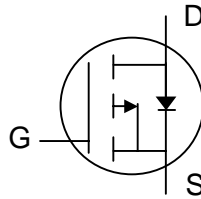




P-channel Enhancement-mode Power MOSFET

- Simple Drive Requirement**
- Small Package Outline**
- Surface Mount Device**
- RoHS-compliant, Halogen-free**



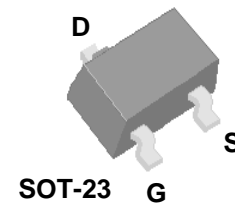
BV_{DSS}	-30V
$R_{DS(ON)}$	75mΩ
I_D	-3.7A

Description

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

The AP2309GN-HF-3 is in the popular SOT-23 small surface-mount package which is widely used in commercial and industrial applications where a small board footprint is required.

This device is well suited for use in medium current applications such as load switches.



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-30	V
V_{GS}	Gate-Source Voltage	±20	V
I_D at $T_A=25^{\circ}C$	Continuous Drain Current ³	-3.7	A
I_D at $T_A=70^{\circ}C$	Continuous Drain Current ³	-3	A
I_{DM}	Pulsed Drain Current ¹	-12	A
P_D at $T_A=25^{\circ}C$	Total Power Dissipation	1.38	W
	Linear Derating Factor	0.01	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-a	Maximum Thermal Resistance, Junction-ambient	90	°C/W

Ordering Information

AP2309GN-HF-3TR : in RoHS-compliant, halogen-free SOT-23, shipped on tape and reel, 3000pcs/reel



Electrical Specifications at $T_j=25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-30	-	-	V
$\Delta BV_{DSS}/\Delta T_j$	Breakdown Voltage Temperature Coefficient	Reference to 25°C , $I_D=-1\text{mA}$	-	-0.02	-	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=-10V, I_D=-3A$	-	-	75	$m\Omega$
		$V_{GS}=-4.5V, I_D=-2.6A$	-	-	120	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1	-	-3	V
g_{fs}	Forward Transconductance	$V_{DS}=-10V, I_D=-3A$	-	5	-	S
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	μA
	Drain-Source Leakage Current ($T_j=55^\circ\text{C}$)	$V_{DS}=-24V, V_{GS}=0V$	-	-	-25	μA
I_{GSS}	Gate-Source Leakage	$V_{GS}=\pm 20V$	-	-	± 100	nA
Q_g	Total Gate Charge ²	$I_D=-3A$	-	5	8	nC
Q_{gs}	Gate-Source Charge	$V_{DS}=-24V$	-	1	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	$V_{GS}=-4.5V$	-	3	-	nC
$t_{d(on)}$	Turn-on Delay Time ²	$V_{DS}=-15V$	-	8	-	ns
t_r	Rise Time	$I_D=-1A$	-	5	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=3.3\Omega, V_{GS}=-10V$	-	20	-	ns
t_f	Fall Time	$R_D=15\Omega$	-	7	-	ns
C_{iss}	Input Capacitance	$V_{GS}=0V$	-	412	660	pF
C_{oss}	Output Capacitance	$V_{DS}=-25V$	-	91	-	pF
C_{rss}	Reverse Transfer Capacitance	$f=1.0\text{MHz}$	-	62	-	pF

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Forward On Voltage ²	$I_S=-1.2A, V_{GS}=0V$	-	-	-1.2	V
t_{rr}	Reverse Recovery Time ²	$I_S=-3A, V_{GS}=0V,$	-	20	-	ns
Q_{rr}	Reverse Recovery Charge	$di/dt=100A/\mu s$	-	15	-	nC

Notes:

1. Pulse width limited by maximum junction temperature.
2. Pulse test - pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
3. Surface mounted on 1 in² copper pad of FR4 board, $t \leq 10\text{sec}$; 270°C/W when mounted on minimum copper pad.

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.

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Typical Electrical Characteristics

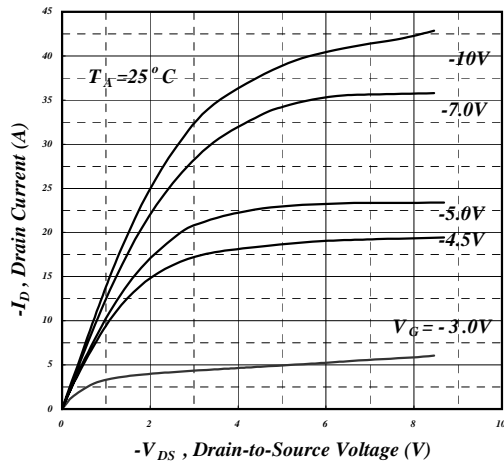


Fig 1. Typical Output Characteristics

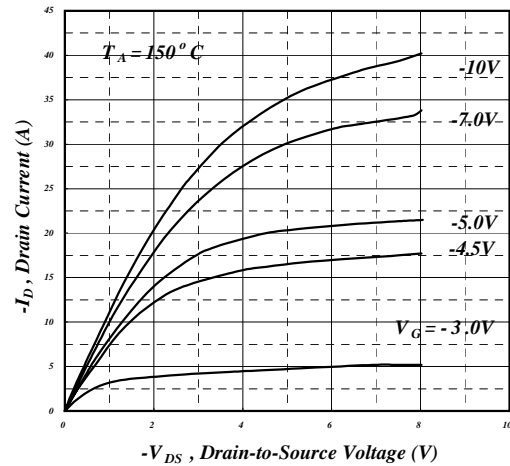


Fig 2. Typical Output Characteristics

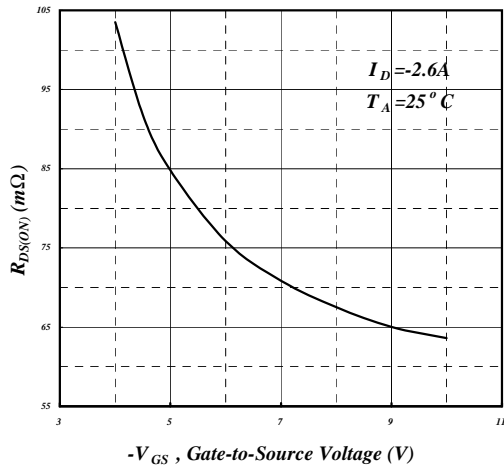


Fig 3. On-Resistance vs. Gate Voltage

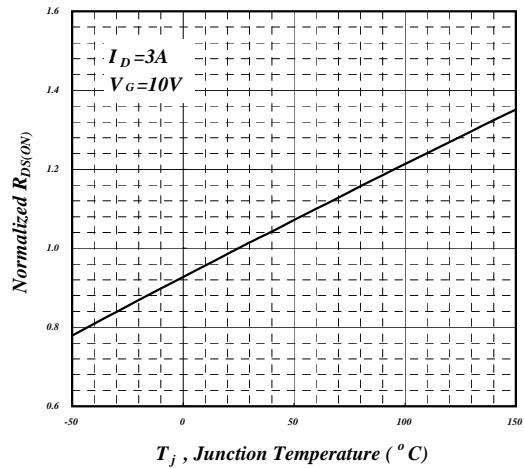


Fig 4. Normalized On-Resistance vs. Junction Temperature

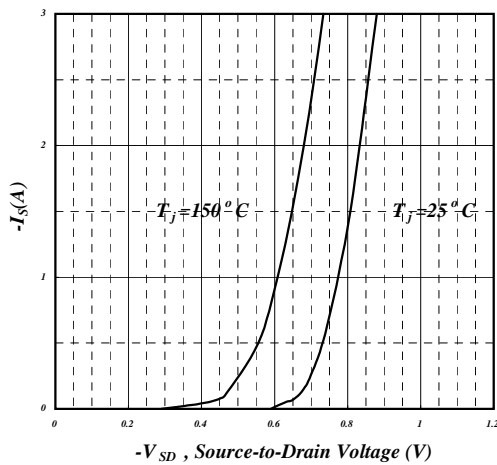


Fig 5. Forward Characteristic of Reverse Diode

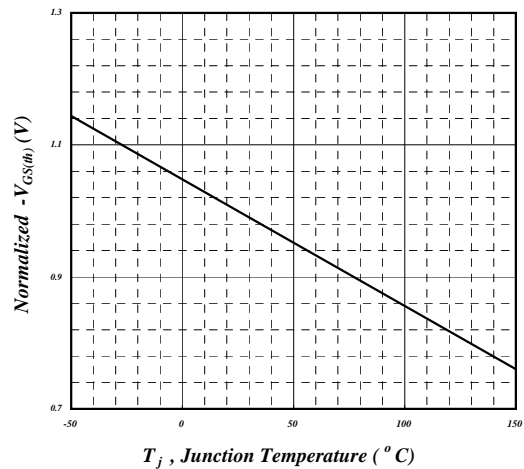


Fig 6. Gate Threshold Voltage vs. Junction Temperature



Typical Electrical Characteristics (cont.)

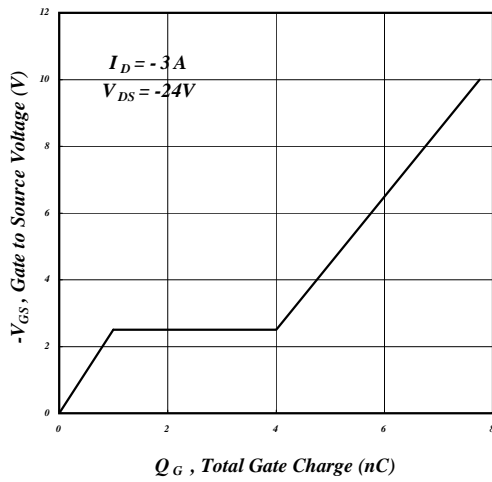


Fig 7. Gate Charge Characteristics

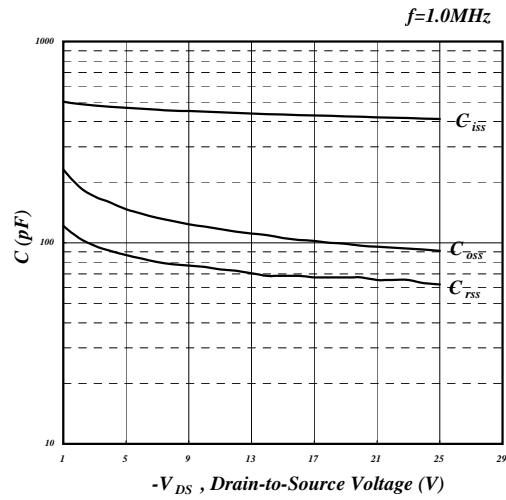


Fig 8. Typical Capacitance Characteristics

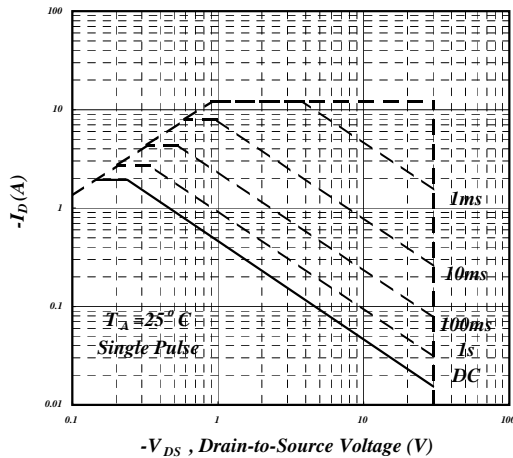


Fig 9. Maximum Safe Operating Area

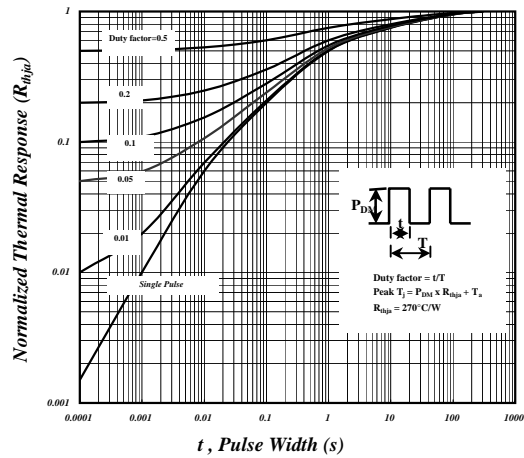


Fig 10. Effective Transient Thermal Impedance

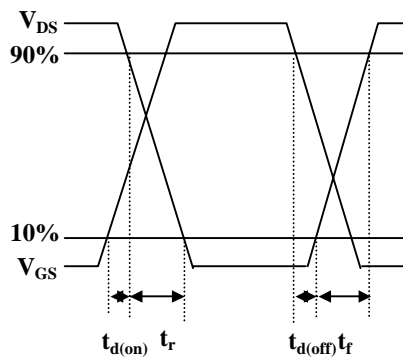


Fig 11. Switching Time Circuit

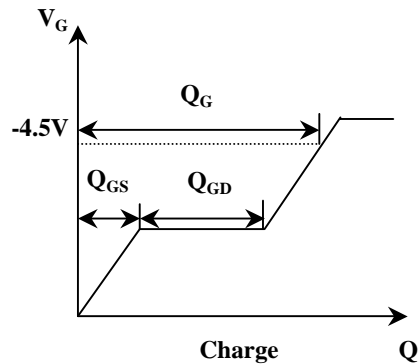
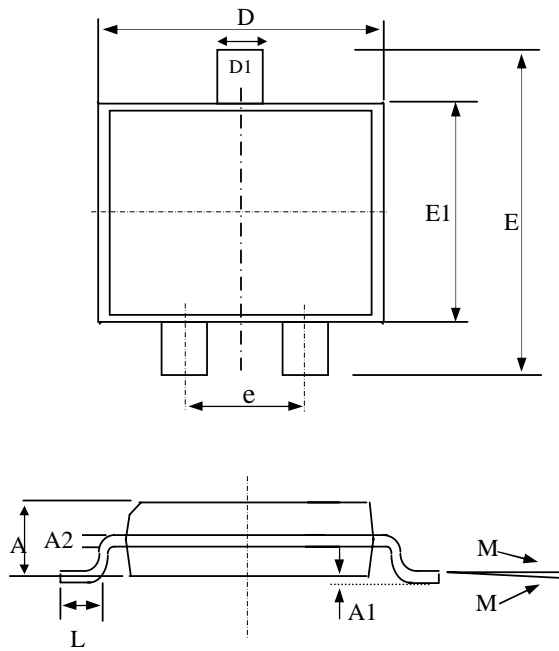


Fig 12. Gate Charge Waveform



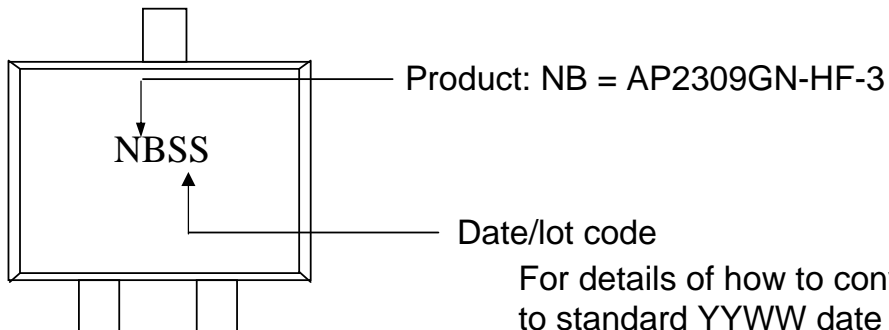
Package Dimensions: SOT-23



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	0.88	--	1.30
A1	0.00	--	0.10
A2	0.08	--	0.25
D1	0.30	0.40	0.50
e	1.70	2.00	2.30
D	2.70	2.90	3.10
E	2.20	2.60	3.00
E1	1.20	1.50	1.80
M	0°	--	10°
L	0.30	--	0.60

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

Marking Information: SOT-23



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