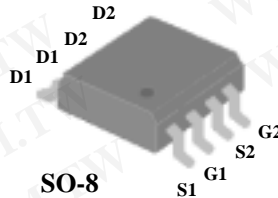




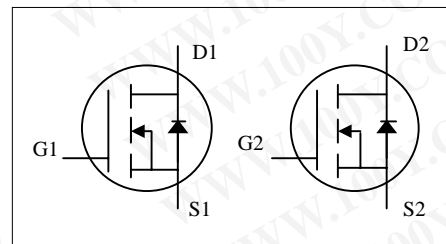
- ▼ Low On-Resistance
- ▼ Fast Switching Speed
- ▼ Surface Mount Package



$BV_{DSS}$	40V
$R_{DS(ON)}$	20m $\Omega$
$I_D$	7.8A

## Description

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



## Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	40	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current <sup>3</sup>	7.8	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current <sup>3</sup>	6.2	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	20	A
$P_D @ T_A = 25^\circ C$	Total Power Dissipation	2	W
	Linear Derating Factor	0.016	W/ $^\circ C$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$

## Thermal Data

Symbol	Parameter	Value	Unit
Rthj-amb	Thermal Resistance Junction-ambient <sup>3</sup>	Max. 62.5	$^\circ C/W$

# AP9960M



## Electrical Characteristics @ $T_j=25^{\circ}\text{C}$ (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
$\Delta BV_{DSS}/\Delta T_j$	Breakdown Voltage Temperature Coefficient	Reference to $25^{\circ}\text{C}$ , $I_D=1\text{mA}$	-	0.032	-	$\text{V}/^{\circ}\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=7A$	-	-	20	$\text{m}\Omega$
		$V_{GS}=4.5V, I_D=5A$	-	-	32	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1	-	3	V
$g_{fs}$	Forward Transconductance	$V_{DS}=10V, I_D=7A$	-	25	-	S
$I_{DSS}$	Drain-Source Leakage Current ( $T_j=25^{\circ}\text{C}$ )	$V_{DS}=40V, V_{GS}=0V$	-	-	1	$\mu A$
	Drain-Source Leakage Current ( $T_j=70^{\circ}\text{C}$ )	$V_{DS}=32V, V_{GS}=0V$	-	-	25	$\mu A$
$I_{GSS}$	Gate-Source Leakage	$V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
$Q_g$	Total Gate Charge <sup>2</sup>	$I_D=7A$	-	14.7	-	nC
$Q_{gs}$	Gate-Source Charge	$V_{DS}=20V$	-	7.1	-	nC
$Q_{gd}$	Gate-Drain ("Miller") Charge	$V_{GS}=4.5V$	-	6.8	-	nC
$t_{d(on)}$	Turn-on Delay Time <sup>2</sup>	$V_{DS}=20V$	-	11.5	-	ns
$t_r$	Rise Time	$I_D=1A$	-	6.3	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=3.3\Omega, V_{GS}=10V$	-	28.2	-	ns
$t_f$	Fall Time	$R_D=20\Omega$	-	12.6	-	ns
$C_{iss}$	Input Capacitance	$V_{GS}=0V$	-	1725	-	pF
$C_{oss}$	Output Capacitance	$V_{DS}=25V$	-	235	-	pF
$C_{rss}$	Reverse Transfer Capacitance	$f=1.0\text{MHz}$	-	145	-	pF

## Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$I_S$	Continuous Source Current ( Body Diode )	$V_D=V_G=0V, V_S=1.3V$	-	-	2.3	A
$I_{SM}$	Pulsed Source Current ( Body Diode ) <sup>1</sup>		-	-	20	A
$V_{SD}$	Forward On Voltage <sup>2</sup>	$T_j=25^{\circ}\text{C}, I_S=2.3A, V_{GS}=0V$	-	-	1.3	V

### Notes:

1. Pulse width limited by Max. junction temperature.
2. Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
3. Surface mounted on FR4 board,  $t \leq 10$  sec.

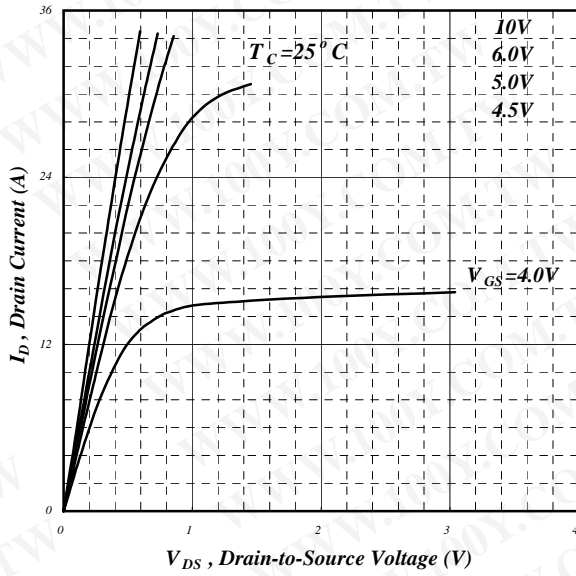


Fig 1. Typical Output Characteristics

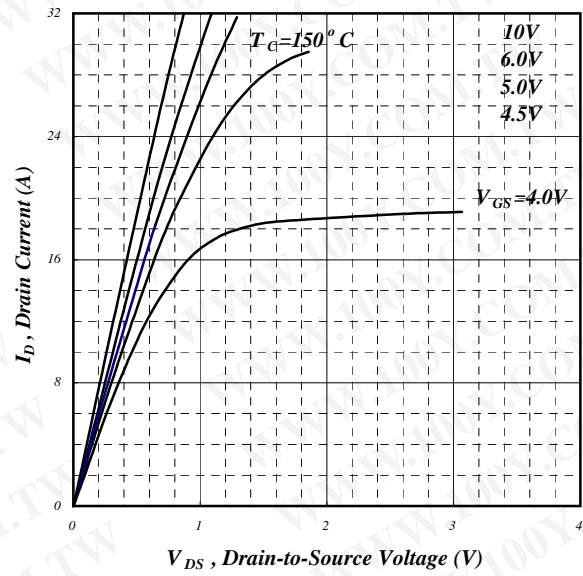


Fig 2. Typical Output Characteristics

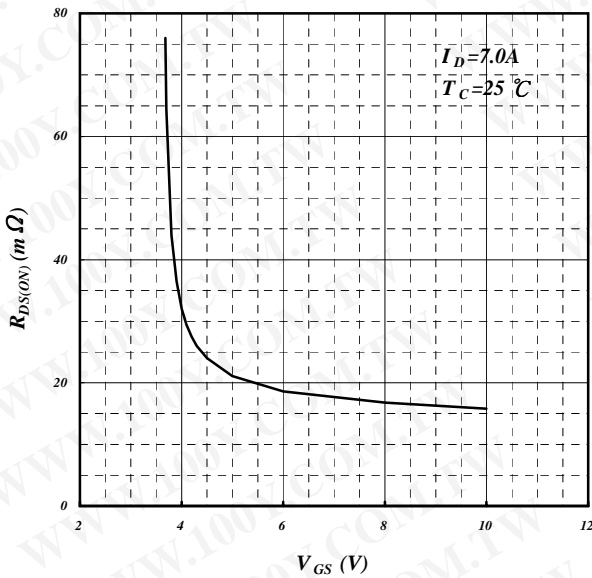


Fig 3. On-Resistance v.s. Gate Voltage

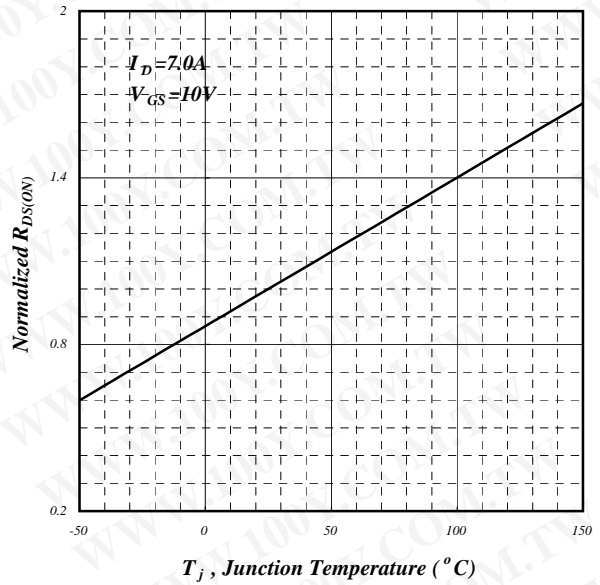


Fig 4. Normalized On-Resistance v.s. Junction Temperature

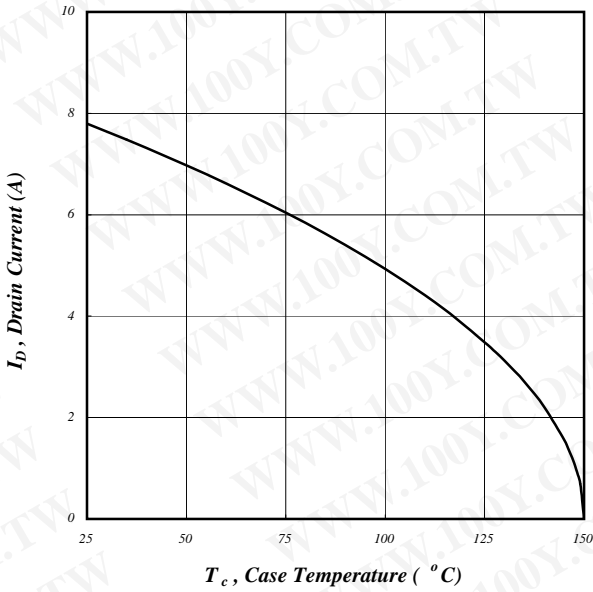


Fig 5. Maximum Drain Current v.s. Case Temperature

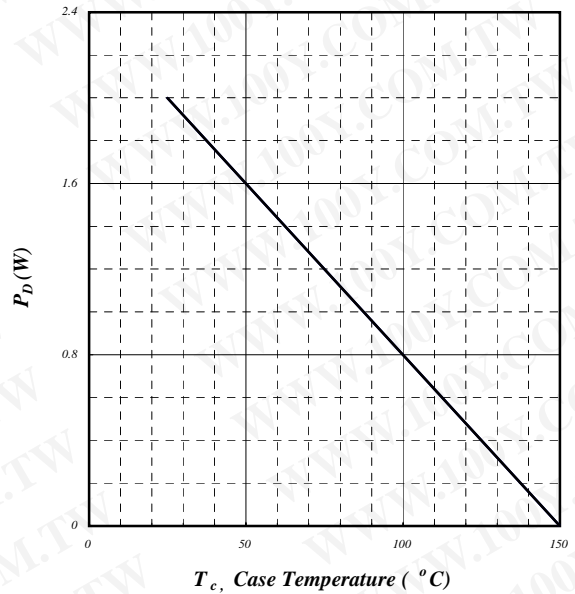


Fig 6. Typical Power Dissipation

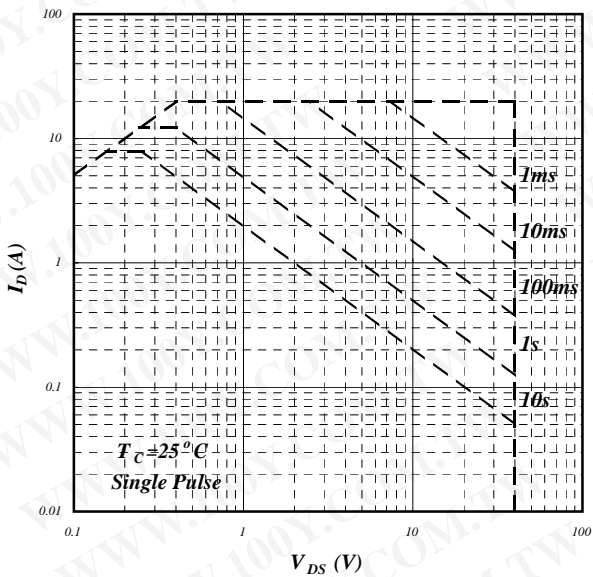


Fig 7. Maximum Safe Operating Area

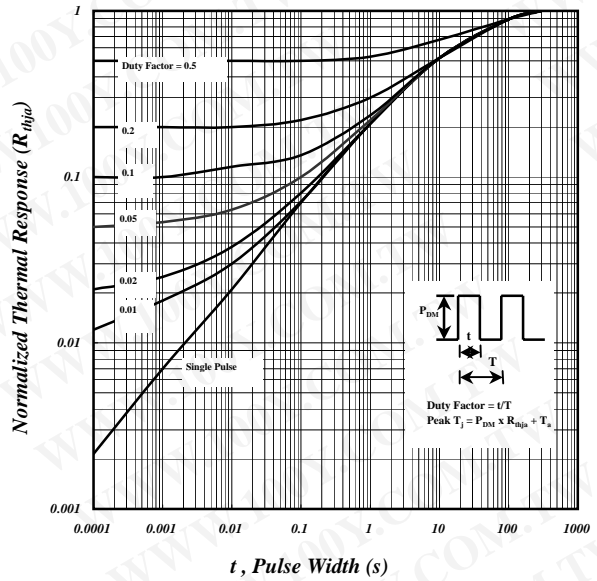


Fig 8. Effective Transient Thermal Impedance



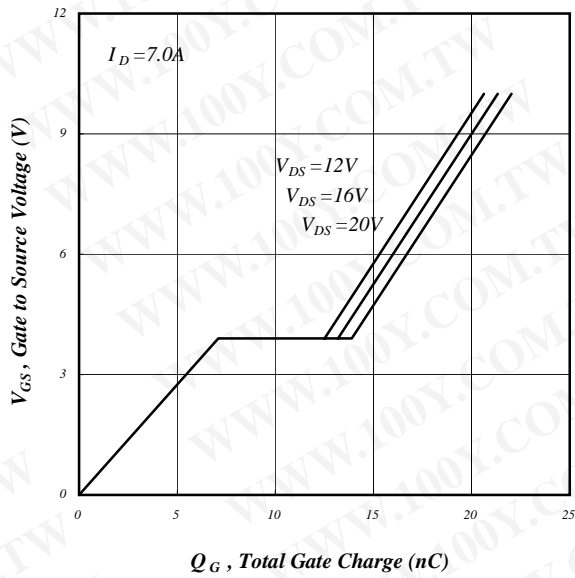


Fig 9. Gate Charge Characteristics

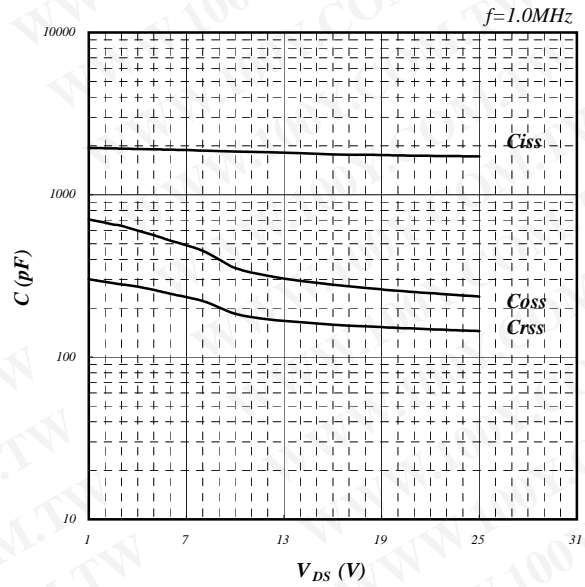


Fig 10. Typical Capacitance Characteristics

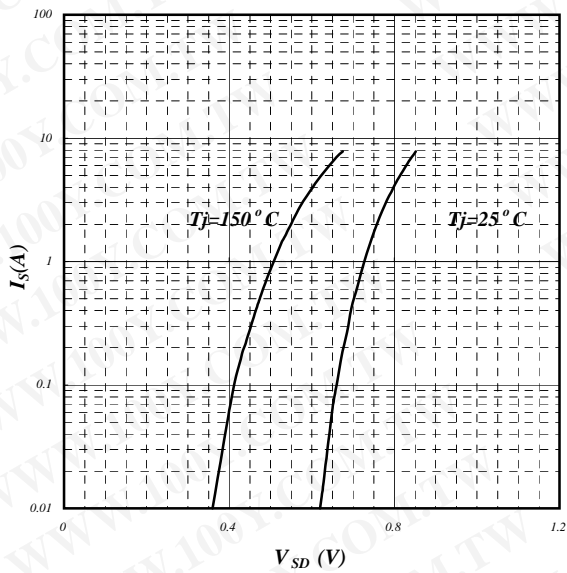


Fig 11. Forward Characteristic of Reverse Diode

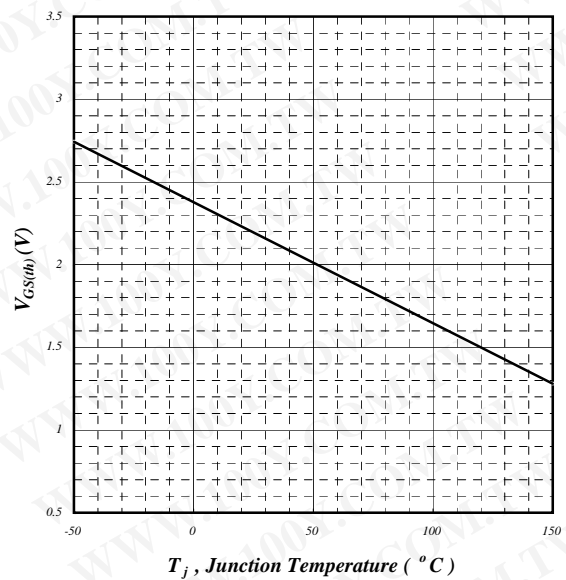


Fig 12. Gate Threshold Voltage v.s. Junction Temperature

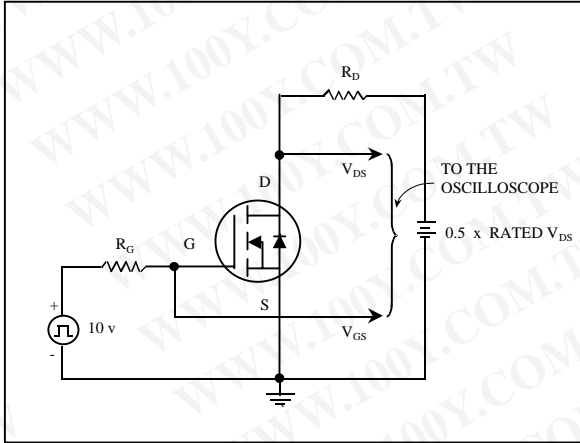


Fig 13. Switching Time Circuit

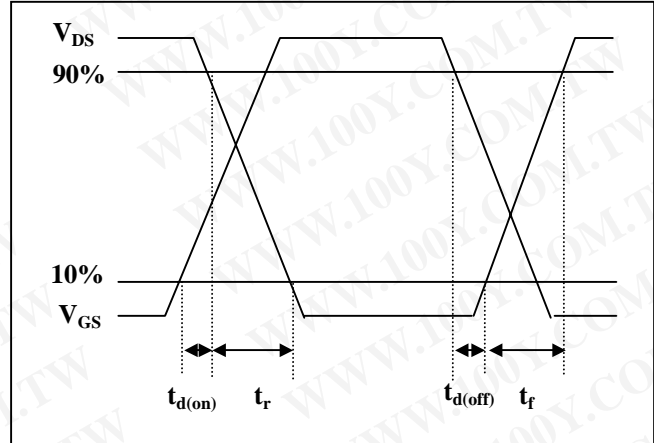


Fig 14. Switching Time Waveform

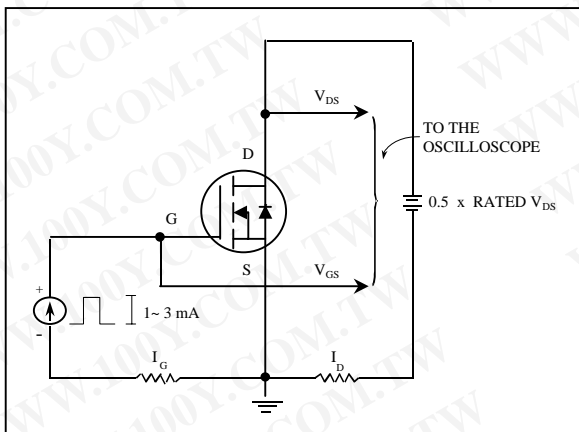


Fig 15. Gate Charge Circuit

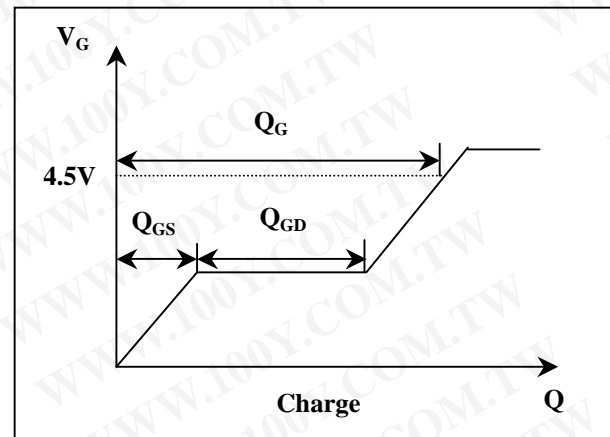


Fig 16. Gate Charge Waveform