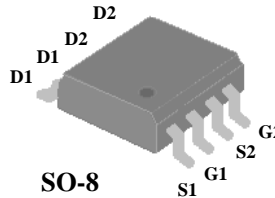




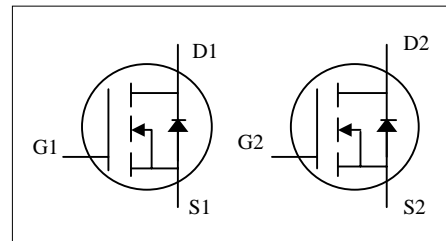
- ▼ Low On-Resistance
- ▼ Fast Switching Speed
- ▼ Surface Mount Package
- ▼ RoHS Compliant & Halogen-Free



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

## Description

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
$R_{thj-amb}$	Maximum Thermal Resistance, Junction-ambient <sup>3</sup>	62.5	$^\circ C/W$



# AP9960GM-HF

## 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 <sup>2</sup>	$V_{GS}=10V, I_D=7A$	-	-	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	$V_{DS}=40V, V_{GS}=0V$	-	-	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	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	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
$C_{riss}$	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 )	$V_D=V_G=0V, V_S=1.3V$	-	-	1.54	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 1 in<sup>2</sup> copper pad of FR4 board ;  $135^{\circ}\text{C}/\text{W}$  when mounted on Min. 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.

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.

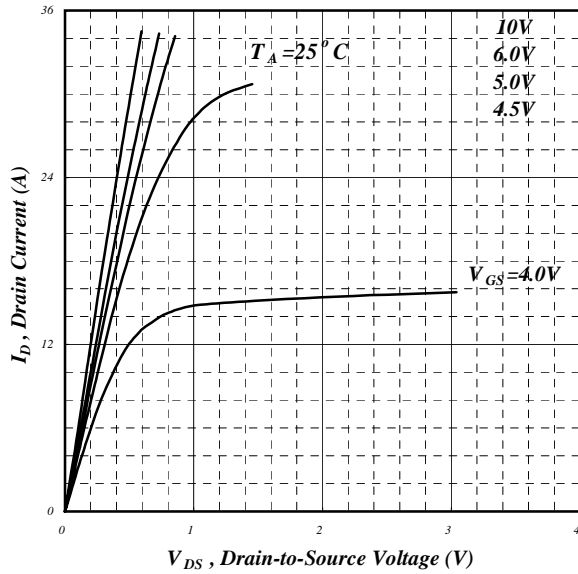


Fig 1. Typical Output Characteristics

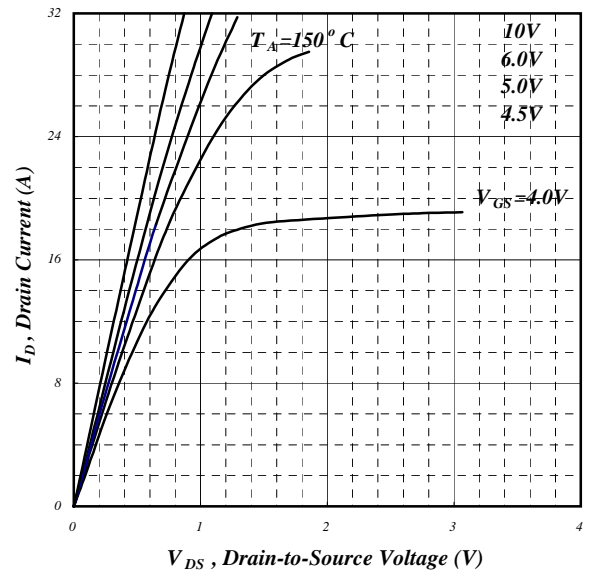


Fig 2. Typical Output Characteristics

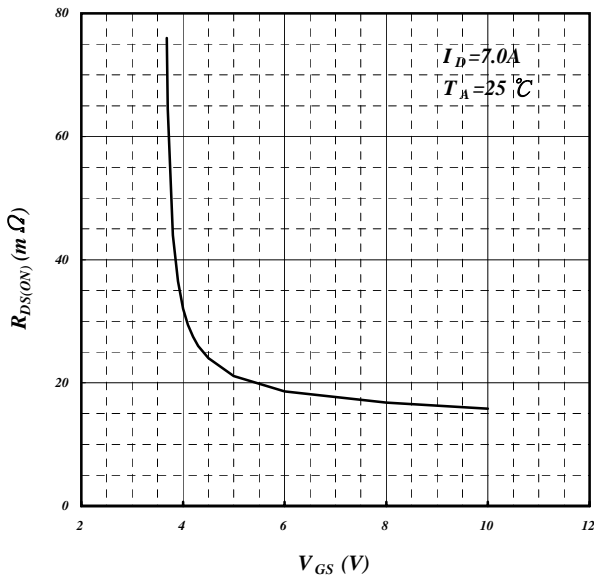


Fig 3. On-Resistance v.s. Gate Voltage

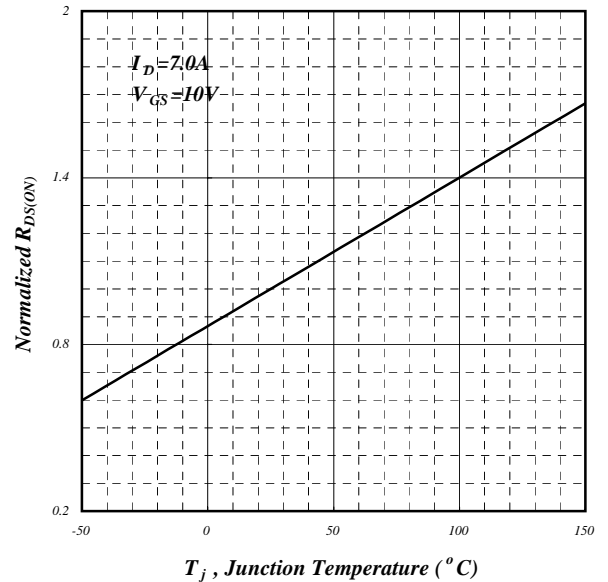


Fig 4. Normalized On-Resistance v.s. Junction Temperature

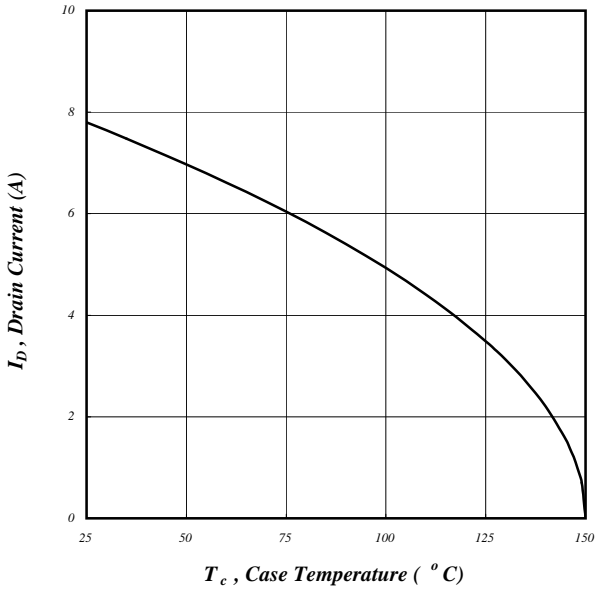


Fig 5. Maximum Drain Current v.s. Case Temperature

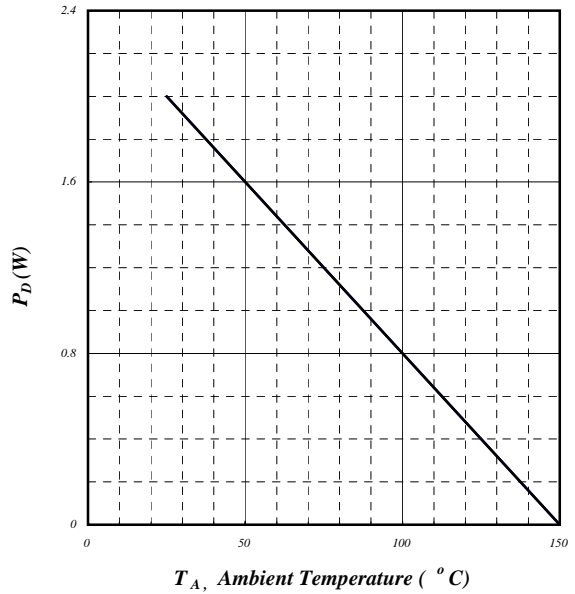


Fig 6. Typical Power Dissipation

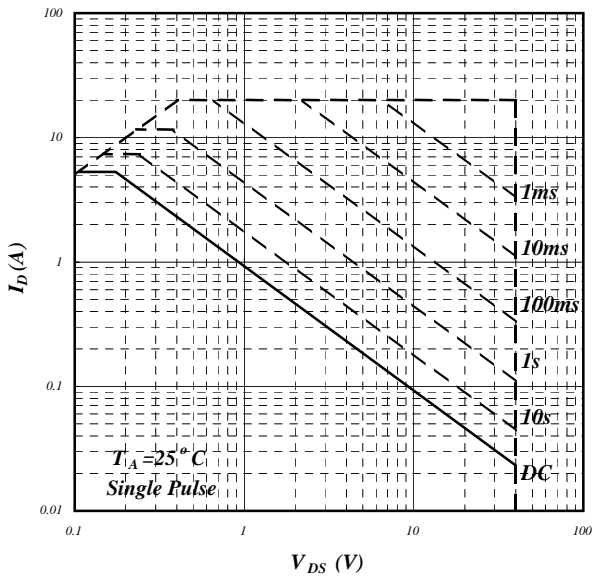


Fig 7. Maximum Safe Operating Area

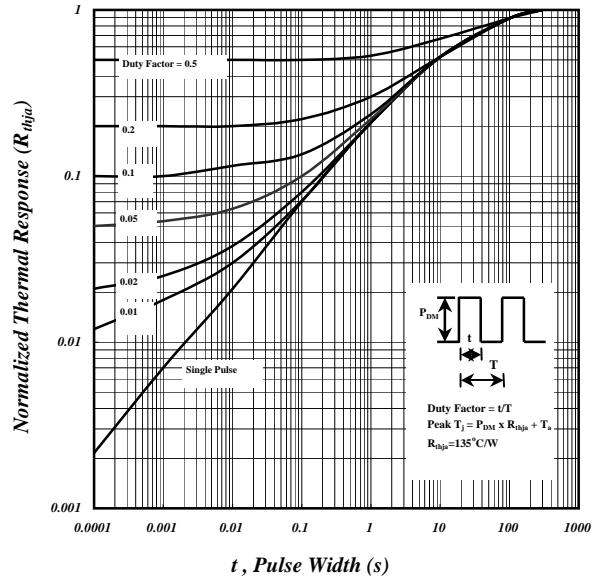


Fig 8. Effective Transient Thermal Impedance

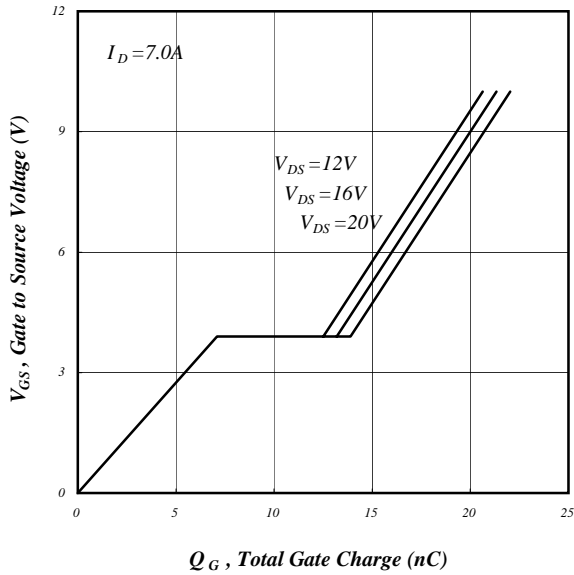


Fig 9. Gate Charge Characteristics

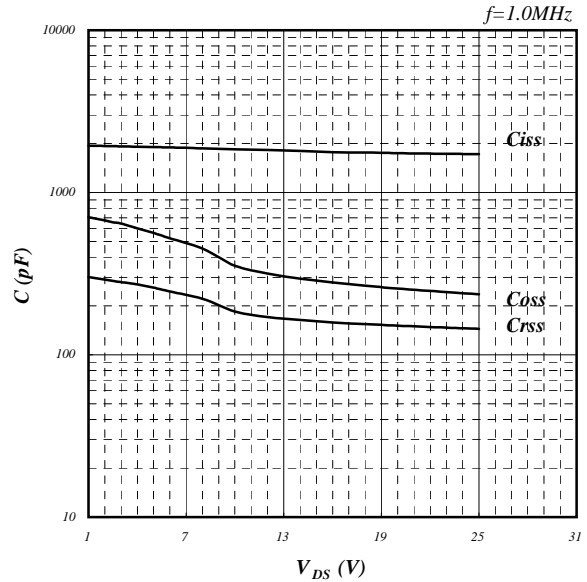


Fig 10. Typical Capacitance Characteristics

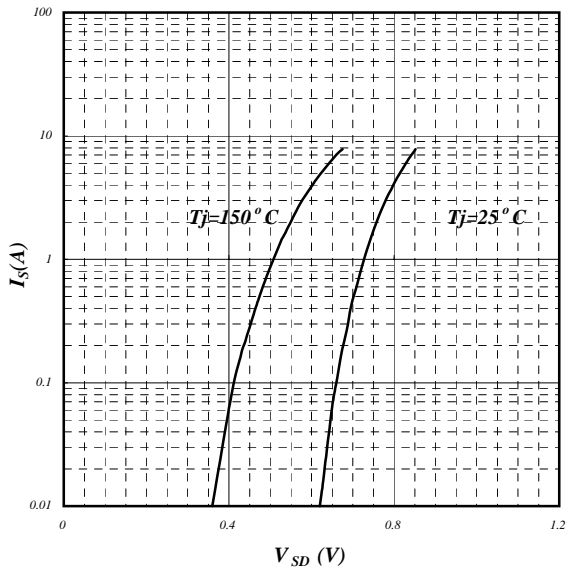


Fig 11. Forward Characteristic of Reverse Diode

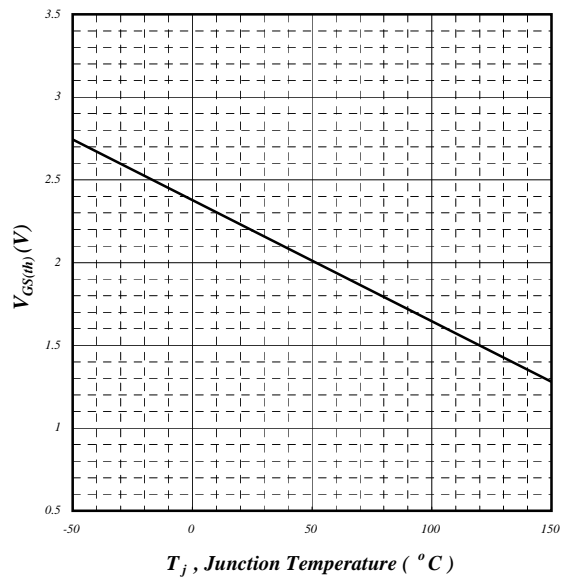


Fig 12. Gate Threshold Voltage v.s. Junction Temperature

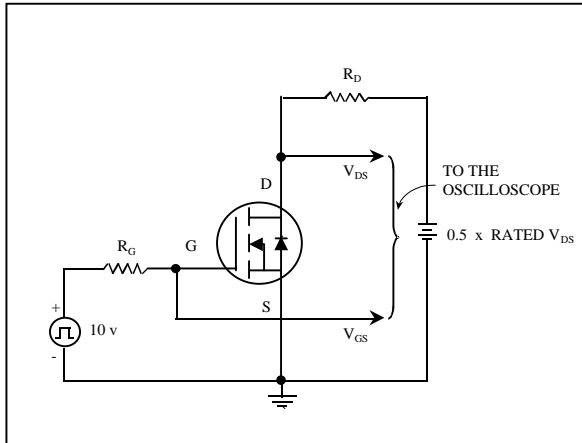


Fig 13. Switching Time Circuit

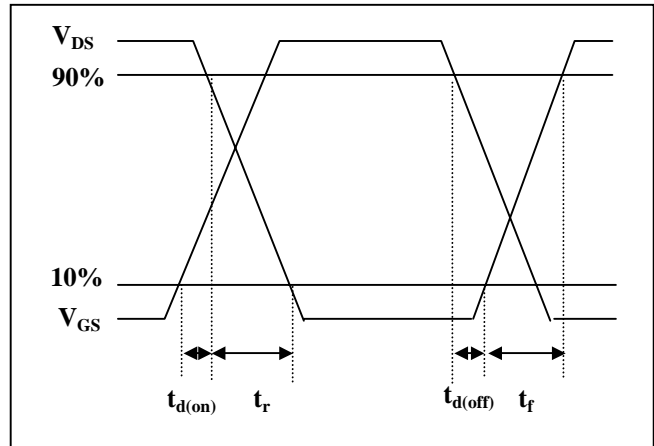


Fig 14. Switching Time Waveform

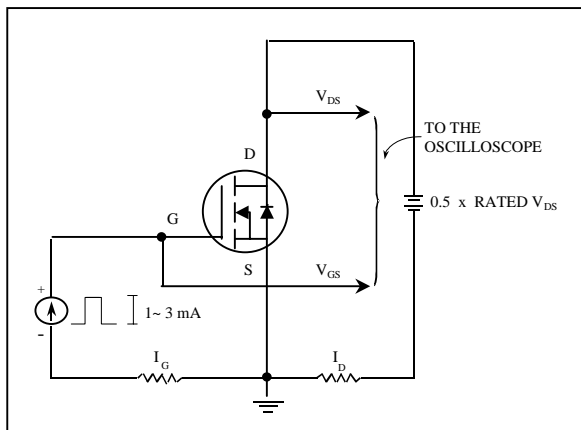


Fig 15. Gate Charge Circuit

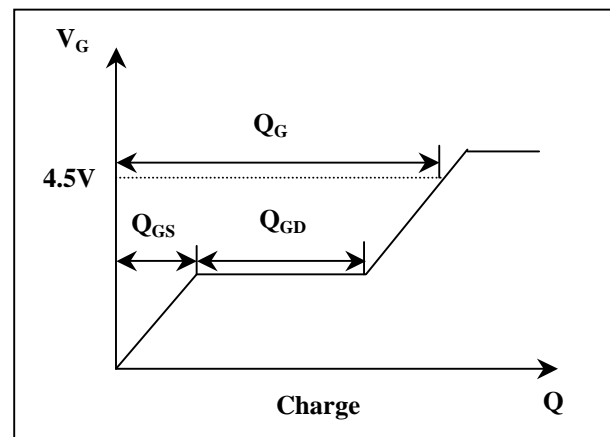


Fig 16. Gate Charge Waveform