P-Channel Enhancement Mode MOSFET

Feature

- -30V/-65A
  $R_{DS(ON)}$= 7.9 mΩ(typ.) @VGS = -10V
  $R_{DS(ON)}$= 13 mΩ(typ.) @VGS = -4.5V
-

Pin Description

Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
Common Ratings (Tc=25°C Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage		-30	V
V_{GSS}	Gate-Source Voltage		±20	V
T_J	Junction Temperature Range		-55 to 175	°C
T_{STG}	Storage Temperature Range			°C
I_S	Source Current-Continuous(Body Diode)	Tc=25°C	-65	A
Mounted on Large Heat Sink				
I_{DM}	Pulsed Drain Current *	Tc=25°C	-195	A
I_D	Continuous Drain Current	Tc=25°C	-65	A
		Tc=100°C	-46	A
P_D	Maximum Power Dissipation	Tc=25°C	75	W
		Tc=100°C	37.5	W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case		2.01	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient **		75	°C/W
E_{AS}	Single Pulsed-Avalanche Energy ***	L=0.3mH	116	mJ

Note: * Repetitive rating; pulse width limited by max.junction temperature.
** Surface mounted on 1in2 FR-4 board.
*** Limited by $T_J$max , starting T_J=25°C, L = 0.3mH, R_G= 25Ω, V_{GS} =-10V.

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

Symbol	Parameter	Test Conditions	HYG110P03LQ1			Unit
			Min	Typ.	Max	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V,I_{DS}=-250μA	-30	-	-	V
I_{DSS}	Drain-to-Source Leakage Current	V_{DS}=-30V,V_{GS}=0V	-	-	-1	μA
		T_J=125°C	-	-	-50	μA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=-250μA	-1.0	-1.6	-3.0	V
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=-10V,I_{DS}=-20A	-	7.9	9.9	mΩ
		V_{GS}=-4.5V,I_{DS}=-20A	-	13	1	

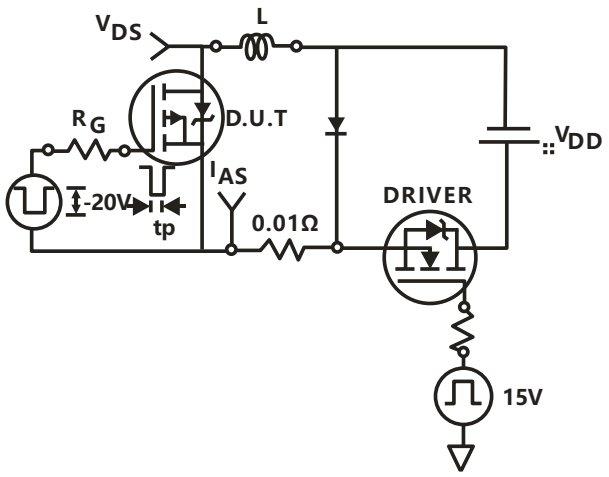
Electrical Characteristics (Cont.) (Tc =25°C Unless Otherwise Noted)

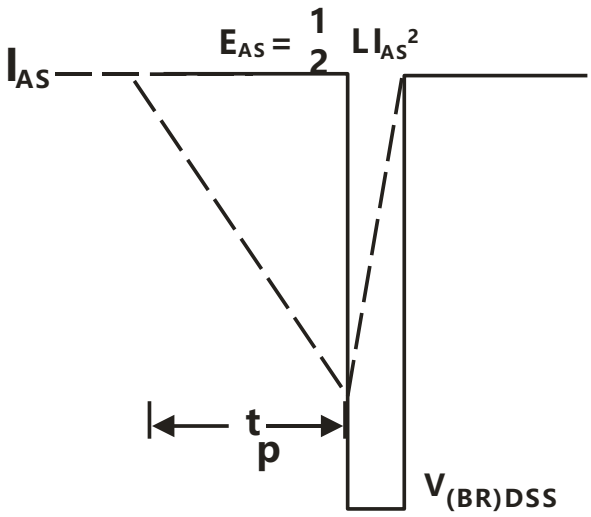
Symbol	Parameter	Test Conditions	HYG110P03LQ1			Unit
			Min	Typ.	Max	
Dynamic Characteristics						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz	-	5.9	-	Ω
C_{iss}	Input Capacitance	V_{GS}=0V,	-	2030	-	pF
C_{oss}	Output Capacitance	V_{DS}=-25V,	-	247	-	
C_{rss}	Reverse Transfer Capacitance	Frequency=1MHz	-	222	-	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=-15V,R_G=2.5Ω, I_{DS}=-20A,V_{GS}=-10V	-	8.9	-	ns
T_r	Turn-on Rise Time		-	60.9	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	65.3	-	
T_f	Turn-off Fall Time		-	76.4	-	
Gate Charge Characteristics						
Q_g	Total Gate Charge(V_{GS}=-10V)	V_{DS}=-24V, I_{DS}=-20A	-	47.1	-	nC
	Total Gate Charge(V_{GS}=-4.5V)		-	24.1	-	
Q_{gs}	Gate-Source Charge		-	7.9	-	
Q_{gd}	Gate-Drain Charge		-	13.3	-	
$V_{plateau}$	Gate plateau voltage		-	-3.5	-	V

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

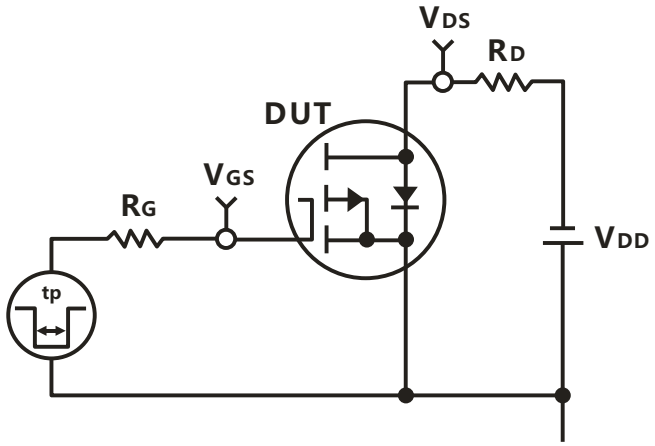
Typical Operating Characteristics(Cont.)

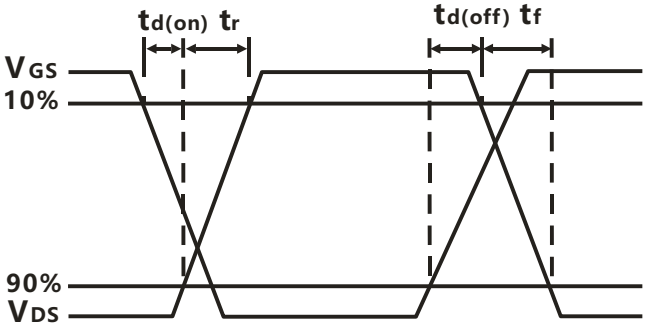
Avalanche Test Circuit



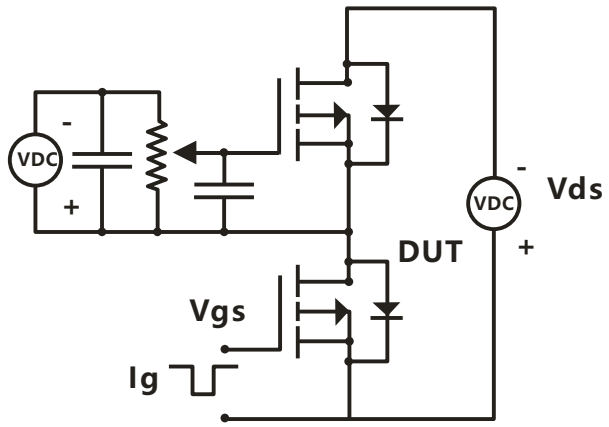


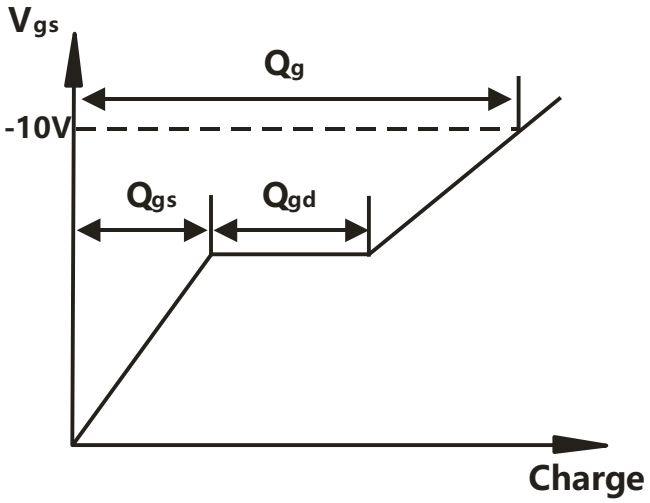
Switching Time Test Circuit





Gate Charge Test Circuit





Device Per Unit

Package Type	Unit	Quantity
TO-252-2L	Tube	75
TO-252-2L	Reel	2500
TO-251-3L	Tube	75
TO-251-3S	Tube	75

Package Information

TO-252-2L

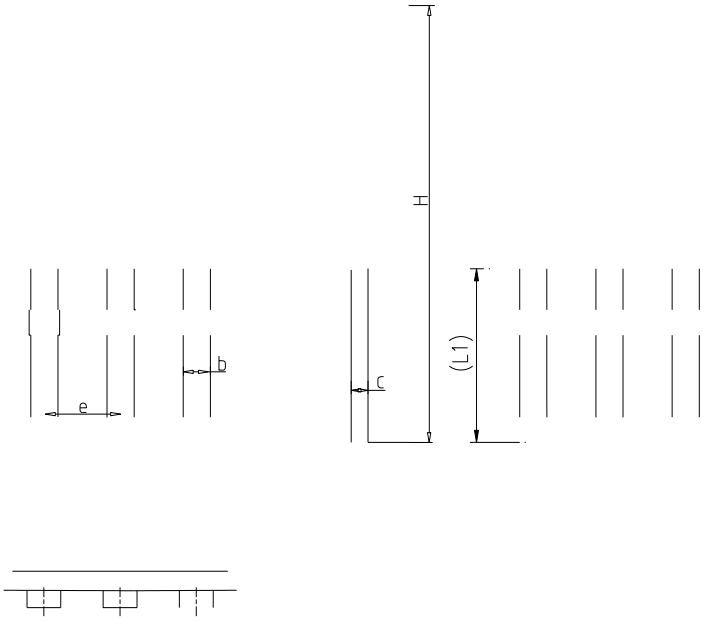
COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0.00	-	0.12
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c			

TO-251-3L

COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b2	0.00	0.04	0.10
b2'	0.00	0.04	0.10
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	4.30	5.30	

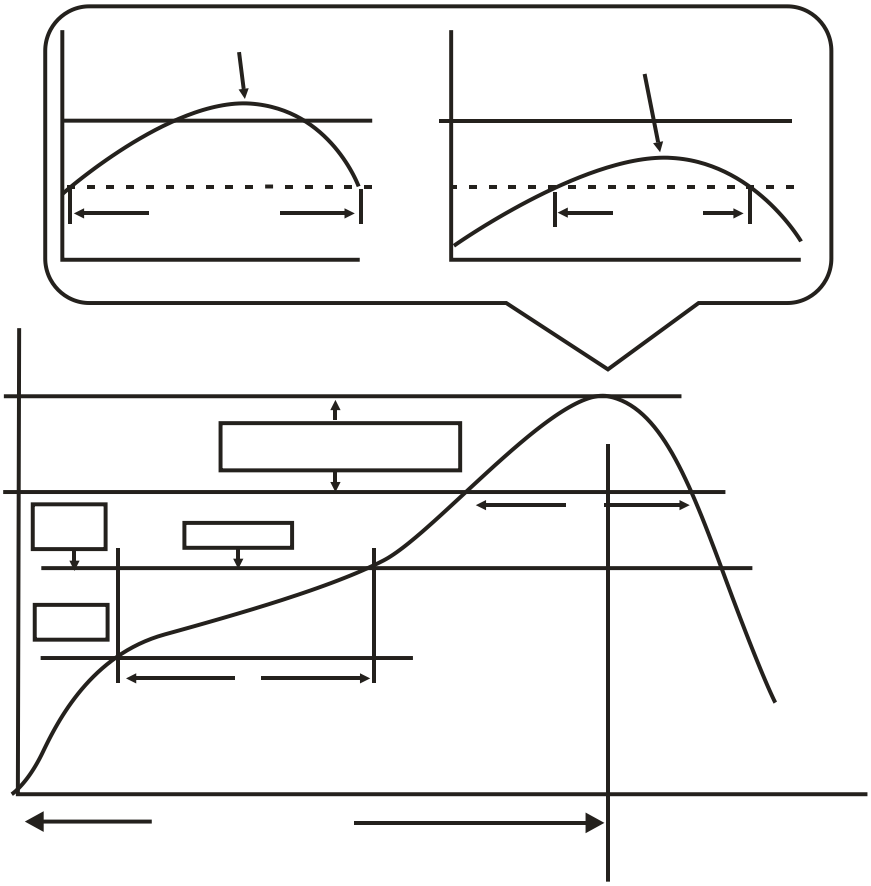
5.46

TO-251-3S



COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c	0.43	0.53	0.60
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	-	-
e	2.286BSC		
H	10.00	11.22	11.44
L1	3.90	4.10	4.30
L3	0.88	1.02	1.28
L5	1.65	1.80	1.95

Classification Profile



Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{smin}) Temperature max (T_{smax}) Time (Tsmin to Tsmax) (t_s)	100 °C 150 °C 60-120 seconds	150 °C 200 °C 60-120 seconds
Average ramp-up rate ($T_{smax}$to T_P)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L) Time at liquidous (t_L)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body Temperature (T_p)*	See Classification Temp in table 1	SeeClassification Tempin 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 mm³ <350	Volume mm³ ⩾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 mm³ <350	Volume mm³ 350-2000	Volume mm³ ⩾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 Hrs, Bias @ 150°C
HTGB	JESD-22, A108	168/500 Hrs, V_{gs}100% @ 150°C
PCT	JESD-22, A102	96 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	250/500 Cycles, -55°C~150°C

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