N-Channel Enhancement Mode MOSFET

Feature

- 60V/9A
  $R_{DS(ON)}$= 16m (typ.) @V_{GS} = 10V
  $R_{DS(ON)}$= 18.5m (typ.) @V_{GS} = 4.5V
- 100% Avalanche Tested
- Reliable and Rugged
- Halogen Free and Green Devices Available
  (RoHS Compliant)

Pin Description

Applications

- Power Management for DC/DC
- Switching Application
- Battery Protection

Ordering and Marking Information

S G210N06 XYMXXXXXX	Package Code S: SOP-8L Date Code XYMXXXXXX

Note:HUAYI lead-free products contain molding compounds/die attach materials and 100% matte tin plate Termi-Nation finish;which are fully compliant with RoHS.HUAYI lead-free products meet or exceed the lead-Free require-ments of IPC/JEDEC J-STD-020 for MSL classification at lead-free peak reflow temperature.HUAYI defines Green to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

HUAYI reserves the right to make changes, corrections, enhancements, modifications, and improvements to this product and/or to this document at any time without notice.

Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
Common Ratings (Tc=25°C Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage		60	V
V_{GSS}	Gate-Source Voltage		±20	V
T_J	Junction Temperature Range		-55 to 175	℃
T_{STG}	Storage Temperature Range		-55 to 175	℃
I_S	Source Current-Continuous(Body Diode)	Tc=25°C	9	A
Mounted on Large Heat Sink				
I_{DM}	Pulsed Drain Current *	Tc=25°C	36	A
I_D	Continuous Drain Current	Tc=25°C	9	A
		Tc=100°C	6.3	A
P_D	Maximum Power Dissipation	Tc=25°C	3.0	W
		Tc=100°C	1.5	W
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient **		50	°C/W
E_{AS}	Single Pulsed-Avalanche Energy ***	L=0.1mH	66	mJ

Note: * Repetitive rating pulse width limited by max.junction temperature.
** Surface Mounted on FR4 Board.
*** Limited by $T_J$max , starting T_J=25°C, L = 0.1mH, R_G= 25Ω, V_{GS} =10V.

Electrical Characteristics(Tc =25°C Unless Otherwise Noted)

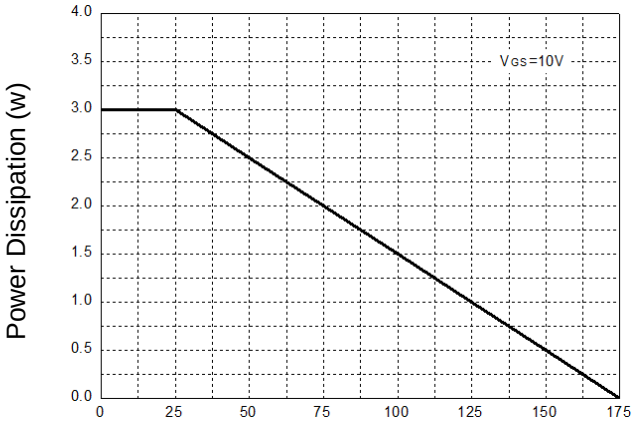
Symbol	Parameter	Test Conditions	HYG210N06LA1			Unit
			Min	Typ.	Max	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V,I_{DS}=250 A				

Electrical Characteristics (Cont.) (Tc =25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	HYG210N06LA1			Unit
			Min	Typ.	Max	
Dynamic Characteristics						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V, F=1MHz	-	2.2	-	Ω
C_{iss}	Input Capacitance	V_{GS}=0V,	-	1154	-	pF
C_{oss}	Output Capacitance	V_{DS}=25V,	-	88	-	
C_{rss}	Reverse Transfer Capacitance	Frequency=1.0MHz	-	56	-	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=30V,R_G=2.5 I_{DS}=6A,V_{GS}=10V	-	7.7	-	ns
T_r	Turn-on Rise Time		-	11.2	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	22.3	-	
T_f	Turn-off Fall Time		-	8	-	
Gate Charge Characteristics						
Q_g(10V)	Total Gate Charge	V_{DS} =48V, V_{GS}=10V I_D=6A	-	23	-	nC
Q_g(4.5V)	Total Gate Charge			11		
Q_{gs}	Gate-Source Charge		-	4.3	-	
Q_{gd}	Gate-Drain Charge		-	5.6	-	

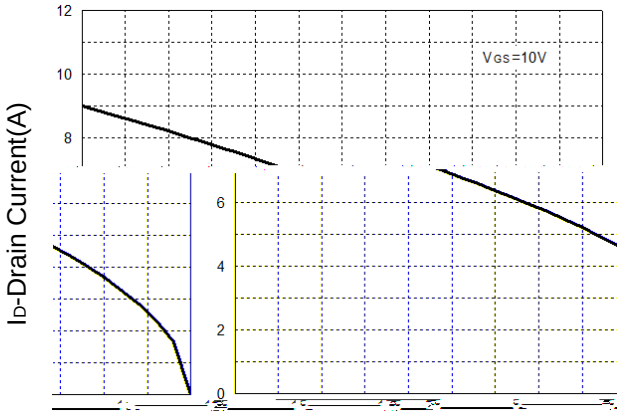
Typical Operating Characteristics

Figure 1: Power Dissipation



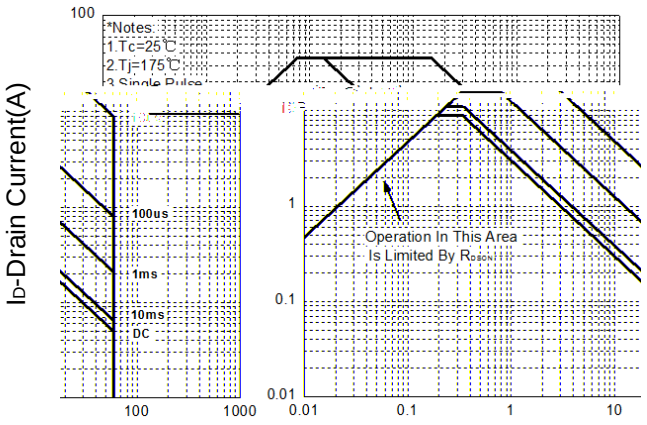
Tc-Case Temperature( )

Figure 2: Drain Current



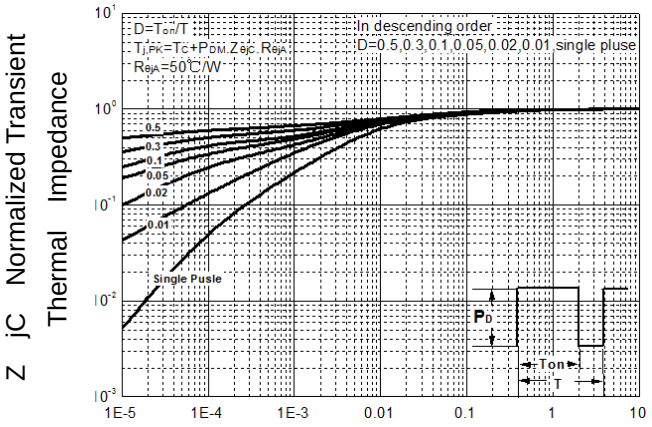
Tc-Case Temperature( )

Figure 3: Safe Operation Area



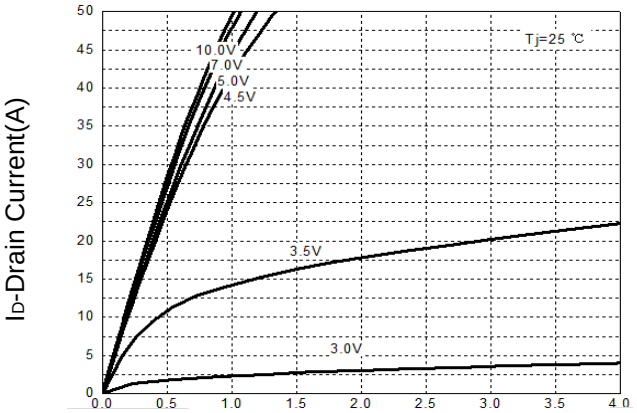
VDS-Drain-Source Voltage(V)

Figure 4: Thermal Transient Impedance



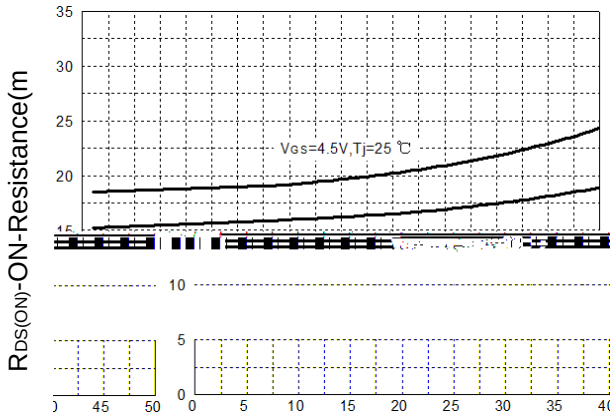
Maximum Effective Transient Thermal Impedance, Junction-to-Case

Figure 5: Output Characteristics



VDS-Drain-Source Voltage (V)

Figure 6: Drain-Source On Resistance



ID-Drain Current(A)

Typical Operating Characteristics(Cont.)

Figure 9: On-Resistance vs. Temperature

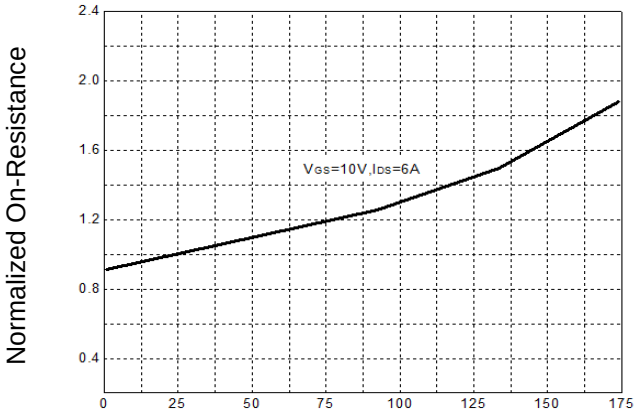


Figure 10: Source-Drain Diode Forward

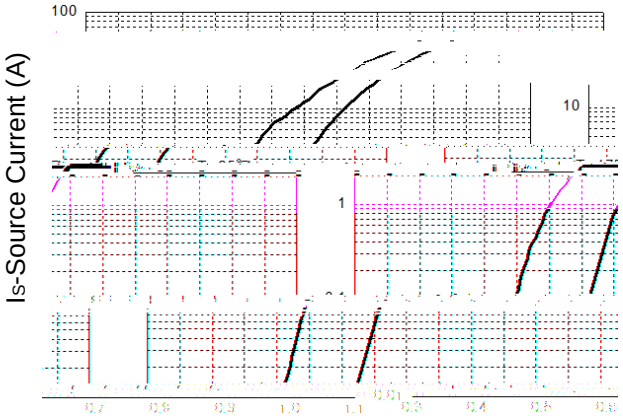


Figure 11: Capacitance Characteristics

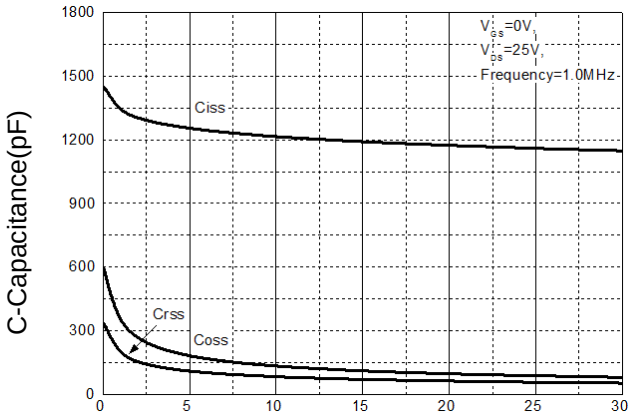
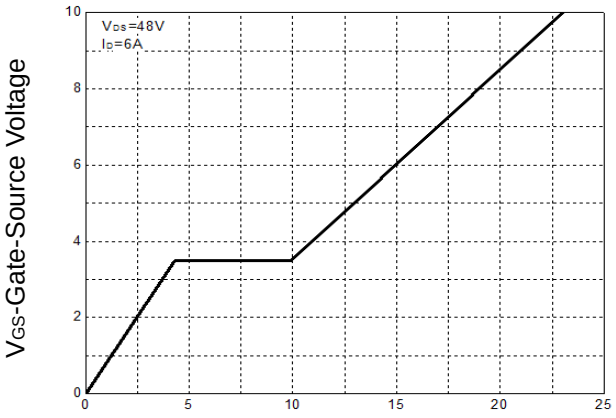
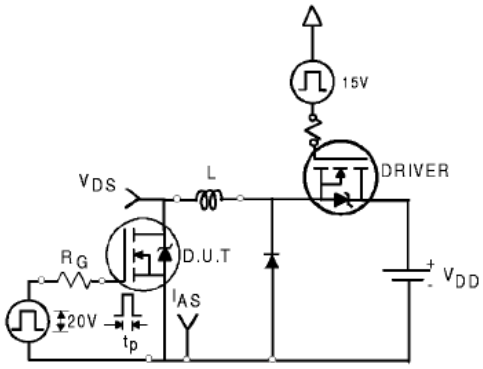


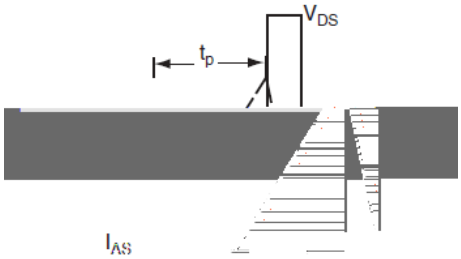
Figure 12: Gate Charge Characteristics



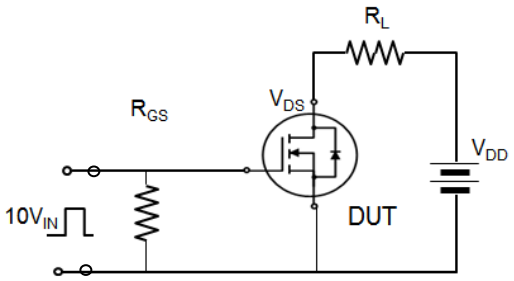
Avalanche Test Circuit

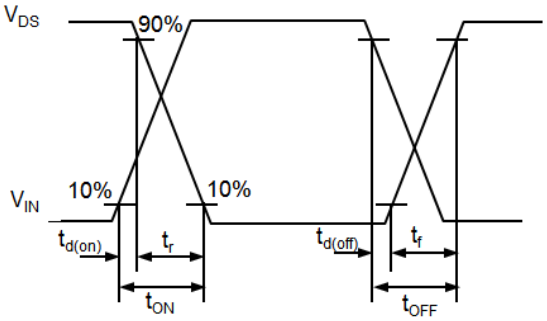


$$E_{AS} = \frac{1}{2} L I_{AS}^2$$

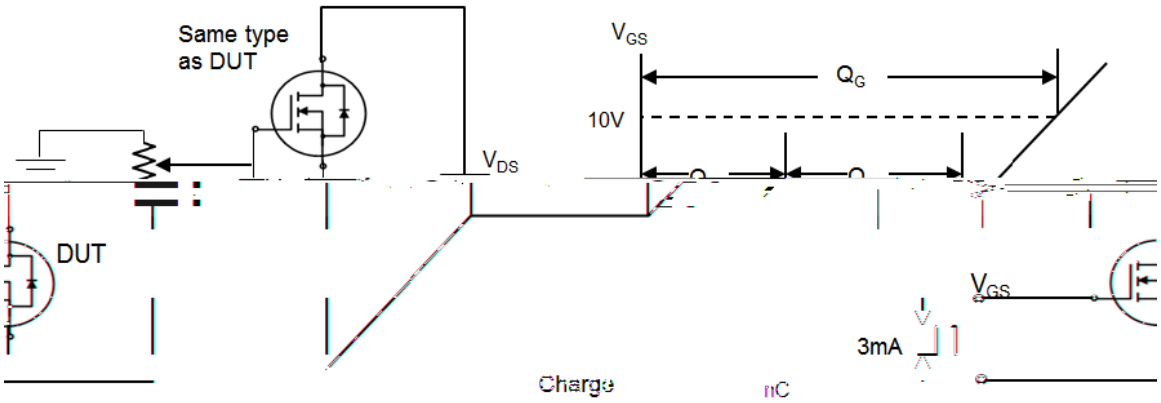


Switching Time Test Circuit





Gate Charge Test Circuit



Device Per Unit

Package Type	Unit	Quantity
SOP-8L	Reel	2500

Carr227pni(r22er) Tap& pn223(R pne1S)el23(223(D)13ni(r22men))-si(r22o pnn pr

Classification Profile

Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{smin})	100 °C	
Temperature max (T_{smax})	150 °C	
Time (Tsmin to Tsmax) (t_s)		

Table 1.SnPb Eutectic Process Classification Temperatures (Tc)

Package Thickness	Volume mm <350	Volume mm 350
2.5 mm	235 °C	220 °C
	220 °C	220 °C

Table 2.Pb-free Process Classification Temperatures (Tc)

Package Thickness	Volume mm <350	Volume mm 350-2000	Volume mm 2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm 2.5 mm	260 °C	250 °C	245 °C
2.5 mm	250 °C	245 °C	245 °C

Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HTRB	JESD-22, A108	168/500/1000 Hrs, Bias @ 150°C
HTGB	JESD-22, A108	168 /500/1000Hrs, V_{gs}100% @ 150°C
PCT	JESD-22, A102	96 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -55°C~150°C

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