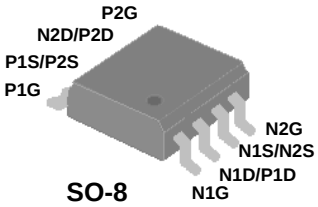
Quad Complementary N and P-channel Enhancement-mode Power MOSFETs

Simple Drive Requirement

Low On-resistance

Full Bridge Applications

RoHS-compliant, halogen-free



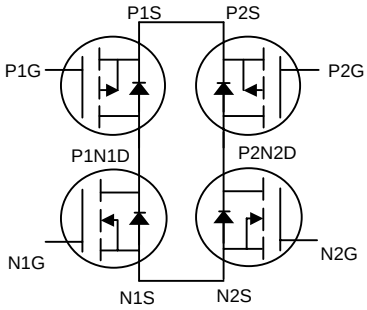
SO-8

N-CH	BV_{DSS}	30V
	$R_{DS(ON)}$	33mΩ
	I_D	5.5A
P-CH	BV_{DSS}	-30V
	$R_{DS(ON)}$	55mΩ
	I_D	-4.1A

Description

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

The AP9930GM-HF-3 is in a standard SO-8 package, which is widely used for commercial and industrial surface-mount applications, and is well suited for applications such as DC and servo motor drives.



Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-channel	P-channel	
V_{DS}	Drain-Source Voltage	30	-30	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D at T_A=25°C	Continuous Drain Current[3]	5.5	-4.1	A
I_D at T_A=70°C	Continuous Drain Current[3]	4.4	-3.3	A
I_{DM}	Pulsed Drain Current[1]	20	-20	A
P_D at T_A=25°C	Total Power Dissipation	1.38		W
	Linear Derating Factor	0.011		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[3]	90	°C/W

Ordering Information

AP9930GM-HF-3TR : in RoHS-compliant, halogen-free SO-8, shipped on tape and reel (3000 pcs/reel)

N-channel 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	30	-	-	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=10V, I_D=5A	-	-	33	mΩ
		V_{GS}=4.5V, I_D=3A	-	-	60	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250uA	1	-	3	V
g_{fs}	Forward Transconductance	V_{DS}=10V, I_D=5A	-	5.2	-	S
I_{DSS}	Drain-Source Leakage Current	V_{DS}=30V, V_{GS}=0V	-	-	1	uA
	Drain-Source Leakage Current (T_j=70°C)	V_{DS}=24V, V_{GS}=0V	-	-	25	uA
I_{GSS}	Gate-Source Leakage	V_{GS}=±20V	-	-	±100	nA
Q_g	Total Gate Charge[2]	I_D=5A	-	7	10	nC
Q_{gs}	Gate-Source Charge	V_{DS}=15V	-	2	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	V_{GS}=4.5V	-	4	-	nC
$t_{d(on)}$	Turn-on Delay Time[2]	V_{DS}=15V	-	7	-	ns
t_r	Rise Time	I_D=1A	-	10	-	ns
$t_{d(off)}$	Turn-off Delay Time	R_G=6Ω, V_{GS}=10V	-	18	-	ns
t_f	Fall Time	R_D=15Ω	-	8	-	ns
C_{iss}	Input Capacitance	V_{GS}=0V	-	600	960	pF
C_{oss}	Output Capacitance	V_{DS}=25V	-	229.8	-	pF
C_{rss}	Reverse Transfer Capacitance	f=1.0MHz	-	94	-	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=1.7A, V_{GS}=0V	-	21	-	ns
Q_{rr}	Reverse Recovery Charge	dI/dt=100A/μs	-	16	-	nC

Notes:

1.Pulse width limited by maximum junction temperature.

2.Pulse width≤300us, duty cycle≤ 2%.

3.Surface mounted on 1 in^2 copper pad of FR4 board, t ≤10sec; 186°C/W when mounted on min. copper pad.

P-channel 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	-30	-	-	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=-10V, I_D=-4A	-	-	55	mΩ
		V_{GS}=-4.5V, I_D=-2A	-	-	100	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=-250uA	-1	-	-3	V
g_{fs}	Forward Transconductance	V_{DS}=-10V, I_D=-4A	-	4	-	S
I_{DSS}	Drain-Source Leakage Current	V_{DS}=-30V, V_{GS}=0V	-	-	-1	uA
	Drain-Source Leakage Current (T_j=70°C)	V_{DS}=-24V, V_{GS}=0V	-	-	-25	uA
I_{GSS}	Gate-Source Leakage	V_{GS}=±20V	-	-	±100	nA
Q_g	Total Gate Charge[2]	I_D=-4A	-	8	11	nC
Q_{gs}	Gate-Source Charge	V_{DS}=-24V	-	1.5	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	V_{GS}=-4.5V	-	4	-	nC
$t_{d(on)}$	Turn-on Delay Time[2]	V_{DS}=-15V	-	6.6	-	ns
t_r	Rise Time	I_D=-1A	-	7.7	-	ns
$t_{d(off)}$	Turn-off Delay Time	R_G=3.3Ω, V_{GS}=-10V	-	22	-	ns
t_f	Fall Time	R_D=15Ω	-	9.3	-	ns
C_{iss}	Input Capacitance	V_{GS}=0V	-	570	790	pF
C_{oss}	Output Capacitance	V_{DS}=-25V	-	80	-	pF
C_{rss}	Reverse Transfer Capacitance	f=1.0MHz	-	75	-	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=-4A, V_{GS}=0V,	-	18	-	ns
Q_{rr}	Reverse Recovery Charge	dI/dt=100A/μs	-	10	-	nC

Notes:

1.Pulse width limited by maximum junction temperature.

2.Pulse width≤300us, duty cycle≤ 2%.

3.Surface mounted on 1 in^2 copper pad of FR4 board, t ≤10sec; 186°C/W when mounted on min. copper pad.

Typical N-channel Electrical Characteristics

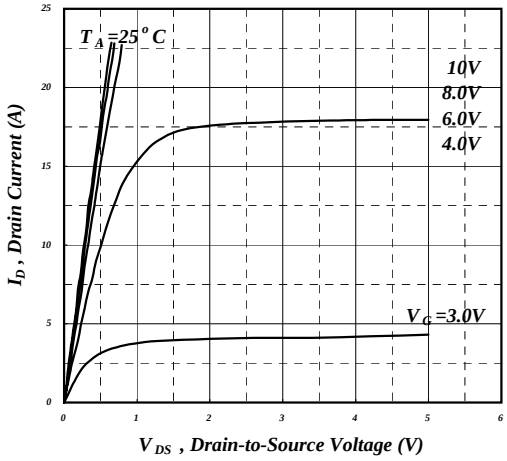


Fig 1. Typical Output Characteristics

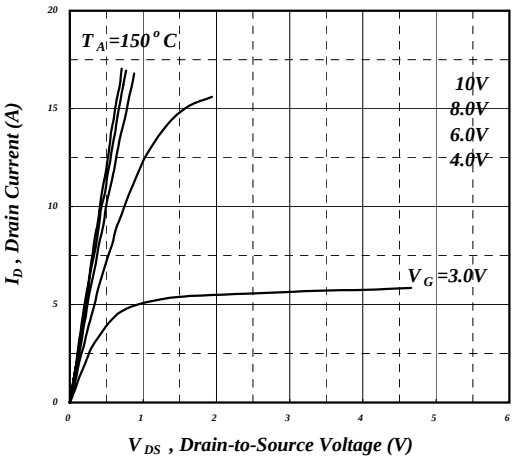


Fig 2. Typical Output Characteristics

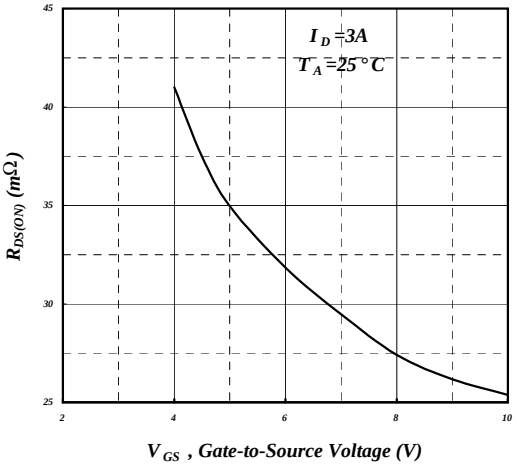


Fig 3. On-Resistance vs. Gate Voltage

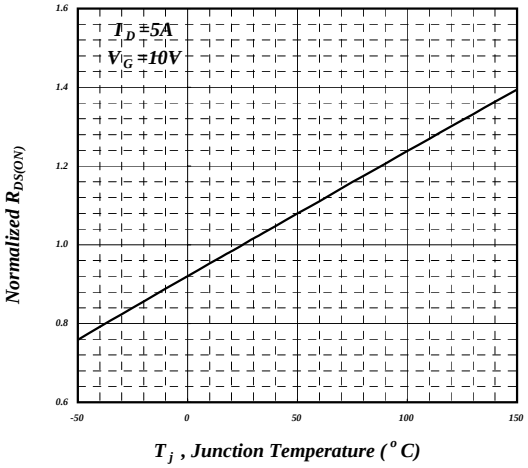


Fig 4. Normalized On-Resistance vs. Junction Temperature

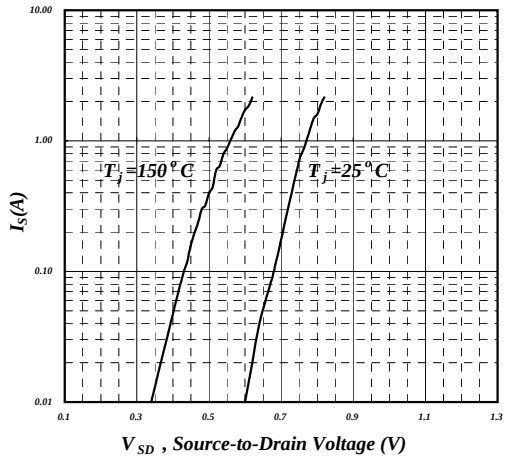


Fig 5. Forward Characteristic of Reverse Diode

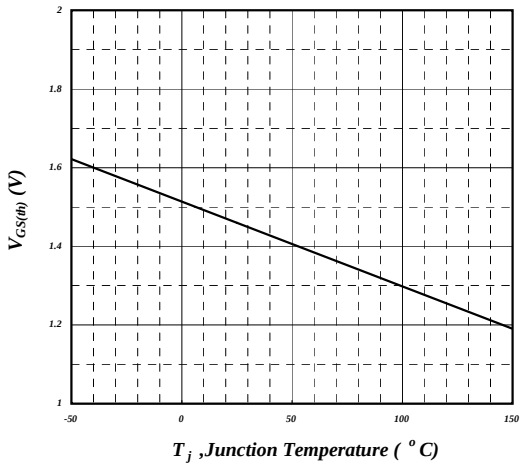


Fig 6. Gate Threshold Voltage vs. Junction Temperature

Typical N-channel Electrical Characteristics (cont.)

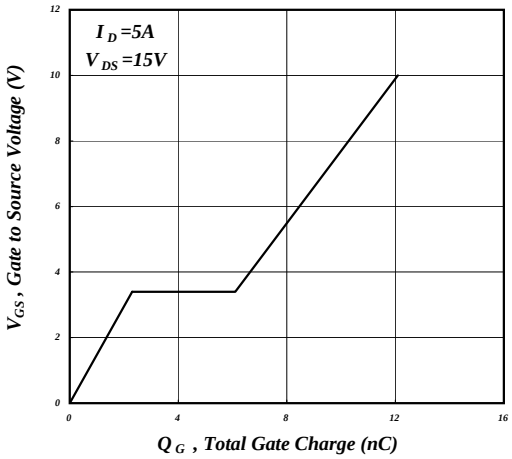


Fig 7. Gate Charge Characteristics

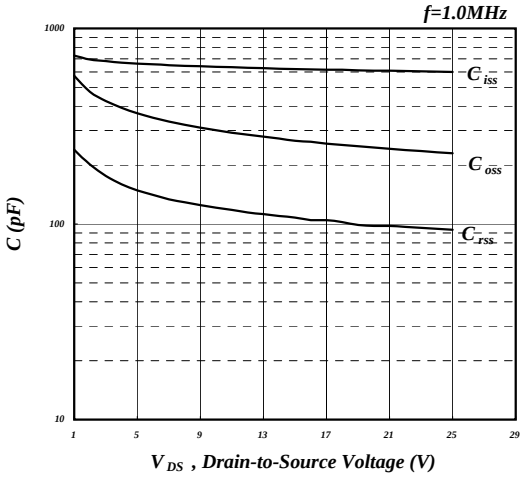


Fig 8. Typical Capacitance Characteristics

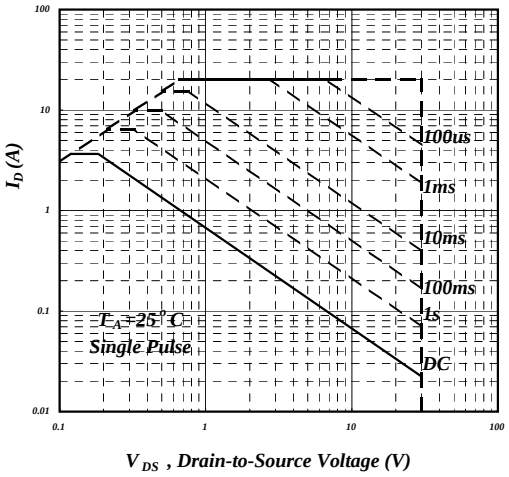


Fig 9. Maximum Safe Operating Area

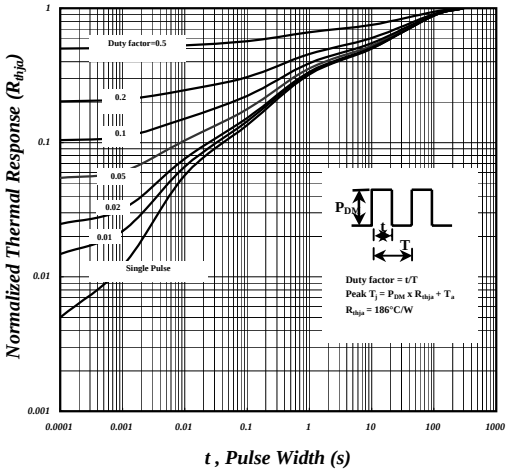


Fig 10. Effective Transient Thermal Impedance

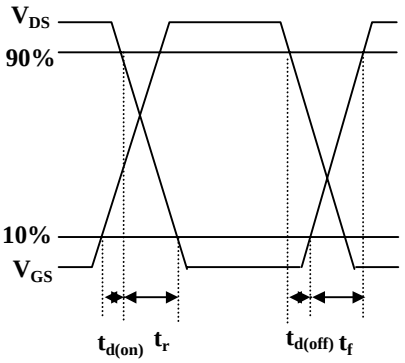


Fig 11. Switching Time Waveforms

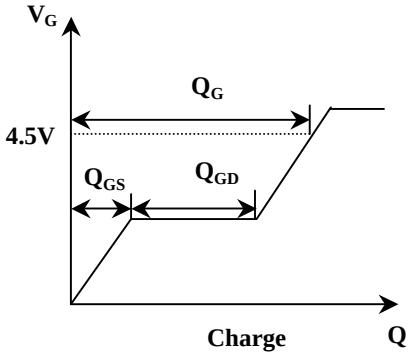


Fig 12. Gate Charge Waveform

Typical P-channel Electrical Characteristics

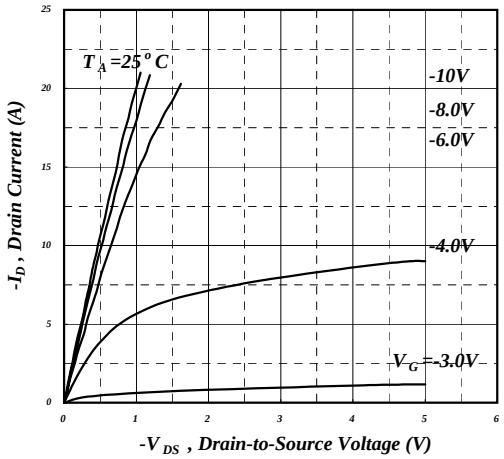


Fig 1. Typical Output Characteristics

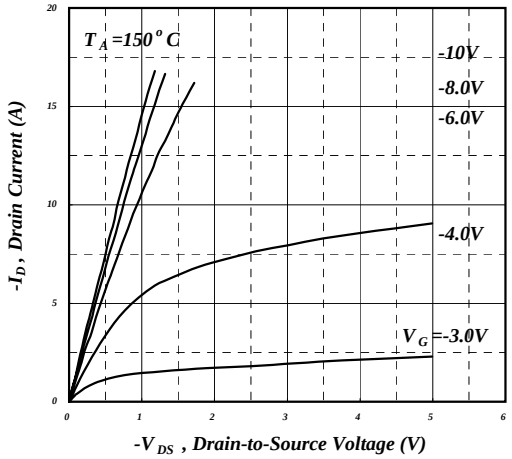


Fig 2. Typical Output Characteristics

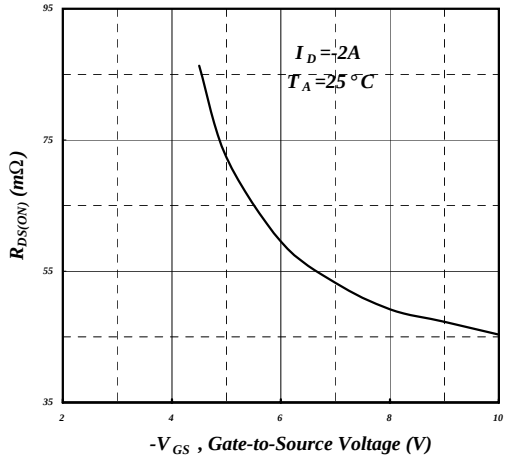


Fig 3. On-Resistance vs. Gate Voltage

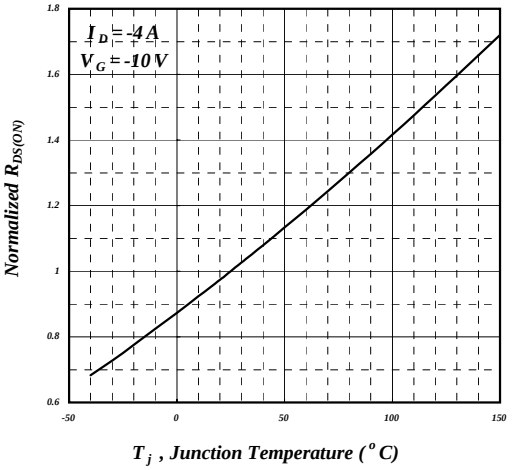


Fig 4. Normalized On-Resistance vs. Junction Temperature

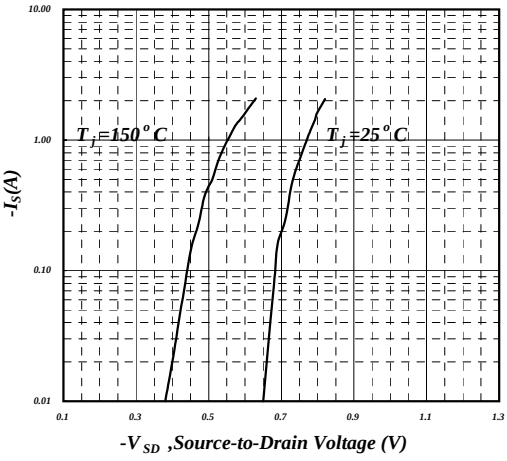


Fig 5. Forward Characteristic of Reverse Diode

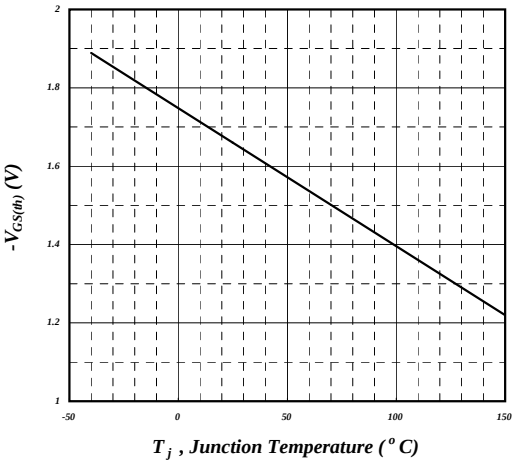


Fig 6. Gate Threshold Voltage vs. Junction Temperature

Typical P-channel Electrical Characteristics (cont.)

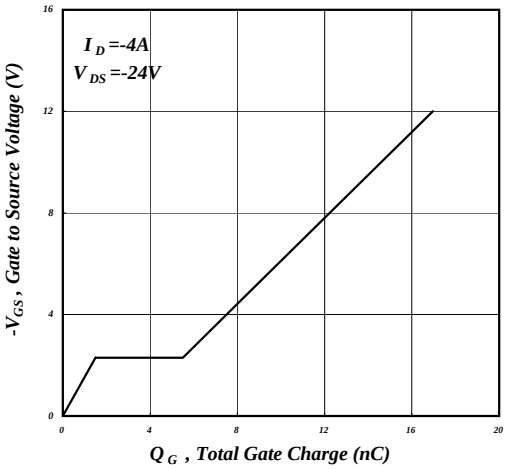


Fig 7. Gate Charge Characteristics

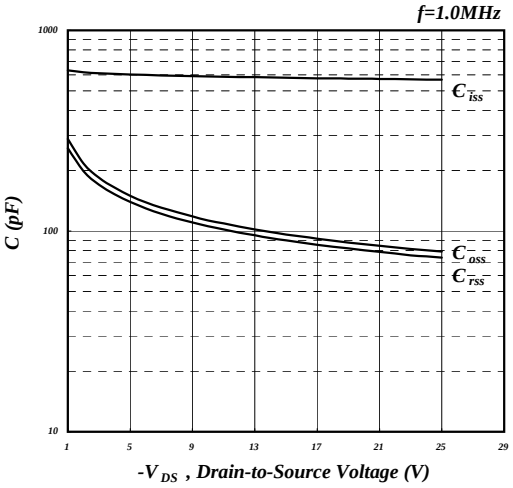


Fig 8. Typical Capacitance Characteristics

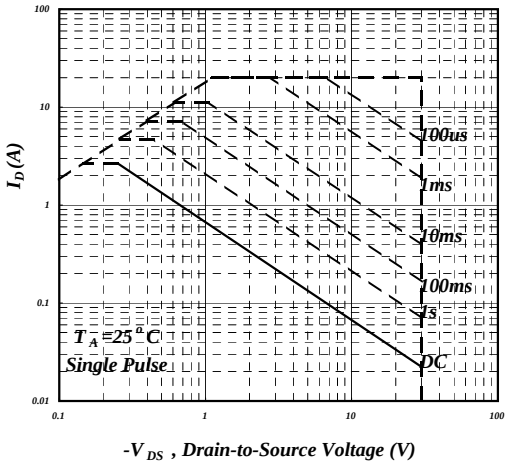


Fig 9. Maximum Safe Operating Area

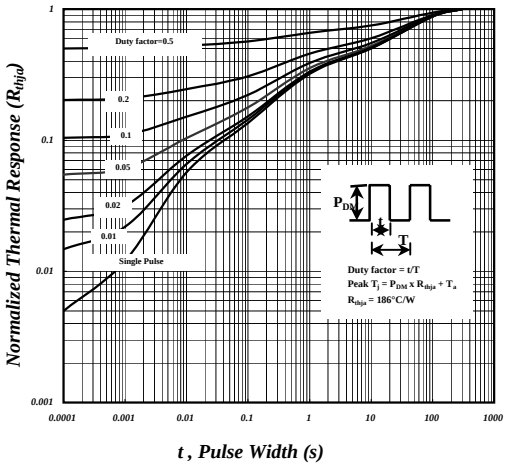


Fig 10. Effective Transient Thermal Impedance

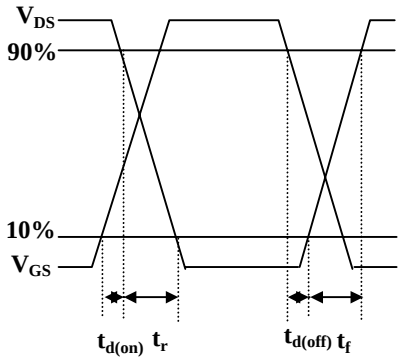


Fig 11. Switching Time Waveforms

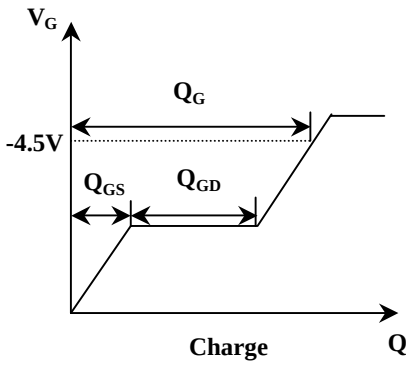
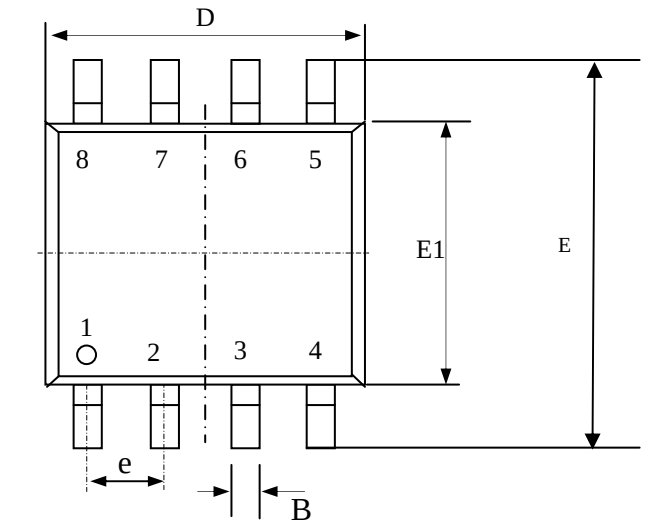
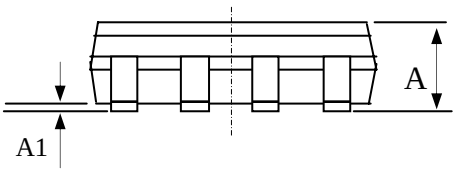


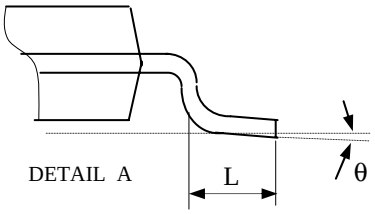
Fig 12. Gate Charge Waveform

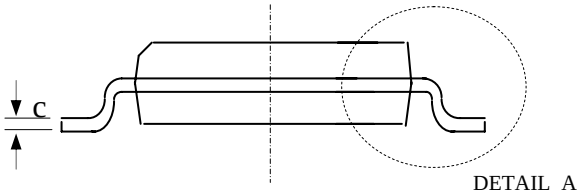
Package Dimensions: SO-8



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	1.35	1.55	1.75
A1	0.10	0.18	0.25
B	0.33	0.41	0.51
C	0.19	0.22	0.25
D	4.80	4.90	5.00
E1	3.80	3.90	4.00
E	5.80	6.15	6.50
L	0.38	0.71	1.27
θ	0	4.00	8.00
e	1.27 TYP		

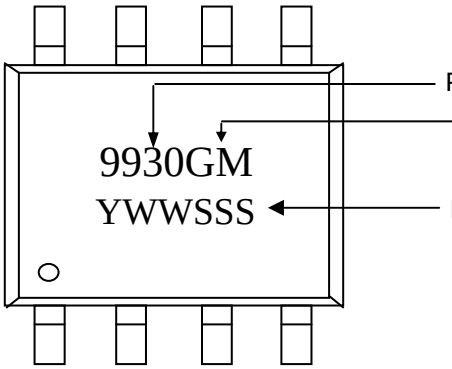






1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information:



Product: AP9930

Package:
GM = RoHS-compliant halogen-free SO-8

Date/lot code (YWWSSS)
Y: Last digit of the year
WW: Work week
SSS: Lot code sequence