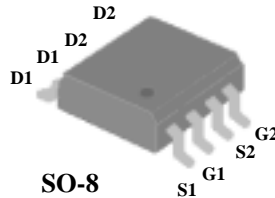




N AND P-CHANNEL ENHANCEMENT  
MODE POWER MOSFET

- ▼ Simple Drive Requirement
- ▼ Low On-resistance
- ▼ Fast Switching

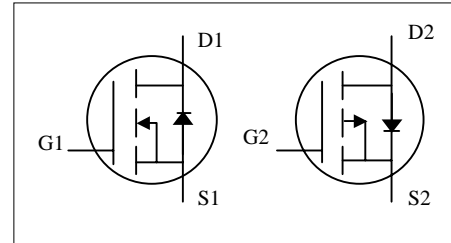


N-CH	$BV_{DSS}$	20V
	$R_{DS(ON)}$	30m $\Omega$
	$I_D$	6A
P-CH	$BV_{DSS}$	-20V
	$R_{DS(ON)}$	50m $\Omega$
	$I_D$	-5A

**Description**

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

The SO-8 package is universally preferred for all commercial-industrial surface mount applications and suited for low voltage applications such as DC/DC converters.



**Absolute Maximum Ratings**

Symbol	Parameter	Rating		Units
		N-channel	P-channel	
$V_{DS}$	Drain-Source Voltage	20	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 8$	$\pm 8$	V
$I_D @ T_A=25^\circ C$	Continuous Drain Current <sup>3</sup>	6	-5	A
$I_D @ T_A=70^\circ C$	Continuous Drain Current <sup>3</sup>	4.8	-4	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	20	-20	A
$P_D @ T_A=25^\circ C$	Total Power Dissipation	2.0		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
$R_{thj-amb}$	Thermal Resistance Junction-ambient <sup>3</sup>	Max. 62.5	$^\circ C/W$



**N-CH Electrical Characteristics @T<sub>j</sub>=25°C(unless otherwise specified)**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	20	-	-	V
ΔBV <sub>DSS</sub> /ΔT <sub>j</sub>	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA	-	0.037	-	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =6A	-	-	30	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =5.2A	-	-	45	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	0.5	-	1.2	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =10V, I <sub>D</sub> =6A	-	18.5	-	S
I <sub>DSS</sub>	Drain-Source Leakage Current (T <sub>j</sub> =25°C)	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V	-	-	1	uA
	Drain-Source Leakage Current (T <sub>j</sub> =70°C)	V <sub>DS</sub> =16V, V <sub>GS</sub> =0V	-	-	25	uA
I <sub>GSS</sub>	Gate-Source Leakage	V <sub>GS</sub> =±8V	-	-	±100	nA
Q <sub>g</sub>	Total Gate Charge <sup>2</sup>	I <sub>D</sub> =6A	-	9	-	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =10V	-	1.8	-	nC
Q <sub>gd</sub>	Gate-Drain ("Miller") Charge	V <sub>GS</sub> =4.5V	-	4.2	-	nC
t <sub>d(on)</sub>	Turn-on Delay Time <sup>2</sup>	V <sub>DS</sub> =10V	-	29	-	ns
t <sub>r</sub>	Rise Time	I <sub>D</sub> =1A	-	65	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time	R <sub>G</sub> =6Ω, V <sub>GS</sub> =4.5V	-	60	-	ns
t <sub>f</sub>	Fall Time	R <sub>D</sub> =10Ω	-	50	-	ns
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V	-	300	-	pF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> =8V	-	255	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance	f=1.0MHz	-	115	-	pF

**Source-Drain Diode**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
I <sub>S</sub>	Continuous Source Current ( Body Diode )	V <sub>D</sub> =V <sub>G</sub> =0V , V <sub>S</sub> =1.2V	-	-	1.67	A
V <sub>SD</sub>	Forward On Voltage <sup>2</sup>	T <sub>j</sub> =25°C, I <sub>S</sub> =1.7A, V <sub>GS</sub> =0V	-	-	1.2	V

**P-CH 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	$V_{GS}=0V, I_D=250\mu A$	-20	-	-	V
$\Delta BV_{DSS}/\Delta T_j$	Breakdown Voltage Temperature Coefficient	Reference to $25^\circ\text{C}$ , $I_D=-1\text{mA}$	-	-0.037	-	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=-4.5V, I_D=-2.2A$	-	-	50	$\text{m}\Omega$
		$V_{GS}=-2.5V, I_D=-1.8A$	-	-	80	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.5	-	-1	V
$g_{fs}$	Forward Transconductance	$V_{DS}=-10V, I_D=-2.2A$	-	2.5	-	S
$I_{DSS}$	Drain-Source Leakage Current ( $T=25^\circ\text{C}$ )	$V_{DS}=-20V, V_{GS}=0V$	-	-	-1	$\mu A$
	Drain-Source Leakage Current ( $T=70^\circ\text{C}$ )	$V_{DS}=-16V, V_{GS}=0V$	-	-	-25	$\mu A$
$I_{GSS}$	Gate-Source Leakage	$V_{GS}=\pm 8V$	-	-	$\pm 100$	nA
$Q_g$	Total Gate Charge <sup>2</sup>	$I_D=-2.2A$	-	11.5	-	nC
$Q_{gs}$	Gate-Source Charge	$V_{DS}=-6V$	-	3.2	-	nC
$Q_{gd}$	Gate-Drain ("Miller") Charge	$V_{GS}=-4.5V$	-	1.5	-	nC
$t_{d(on)}$	Turn-on Delay Time <sup>2</sup>	$V_{DS}=-10V$	-	10	-	ns
$t_r$	Rise Time	$I_D=-2.2A$	-	25	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=6\Omega, V_{GS}=-4.5V$	-	50	-	ns
$t_f$	Fall Time	$R_D=4.5\Omega$	-	30	-	ns
$C_{iss}$	Input Capacitance	$V_{GS}=0V$	-	940	-	pF
$C_{oss}$	Output Capacitance	$V_{DS}=-15V$	-	440	-	pF
$C_{rss}$	Reverse Transfer Capacitance	$f=1.0\text{MHz}$	-	130	-	pF

**Source-Drain Diode**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$I_S$	Continuous Source Current ( Body Diode )	$V_D=V_G=0V, V_S=-1.2V$	-	-	-1.67	A
$V_{SD}$	Forward On Voltage <sup>2</sup>	$T_j=25^\circ\text{C}, I_S=-1.8A, V_{GS}=0V$	-	-	-1.2	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  $1\text{ in}^2$  copper pad of FR4 board ;  $135^\circ\text{C}/W$  when mounted on Min. copper pad.



N-Channel

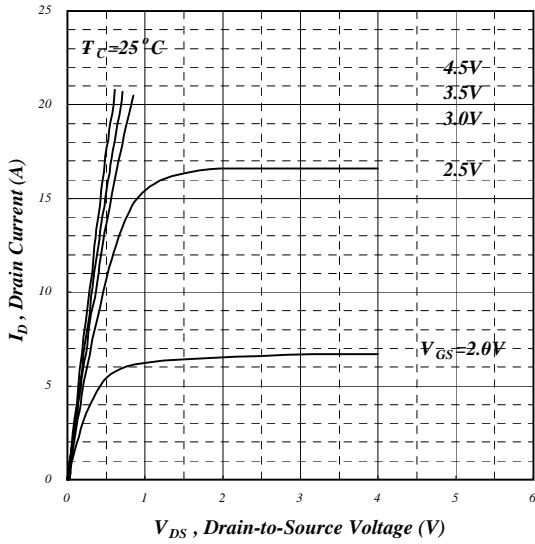


Fig 1. Typical Output Characteristics

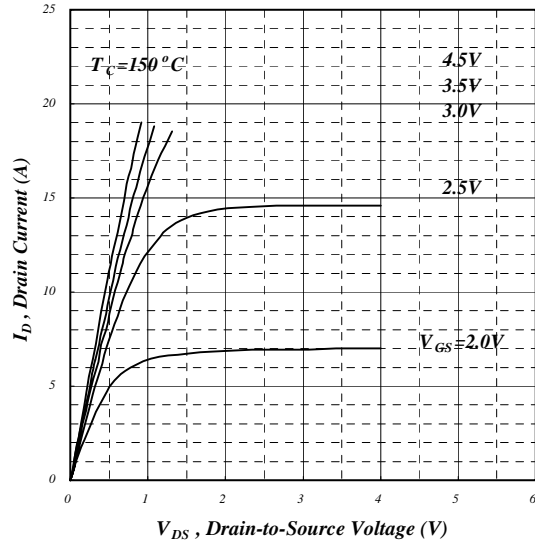


Fig 2. Typical Output Characteristics

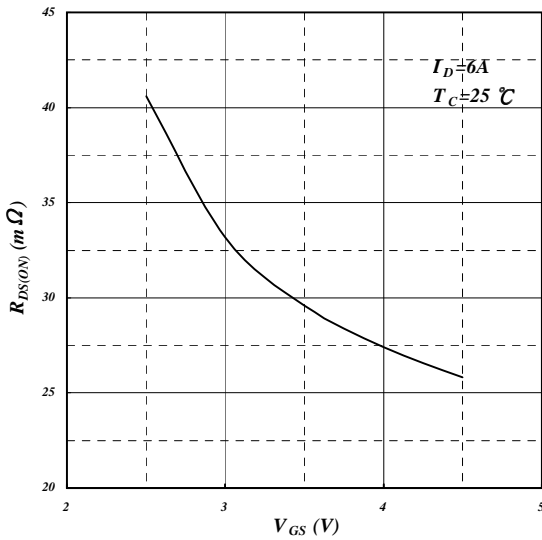


Fig 3. On-Resistance v.s. Gate Voltage

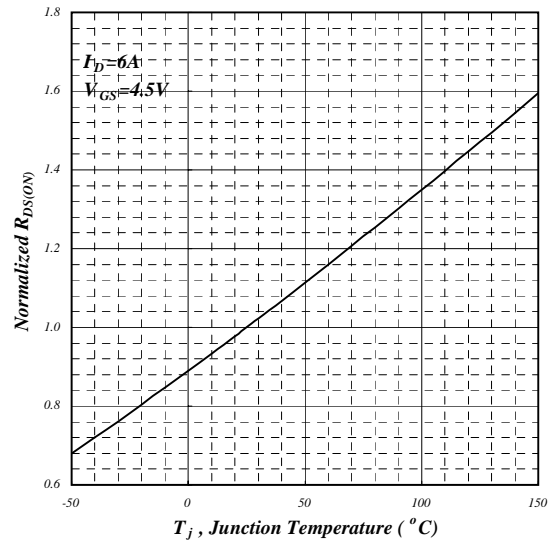


Fig 4. Normalized On-Resistance v.s. Junction Temperature



N-Channel

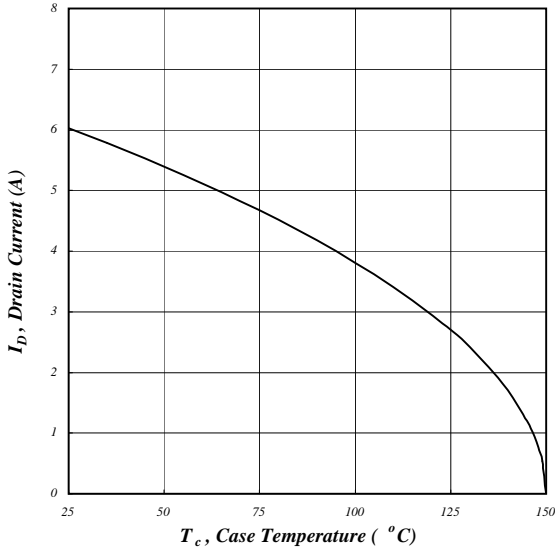


Fig 5. Maximum Drain Current v.s. Case Temperature

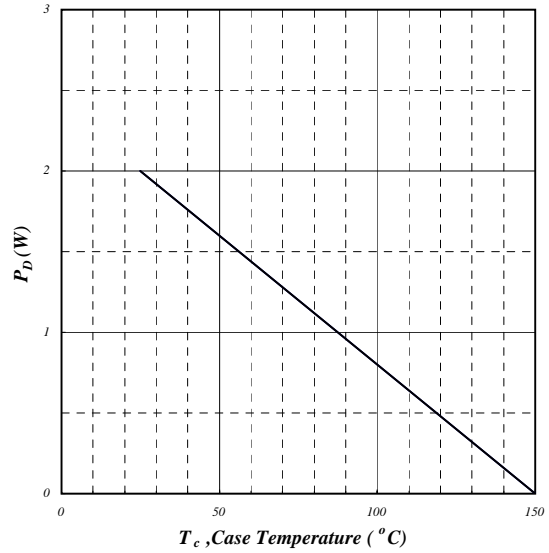


Fig 6. Typical Power Dissipation

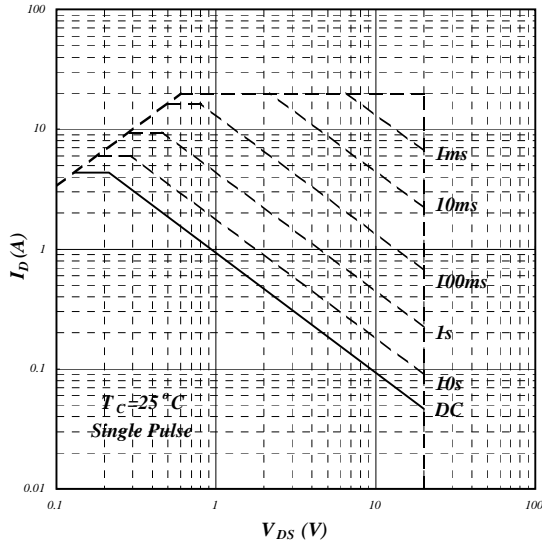


Fig 7. Maximum Safe Operating Area

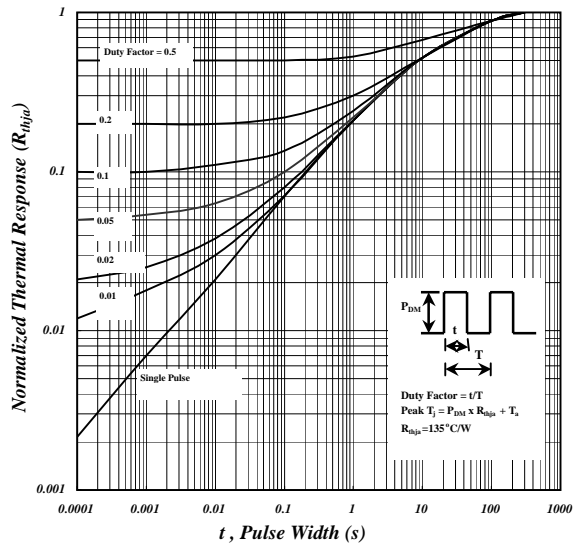


Fig 8. Effective Transient Thermal Impedance



N-Channel

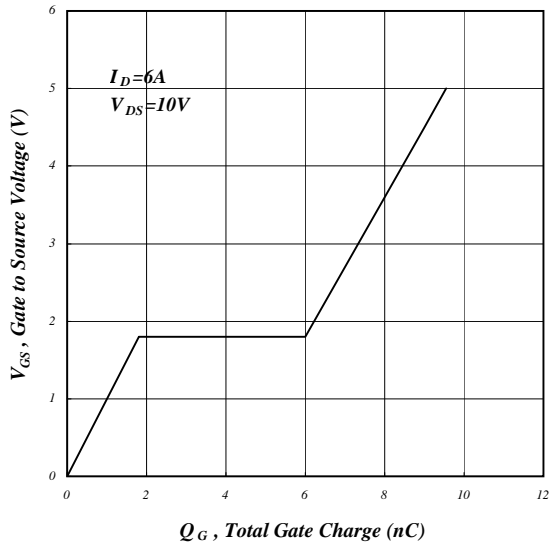


Fig 9. Gate Charge Characteristics

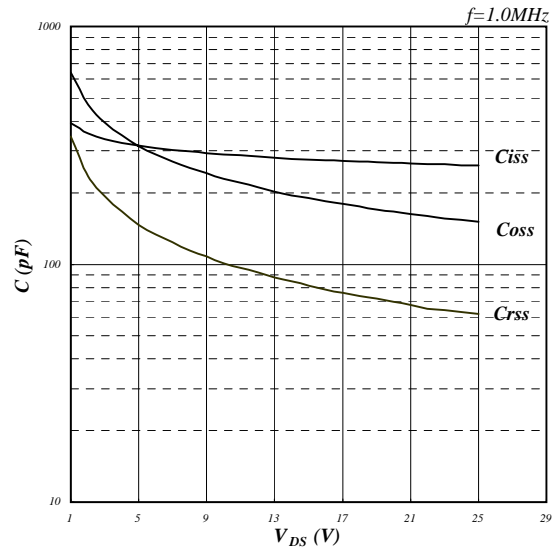


Fig 10. Typical Capacitance Characteristics

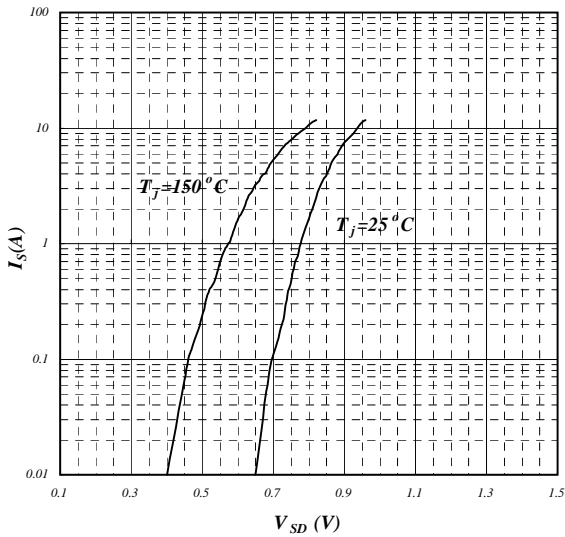


Fig 11. Forward Characteristic of Reverse Diode

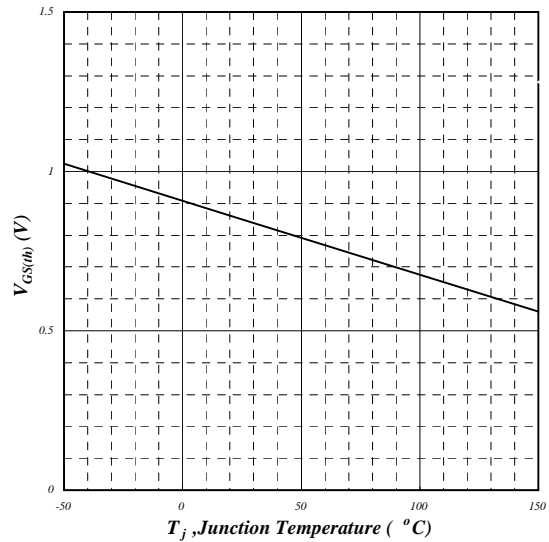


Fig 12. Gate Threshold Voltage v.s. Junction Temperature



N-Channel

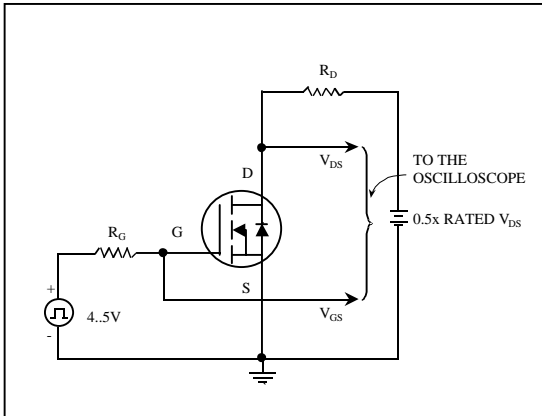


Fig 13. Switching Time Circuit

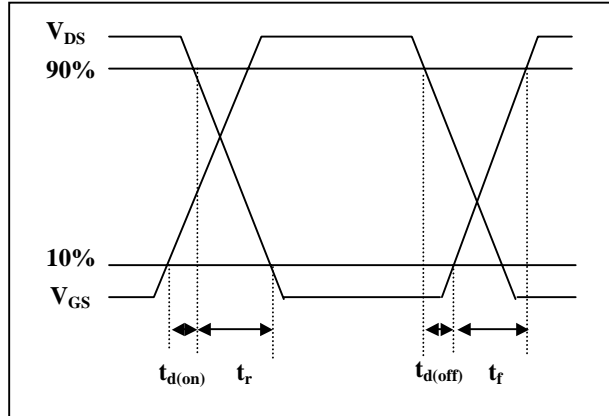


Fig 14. Switching Time Waveform

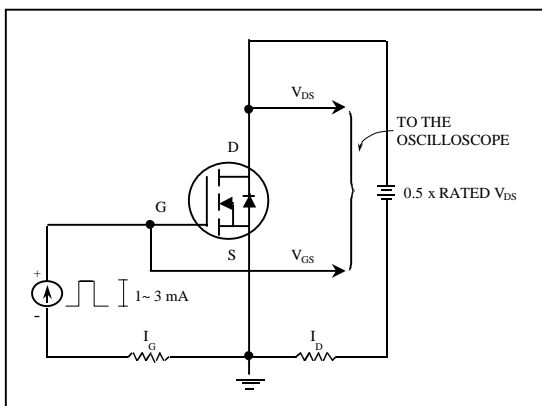


Fig 15. Gate Charge Circuit

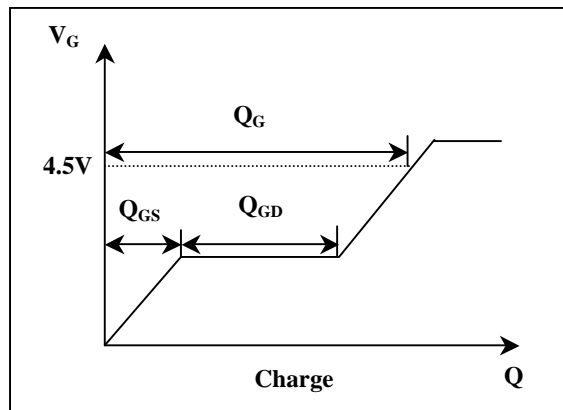


Fig 16. Gate Charge Waveform



P-Channel

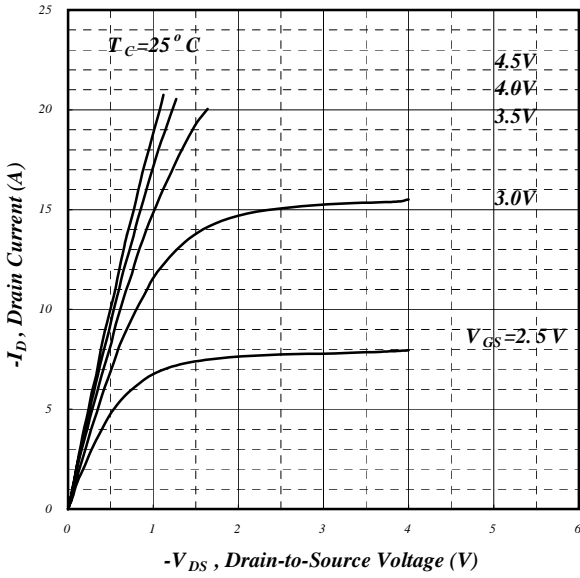


Fig 1. Typical Output Characteristics

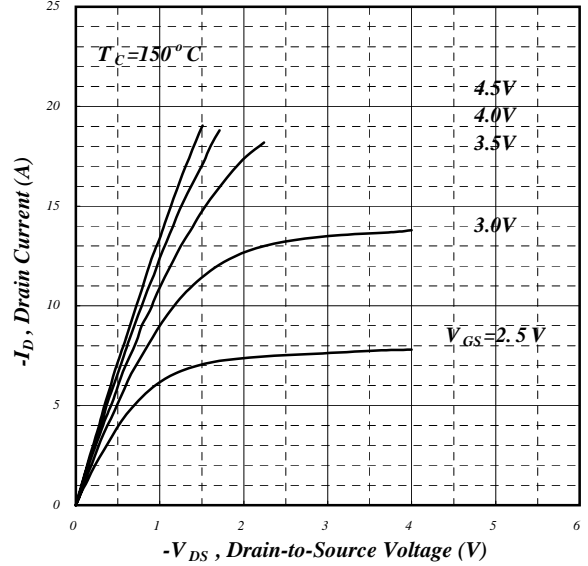


Fig 2. Typical Output Characteristics

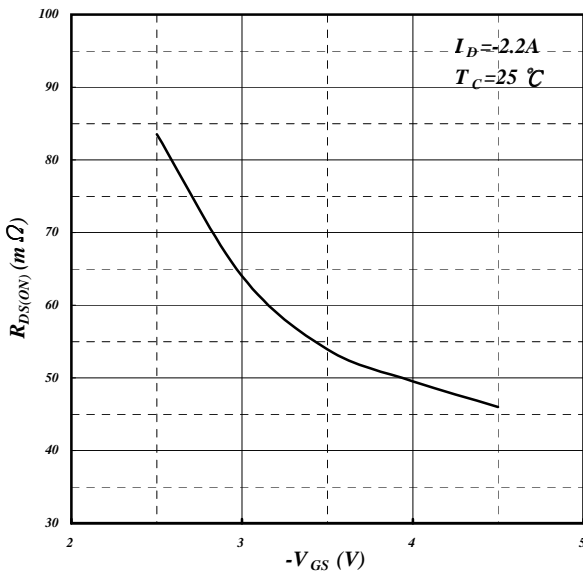


Fig 3. On-Resistance v.s. Gate Voltage

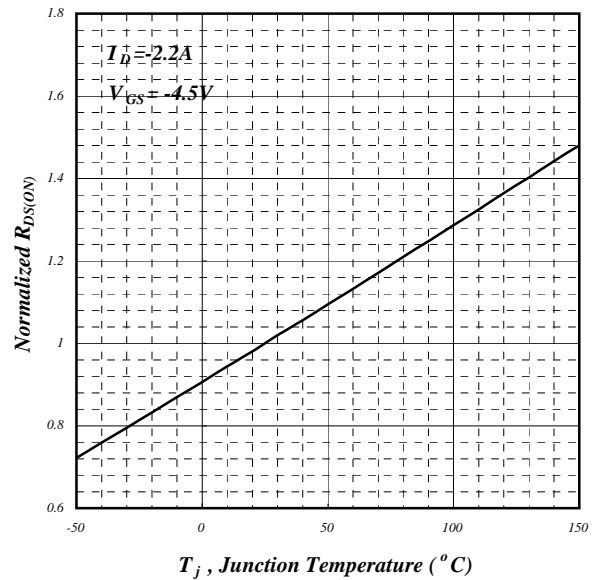


Fig 4. Normalized On-Resistance v.s. Junction Temperature





P-Channel

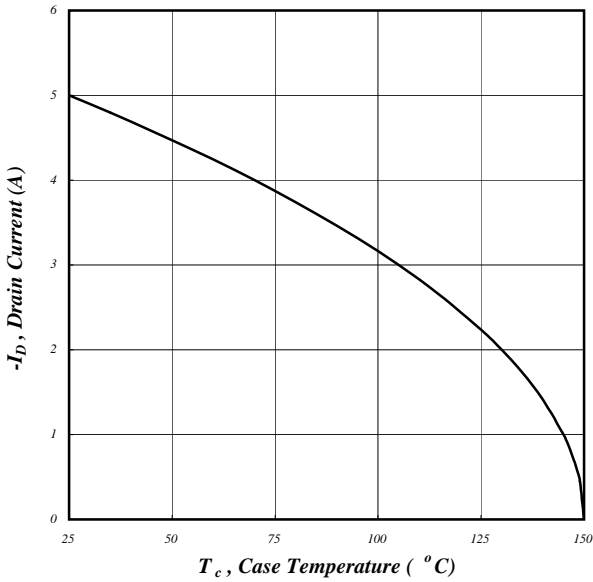


Fig 5. Maximum Drain Current v.s. Case Temperature

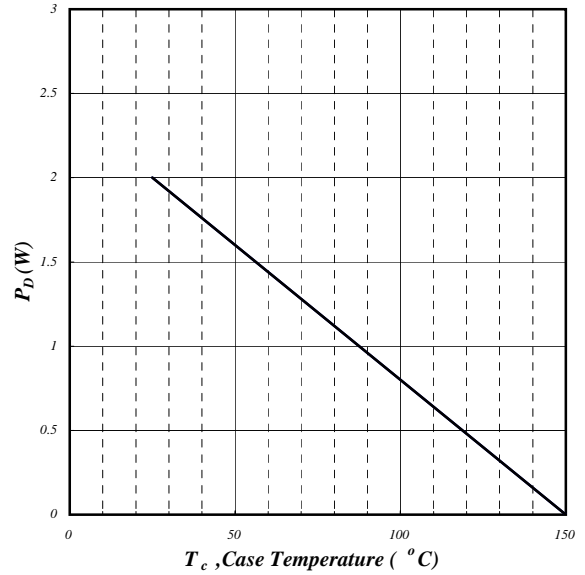


Fig 6. Typical Power Dissipation

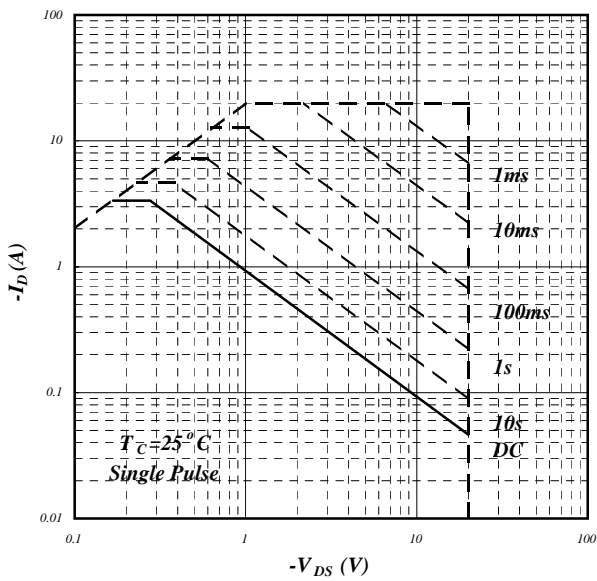


Fig 7. Maximum Safe Operating Area

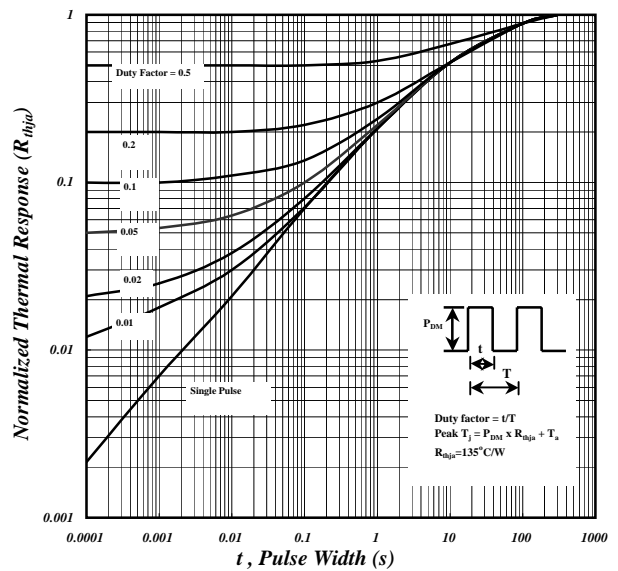


Fig 8. Effective Transient Thermal Impedance



P-Channel

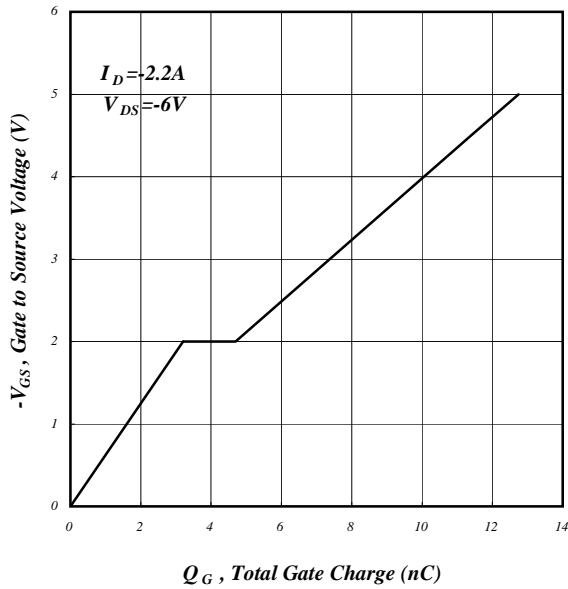


Fig 9. Gate Charge Characteristics

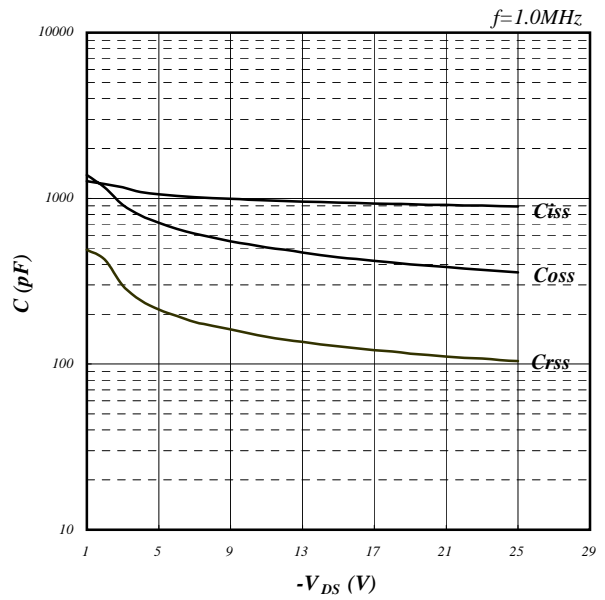


Fig 10. Typical Capacitance Characteristics

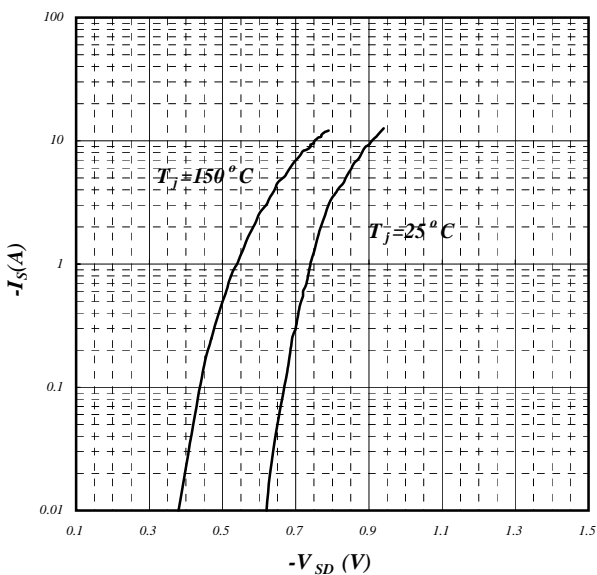


Fig 11. Forward Characteristic of Reverse Diode

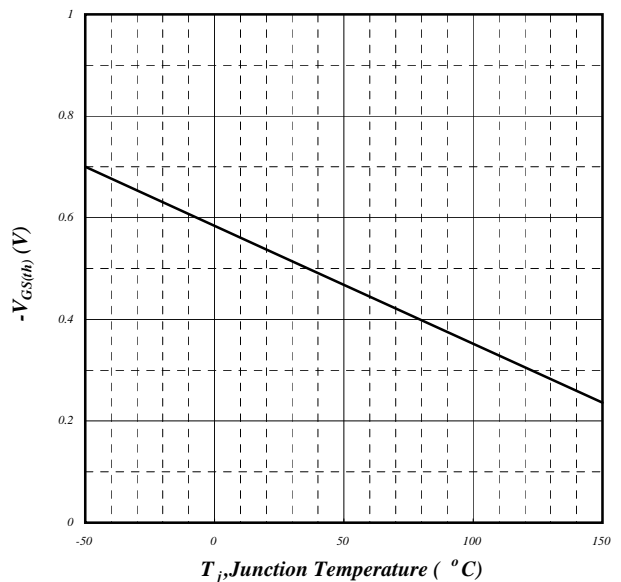


Fig 12. Gate Threshold Voltage v.s. Junction Temperature



P-Channel

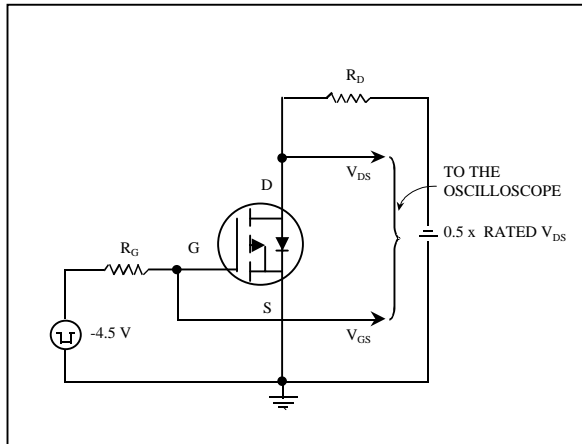


Fig 13. Switching Time Circuit

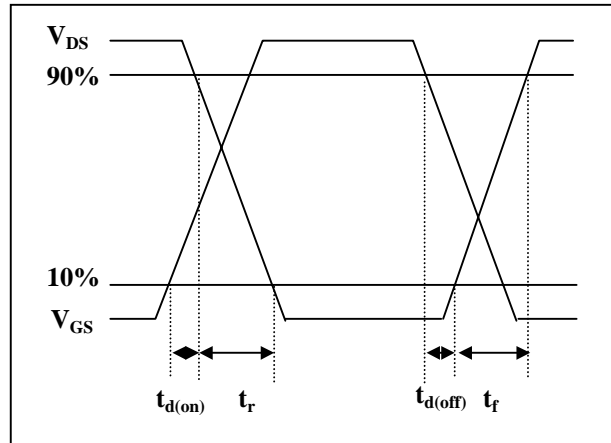


Fig 14. Switching Time Waveform

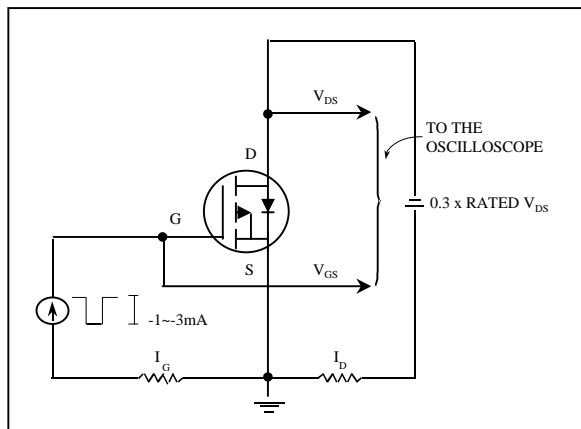


Fig 15. Gate Charge Circuit

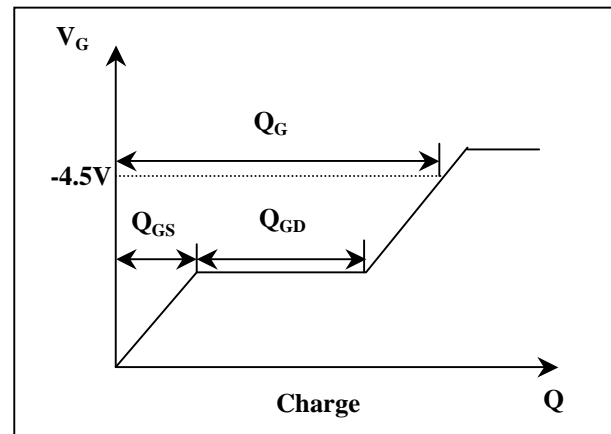


Fig 16. Gate Charge Waveform