

**• General Description**

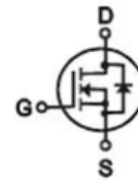
It combines advanced SGT MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ .

**• Features**

- Advance high cell density Trench technology
- Low  $R_{DS(ON)}$  to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance

**• Application**

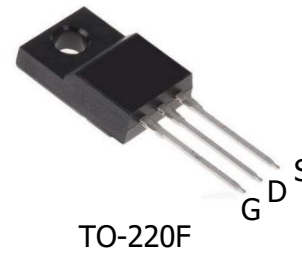
- Synchronous Rectification for AC-DC/DC-DC converter
- Oring switches
- Power Tools

**• Product Summary**


$V_{DS} = 120V$

$R_{DS(ON)} = 6.0m\Omega$

$I_D = 60A$


**• Ordering Information:**

Part NO.	ZMS060N12HF
Marking	ZMS060N12H
Packing Information	Bulk Tube
Basic ordering unit (pcs)	800

**• Absolute Maximum Ratings (T<sub>C</sub> =25°C)**

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	$V_{DS}$	120	V
Gate-Source Voltage	$V_{GS}$	±20	V
Continuous Drain Current	$I_{D@TC=25^{\circ}C}$	60	A
	$I_{D@TC=75^{\circ}C}$	45.6	A
	$I_{D@TC=100^{\circ}C}$	37.8	A
Pulsed Drain Current ①	$I_{DM}$	180	A
Total Power Dissipation(TC=25°C)	$P_D@TC=25^{\circ}C$	75	W
Total Power Dissipation(TA=25°C)	$P_D@TA=25^{\circ}C$	2	W
Operating Junction Temperature	$T_J$	-55 to 150	°C
Storage Temperature	$T_{STG}$	-55 to 150	°C
Single Pulse Avalanche Energy@L=0.1mH	$E_{AS}$	320	mJ

**•Thermal resistance**

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	$R_{thJC}$	-	-	2.8	° C/W
Thermal resistance, junction - ambient	$R_{thJA}$	-	-	62	° C/W
Soldering temperature, wave soldering for 10s	$T_{sold}$	-	-	265	° C

**•Electronic Characteristics**

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	120			V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\mu A$	2.0		4.0	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 120V, V_{GS} = 0V$			1.0	$\mu A$
Gate- Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$			$\pm 100$	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 25A$		6.0	7.8	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS} = 25V, I_D = 10A$		40		s
Source-drain voltage	$V_{SD}$	$I_S = 25A$			1.28	V

**•Electronic Characteristics**

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Input capacitance	$C_{iss}$	$V_{GS} = 0V, V_{DS} = 25V$ $f = 1MHz$	-	4550	-	pF
Output capacitance	$C_{oss}$		-	1850	-	
Reverse transfer capacitance	$C_{rss}$		-	160	-	

**•Gate Charge characteristics( $T_a = 25^\circ C$ )**

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Total gate charge	$Q_g$	$V_{DD} = 25V$	-	56	-	nC
Gate - Source charge	$Q_{gs}$	$I_D = 8A$	-	8	-	
Gate - Drain charge	$Q_{gd}$	$V_{GS} = 10V$	-	12	-	
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 20A,$ $di/dt = 100A/\mu s$		TBD		nS
Body Diode Reverse Recovery Charge	$Q_{rr}$	$I_F = 20A,$ $di/dt = 100A/\mu s$		TBD		nC

Note: ① Pulse Test : Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$  ;

Fig.1 Gate-Charge Characteristics

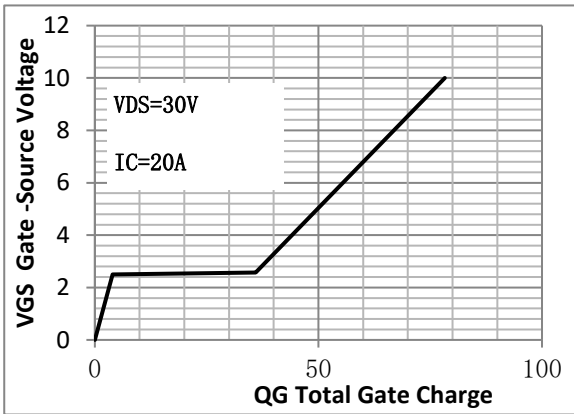


Fig.2 Capacitance Characteristics

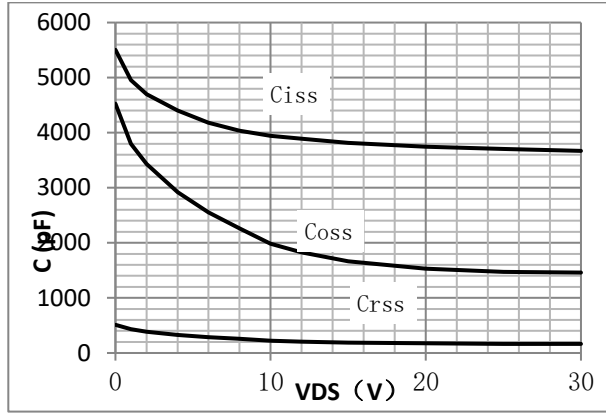


Fig.3 Power Dissipation

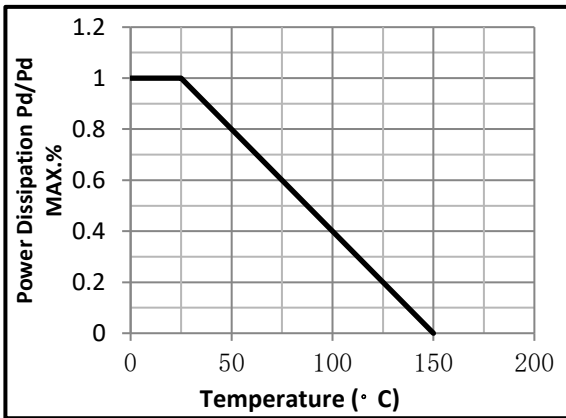


Fig.4 Typical output Characteristics

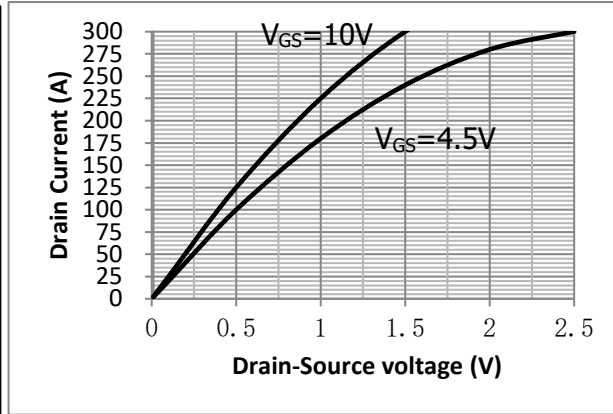


Fig.5 Threshold Voltage V.S Junction Temperature

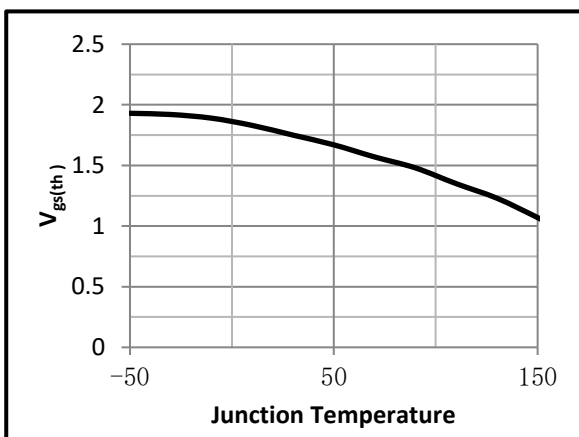


Fig.6 Resistance V.S Drain Current

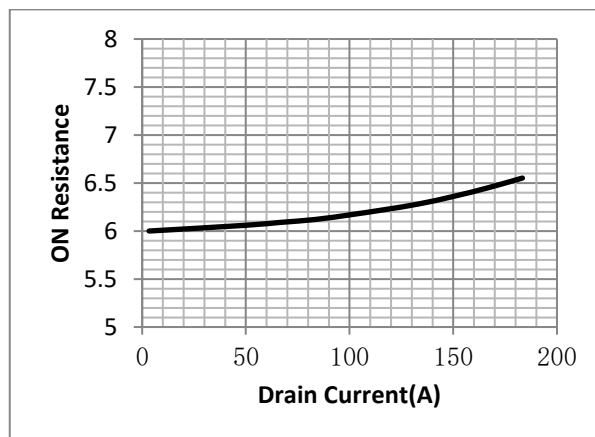


Fig.7 On-Resistance VS Gate Source Voltage

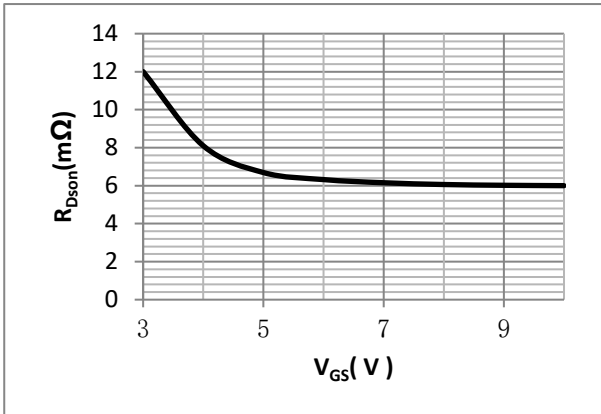


Fig.8 On-Resistance V.S Junction Temperature

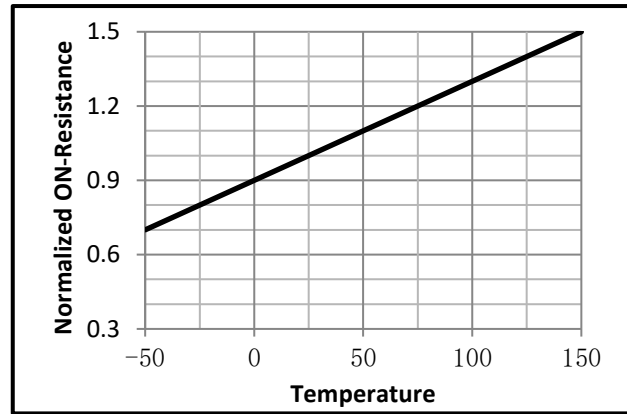


Fig.9 SOA Maximum Safe Operating Area

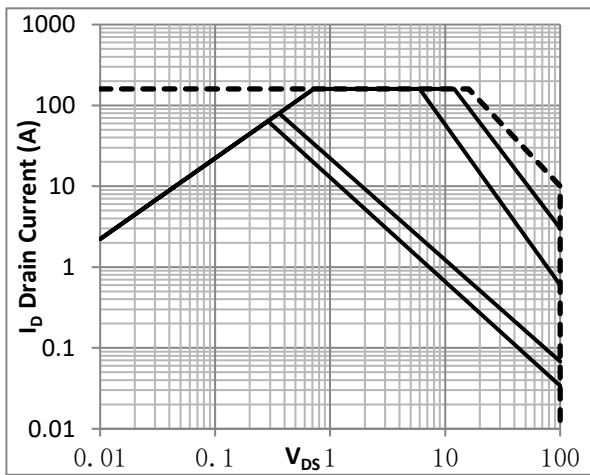


Fig.10 I<sub>D</sub>-Junction Temperature

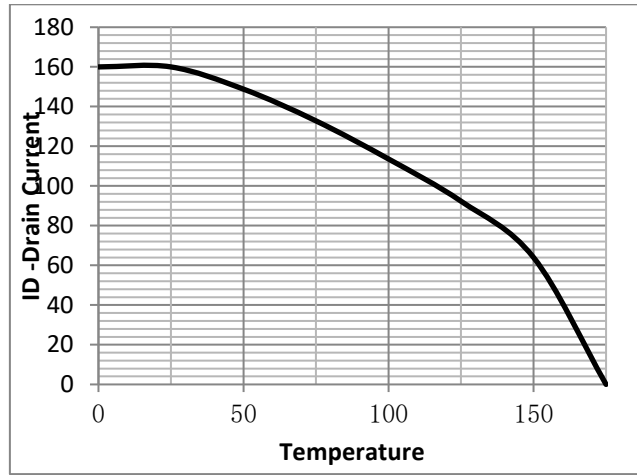


Fig.11 Switching Time Measurement Circuit

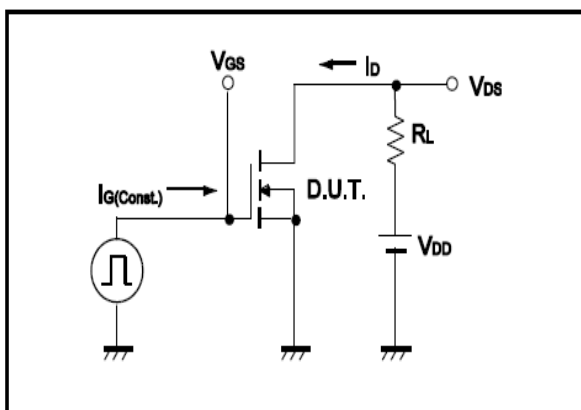


Fig.12 Gate Charge Waveform

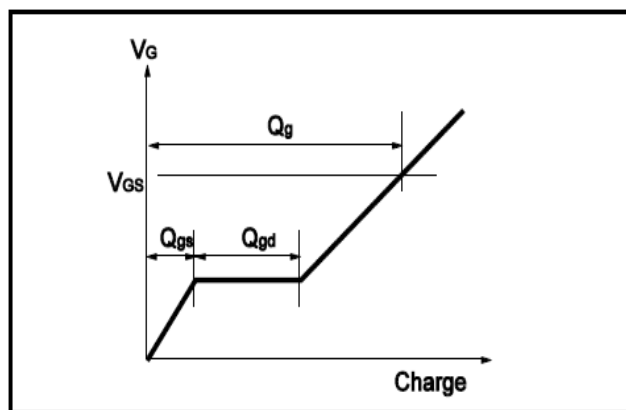


Fig.13 Switching Time Measurement Circuit

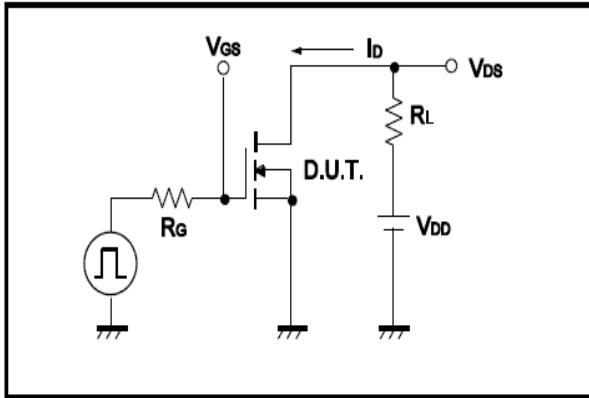


Fig.14 Gate Charge Waveform

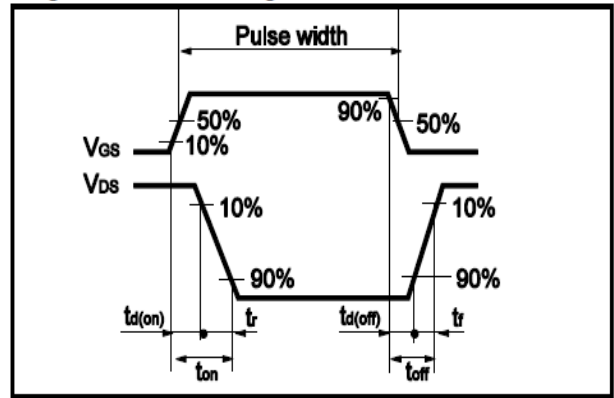


Fig.15 Avalanche Measurement Circuit

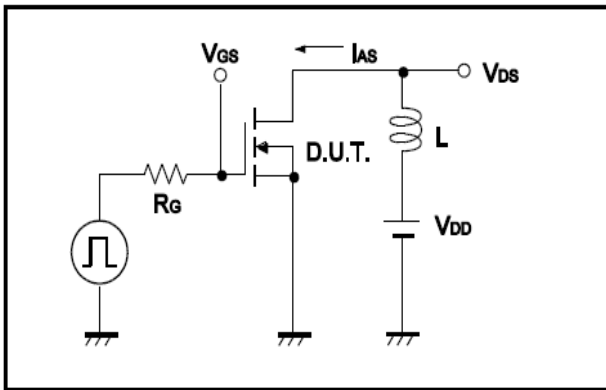
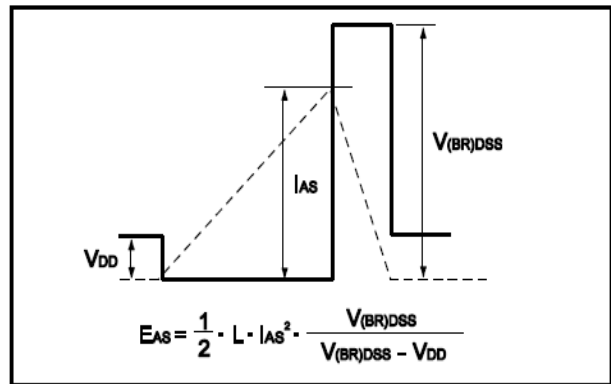


Fig.16 Avalanche Waveform





• Dimensions (TO-220F)

Unit: mm

SYMBOL	min	nom	max	SYMBOL	min	nom	max
A	4.40		4.95	e		2.54	
A <sub>1</sub>	2.30		2.90	L	12.50		14.30
b	0.45		0.90	L <sub>1</sub>	9.10		10.05
b <sub>1</sub>	1.10		1.70	L <sub>2</sub>	15.00		16.00
c	0.35		0.90	L <sub>3</sub>	3.00		4.00
D	14.50		17.00	øp	3.00		3.50
D1	6.10		9.00	Q	2.30		2.80
E	9.60		10.30				

