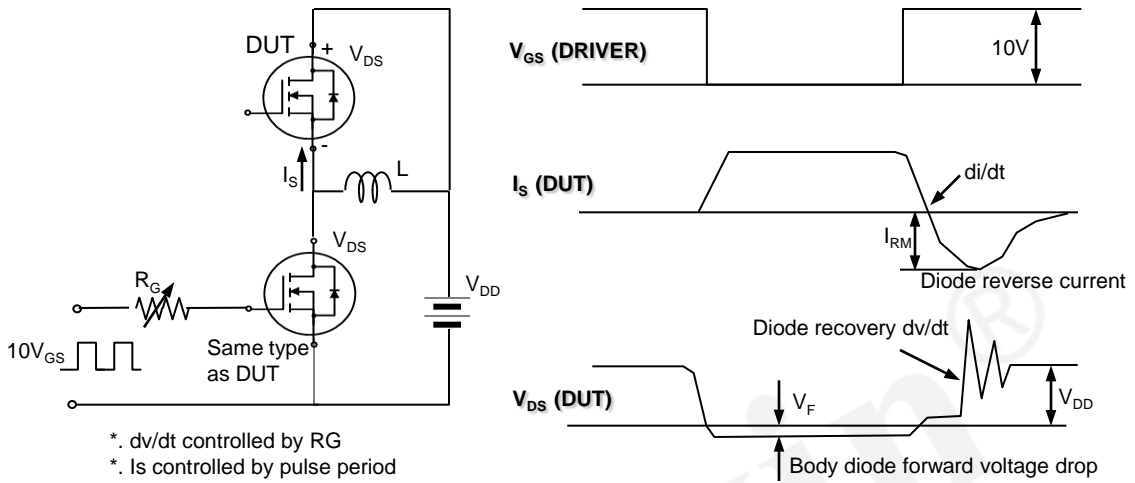


Fig. 14. Peak diode recovery dv/dt test circuit & waveform



## DISCLAIMER

- \* All the data & curve in this document was tested in XI'AN SEMIPOWER TESTING & APPLICATION CENTER.
- \* This product has passed the PCT,TC,HTRB,HTGB,HAST,PC and Solderdunk reliability testing.
- \* Qualification standards can also be found on the Web site (<http://www.semipower.com.cn>)
- \* Suggestions for improvement are appreciated, Please send your suggestions to [samwin@samwinsemi.com](mailto:samwin@samwinsemi.com)