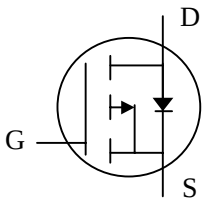
P-channel Enhancement-mode Power MOSFET

Simple Drive Requirement

Fast Switching Characteristics

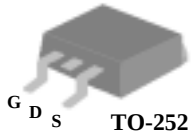
2.5V Gate Drive Capability

RoHS-compliant, halogen-free



BV_{DSS}	-20V
$R_{DS(ON)}$	150mΩ
I_D	-10A

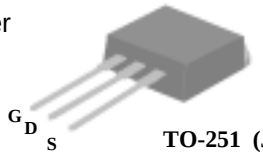
Description



TO-252 (H)

Advanced Power MOSFETs from APEC provide the designer with the best combination of fast switching, low on-resistance and cost-effectiveness.

The AP3310GH-HF-3 is in the TO-252 package which is widely preferred for commercial and industrial surface mount applications such as medium-power DC/DC converters. The through-hole TO-251 version (AP3310GJ-HF-3) is available where a small PCB footprint is required.



TO-251 (J)

Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-20	V
V_{GS}	Gate-Source Voltage	±12	V
I_D at T_C=25°C	Continuous Drain Current[3]	-10	A
I_D at T_C=100°C	Continuous Drain Current[3]	-6.2	A
I_{DM}	Pulsed Drain Current[1]	-24	A
P_D at T_C=25°C	Total Power Dissipation	25	W
	Linear Derating Factor	0.2	W/°C
T_{STG}	Storage Temperature Range	-55 to 150	°C
T_J	Operating Junction Temperature Range	-55 to 150	°C

Thermal Data

Symbol	Parameter	Value	Unit
Rthj-c	Maximum Thermal Resistance, Junction-case	5.0	°C/W
Rthj-a	Maximum Thermal Resistance, Junction-ambient(PCB mount)[3]	62.5	°C/W
Rthj-a	Maximum Thermal Resistance, Junction-ambient	110	°C/W

Ordering Information

AP3310GH-HF-3TR **RoHS-compliant TO-252 shipped on tape and reel (3000 pcs/reel)**

AP3310GJ-HF-3TB **RoHS-compliant TO-251 shipped in tubes**

©2009 Advanced Power Electronics Corp. USA
www.a-powerusa.com

Electrical Specifications at T_j=25°C (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=-250uA	-20	-	-	V
$\Delta BV_{DSS}/DT_j$	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I_D=-1mA	-	-0.1	-	V/°C
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=-4.5V, I_D=-2.8A	-	-	150	mΩ
		V_{GS}=-2.5V, I_D=-2.0A	-	-	250	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=-250uA	-0.5	-	-	V
g_{fs}	Forward Transconductance	V_{DS}=-5V, I_D=-2.8A	-	4.4	-	S
I_{DSS}	Drain-Source Leakage Current	V_{DS}=-20V, V_{GS}=0V	-	-	-1	uA
	Drain-Source Leakage Current (T_j=125°C)	V_{DS}=-16V, V_{GS}=0V	-	-	-250	uA
I_{GSS}	Gate-Source Leakage	V_{GS}=±12V, V_{DS}=0V	-	-	±100	nA
Q_g	Total Gate Charge[2]	I_D=-2.8A	-	6	-	nC
Q_{gs}	Gate-Source Charge	V_{DS}=-6V	-	1.5	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	V_{GS}=-5V	-	0.6	-	nC
$t_{d(on)}$	Turn-on Delay Time[2]	V_{DS}=-6V	-	25	-	ns
t_r	Rise Time	I_D=-1A	-	60	-	ns
$t_{d(off)}$	Turn-off Delay Time	R_G=6Ω ,V_{GS}=-5V	-	70	-	ns
t_f	Fall Time	R_D=6Ω	-	60	-	ns
C_{iss}	Input Capacitance	V_{GS}=0V	-	300	-	pF
C_{oss}	Output Capacitance	V_{DS}=-6V	-	180	-	pF
C_{rss}	Reverse Transfer Capacitance	f=1.0MHz	-	60	-	pF

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
I_S	Continuous Source Current (Body Diode)	V_D=V_G=0V , V_S=-1.2V	-	-	-10	A
I_{SM}	Pulsed Source Current (Body Diode)[1]		-	-	-24	A
V_{SD}	Forward On Voltage[2]	T_j=25°C, I_S=-10A, V_{GS}=0V	-	-	-1.2	V

Notes:

1.Pulse width limited by maximum junction temperature.

2.Pulse test - pulse width ≤ 300μs , duty cycle≤ 2%

3.Surface mounted on 1 in^2 copper pad of FR4 board,

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.

APEC DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

APEC RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN.

Typical Electrical Characteristics

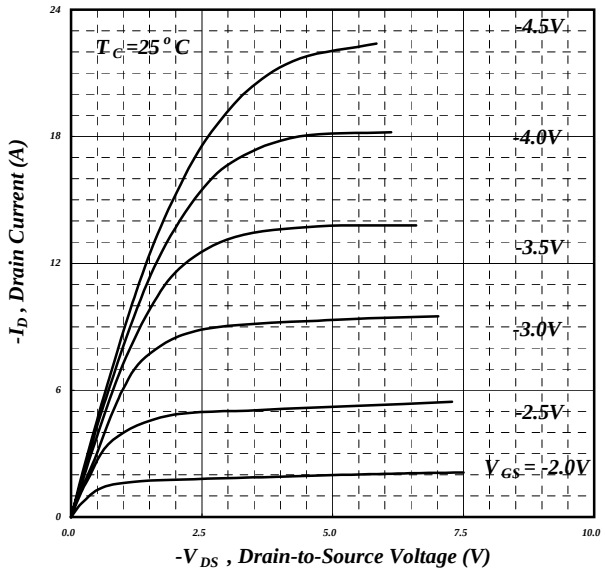


Fig 1. Typical Output Characteristics

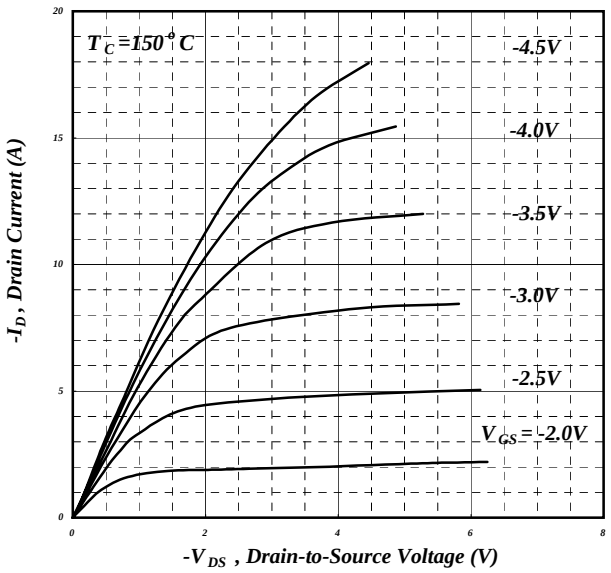


Fig 2. Typical Output Characteristics

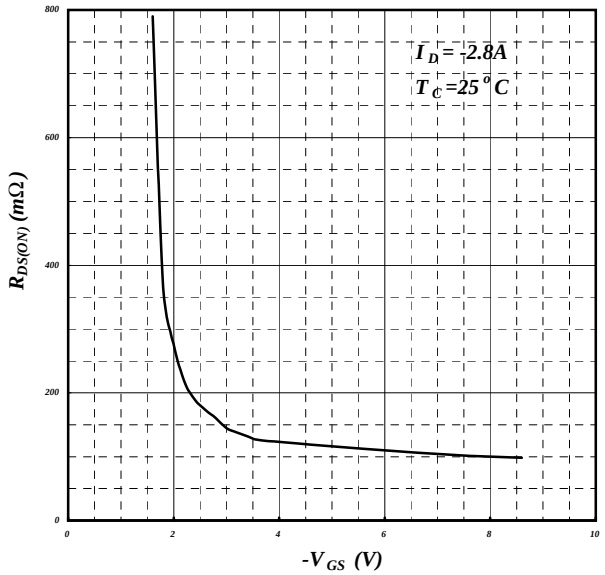


Fig 3. On-Resistance vs. Gate Voltage

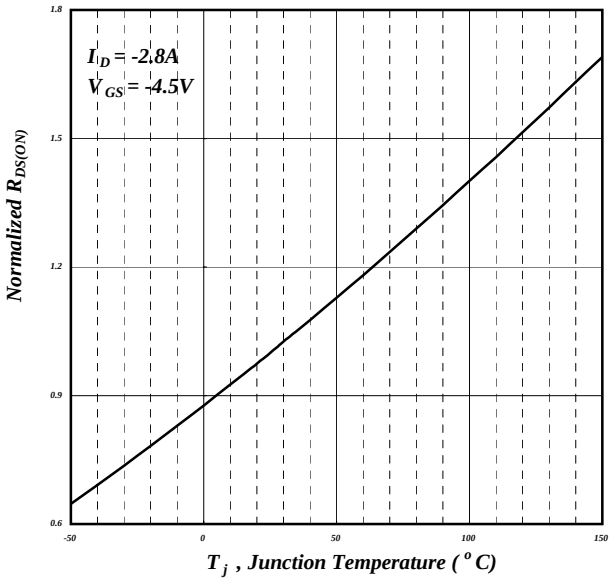


Fig 4. Normalized On-Resistance vs. Junction Temperature

©2009 Advanced Power Electronics Corp. USA
www.a-powerusa.com

Typical Electrical Characteristics (cont.)

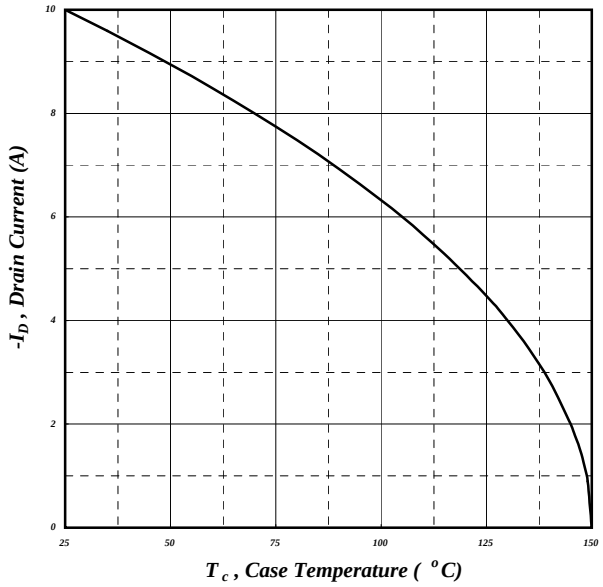


Fig 5. Maximum Drain Current vs. Case Temp.

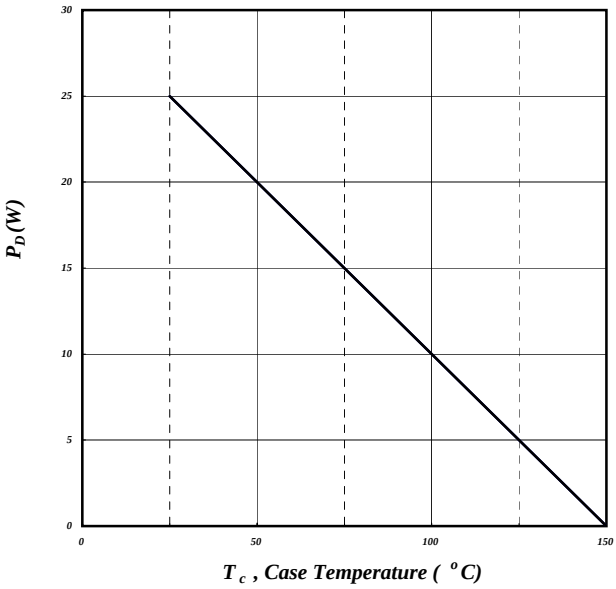


Fig 6. Typical Power Dissipation

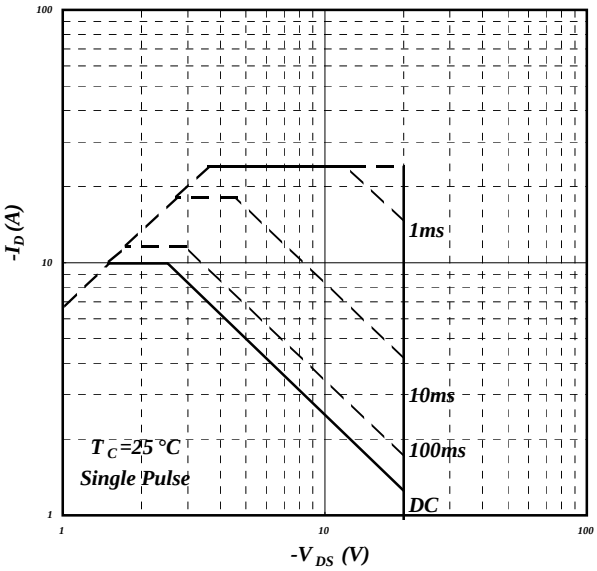


Fig 7. Maximum Safe Operating Area

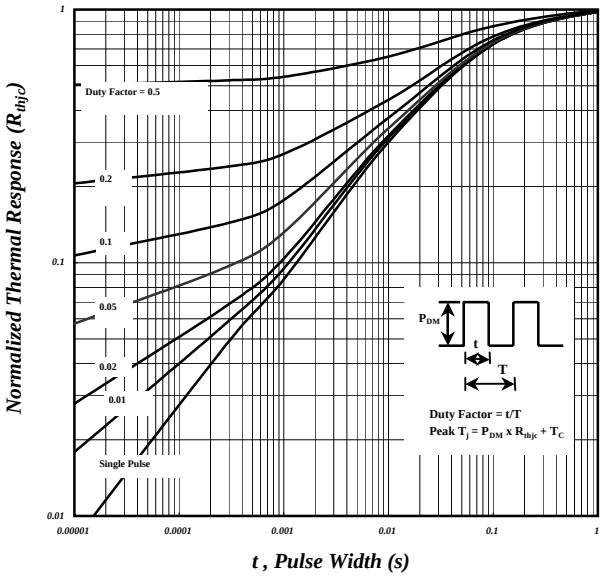


Fig 8. Effective Transient Thermal Impedance

©2009 Advanced Power Electronics Corp. USA
www.a-powerusa.com

Typical Electrical Characteristics (cont.)

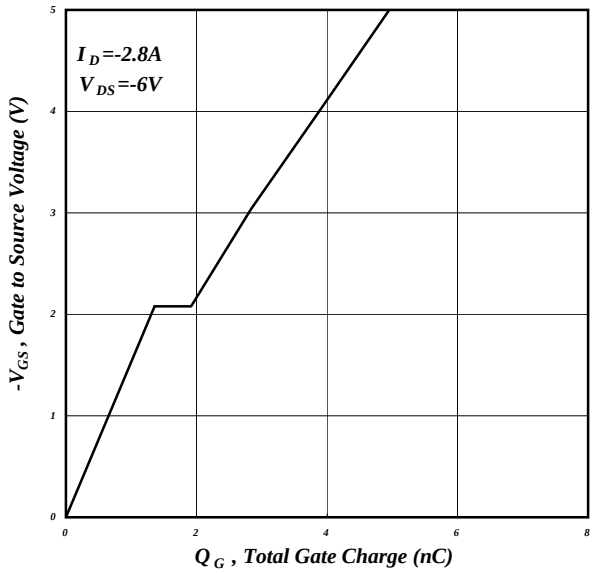


Fig 7. Gate Charge Characteristics

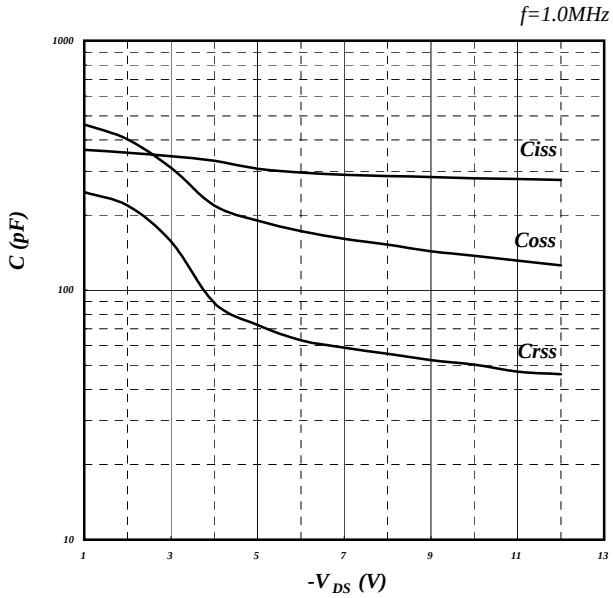


Fig 8. Typical Capacitance Characteristics

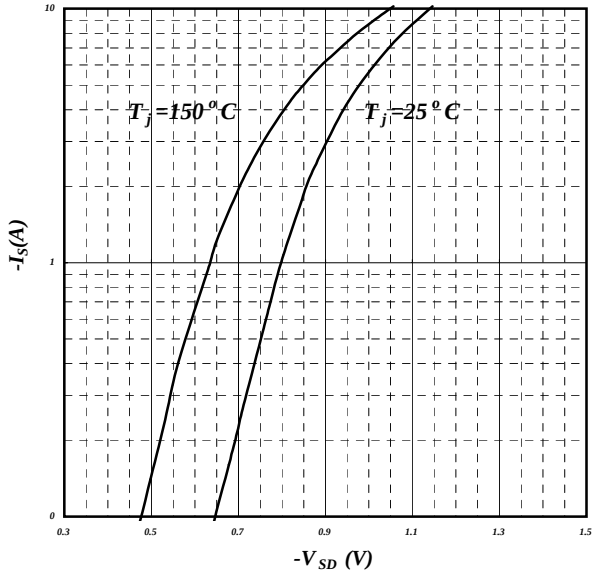


Fig 11. Forward Characteristic of Reverse Diode

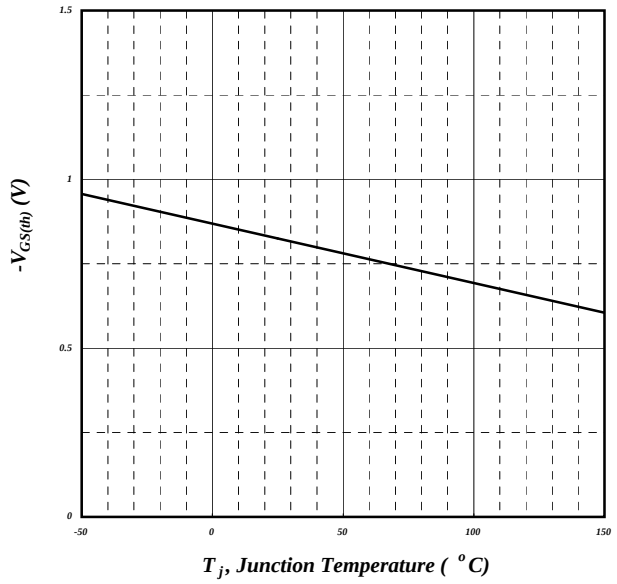


Fig 12. Gate Threshold Voltage vs. Junction Temperature

©2009 Advanced Power Electronics Corp. USA
www.a-powerusa.com

Typical Electrical Characteristics (cont.)

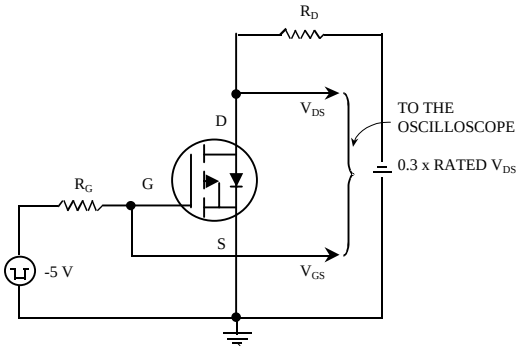


Fig 13. Switching Time Circuit

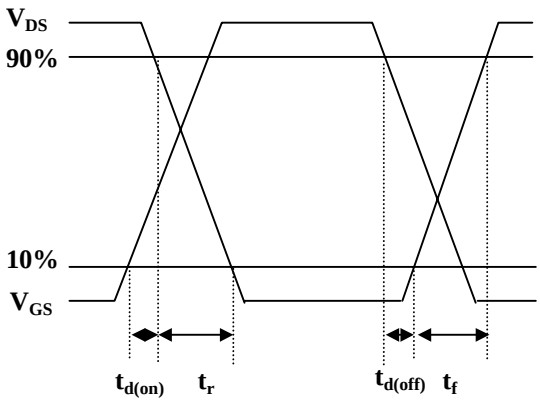


Fig 14. Switching Time Waveform

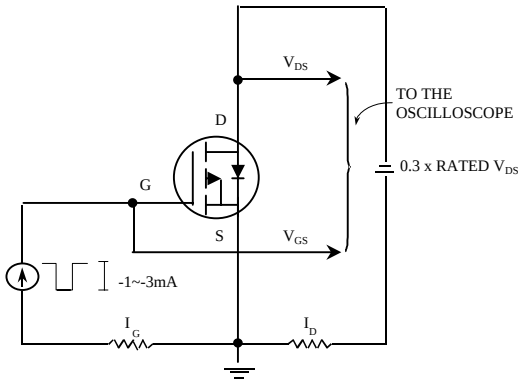


Fig 15. Gate Charge Circuit

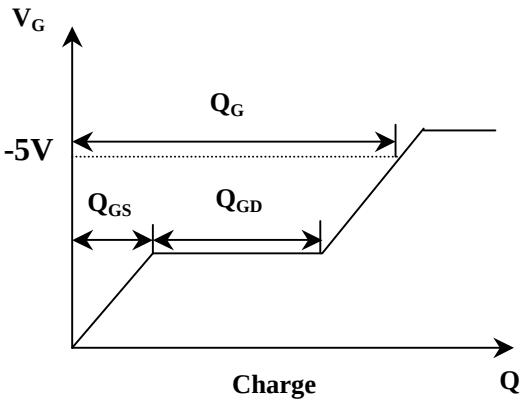
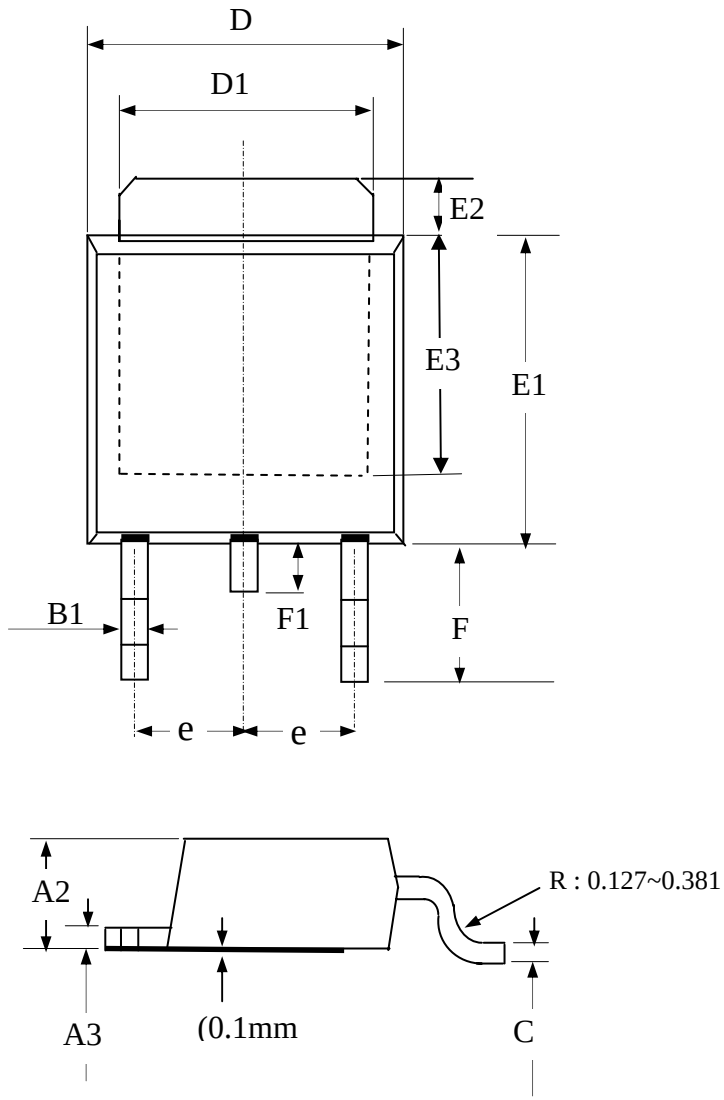


Fig 16. Gate Charge Waveform

©2009 Advanced Power Electronics Corp. USA
www.a-powerusa.com

Package Dimensions: TO-252

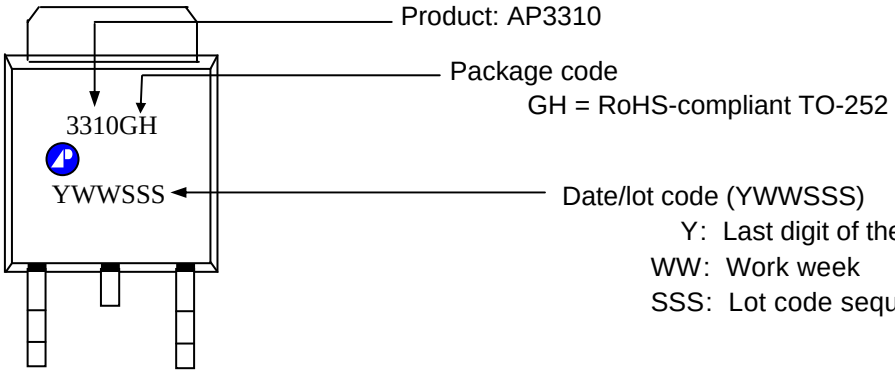


SYMBOLS	Millimeters		
	MIN	NOM	MAX
A2	1.80	2.30	2.80
A3	0.40	0.50	0.60
B1	0.40	0.70	1.00
D	6.00	6.50	7.00
D1	4.80	5.35	5.90
E3	3.50	4.00	4.50
F	2.20	2.63	3.05
F1	0.50	0.85	1.20
E1	5.10	5.70	6.30
E2	0.50	1.10	1.80
e	--	2.30	--
C	0.35	0.50	0.65

1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

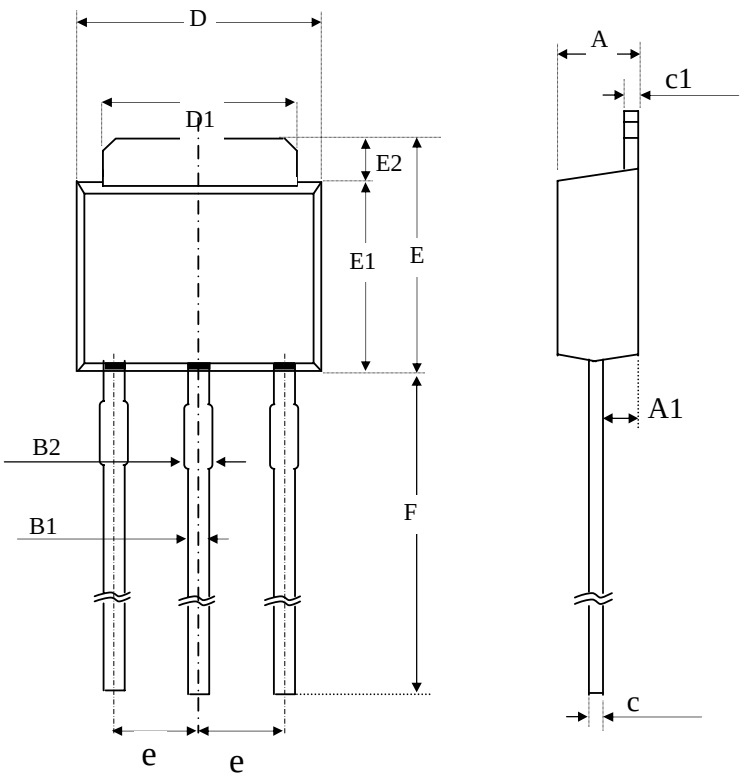
Marking Information: TO-252

Laser Marking



©2009 Advanced Power Electronics Corp. USA
www.a-powerusa.com

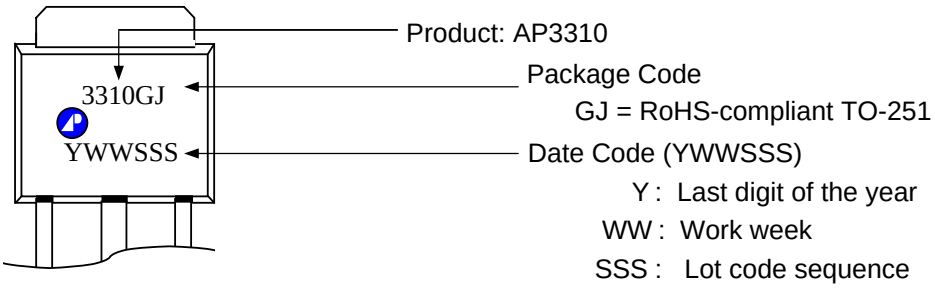
Package Dimensions: TO-251



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0.90	1.20	1.50
B1	0.40	0.60	0.80
B2	0.60	0.85	1.05
c	0.40	0.50	0.60
c1	0.40	0.50	0.60
D	6.40	6.60	6.80
D1	4.80	5.20	5.50
E	6.70	7.00	7.30
E1	5.40	5.60	5.80
E2	1.30	1.50	1.70
e	----	2.30	----
F	7.00	8.30	9.60

1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information: TO-251



©2009 Advanced Power Electronics Corp. USA
www.a-powerusa.com