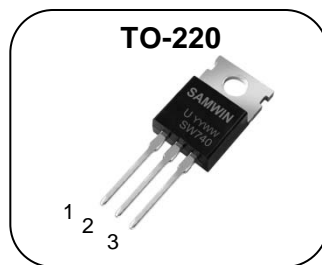


## N-channel TO-220 MOSFET

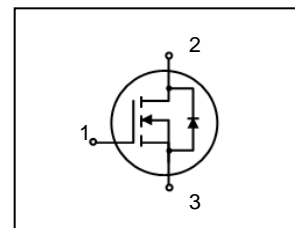
### Features

- High ruggedness
- $R_{DS(ON)}$  (Max 0.55Ω) @  $V_{GS}=10V$
- Gate Charge (Typical 38nC)
- Improved dv/dt Capability
- 100% Avalanche Tested



1. Gate 2. Drain 3. Source

$BV_{DSS}$  : 400V  
 $I_D$  : 10A  
 $R_{DS(ON)}$  : 0.55ohm



### 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 740U	SW740	TO-220	TUBE

### Absolute maximum ratings

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain to Source Voltage	400	V
$I_D$	Continuous Drain Current (@ $T_C=25^{\circ}C$ )	10*	A
	Continuous Drain Current (@ $T_C=100^{\circ}C$ )	6.3*	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)	1200	mJ
$E_{AR}$	Repetitive Avalanche Energy (note 1)	170	mJ
dv/dt	Peak diode Recovery dv/dt (note 3)	5	V/ns
$P_D$	Total power dissipation (@ $T_C=25^{\circ}C$ )	226	W
	Derating Factor above 25°C	1.8	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

### Thermal characteristics

Symbol	Parameter	Value	Unit
$R_{thjc}$	Thermal resistance, Junction to case	0.55	°C/W
$R_{thcs}$	Thermal resistance, Case to Sink	0.5	°C/W
$R_{thja}$	Thermal resistance, Junction to ambient	58	°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	$V_{GS}=0V, I_D=250\mu A$	400			V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown voltage temperature coefficient	$I_D=250\mu A$ , referenced to $25^\circ\text{C}$		0.43		V/ $^\circ\text{C}$
$I_{DSS}$	Drain to source leakage current	$V_{DS}=400V, V_{GS}=0V$			1	$\mu A$
		$V_{DS}=320V, T_C=125^\circ\text{C}$			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	$V_{GS}=10V, I_D = 5A$		0.35	0.55	$\Omega$
$G_{fs}$	Forward Transconductance	$V_{DS}=20V, I_D = 5 A$	10			S
<b>Dynamic characteristics</b>						
$C_{iss}$	Input capacitance	$V_{GS}=0V, V_{DS}=25V, f=1\text{MHz}$		1150		pF
$C_{oss}$	Output capacitance			170		
$C_{rss}$	Reverse transfer capacitance			40		
$t_{d(on)}$	Turn on delay time	$V_{DS}=200V, I_D=10A, R_G=25\Omega$ (note 4,5)		15	30	ns
$t_r$	Rising time			35	60	
$t_{d(off)}$	Turn off delay time			98	200	
$t_f$	Fall time			38	80	
$Q_g$	Total gate charge	$V_{DS}=320V, V_{GS}=10V, I_D=10A$ (note 4,5)		38	70	nC
$Q_{gs}$	Gate-source charge			6		
$Q_{gd}$	Gate-drain charge			18		

### 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	$I_S=10A, V_{GS}=0V,$ $di_f/dt=100A/\mu s$		270		ns
$Q_{rr}$	Reverse recovery Charge				2.53	$\mu C$

#### ※. Notes

1. Repetitive rating : pulse width limited by junction temperature.
2.  $L = 25.4\text{mH}, I_{AS} = 10A, V_{DD} = 50V, R_G=25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 10A, di/dt = 100A/\mu s, V_{DD} \leq BV_{DSS}$ , 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

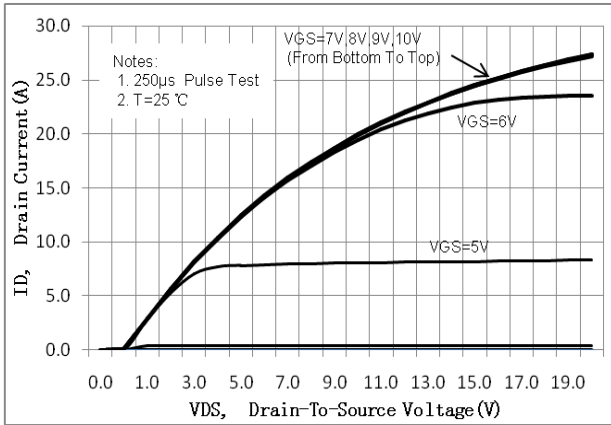


Fig. 2. On-resistance variation vs. drain current and gate voltage

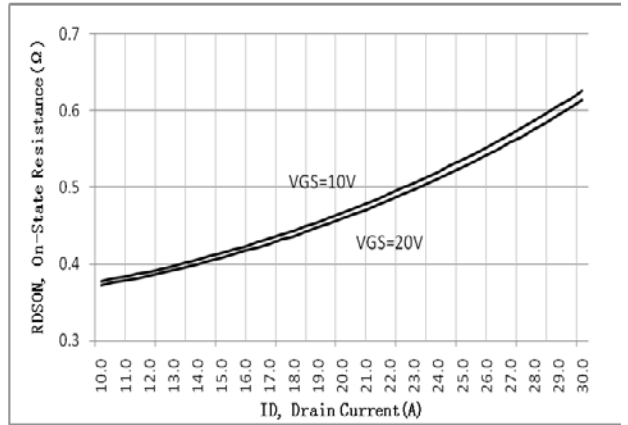


Fig. 3. Gate charge characteristics

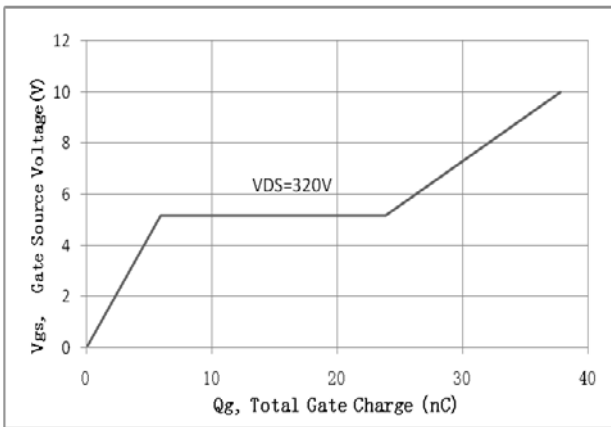


Fig. 4. On state current vs. diode forward voltage

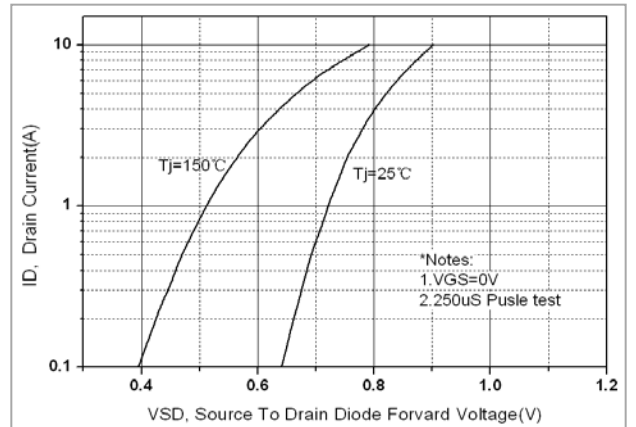


Fig 5. Breakdown Voltage Variation vs. Junction Temperature

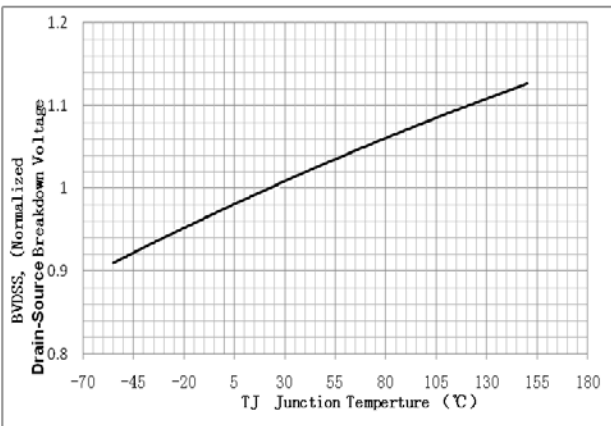


Fig. 6. On resistance variation vs. junction temperature

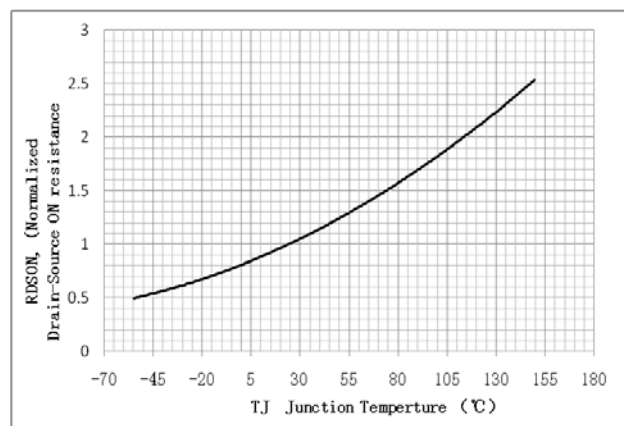


Fig. 7. Maximum safe operating area

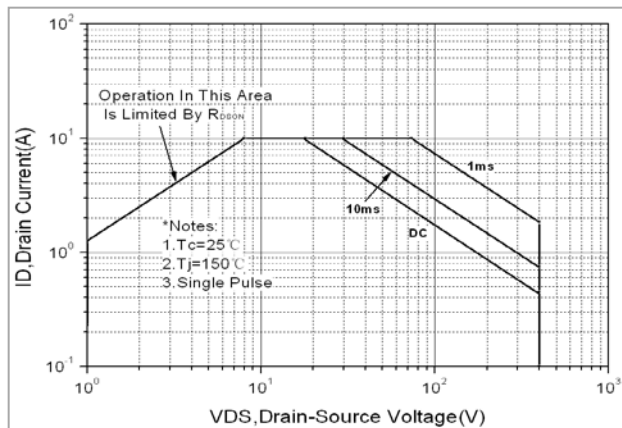


Fig. 8. Transient thermal response curve

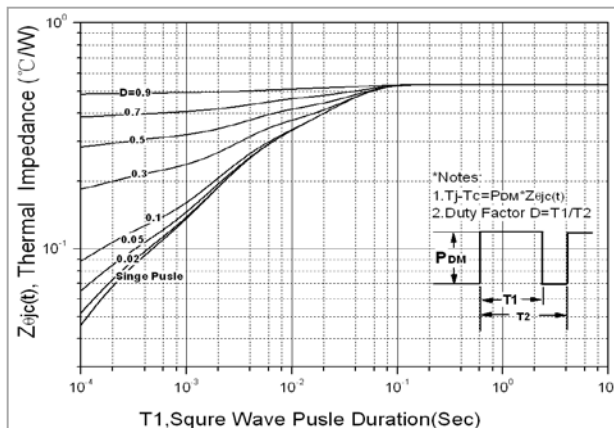


Fig. 9. Gate charge test circuit & waveform

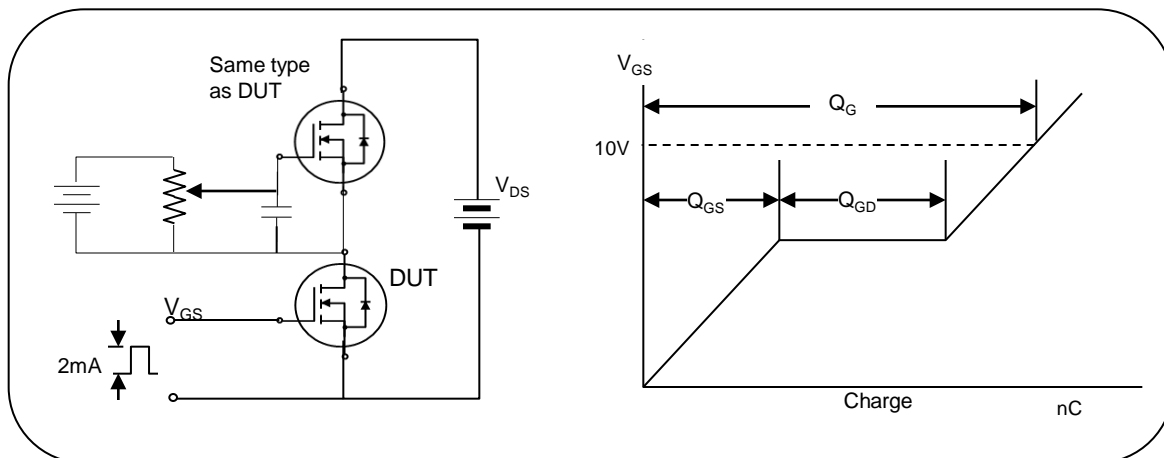


Fig. 10. Switching time test circuit & waveform

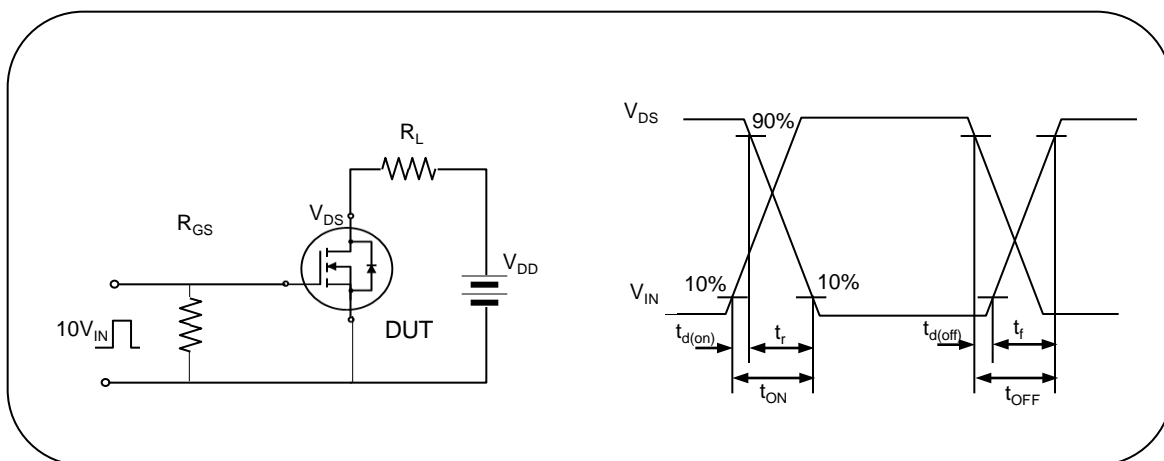


Fig. 11. Unclamped Inductive switching test circuit & waveform

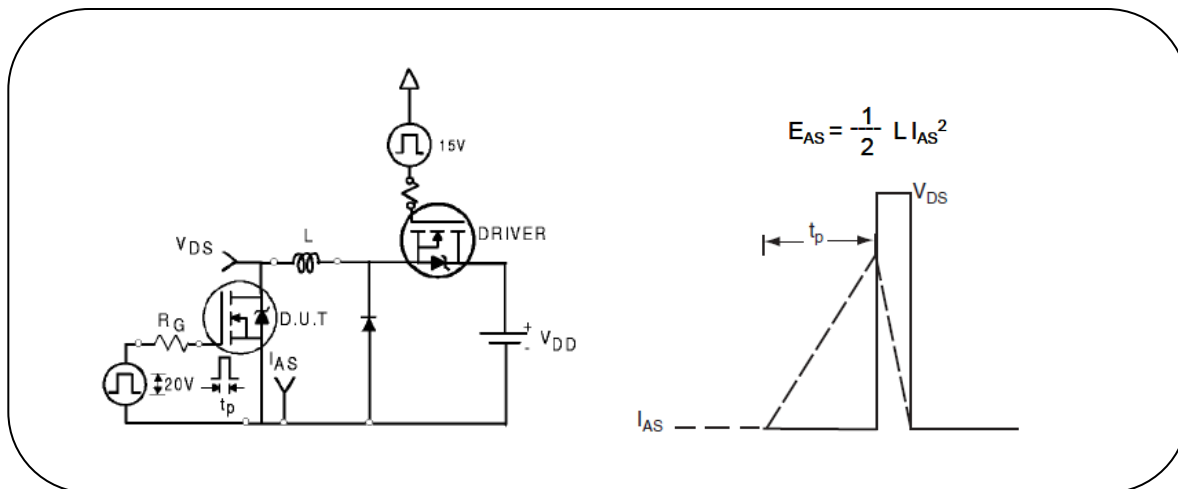


Fig. 12. Peak diode recovery dv/dt test circuit & waveform

