

HYA013N04

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
Common Ratings (Tc=25°C Unless Otherwise Noted)			
V _{DSS}	Drain-Source Voltage	40	V
V _{GSS}	Gate-Source Voltage	20	V
T _J	Junction Temperature Range	-55 to 175	°C
T _{STG}	Storage Temperature Range		°C

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

Symbol	Parameter	Test Conditions	HYA013N04NR1			Unit
			Min	Typ.	Max	
Dynamic Characteristics						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	0.6	-	
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, Frequency=1MHz	-	8576	-	pF
C _{oss}	Output Capacitance					
C _{rss}	Reverse Transfer Capacitance					
t _{d(ON)}	Turn-on Delay Time	V _{DD} =20V, R _G =4 Ω, I _{DS} =40A, V _{GS} =10V	-	37	-	ns
T _r	Turn-on Rise Time					
t _{d(OFF)}	Turn-off Delay Time					
T _f	Turn-off Fall Time					
Gate Charge Characteristics						
Q _g	Total Gate Charge(V _{GS} =10V)	V _{DS} =32V, I _{DS} =40A	-	167	-	nC
Q _{gs}	Gate-Source Charge					
Q _{gd}	Gate-Drain Charge					
V _{plateau}	Gate plateau voltage		-	5.6	-	V

Note: *Pulse test pulse width 300us duty cycle 2%

Typical Operating Characteristics

Figure 1: Power Dissipation



Figure 2: Drain Current



Figure 3: Safe Operation Area



Figure 4: Thermal Transient Impedance



Figure 5: Output Characteristics

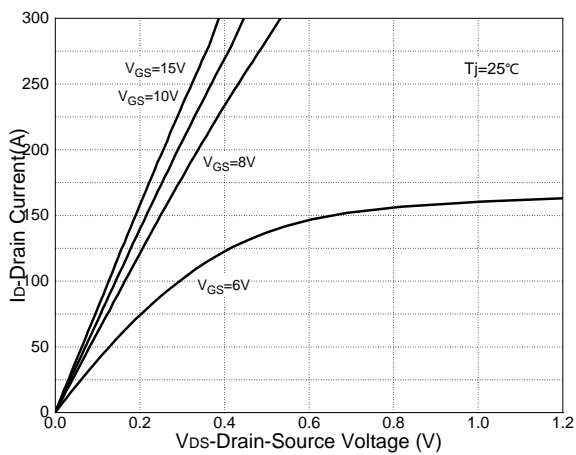


Figure 6: Drain-Source On Resistance



Typical Operating Characteristics(Cont.)

Figure 7: On-Resistance vs. Temperature

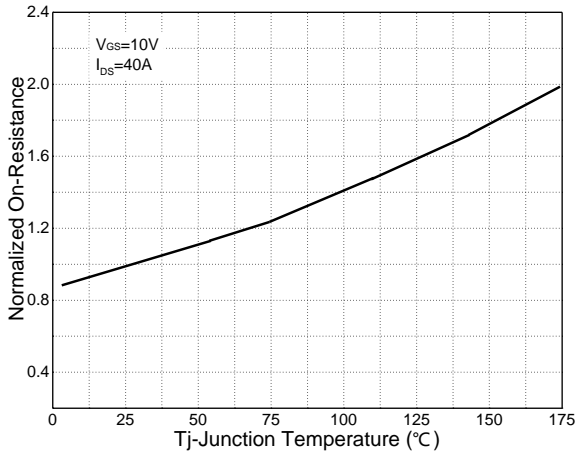


Figure 8: Source-Drain Diode Forward

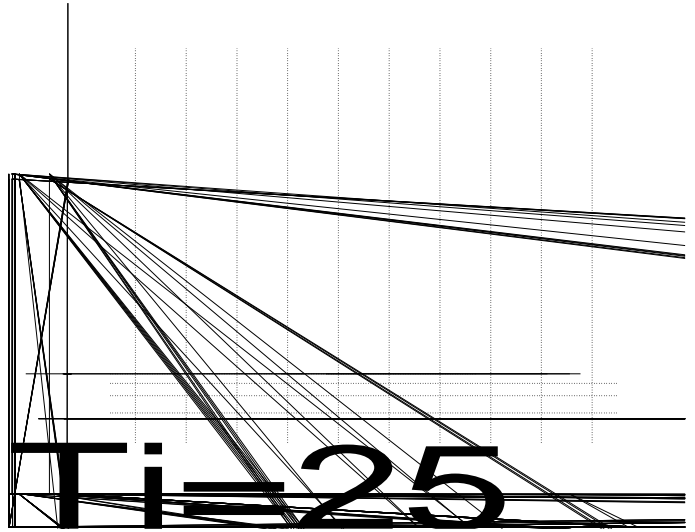


Figure 9: Capacitance Characteristics



Figure 10: Gate Charge Characteristics



Figure 11: Transfer Characteristics

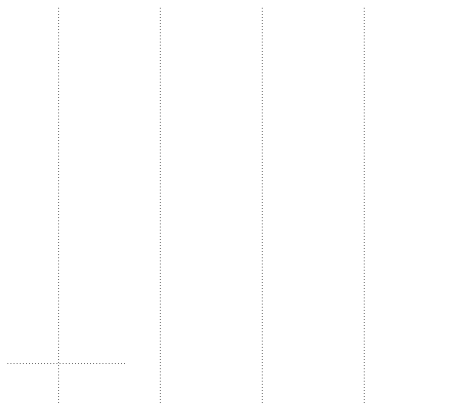
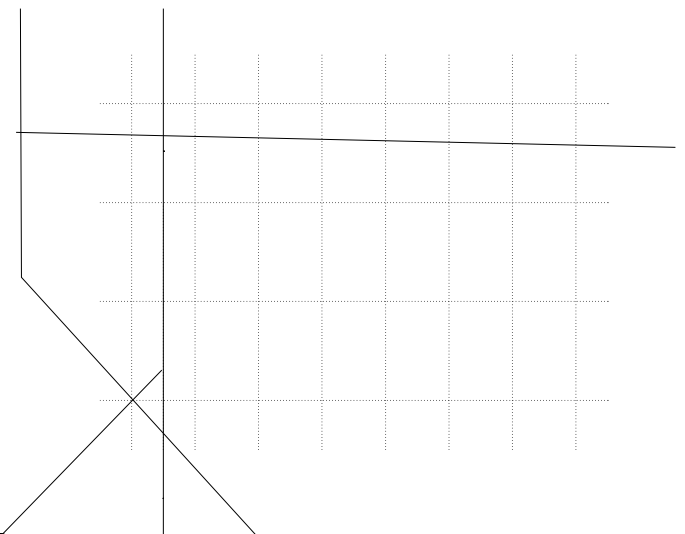


Figure 12: Gate Threshold Voltage



Typical Operating Characteristics(Cont.)

Figure 13: Drain-Source Breakdown

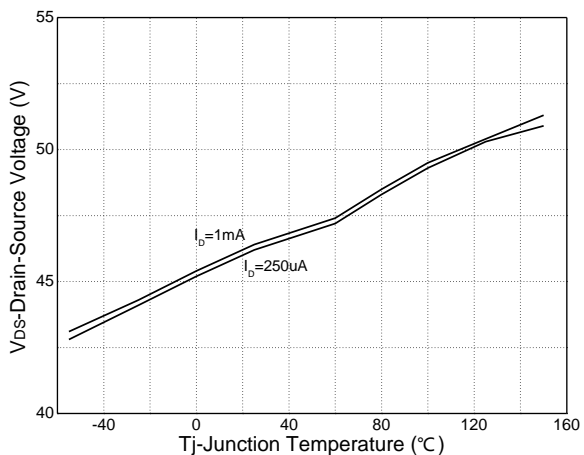


Figure 14: R_{dson} vs. Gate Voltage

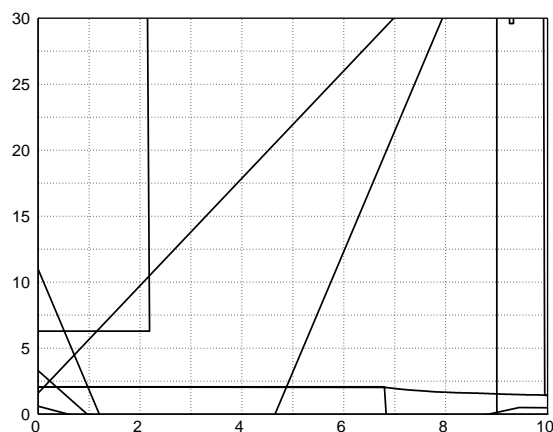
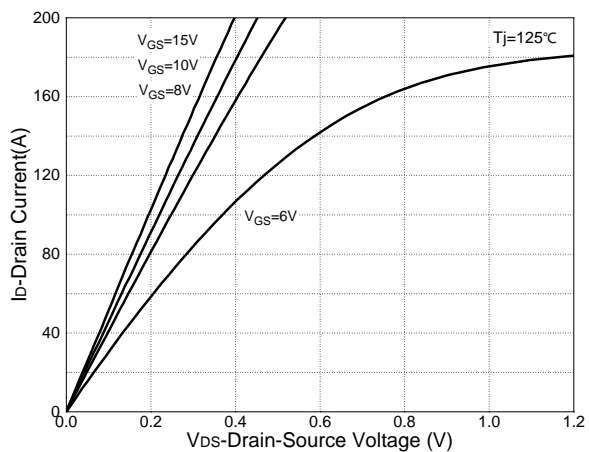
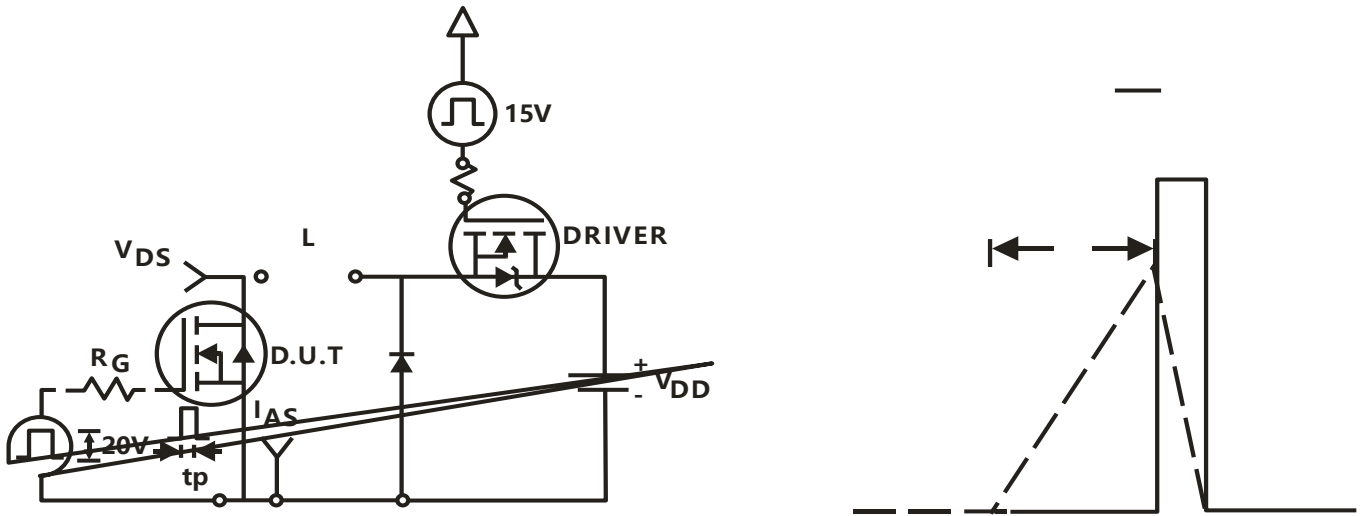


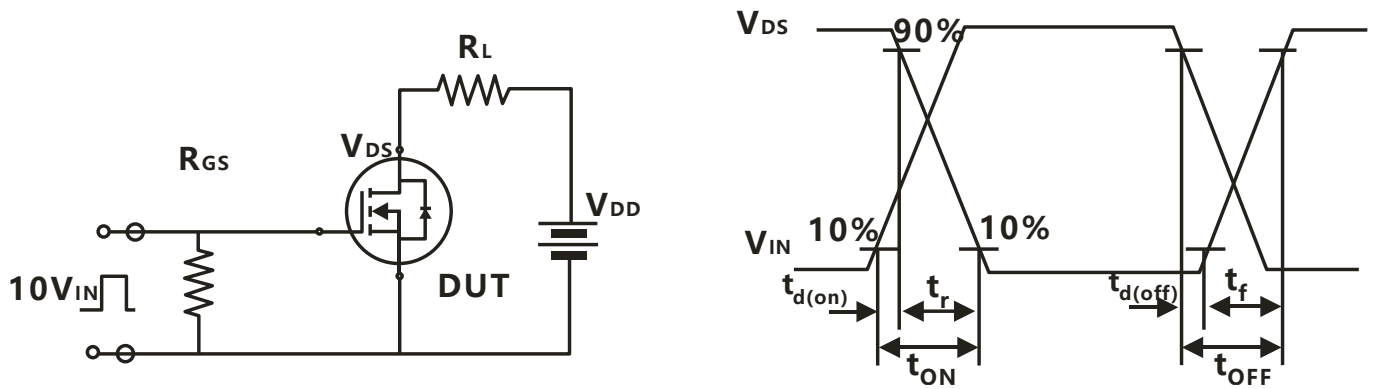
Figure 15: Output Characteristics 125



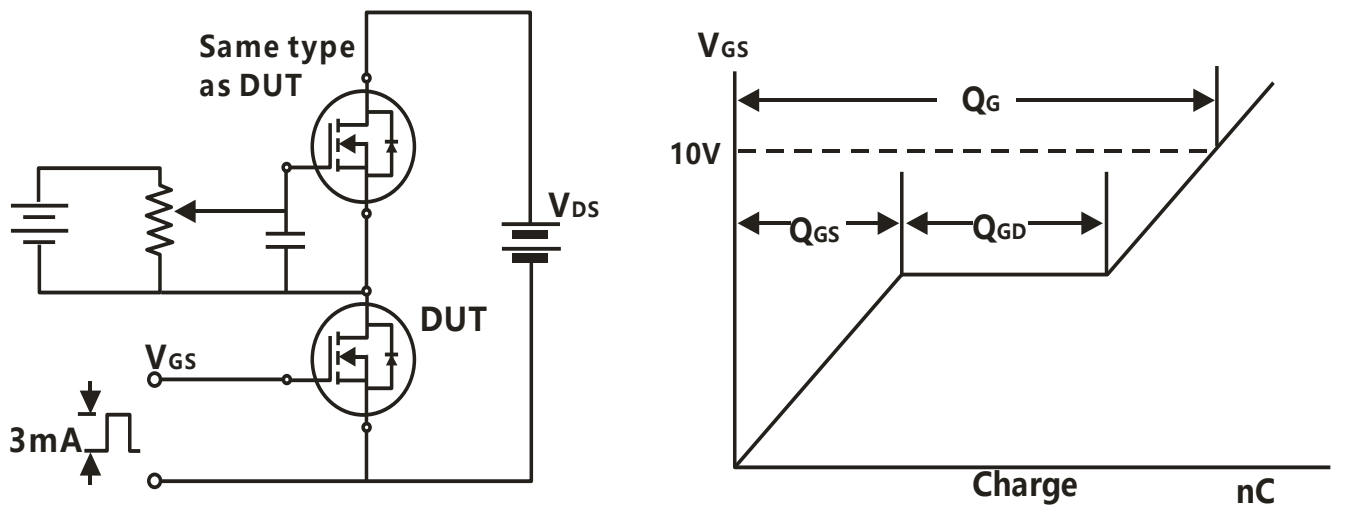
Avalanche Test Circuit



Switching Time Test Circuit

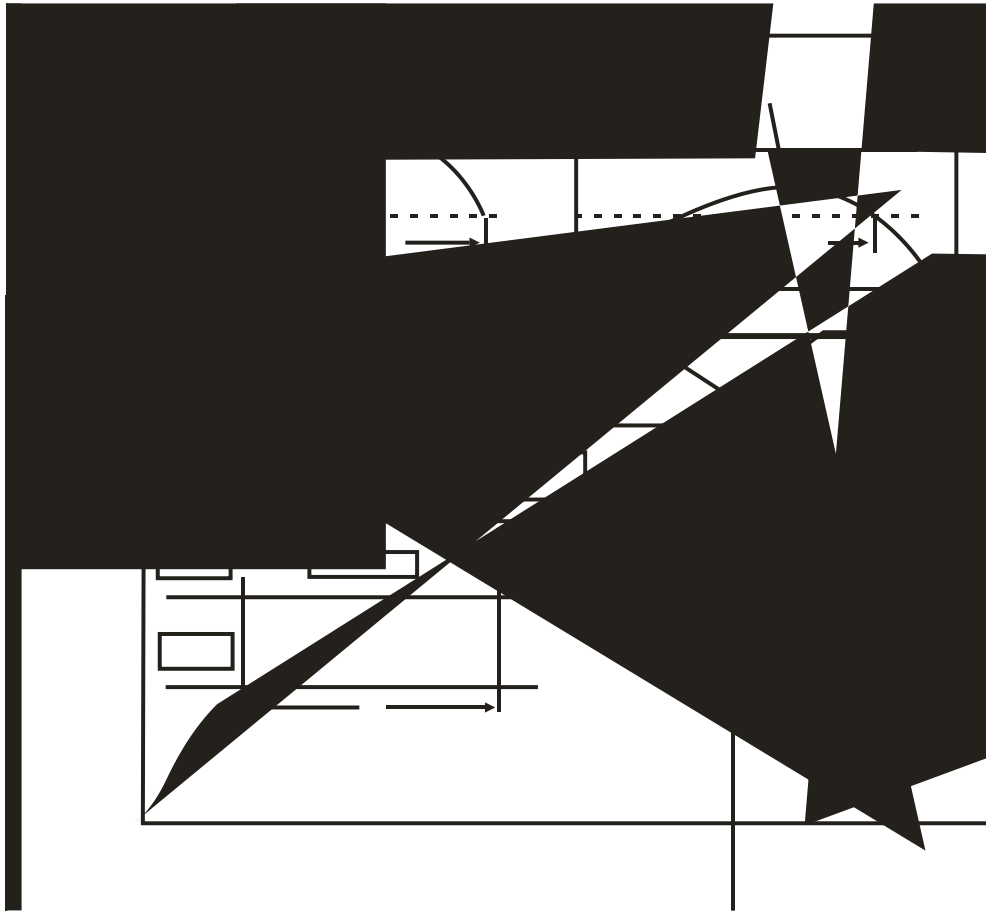


Gate Charge Test Circuit



Device Per Unit

Classification Profile



Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{smin})	100 °C	150 °C
Temperature max (T_{smax})	150 °C	200 °C
Time (T_{smin} to T_{smax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{smax} to T_P)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L)	183 °C	217 °C
Time at liquidous (t_L)	60-150 seconds	60-150 seconds
Peak package body Temperature (T_P)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_P)** within 5°C of the specified classification temperature (T_C)	20** seconds	30** seconds
Average ramp-down rate (T_P to T_{smax})	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.

*Tolerance for peak profile Temperature (T_P) is defined as a supplier minimum and a user maximum.

** Tolerance for time at peak profile temperature (t_P) is defined as a supplier minimum and a user maximum.

Table 1.SnPb Eutectic Process – Classification Temperatures (Tc)

Package Thickness	Volume mm <350	Volume mm 350
2.5 mm	235 °C	220 °C
2.5 mm	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
MSL	JESD22-A113	85°C/85%/168Hrs
RSH	JESD22- B106(PTH)	260 5 10 1S
PCT	JESD22-A102	121 ,100%RH, 96hours, 205KPa
TCT	JESD22-A104	250/500/1000 Cycles, -55°C~150°C
HTRB	JESD22-A108B	168/500/1000 Hrs, 100% BV _{DSS} @ 175
HTGB	JESD22-A108B	168/500/1000 Hrs, 100%V _{gs} @ 175
BHAST	JESD22-A110D	130 85%RH 230KPA;U=32V
IOL	MIL-STD-750	Ta=25 , Tj 100 , Ton/Toff 3.5min, 8600cycles

Customer Service

Worldwide Sales and Service: sales@hymexa.com

Technical Support:Technology@hymexa.com

Huayi Microelectronics Co., Ltd.

No.8928,Shangji Road,Economic and Technological Development Zone,Xi'an,China

TEL: (86-029) 86685706

FAX: (86-029) 86685705

E-mail: sales@hymexa.com

Web net: <http://www.hymexa.com/>