



## Description

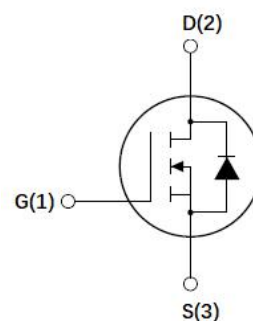
### Features

- 60V/40A  
 $R_{DS(ON)} = 16.0\text{m}\Omega(\text{typ.})@V_{GS} = 10\text{V}$   
 $R_{DS(ON)} = 19.8\text{m}\Omega(\text{typ.})@V_{GS} = 4.5\text{V}$
- 100% Avalanche Tested
- Reliable and Rugged
- Halogen Free and Green Devices Available (RoHS Compliant)

### Applications

- Power Management for DC/DC
- Switching application

### Package



## Electrical Characteristics(T<sub>c</sub> =25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	HYG210N06LA1			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	60	-	-	V
I <sub>DSS</sub>	Drain-to-Source Leakage Current	V <sub>DS</sub> =60V, 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	1.6	2.1	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> =20A	-	16.0	21.5	mΩ
		V <sub>GS</sub> =4.5V, I <sub>DS</sub> =20A	-	19.8	26.5	
<b>Diode Characteristics</b>						
V <sub>SD*</sub>	Diode Forward Voltage	I <sub>SD</sub> =20A, V <sub>GS</sub> =0V	-	0.86	1.26	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> =20A, dI <sub>SD</sub> /dt=100A/μs	-	13		ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	7.8		nC


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

Symbol	Parameter	Test Conditions	HYG210N06LA1			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	-	4.8	-	Ω
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> = 25V, Frequency=1.0MHz	-	1345	-	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> = 30V, R <sub>G</sub> =2.5Ω, I <sub>DS</sub> = 20A, V <sub>GS</sub> = 10V	-	8.2	
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> (10V)	Total Gate Charge	V <sub>DS</sub> =48V, V <sub>GS</sub> =10V, I <sub>D</sub> =20A	-	28	-	nC
Q <sub>g</sub> (4.5V)	Total Gate Charge					
Q <sub>gs</sub>	Gate-Source Charge					
Q <sub>gd</sub>	Gate-Drain Charge					

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

### Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit	
<b>Common Ratings</b> (Tc=25°C Unless Otherwise Noted)				
V <sub>DSS</sub>	Drain-Source Voltage	60	V	
V <sub>GSS</sub>	Gate-Source Voltage	±20	V	
T <sub>J</sub>	Junction Temperature Range	-55 to 155	°C	
T <sub>STG</sub>	Storage Temperature Range	-55 to 155	°C	
I <sub>S</sub>	Source Current-Continuous(Body Diode)	Tc=25°C	40	A
<b>Mounted on Large Heat Sink</b>				
I <sub>DM</sub>	Pulsed Drain Current *	Tc=25°C	90	A
I <sub>D</sub>	Continuous Drain Current	Tc=25°C	40	A
		Tc=100°C	27.5	A
P <sub>D</sub>	Maximum Power Dissipation	Tc=25°C	62.8	W
		Tc=100°C	30.3	W
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case		2.48	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient **		118	°C/W
E <sub>AS</sub>	Single Pulsed-Avalanche Energy ***	L=0.5mH	96	mJ

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

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

\*\*\* Limited by T<sub>Jmax</sub>, starting T<sub>J</sub>=25°C, L = 0.5mH, R<sub>G</sub>= 25Ω, V<sub>GS</sub> =10V.



### Typical Operating Characteristics

Figure 1: Power Dissipation

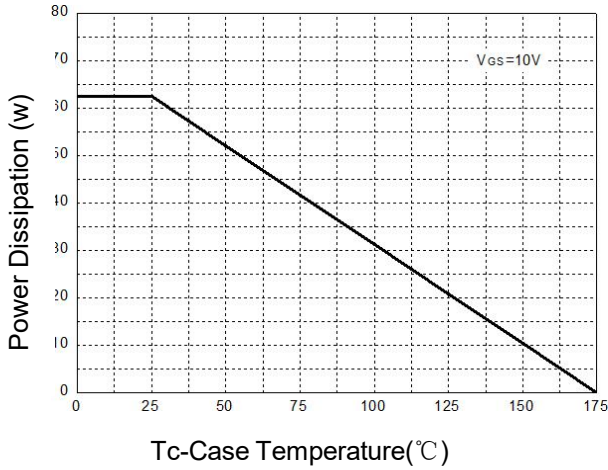


Figure 2: Drain Current

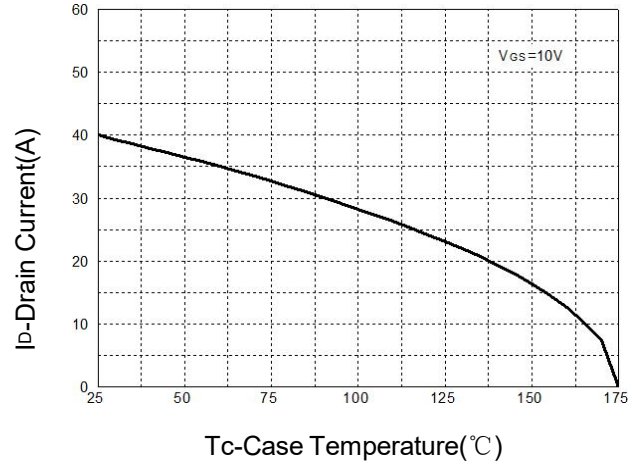


Figure 3: Safe Operation Area

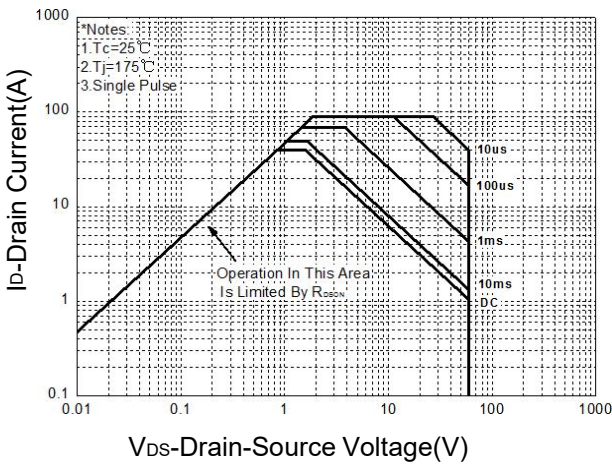


Figure 4: Thermal Transient Impedance

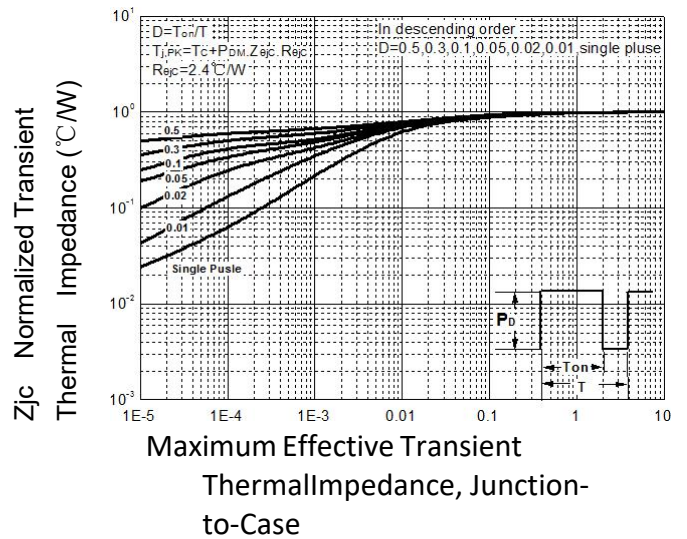


Figure 5: Output Characteristics

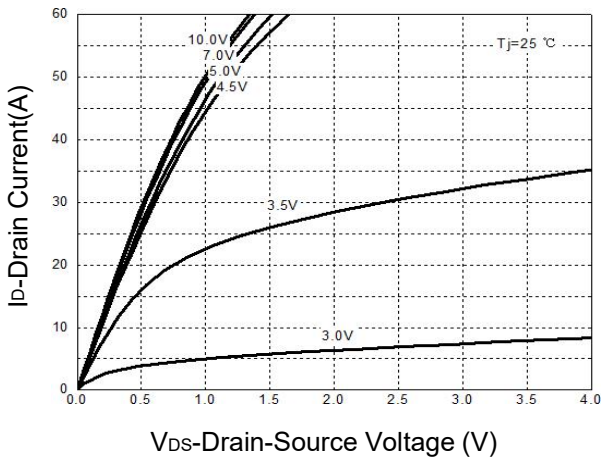
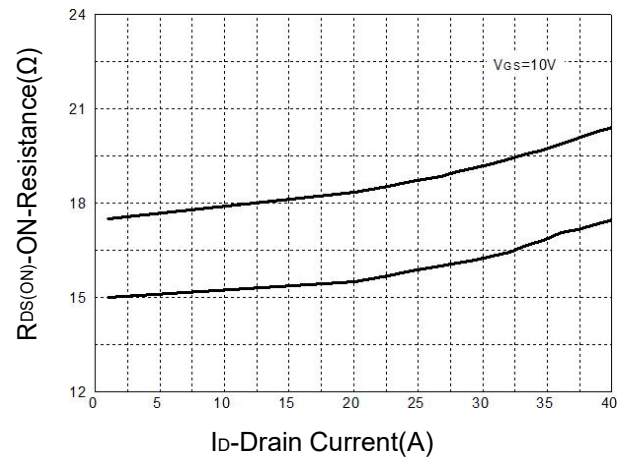


Figure 6: Drain-Source On Resistance



### Typical Operating Characteristics(Cont.)

Figure 7: Capacitance Characteristics

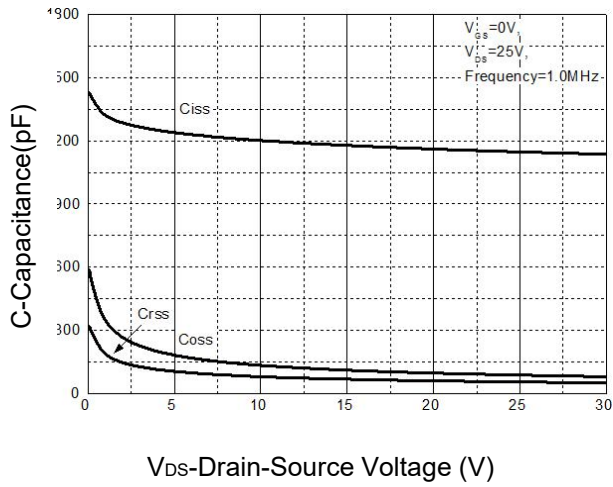
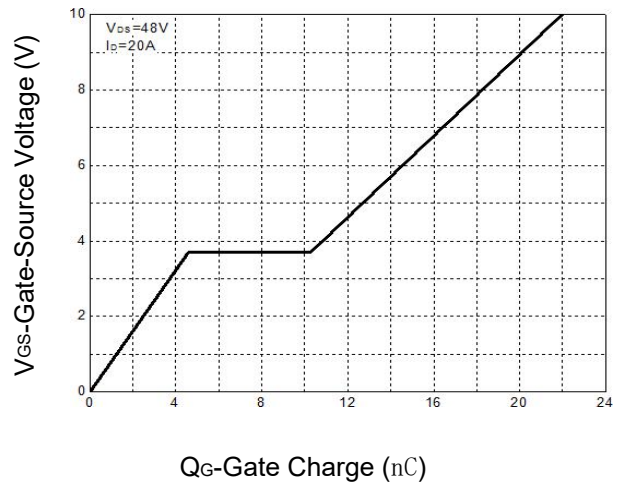
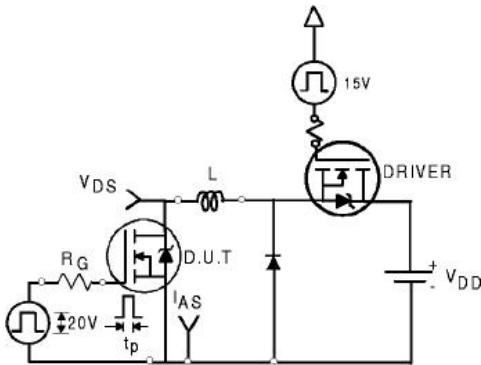


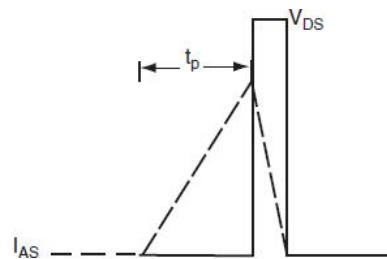
Figure 8: Gate Charge Characteristics



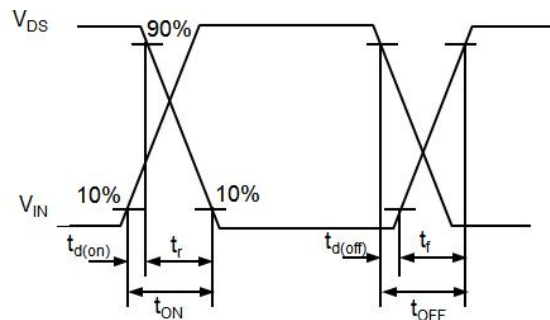
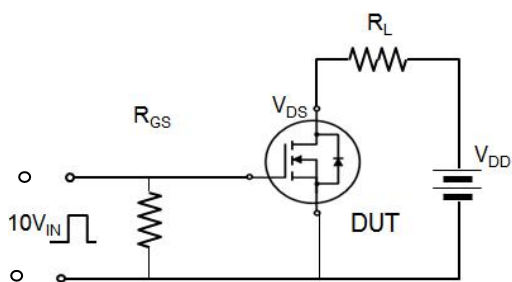
### Avalanche Test Circuit



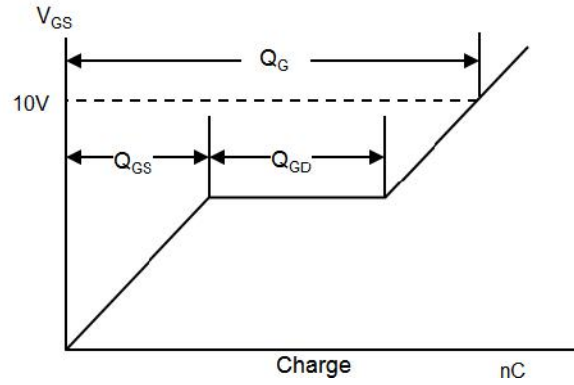
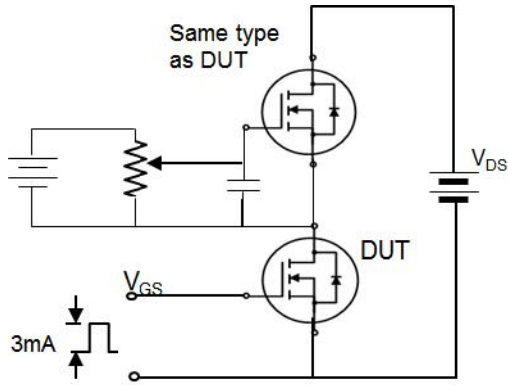
$$E_{AS} = \frac{1}{2} L I_{AS}^2$$



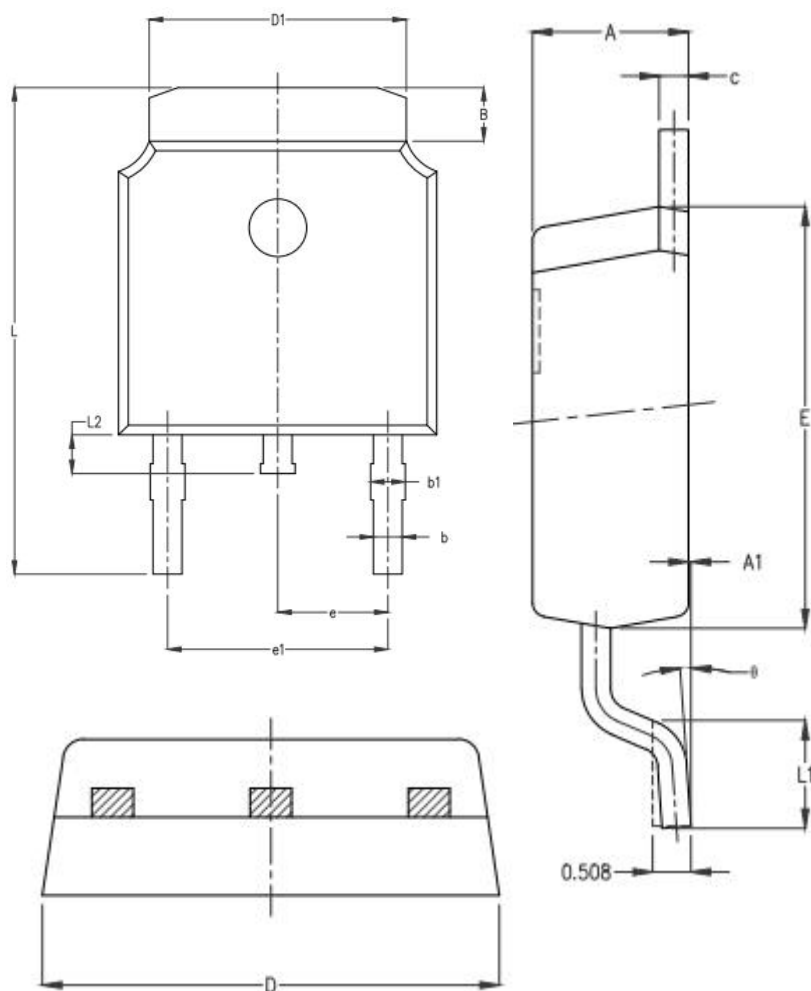
### Switching Time Test Circuit



## Gate Charge Test Circuit



### TO-252 Package Information



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	2.15	2.25	2.35
A1	0.00	0.06	0.12
B	0.96	1.11	1.26
b	0.59	0.69	0.79
b1	0.69	0.81	0.93
c	0.34	0.42	0.50
D	6.45	6.60	6.75
D1	5.23	5.33	5.43
E	5.95	6.10	6.25
e	2.286TYP.		
e1	4.47	4.57	4.67
L	9.90	10.10	10.30
L1	1.40	1.55	1.70
L2	0.60	0.80	1.00
$\theta$	0°	4°	8°



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