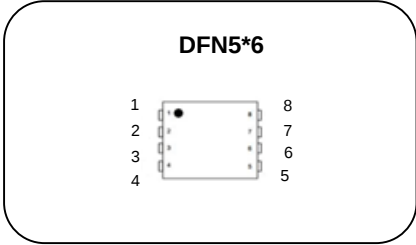


N-channel Enhanced mode DFN5*6 MOSFET

Features

- High ruggedness
- Low $R_{DS(ON)}$ (Typ 44mΩ)@ $V_{GS}=10V$
- Low Gate Charge (Typ 17nC)
- Improved dv/dt Capability
- 100% Avalanche Tested
- Application:Synchronous Rectification, Li Battery Protect Board, Motor Drives



4. Gate 5,6,7,8.Drain 1,2,3.Source

$BV_{DSS} : 200V$
 $I_D : 24A$
 $R_{DS(ON)} : 44m\Omega$



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 HA 420R20ES	SW420R20ES	DFN5*6	REEL

Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DSS}	Drain to source voltage	200	V
I_D	Continuous drain current (@ $T_C=25^{\circ}C$)	24*	A
	Continuous drain current (@ $T_C=100^{\circ}C$)	23*	A
I_{DM}	Drain current pulsed (note 1)	96	A
I_{DSM}	Continuous drain current (@ $T_a=25^{\circ}C$)	6	A
	Continuous drain current (@ $T_a=70^{\circ}C$)	5	A
V_{GS}	Gate to source voltage	± 20	V
E_{AS}	Single pulsed avalanche energy (note 2)	30	mJ
E_{AR}	Repetitive avalanche energy (note 1)	3	mJ
dv/dt	Peak diode recovery dv/dt (note 3)	5	V/ns
P_D	Total power dissipation (@ $T_C=25^{\circ}C$)	125	W
	Total power dissipation (@ $T_a=25^{\circ}C$)	3.6	W
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_{thjc}	Thermal resistance, Junction to case	1.0	$^{\circ}C/W$
R_{thja}	Thermal resistance, Junction to ambient	35	$^{\circ}C/W$

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.



DFN5*6 $R_{thja} : 35^{\circ}C/W$ on a 1 in² pad of 2oz copper.

Electrical characteristic (T_J = 25°C unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
Off characteristics						
BV _{DSS}	Drain to source breakdown voltage	V _{GS} =0V, I _D =250μA	200			V
ΔBV _{DSS} / ΔT _J	Breakdown voltage temperature coefficient	I _D =250μA, referenced to 25°C		0.13		V/°C
I _{DSS}	Drain to source leakage current	V _{DS} =200V, V _{GS} =0V			1	μA
		V _{DS} =160V, T _J =125°C			50	μA
I _{GSS}	Gate to source leakage current, forward	V _{GS} =20V, V _{DS} =0V			100	nA
	Gate to source leakage current, reverse	V _{GS} =-20V, V _{DS} =0V			-100	nA
On characteristics						
V _{GS(TH)}	Gate threshold voltage	V _{DS} =V _{GS} , I _D =250μA	2		4	V
R _{DS(ON)}	Drain to source on state resistance	V _{GS} =10V, I _D =22A, T _J =25°C		44	50	mΩ
		V _{GS} =10V, I _D =22A, T _J =125°C		75		mΩ
G _{fs}	Forward transconductance	V _{DS} =5V, I _D =20A		27		S
Dynamic characteristics						
C _{iss}	Input capacitance	V _{GS} =0V, V _{DS} =100V, f=100KHz		1108		pF
C _{oss}	Output capacitance			113		
C _{rss}	Reverse transfer capacitance			6		
t _{d(on)}	Turn on delay time	V _{DS} =100V, I _D =30A, R _G =4.7Ω, V _{GS} =10V (note 4,5)		11		ns
t _r	Rising time			58		
t _{d(off)}	Turn off delay time			9.5		
t _f	Fall time			37		
Q _g	Total gate charge	V _{DS} =160V, V _{GS} =10V, I _D =30A , I _G =3mA (note 4,5)		17		nC
Q _{gs}	Gate-source charge			7		
Q _{gd}	Gate-drain charge			4.5		
R _g	Gate resistance	V _{DS} =0V, F=1MHz		4		Ω

Source to drain diode ratings characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I _S	Continuous source current	Integral reverse p-n Junction diode in the MOSFET			24	A
I _{SM}	Pulsed source current				96	A
V _{SD}	Diode forward voltage drop.	I _S =22A, V _{GS} =0V			1.4	V
t _{rr}	Reverse recovery time	I _S =30A, V _{GS} =0V, di _F /dt=100A/μs		114		ns
Q _{rr}	Reverse recovery charge			341		nC

- ※. Notes
1.

Repeitative rating : pulse width limited by junction temperature.
2.

L =0.1mH, I_{AS} =24A, V_{DD}=80V, R_G=25Ω, Starting T_J = 25°C
3.

I_{SD} ≤30A, di/dt = 100A/μs, V_{DD} ≤ BV_{DSS}, Staring T_J =25°C
4.

Pulse Test : Pulse Width ≤ 300μs, duty cycle ≤ 2%.
5.

Essentially independent of operating temperature.

Fig. 1. On-state characteristics

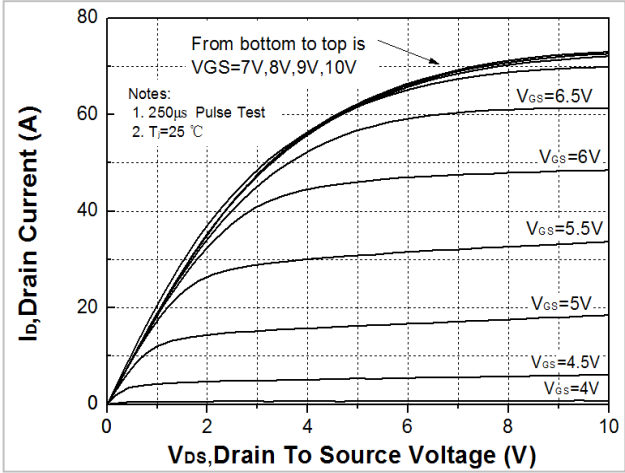


Fig. 2. Transfer Characteristics

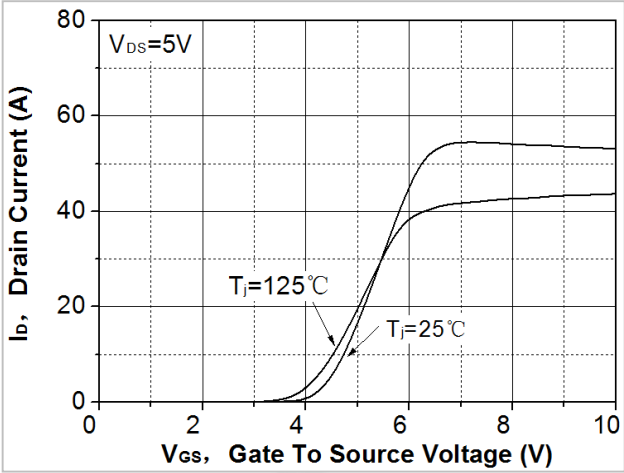


Fig. 3. On-resistance variation vs. drain current and gate voltage

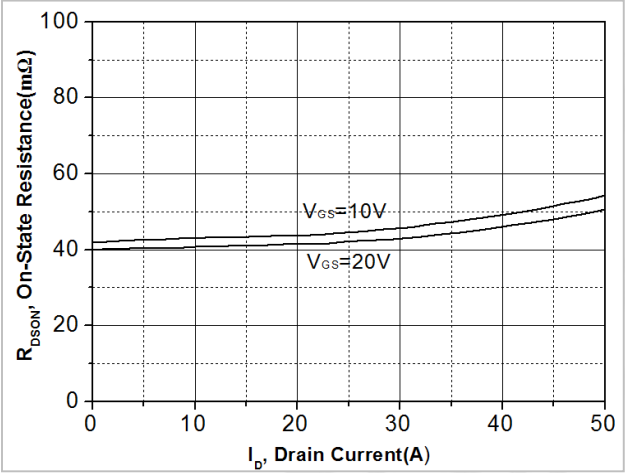


Fig. 4. On-state current vs. diode forward voltage

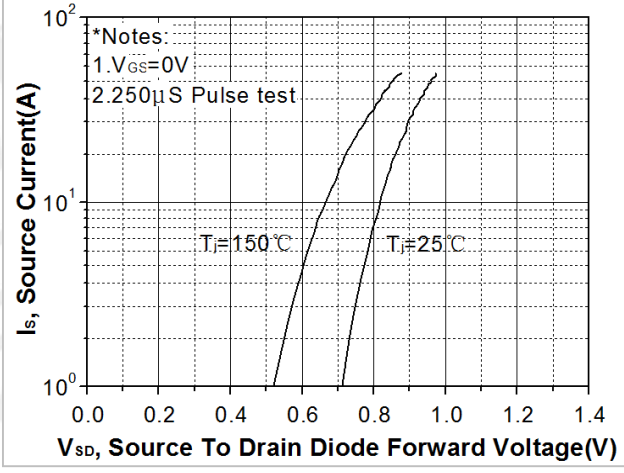


Fig 5. Breakdown voltage variation vs. junction temperature

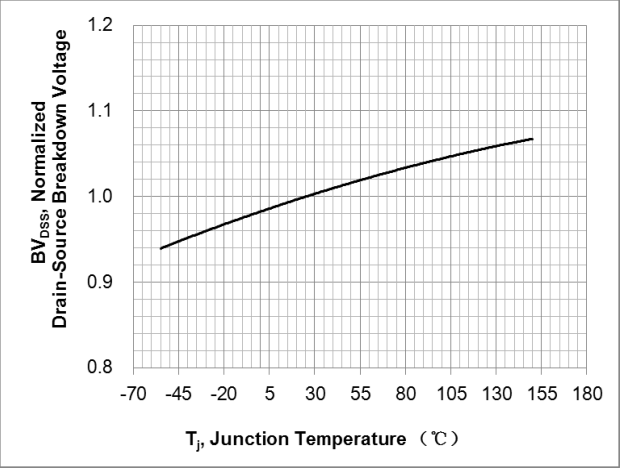


Fig. 6. On-resistance variation vs. junction temperature

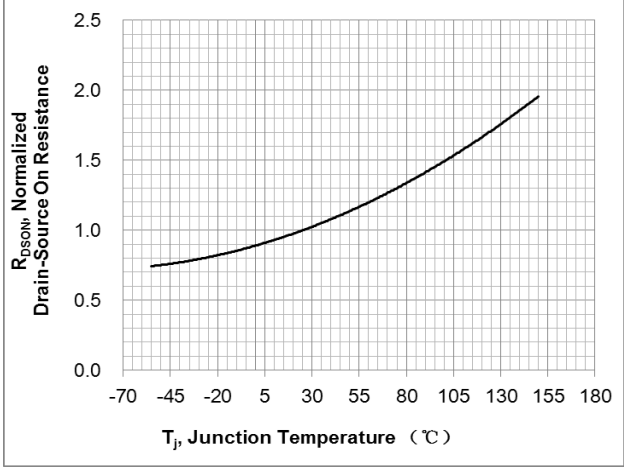


Fig. 7. Gate charge characteristics

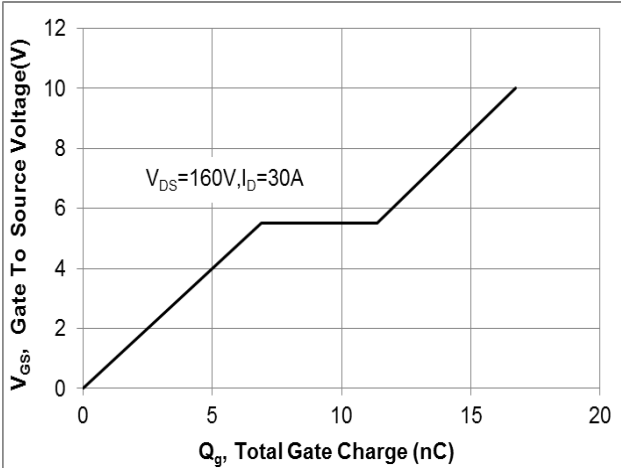


Fig. 8. Capacitance Characteristics

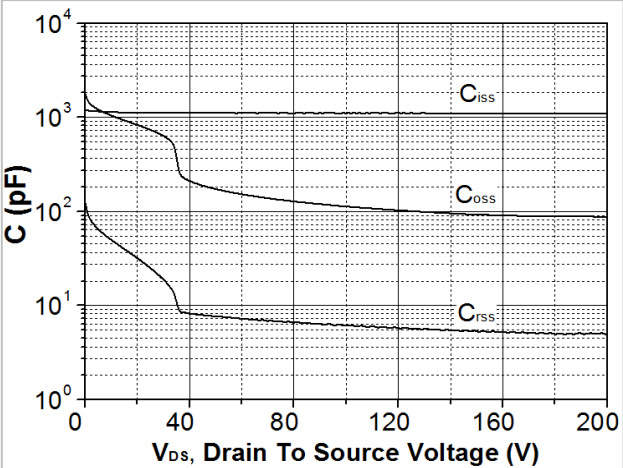


Fig. 9. Maximum safe operating area

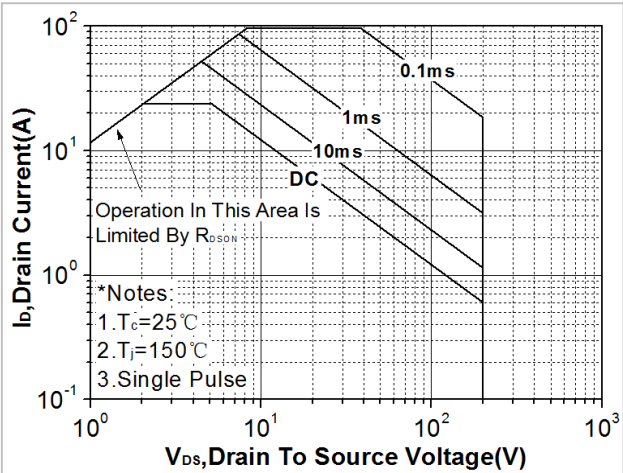


Fig. 10. Maximum drain current vs. case temperature

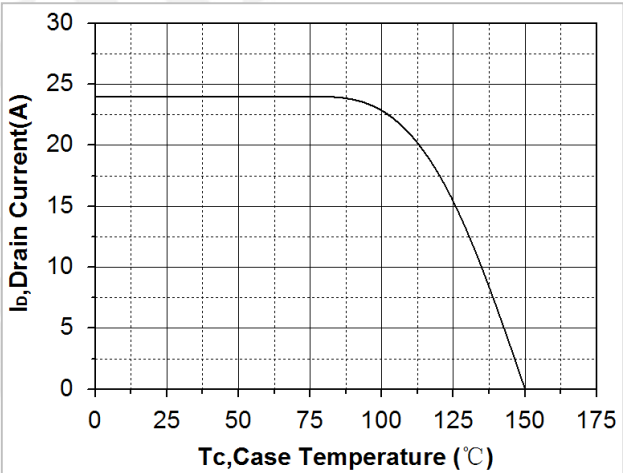


Fig. 11. Transient thermal response curve

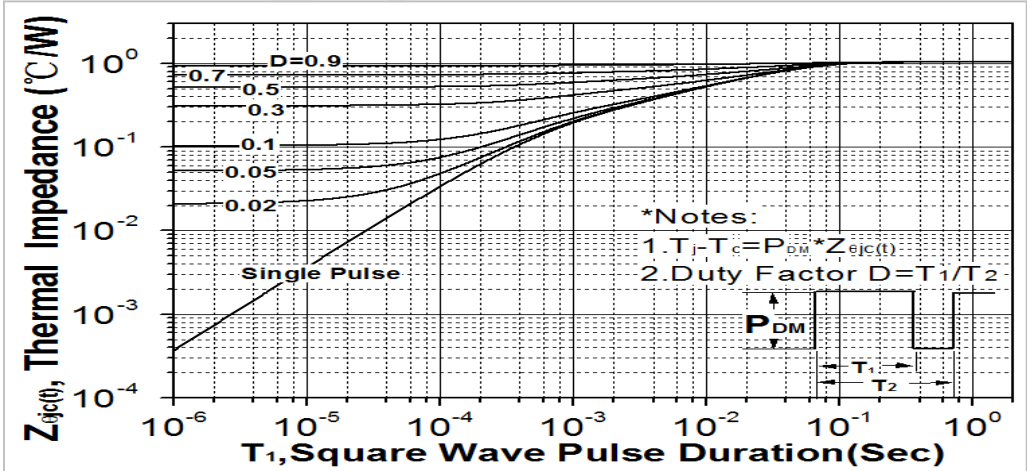


Fig. 12. Gate charge test circuit & waveform

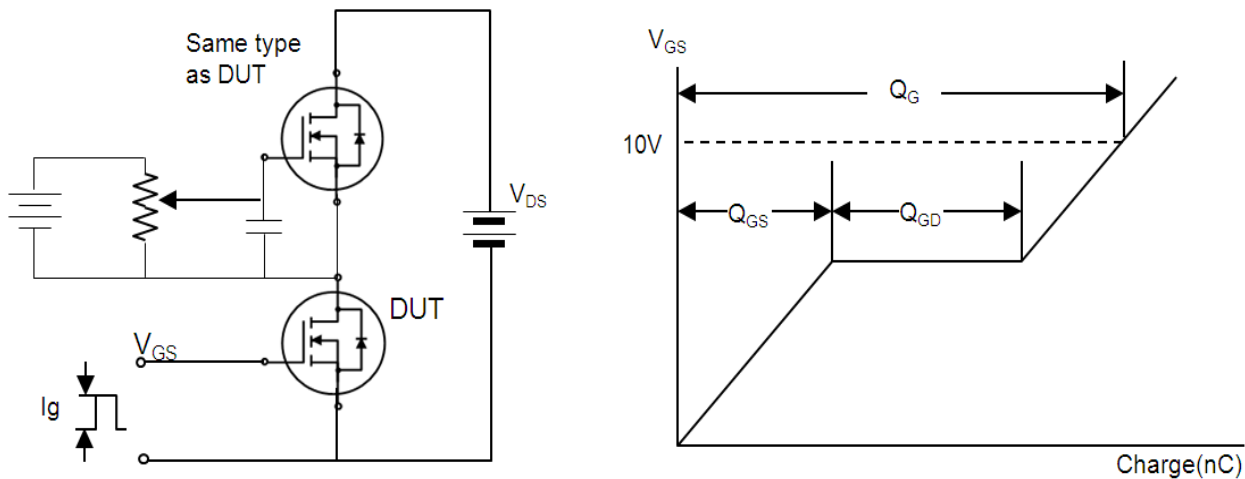


Fig. 13. Switching time test circuit & waveform

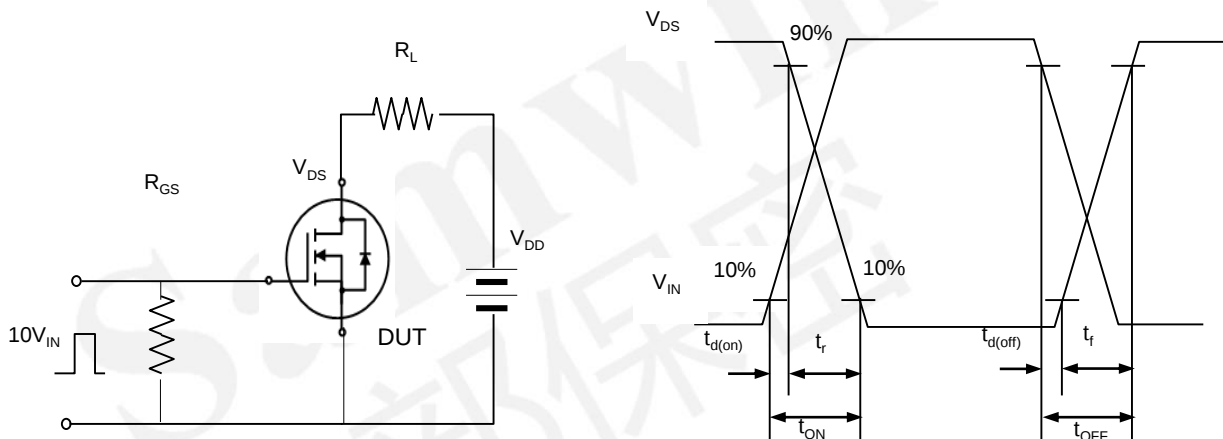


Fig. 14. Unclamped Inductive switching test circuit & waveform

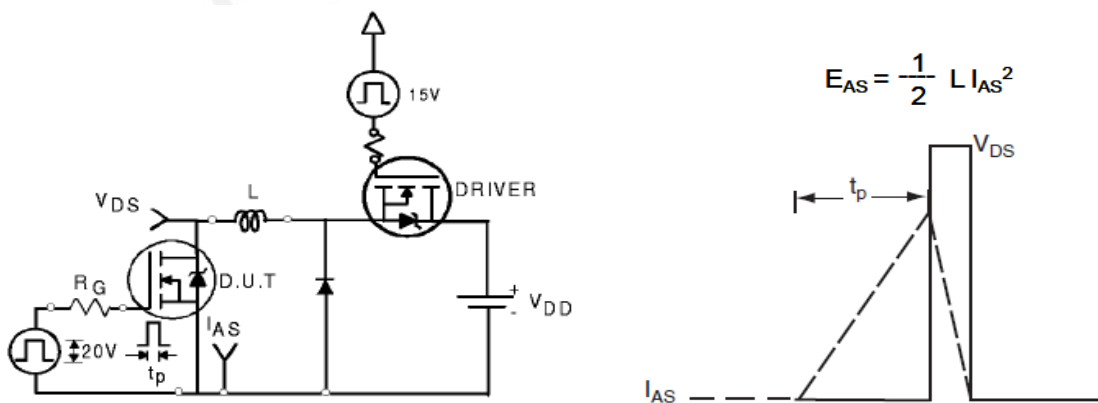
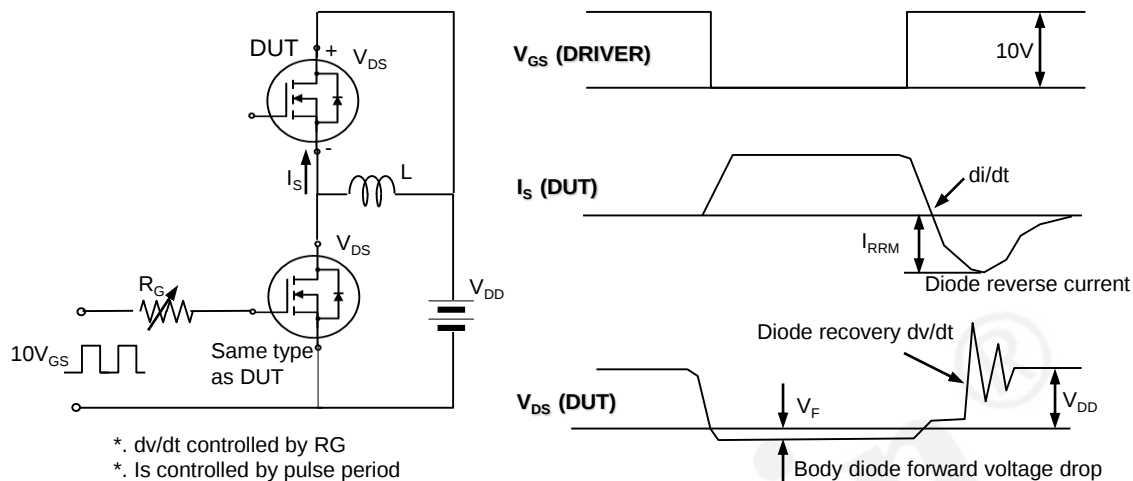


Fig. 15. Peak diode recovery dv/dt test circuit & waveform



DISCLAIMER

* All the data & curve in this document was tested in 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