N-Channel Enhancement Mode MOSFET

Feature

40V/320A

$R_{DS(ON)}$= 1.5 mΩ(typ.) @VGS = 10V

$R_{DS(ON)}$= 1.7 mΩ(typ.) @VGS = 4.5V

100% Avalanche Tested

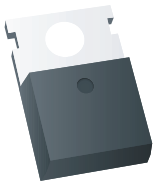
100% DVDS

Reliable and Rugged

Halogen Free and Green Devices Available

(RoHS Compliant)

Pin Description



G D S

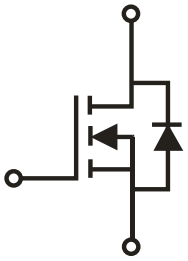
G D S

TO-220FB-3L TO-263-2L

Applications

Switching application

Li-battery protection



Single N-Channel MOSFET

Ordering and Marking Information

P HYG013N04 XYMXXXXXX	B HYG013N04 XYMXXXXXX

Package Code

P:TO-220FB-3L B:TO-263-2L

Date Code

XYMXXXXXX

Note: HUAYI halogen free products contain molding compounds/die attach materials and 100% matte tin plate Termi-Nation finish;which are fully compliant with RoHS. HUAYI halogen free products meet or exceed the halogen free require-ments of IPC/JEDEC J-STD-020 for MSL classification at halogen free peak reflow temperature. HUAYI defines “Green” to mean halogen 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 pr-oduct 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		40	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	320	A
Mounted on Large Heat Sink				
I_{DM}	Pulsed Drain Current *	Tc=25°C	1150	A
I_D	Continuous Drain Current	Tc=25°C	320	A
		Tc=100°C	226	A
P_D	Maximum Power Dissipation	Tc=25°C	333	W
		Tc=100°C	166	W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case		0.45	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient **		62.5	°C/W
E_{AS}	Single Pulsed-Avalanche Energy ***	L=0.3mH	1365	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	HYG013N04LR1			Unit
			Min	Typ.	Max	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V,I_{DS}=250μA	40	-	-	V
I_{DSS}	Drain-to-Source Leakage Current	V_{DS}=40V,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	2.0	3.0	V
I_{GSS}	Gate-Source Leakage Current	V_{GS}= 20V,V_{DS}=0V	->>Tj			

Typical Operating Characteristics(Cont.)

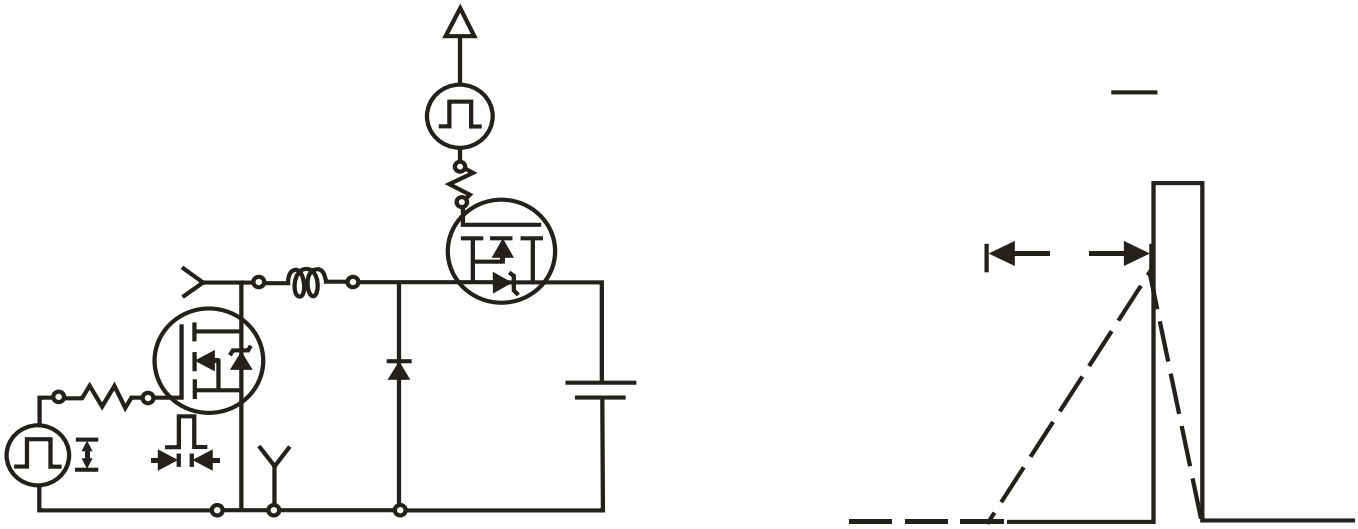
Figure 7: On-Resistance vs. Temperature

Figure 8: Source-Drain Diode Forward

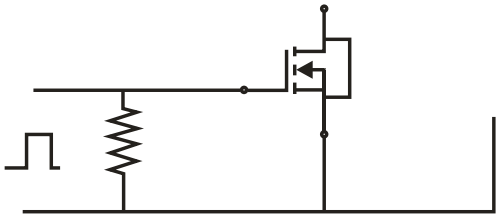
Figure 9: Capacitance Characteristics

Figure 10: Gate Charge Characteristics

Avalanche Test Circuit

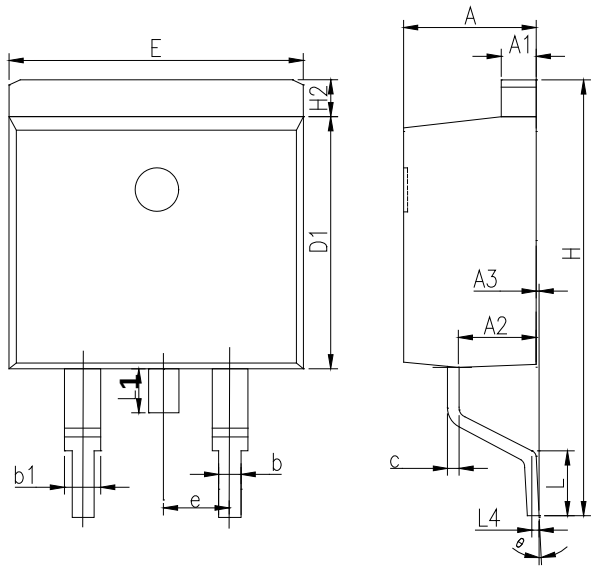


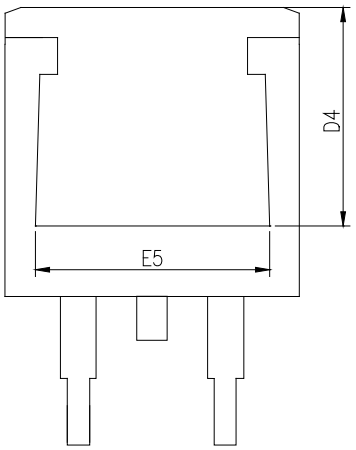
Switching Time Test Circuit



Gate Charge Test Circuit

TO-263-2L





COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MIN
A	4.37	4.57	4.77
A1	1.22	1.27	1.42
A2	2.49	2.69	2.89
A3	0	0.13	0.25
b	0.70	0.81	0.96
b1	1.17	1.27	1.47
c	0.30	0.38	0.53
D1	8.50	8.70	8.90
D4	6.60	-	-
E	9.86	10.16	10.36
E5	7.06	-	-
e	2.54 BSC		
H	14.70	15.10	15.50
H2	1.07	1.27	1.47
L	2.00	2.30	2.60
L1	1.40	1.55	1.70
L4	0.25 BSC		
θ	0°	5°	9°

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.

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