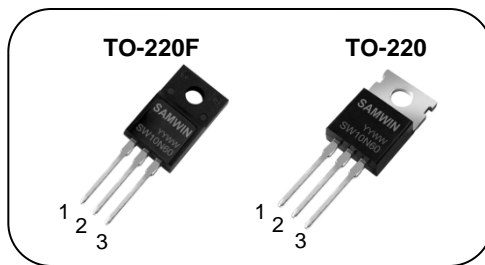


## N-channel MOSFET

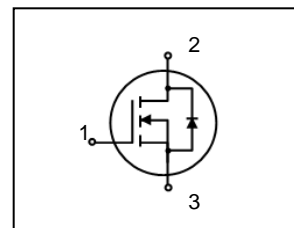
### Features

- High ruggedness
- $R_{DS(ON)}$  (Max 0.75Ω)@ $V_{GS}=10V$
- Gate Charge (Typ 37nC)
- Improved dv/dt Capability
- 100% Avalanche Tested



1. Gate 2. Drain 3. Source

$BV_{DSS}$  : 600V  
 $I_D$  : 10.0A  
 $R_{DS(ON)}$  : 0.75ohm



### General Description

This power MOSFET is produced with advanced VDMOS technology of SAMWIN. This technology enable power MOSFET to have better characteristics, such as fast switching time, low on resistance, low gate charge and especially excellent avalanche characteristics. It is mainly suitable for half bridge or full bridge resonant topology like a electronic ballast, and also low power switching mode power appliances.

### Order Codes

Item	Sales Type	Marking	Package	Packaging
1	SW P 10N60	SW10N60	TO-220	TUBE
2	SW F 10N60	SW10N60	TO-220F	TUBE

### Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220	TO-220F	
$V_{DSS}$	Drain to Source Voltage	600		V
$I_D$	Continuous Drain Current (@ $T_C=25^{\circ}C$ )	10.0	10.0*	A
	Continuous Drain Current (@ $T_C=100^{\circ}C$ )	6.0	6.0*	A
$I_{DM}$	Drain current pulsed (note 1)	40		A
$V_{GS}$	Gate to Source Voltage	$\pm 30$		V
$E_{AS}$	Single pulsed Avalanche Energy (note 2)	745		mJ
$E_{AR}$	Repetitive Avalanche Energy (note 1)	15.6		mJ
dv/dt	Peak diode Recovery dv/dt (note 3)	4.5		V/ns
$P_D$	Total power dissipation (@ $T_C=25^{\circ}C$ )	156	50*	W
	Derating Factor above 25°C	1.25	0.4	W/°C
$T_{STG}, T_J$	Operating Junction Temperature & Storage Temperature	-55 ~ + 150		°C
$T_L$	Maximum Lead Temperature for soldering purpose, 1/8 from Case for 5 seconds.	300		°C

\*. Drain current is limited by junction temperature.

### Thermal characteristics

Symbol	Parameter	Value		Unit
		TO-220	TO-220F	
$R_{thjc}$	Thermal resistance, Junction to case	0.8	2.5	°C/W
$R_{thcs}$	Thermal resistance, Case to Sink	0.5		°C/W
$R_{thja}$	Thermal resistance, Junction to ambient	62.5		°C/W

## Electrical characteristic ( $T_C = 25^\circ\text{C}$ unless otherwise specified )

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
<b>Off characteristics</b>						
$BV_{DSS}$	Drain to source breakdown voltage	$V_{GS}=0V, I_D=250\mu A$	600	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown voltage temperature coefficient	$I_D=250\mu A$ , referenced to $25^\circ\text{C}$	-	0.7	-	$V/^\circ\text{C}$
$I_{DSS}$	Drain to source leakage current	$V_{DS}=600V, V_{GS}=0V$	-	-	1	$\mu A$
		$V_{DS}=480V, T_C=125^\circ\text{C}$	-	-	50	$\mu A$
$I_{GSS}$	Gate to source leakage current, forward	$V_{GS}=30V, V_{DS}=0V$	-	-	100	nA
	Gate to source leakage current, reverse	$V_{GS}=-30V, V_{DS}=0V$	-	-	-100	nA
<b>On characteristics</b>						
$V_{GS(TH)}$	Gate threshold voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
$R_{DS(ON)}$	Drain to source on state resistance	$V_{GS}=10V, I_D = 5.0A$		0.60	0.75	$\Omega$
<b>Dynamic characteristics</b>						
$C_{ISS}$	Input capacitance	$V_{GS}=0V, V_{DS}=25V, f=1\text{MHz}$		1740	2530	pF
$C_{OSS}$	Output capacitance			195	205	
$C_{rSS}$	Reverse transfer capacitance			24	42	
$t_{d(on)}$	Turn on delay time	$V_{DS}=300V, I_D=10A, R_G=25\Omega$			60	ns
$t_r$	Rising time				180	
$t_{d(off)}$	Turn off delay time				300	
$t_f$	Fall time				160	
$Q_g$	Total gate charge	$V_{DS}=480V, V_{GS}=10V, I_D=10A$		37	60	nC
$Q_{gs}$	Gate-source charge			5	-	
$Q_{gd}$	Gate-drain charge			20	-	

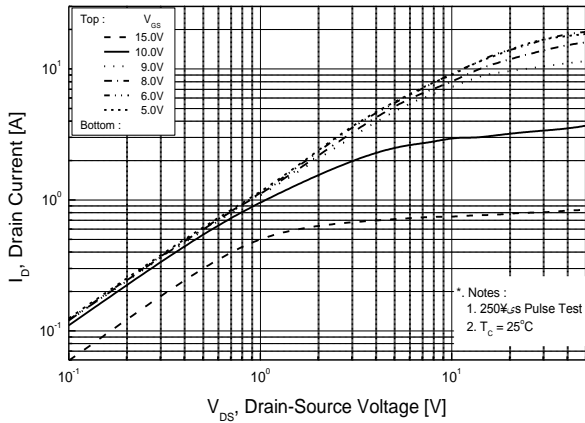
## Source to drain diode ratings characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous source current	Integral reverse p-n Junction diode in the MOSFET	-	-	10	A
$I_{SM}$	Pulsed source current		-	-	40	A
$V_{SD}$	Diode forward voltage drop.	$I_S=10A, V_{GS}=0V$	-	-	1.5	V
$T_{rr}$	Reverse recovery time	$I_S=10A, V_{GS}=0V,$	-	460	-	ns
$Q_{rr}$	Breakdown voltage temperature	$di_F/dt=100A/\mu s$	-	4.3	-	$\mu C$

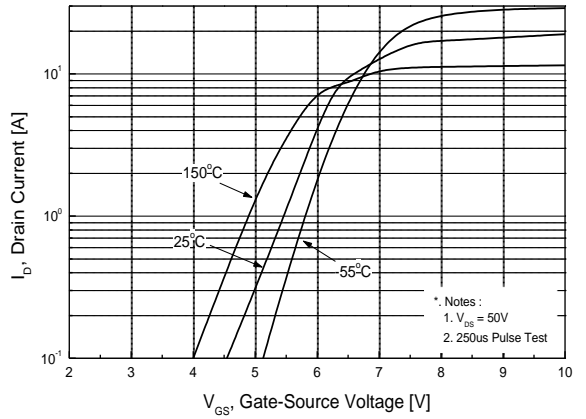
### ※. Notes

1. Repetitive rating : pulse width limited by junction temperature.
2.  $L = 14.2\text{mH}, I_{AS} = 10.0A, V_{DD} = 50V, R_G=25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 10.0A, di/dt = 200A/\mu s, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse Width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
5. Essentially independent of operating temperature.

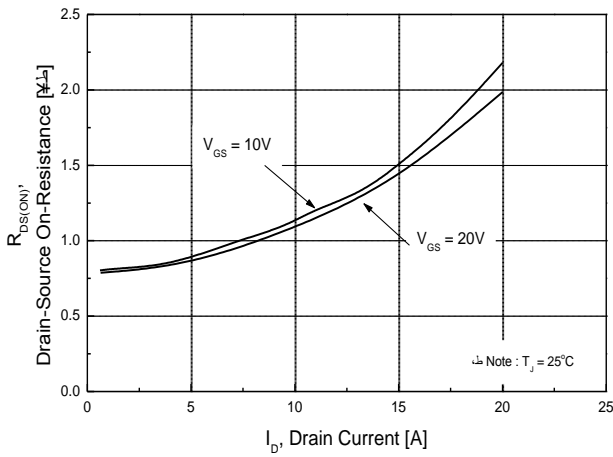
**Fig. 1. On-state characteristics**



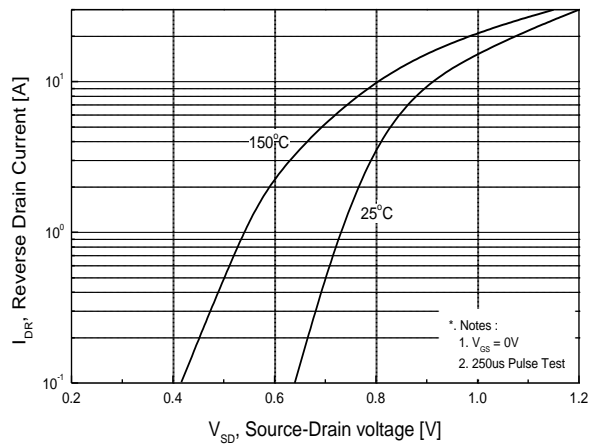
**Fig. 2. Transfer characteristics**



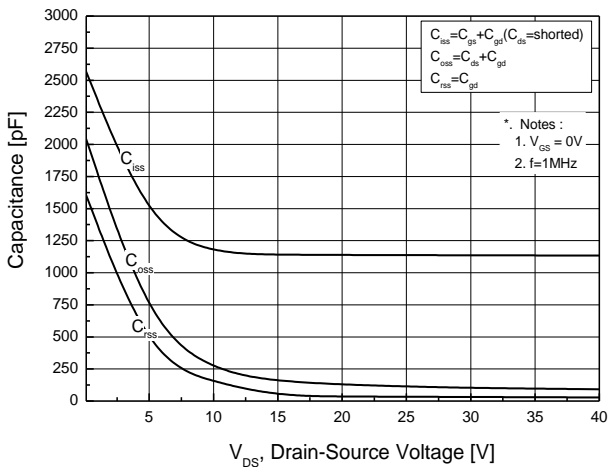
**Fig. 3. On-resistance variation vs. drain current and gate voltage**



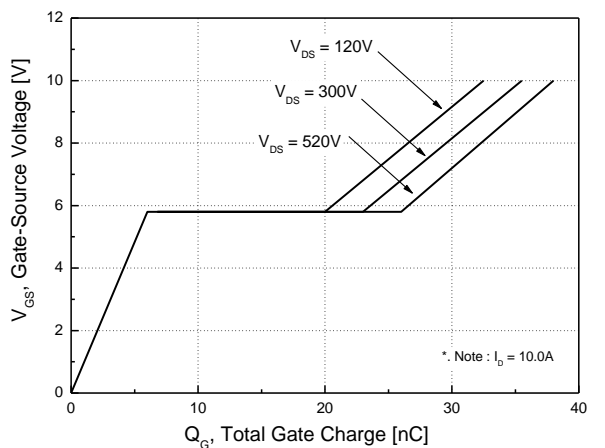
**Fig. 4. On state current vs. diode forward voltage**



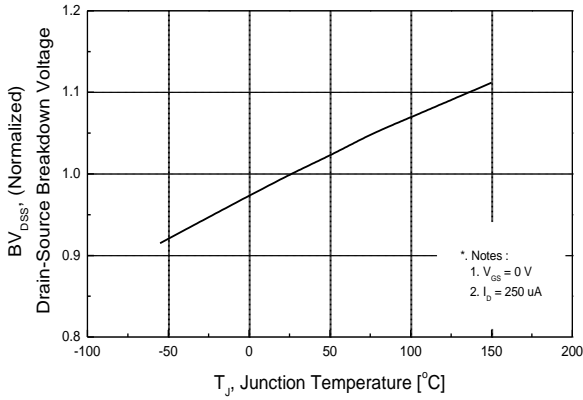
**Fig. 5. Capacitance characteristics (Non-Repetitive)**



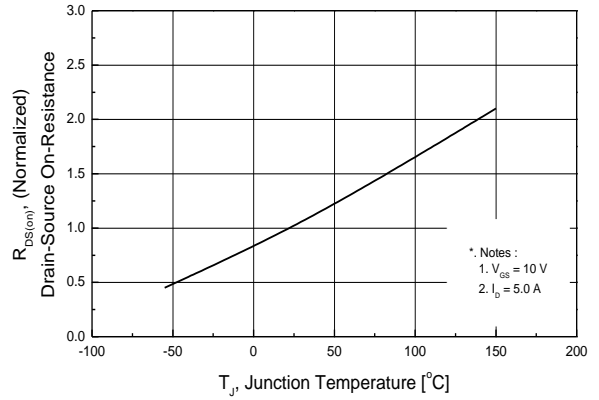
**Fig. 6. Gate charge characteristics**



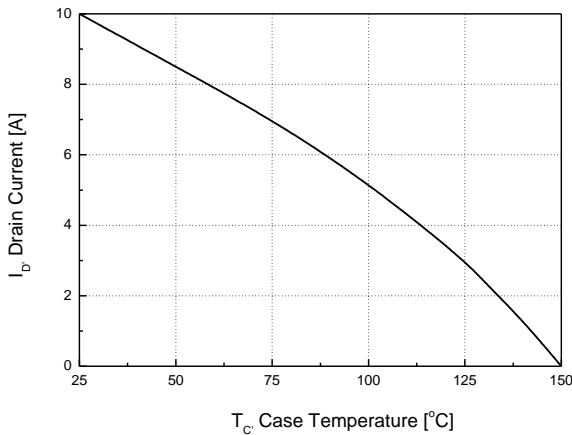
**Fig 7. Breakdown Voltage Variation vs. Junction Temperature**



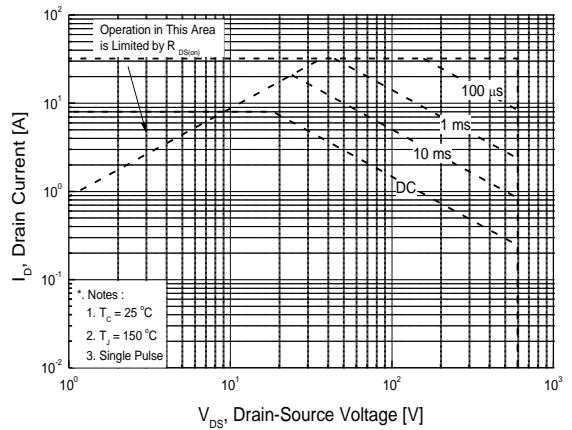
**Fig. 8. On resistance variation vs. junction temperature**



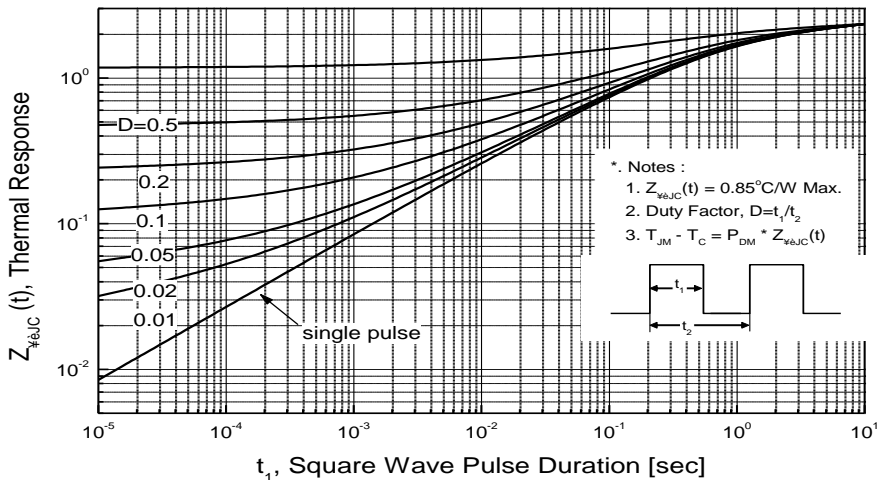
**Fig. 9. Maximum drain current vs. case temperature.**



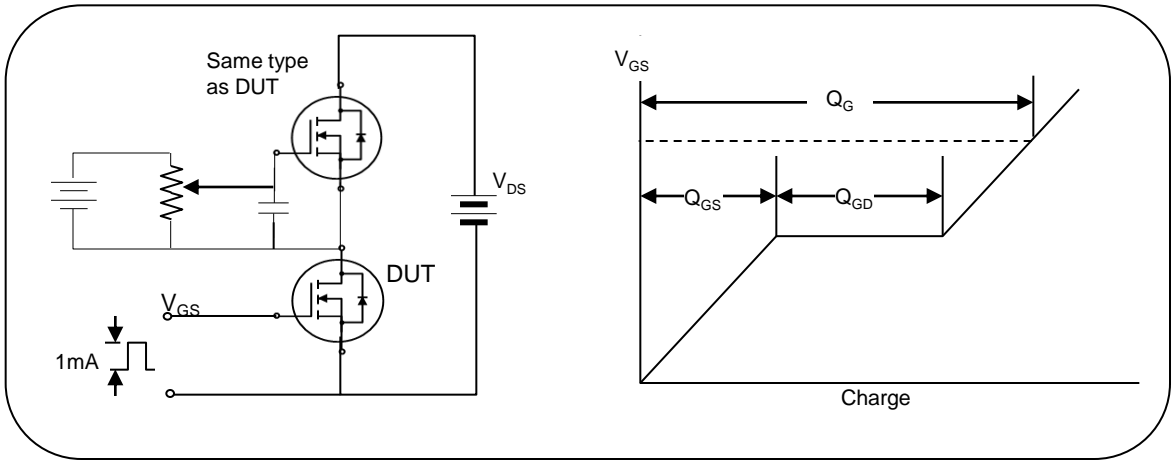
**Fig. 10. Maximum safe operating area**



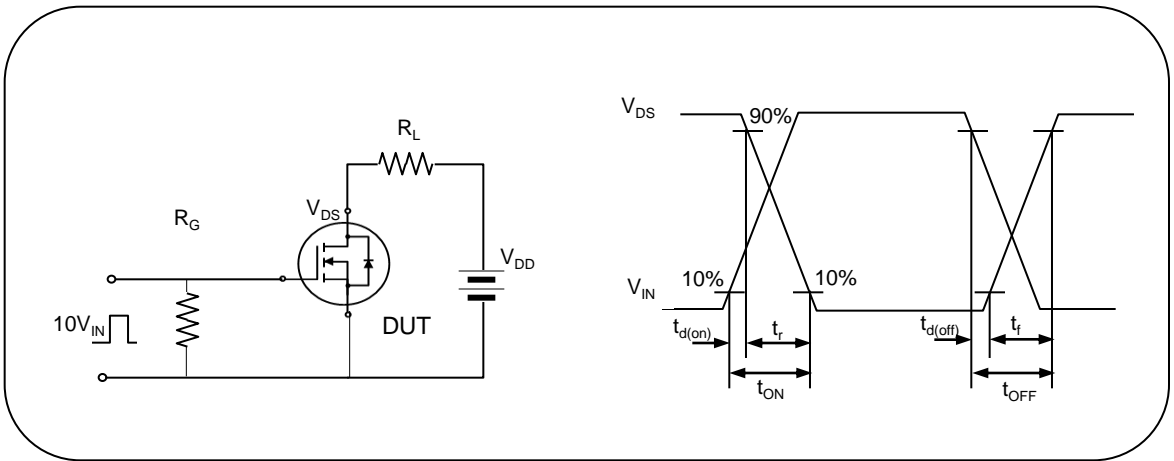
**Fig. 11. Transient thermal response curve**



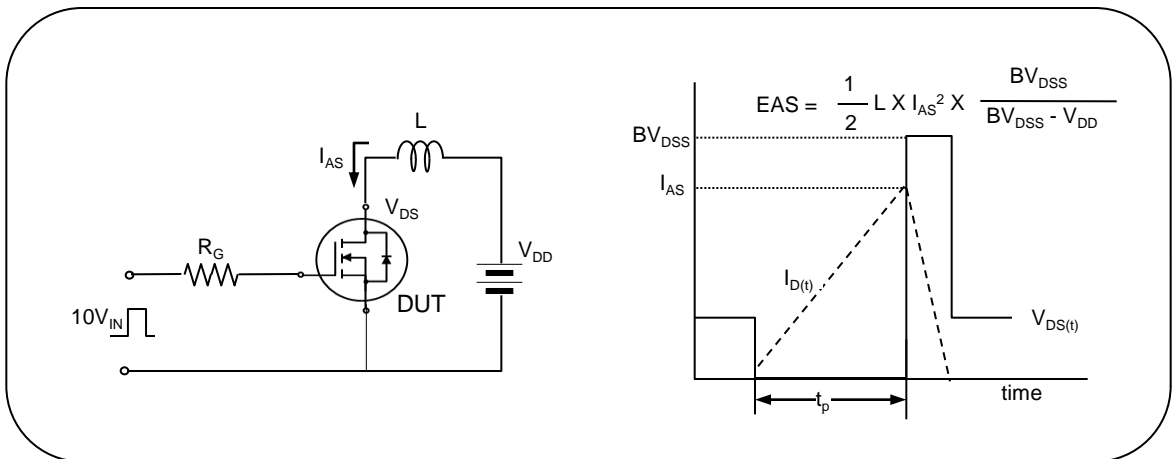
**Fig. 12. Gate charge test circuit & waveform**



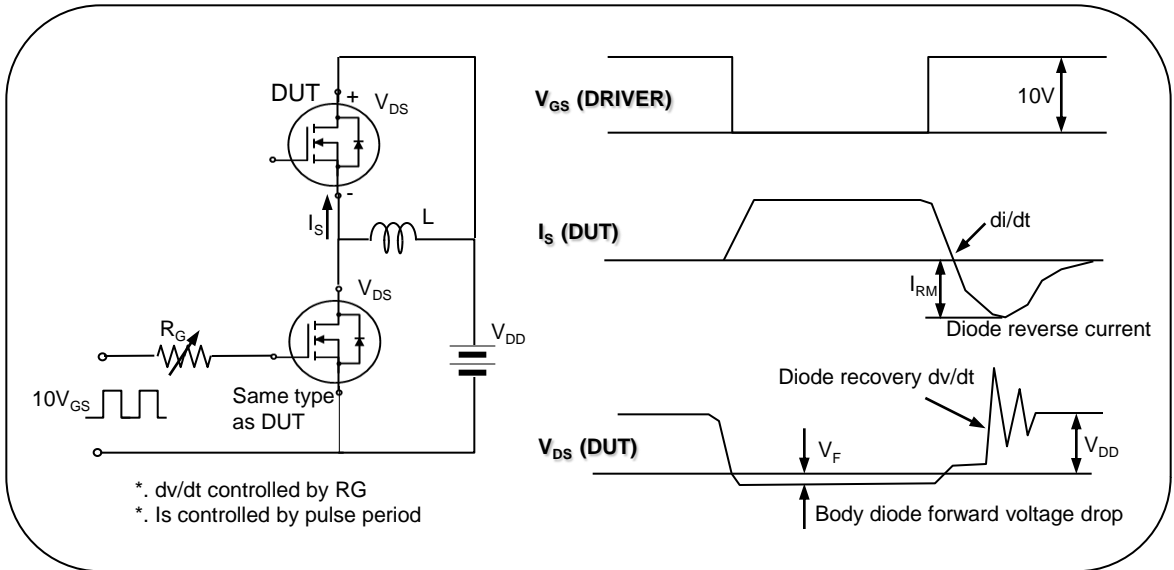
**Fig. 13. Switching time test circuit & waveform**



**Fig. 14. Unclamped Inductive switching test circuit & waveform**



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



## REVISION HISTORY

Revision No.	Changed Characteristics	Responsible	Date	Issuer
REV 1.0	Origination, First Release	Alice Nie	2007.12.05	XZQ
REV 2.0	Updated the format of datasheet and added Order Codes.	Alice Nie	2011.03.24	XZQ

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