

Dual N-Channel Enhancement Mode MOSFET

Feature

- 40V/33A
R_{DS(ON)}= 17m (typ.) @VGS = 10V
R_{DS(ON)}= 20 m (typ.) @VGS = 4.5V
- 100% Avalanche Tested
- 100% DVDS
- Reliable and Rugged
- Halogen Free and Green Devices Available
(RoHS Compliant)

Pin Description

Pin1

Applications

- DC-DC
- Motor control

Ordering and Marking Information

C2 HYG190ND04 XYMXXXXXX	Package Code C2: PDFN8L(5x6) Date Code XYMXXXXXX
-------------------------------	---

Note: HUAYI halogen free products contain molding compounds/die attach materials and 100% matte tin plate Termination finish;which are fully compliant with RoHS. HUAYI halogen

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	33	A
Mounted on Large Heat Sink				
I _{DM}	Pulsed Drain Current *	Tc=25°C	99	A
I _D	Continuous Drain Current	Tc=25°C	33	A
		Tc=100°C	23	A
P _D	Maximum Power Dissipation	Tc=25°C	40	W
		Tc=100°C	20	W
R _{θJC}	Thermal Resistance, Junction-to-Case		3.79	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient **		80	°C/W
E _{AS}	Single Pulsed-Avalanche Energy ***	L=0.1mH	20	mJ

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

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

*** Limited by T_{Jmax}, 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	HYG190ND04LR1			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	1.7	3	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} =10A	-	17	20	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =4.5V, I _{DS} =10A	-	20	26	mΩ
Diode Characteristics						
V _{SD}	Diode Forward Voltage	I _{SD} =10A, V _{GS} =0V	-	0.86	1.20	V
t _{rr}	Reverse Recovery Time	I _{SD} =10A, dI _{SD} /dt=100A/μs	-	8	-	ns
Q _{rr}	Reverse Recovery Charge		-	4	-	nC

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

Symbol	Parameter	Test Conditions	HYG190ND04LR1			Unit
			Min	Typ.	Max	
Dynamic Characteristics						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	2.1	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, Frequency=1MHz	-	566	-	pF
C _{oss}	Output Capacitance					
C _{rss}	Reverse Transfer Capacitance					
t _{d(ON)}	Turn-on Delay Time	V _{DD} =20V, R _G =2.5 , I _{DS} =10A, V _{GS} =10V	-	7	-	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} =10A	-	14	-	nC
Q _g	Total Gate Charge(V _{GS} =4.5V)		-	7	-	
Q _{gs}	Gate-Source Charge		-	2	-	
Q _{gd}	Gate-Drain Charge		-	4	-	
V _{plateau}	Gate plateau voltage		-	3.4	-	V

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

Typical Operating Characteristics

Figure 1: Power Dissipation

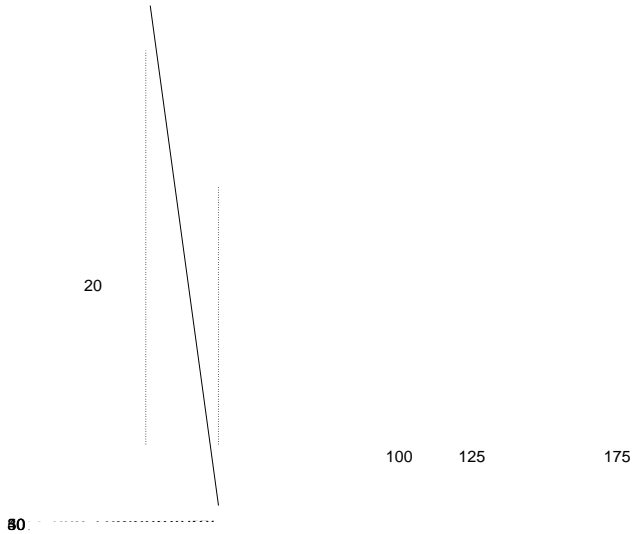


Figure 2: Drain Current

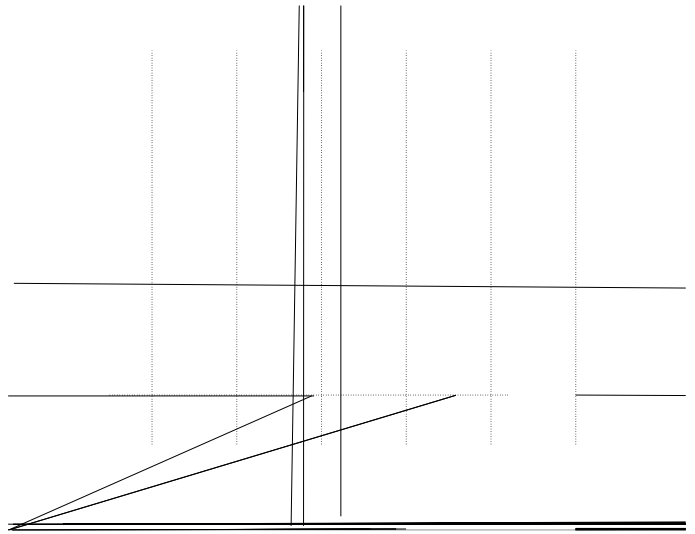


Figure 3: Safe Operation Area

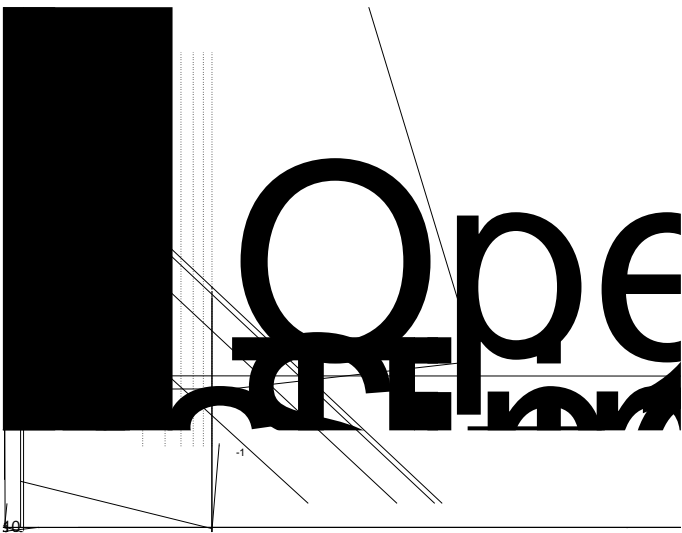


Figure 4: Thermal Transient Impedance

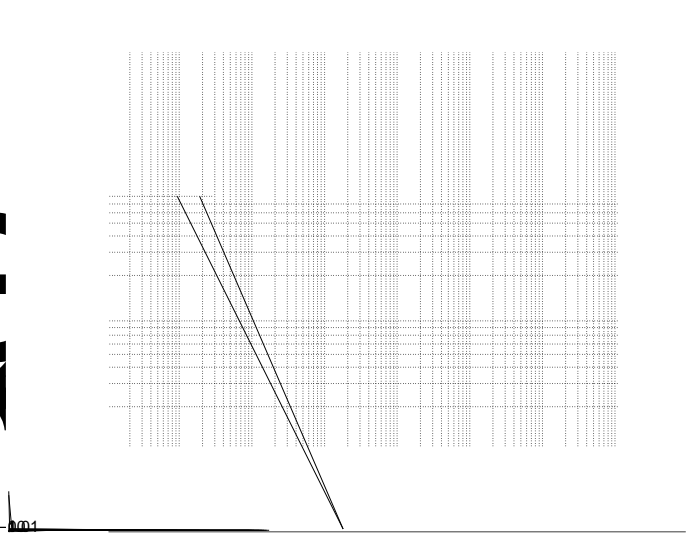
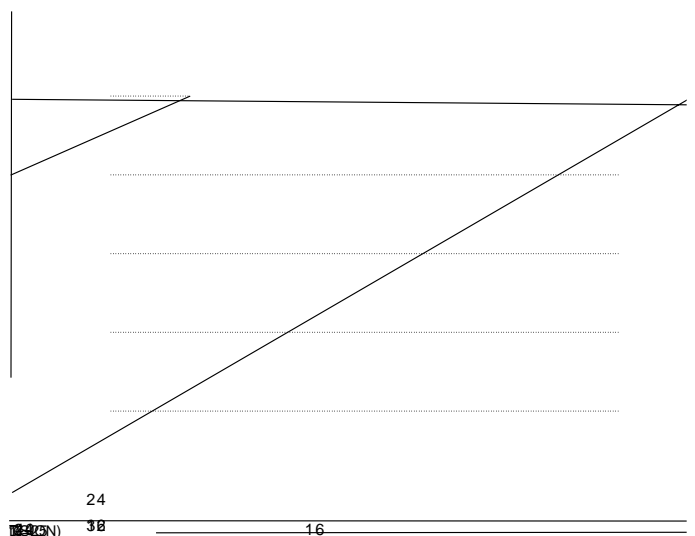


Figure 5: Output Characteristics



Figure 6: Drain-Source On Resistance



Typical Operating Characteristics(Cont.)

Figure 7: On-Resistance vs. Temperature

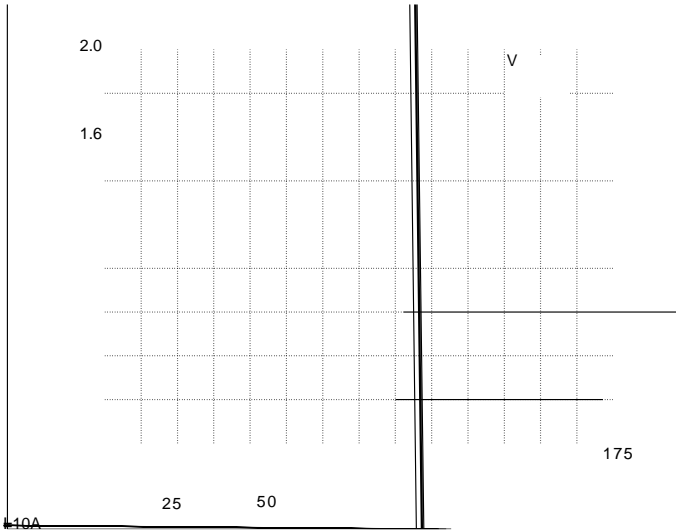


Figure 8: Source-Drain Diode Forward



Figure 9: Capacitance Characteristics

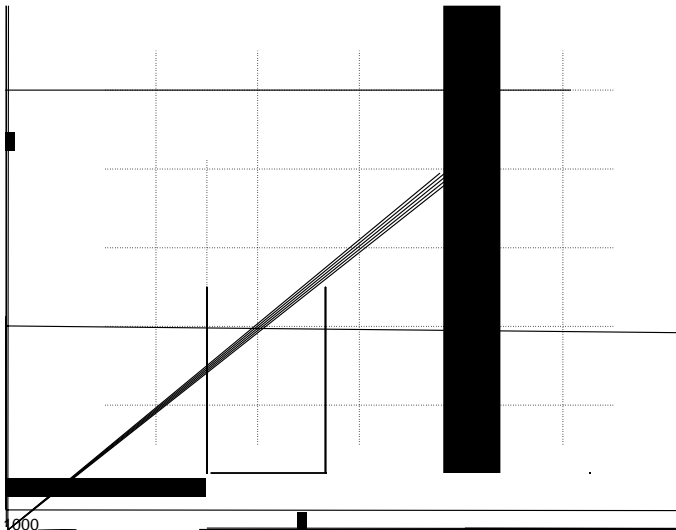
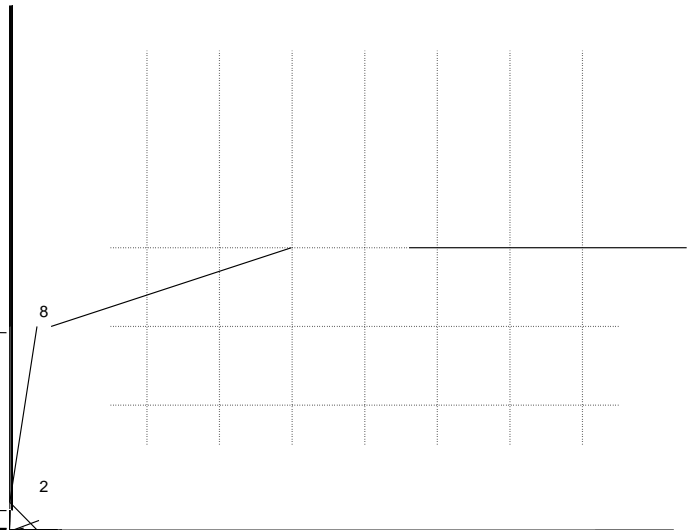
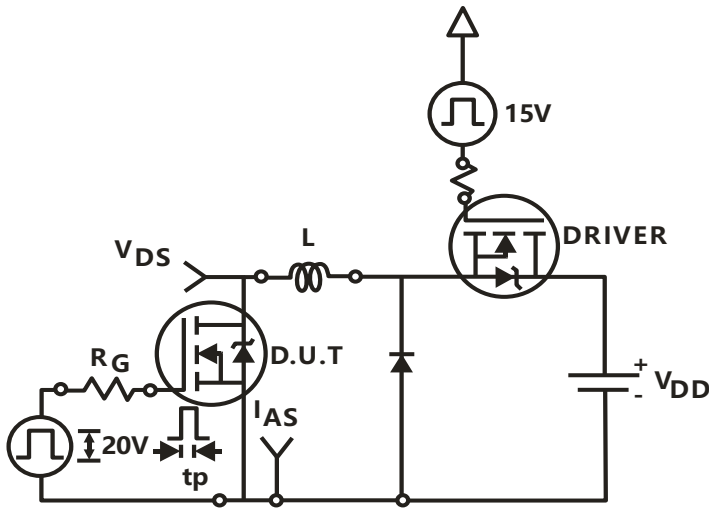


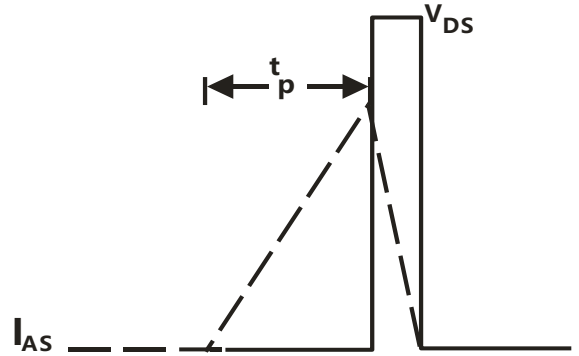
Figure 10: Gate Charge Characteristics



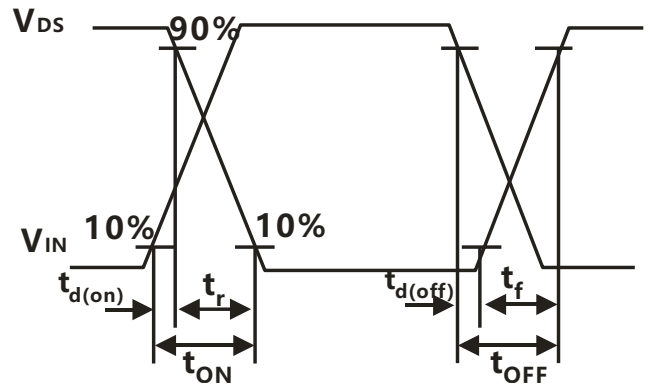
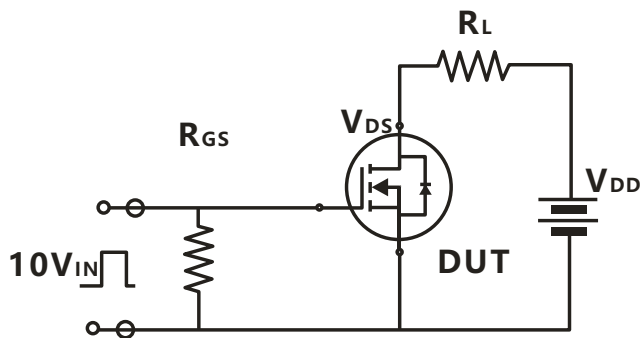
Avalanche Test Circuit



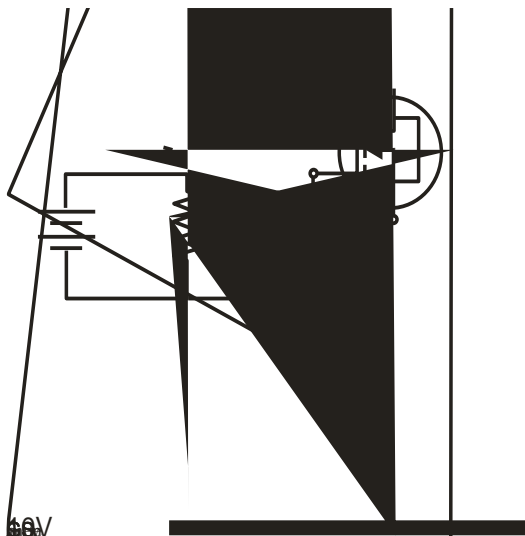
$$E_{AS} = \frac{1}{2} L I_{AS}^2$$



Switching Time Test Circuit



Gate Charge Test Circuit

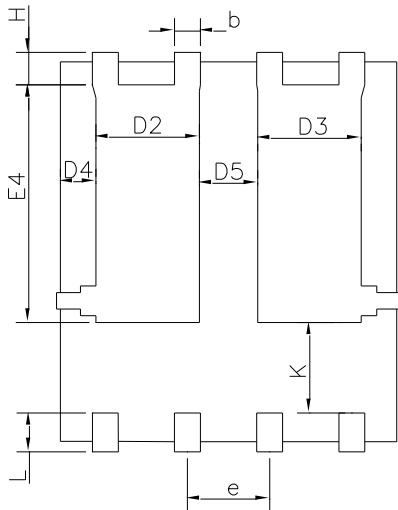
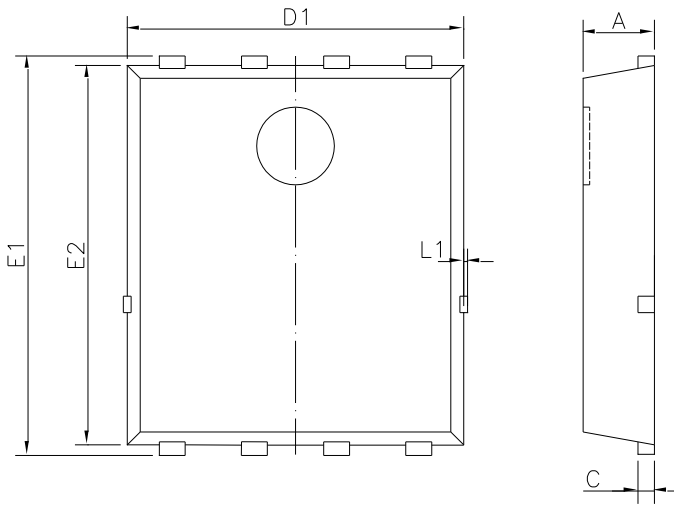


Device Per Unit

Package Type	Unit	Quantity
PDFN8L(5x6)	Reel	5000

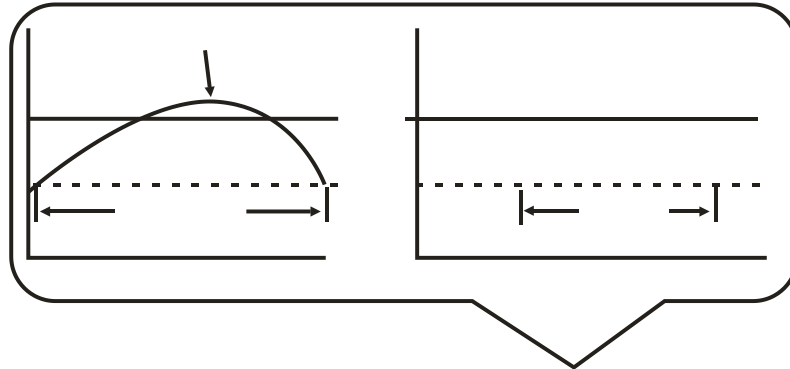
Package Information

PDFN8L(5x6)



COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MAX
A	1.00	1.10	1.20
b	0.30	0.40	0.50
c	0.154	0.254	0.354
D1	5.00	5.20	5.40
D2	1.40	1.60	1.80
D3	1.40	1.60	1.80
D4	0.45	0.55	0.65
D5	0.70	0.90	1.10
e	1.27BSC		
E1	5.95	6.15	6.35
E2	5.66	5.86	6.06
E4	3.47	3.67	3.87
H	0.40	0.50	0.60
K	1.23	1.38	1.53
L	0.30	0.60	0.70
L1	\	\	0.12
*Not specified			

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 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