

## P-Channel Enhancement Mode MOSFET

### Feature

- -30V/-44A  
R<sub>DS(ON)</sub>= 10.5 m (typ.) @VGS = -10V  
R<sub>DS(ON)</sub>= 18.0 m (typ.) @VGS = -4.5V
- 100% Avalanche Tested
- 100% DVDS
- Reliable and Rugged
- Halogen Free and Green Devices Available  
(RoHS Compliant)

### Pin Description

PDFN8L(3.3x3.3)

### Applications

- Switching application
- Li-battery protection
- DC-DC
- Motor control

Single P-Channel MOSFET

### Ordering and Marking Information

HYG 130P03LQ XYMXXXXX	Package Code C1: PDFN8L(3.3x3.3)  Date Code XYMXXXXX
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Note: HUAYI halogen free products contain molding compounds and 100% matte tin plate Termination finish; which are fully compliant with RoHS. HUAYI halogen free products meet or exceed the halogen free requirements 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 product and/or to this document at any time without notice.

## Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit	
<b>Common Ratings</b> (Tc=25°C Unless Otherwise Noted)				
V <sub>DSS</sub>	Drain-Source Voltage	-30	V	
V <sub>GSS</sub>	Gate-Source Voltage	±20	V	
T <sub>J</sub>	Junction Temperature Range	-55 to 175	°C	
T <sub>STG</sub>	Storage Temperature Range		°C	
I <sub>S</sub>	Source Current-Continuous(Body Diode)	Tc=25°C	-44	A
<b>Mounted on Large Heat Sink</b>				
I <sub>DM</sub>	Pulsed Drain Current *	Tc=25°C	-158	A
I <sub>D</sub>	Continuous Drain Current	Tc=25°C	-44	A
		Tc=100°C	-31	A
P <sub>D</sub>	Maximum Power Dissipation	Tc=25°C	48	W
		Tc=100°C	24	W
R <sub>JC</sub>	Thermal Resistance, Junction-to-Case		3.1	°C/W
R <sub>JA</sub>	Thermal Resistance, Junction-to-Ambient **		100	°C/W
E <sub>AS</sub>	Single Pulsed-Avalanche Energy ***	L=0.3mH	81	mJ

Note: \* Repetitive rating; pulse width limited by max.junction temperature.

\*\* Surface mounted on 1in2 FR-4 board.

\*\*\* Limited by T<sub>Jmax</sub>, starting T<sub>J</sub>=25°C, L = 0.3mH, R<sub>G</sub>= 25 Ω, V<sub>GS</sub> = -10V.

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

Symbol	Parameter	Test Conditions	HYG130P03LQ1			Unit
			Min	Typ.	Max	
<b>Static Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>DS</sub> =-250μA	-30	-	-	V
I <sub>DSS</sub>	Drain-to-Source Leakage Current	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V	-	-	-1	μA
		T <sub>J</sub> =125°C	-	-	-50	μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =-250μA	-1	-1.7	-3	V
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =-10V, I <sub>DS</sub> =-15A	-	10.5	12.6	m
		V <sub>GS</sub> =-4.5V, I <sub>DS</sub> =-15A	-	18	25	m
<b>Diode Characteristics</b>						
V <sub>SD</sub>	Diode Forward Voltage	I <sub>SD</sub> =-15A, V <sub>GS</sub> =0V	-	-0.88	-1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> =-15A, dI <sub>SD</sub> /dt=-100A/μs	-	11.5	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	4.7	-	nC

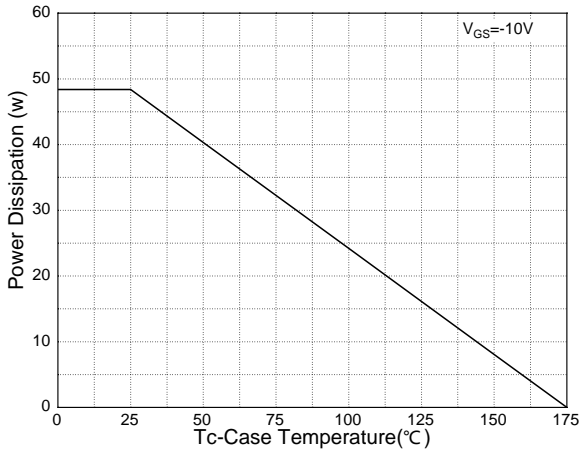
## Electrical Characteristics (Cont.) (Tc =25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	HYG130P03LQ1			Unit
			Min	Typ.	Max	
<b>Dynamic Characteristics</b>						
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz	-	5	-	
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =-25V, Frequency=1MHz	-	1436	-	pF
C <sub>oss</sub>	Output Capacitance					
C <sub>rss</sub>	Reverse Transfer Capacitance					
t <sub>d(ON)</sub>	Turn-on Delay Time	V <sub>DD</sub> =-15V, R <sub>G</sub> =1 , I <sub>DS</sub> =-15A, V <sub>GS</sub> =-10V	-	8.6	-	ns
T <sub>r</sub>	Turn-on Rise Time					
t <sub>d(OFF)</sub>	Turn-off Delay Time					
T <sub>f</sub>	Turn-off Fall Time					
<b>Gate Charge Characteristics</b>						
Q <sub>g</sub>	Total Gate Charge(V <sub>GS</sub> =-10V)	V <sub>DS</sub> =-15V, I <sub>DS</sub> =-15A	-	32	-	nC
	Total Gate Charge(V <sub>GS</sub> =-4.5V)		-	16	-	
Q <sub>gs</sub>	Gate-Source Charge		-	6	-	
Q <sub>gd</sub>	Gate-Drain Charge		-	8	-	
V <sub>plateau</sub>	Gate plateau voltage		-	-3.7	-	V

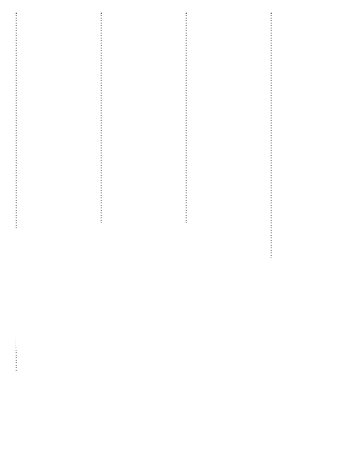
Note: \*Pulse test, pulse width 300us, duty cycle 2%

**Typical Operating Characteristics**

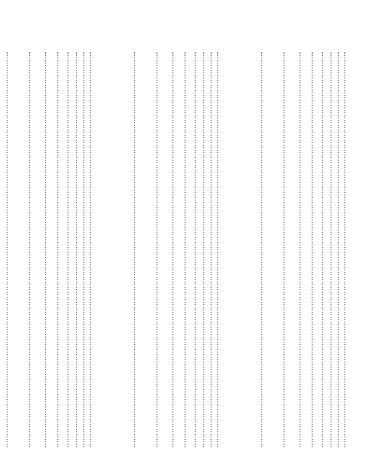
**Figure 1: Power Dissipation**



**Figure 2: Drain Current**



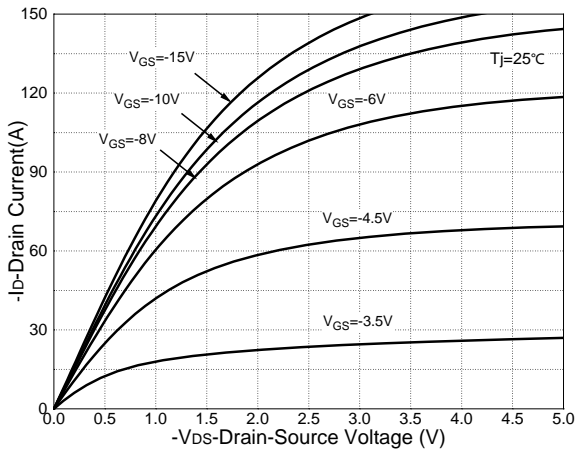
**Figure 3: Safe Operation Area**



**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

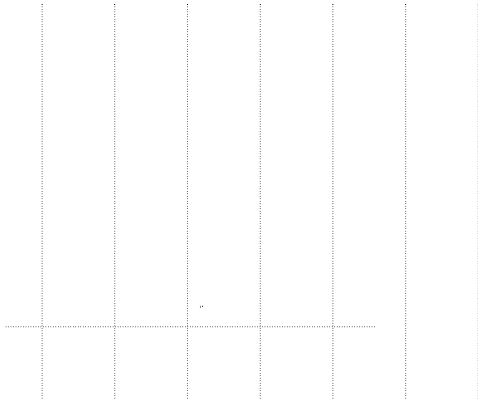


Figure 8: Source-Drain Diode Forward

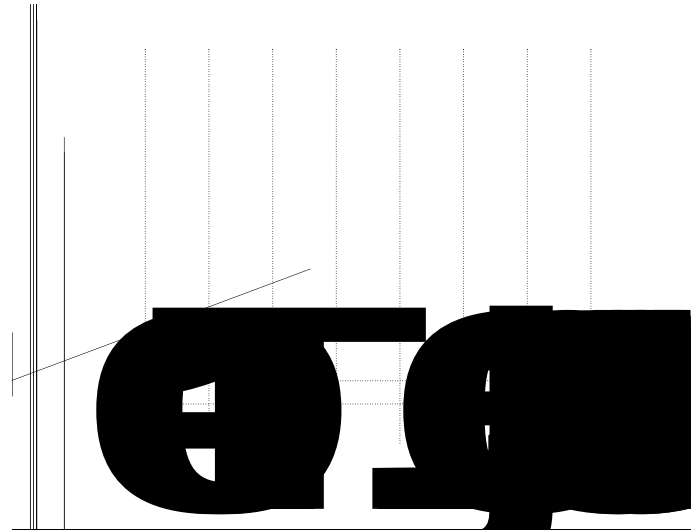


Figure 9: Capacitance Characteristics

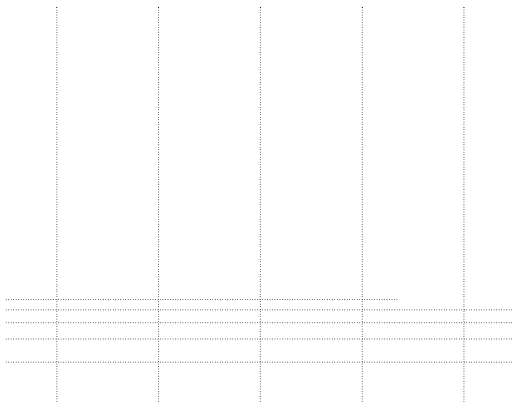
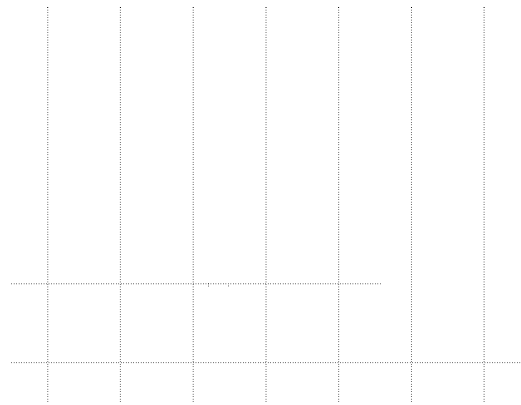
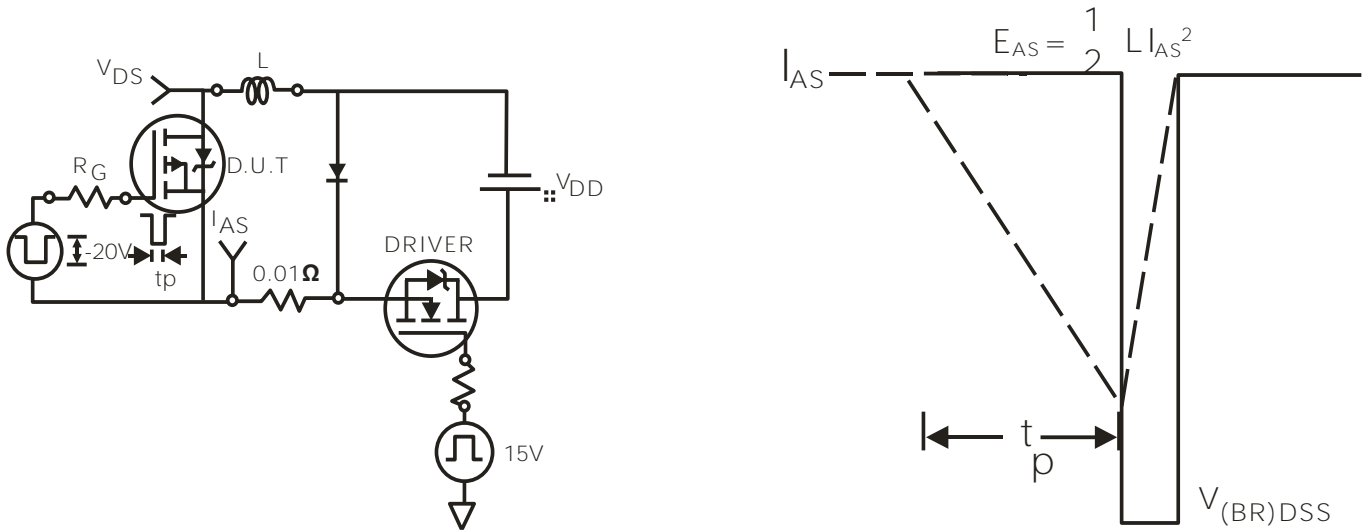


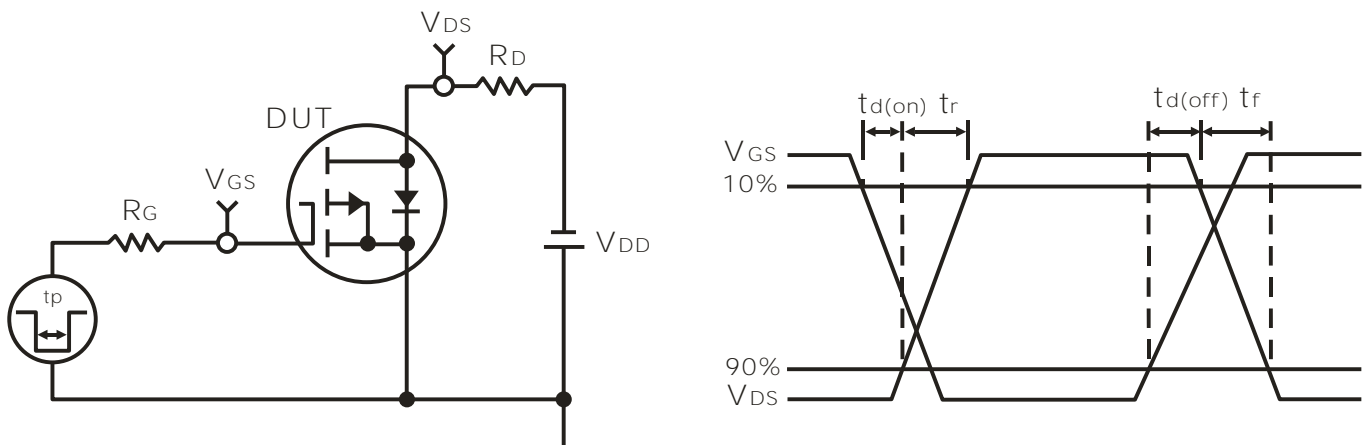
Figure 10: Gate Charge Characteristics



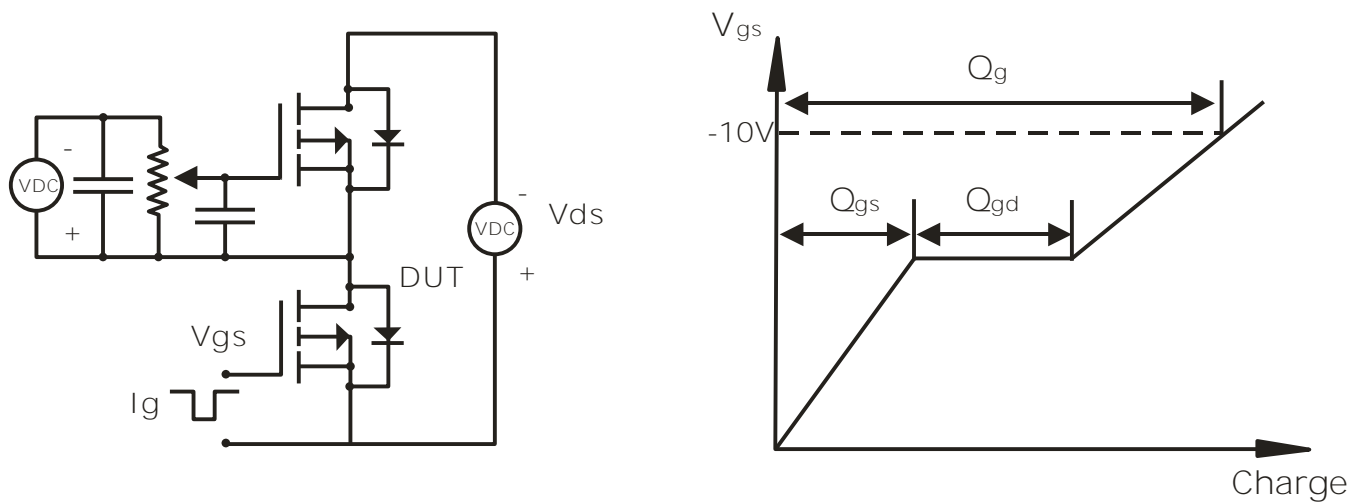
**Avalanche Test Circuit**



**Switching Time Test Circuit**



**Gate Charge Test Circuit**

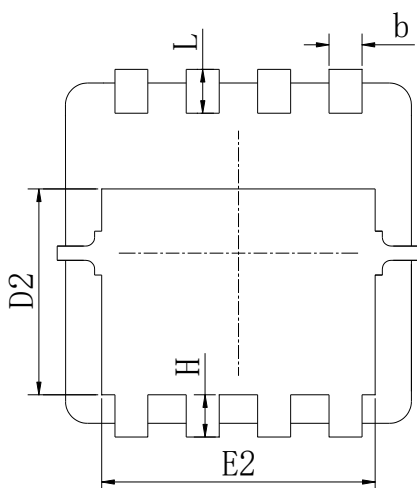
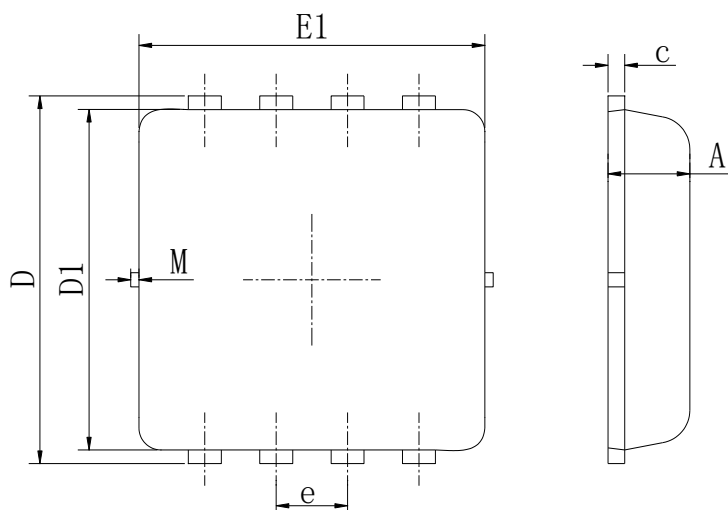


## Device Per Unit

Package Type	Unit	Quantity
PDFN8L(3.3x3.3)	Reel	6500

## Package Information

PDFN8L(3.3x3.3)



COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MAX
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.78	1.88	1.98
E1	3.10	3.20	3.30
E2	2.44	2.54	2.64
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
M	\	\	0.10
*Not specified			

## Classification Profile

## Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
<b>Preheat &amp; Soak</b>		
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



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

Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> ≥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 <sup>3</sup> <350	Volume mm <sup>3</sup> 350-2000	Volume mm <sup>3</sup> ≥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 <sub>gs</sub> 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

## Customer Service

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