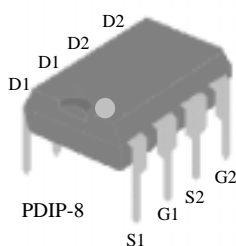


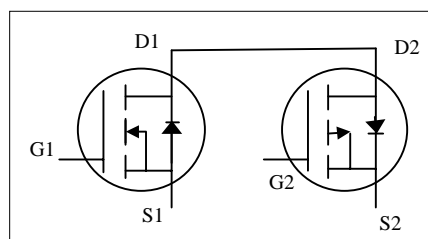
- ▼ Simple Drive Requirement
- ▼ Low On-resistance
- ▼ Fast Switching



N-CH	$BV_{DSS}$	20V
	$R_{DS(ON)}$	60m $\Omega$
	$I_D$	2.6A
P-CH	$BV_{DSS}$	-20V
	$R_{DS(ON)}$	80m $\Omega$
	$I_D$	-2.3A

### 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.



### Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-channel	P-channel	
$V_{DS}$	Drain-Source Voltage	20	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	$\pm 12$	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current <sup>3</sup>	2.6	-2.3	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current <sup>3</sup>	2.1	-1.8	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	15	-10	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-a	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> =2.6A	-	-	60	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =1.8A	-	-	90	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> =5V, I <sub>D</sub> =2.6A	-	3.6	-	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> =150°C)	V <sub>DS</sub> =16V, V <sub>GS</sub> =0V	-	-	25	uA
I <sub>GSS</sub>	Gate-Source Leakage	V <sub>GS</sub> =±12V	-	-	±100	nA
Q <sub>g</sub>	Total Gate Charge <sup>2</sup>	I <sub>D</sub> =2.6A	-	9	-	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =10V	-	1	-	nC
Q <sub>gd</sub>	Gate-Drain ("Miller") Charge	V <sub>GS</sub> =4.5V	-	4	-	nC
t <sub>d(on)</sub>	Turn-on Delay Time <sup>2</sup>	V <sub>DS</sub> =10V	-	6.5	-	ns
t <sub>r</sub>	Rise Time	I <sub>D</sub> =1A	-	14	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time	R <sub>G</sub> =6Ω, V <sub>GS</sub> =4.5V	-	20	-	ns
t <sub>f</sub>	Fall Time	R <sub>D</sub> =10Ω	-	15	-	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	-	-	1.7	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<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> =-2.2A	-	-	80	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-1.8A	-	-	135	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	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-2.2A	-	2.7	-	S
I <sub>DSS</sub>	Drain-Source Leakage Current (T=25°C)	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V	-	-	-1	uA
		V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V	-	-	-25	uA
I <sub>GSS</sub>	Gate-Source Leakage	V <sub>GS</sub> =±12V	-	-	±100	nA
Q <sub>g</sub>	Total Gate Charge <sup>2</sup>	I <sub>D</sub> =-2.2A	-	11.5	-	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =-6V	-	3.2	-	nC
Q <sub>gd</sub>	Gate-Drain ("Miller") Charge	V <sub>GS</sub> =-4.5V	-	1.5	-	nC
t <sub>d(on)</sub>	Turn-on Delay Time <sup>2</sup>	V <sub>DS</sub> =-10V	-	-	10	ns
t <sub>r</sub>	Rise Time	I <sub>D</sub> =-2.2A	-	-	25	ns
t <sub>d(off)</sub>	Turn-off Delay Time	R <sub>G</sub> =6Ω, V <sub>GS</sub> =-4.5V	-	-	50	ns
t <sub>f</sub>	Fall Time	R <sub>D</sub> =4.5Ω	-	-	30	ns
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V	-	940	-	pF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> =-15V	-	440	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance	f=1.0MHz	-	130	-	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	-	-	-1.7	A
V <sub>SD</sub>	Forward On Voltage <sup>2</sup>	T <sub>j</sub> =25°C, I <sub>S</sub> =-1.8A, V <sub>GS</sub> =0V	-	-0.75	-1.2	V

**Notes:**

- 1.Pulse width limited by Max. junction temperature.
- 2.Pulse width ≤300us , duty cycle ≤2%.
- 3.Mounted on 1 in<sup>2</sup> copper pad of FR4 board ; 90°C/W when mounted on Min. copper pad.



N-Channel

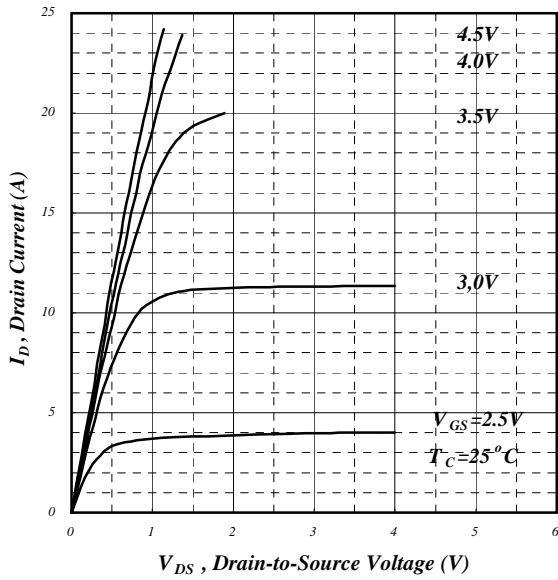


Fig 1. Typical Output Characteristics

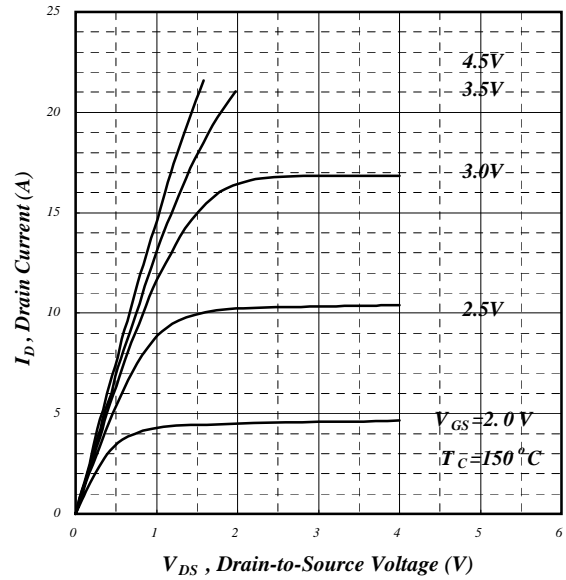


Fig 2. Typical Output Characteristics

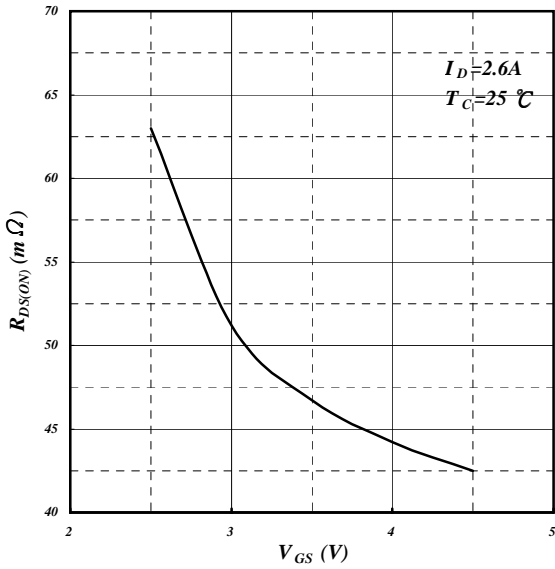


Fig 3. On-Resistance v.s. Gate Voltage

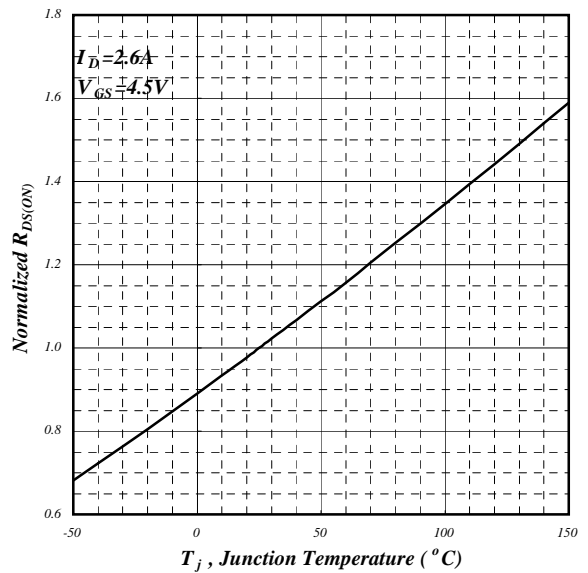


Fig 4. Normalized On-Resistance v.s. Junction Temperature



N-Channel

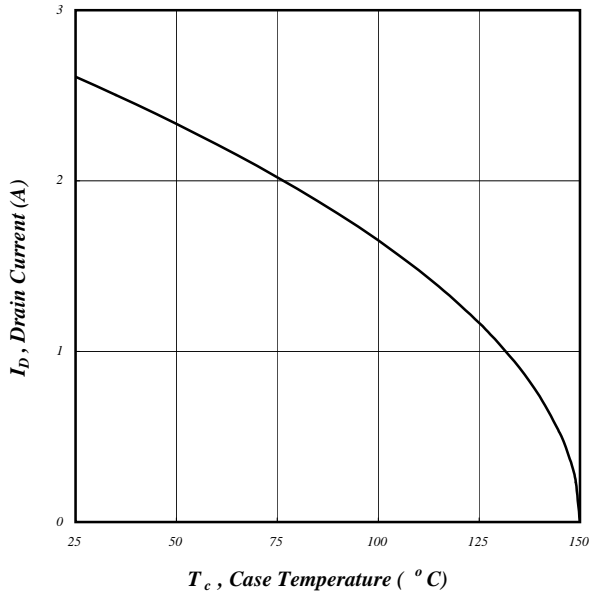


Fig 5. Maximum Drain Current v.s. Case Temperature

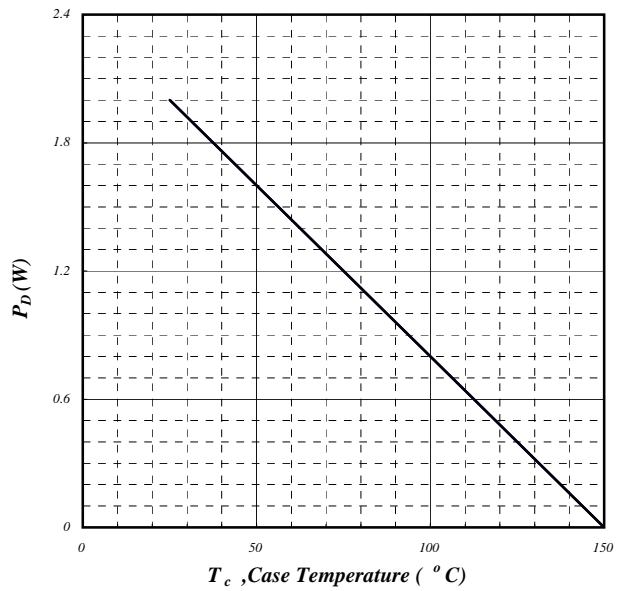


Fig 6. Typical Power Dissipation

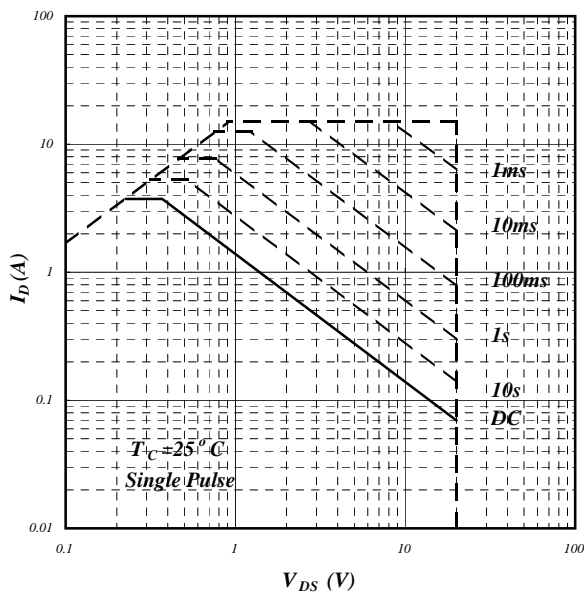


Fig 7. Maximum Safe Operating Area

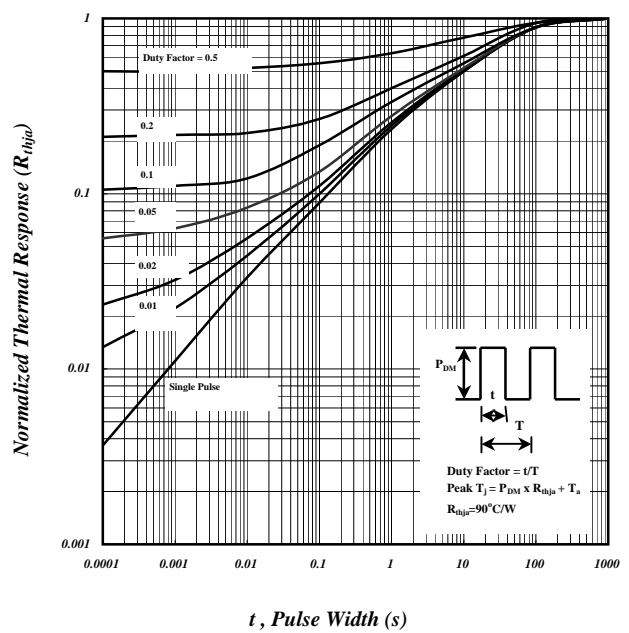


Fig 8. Effective Transient Thermal Impedance



N-Channel

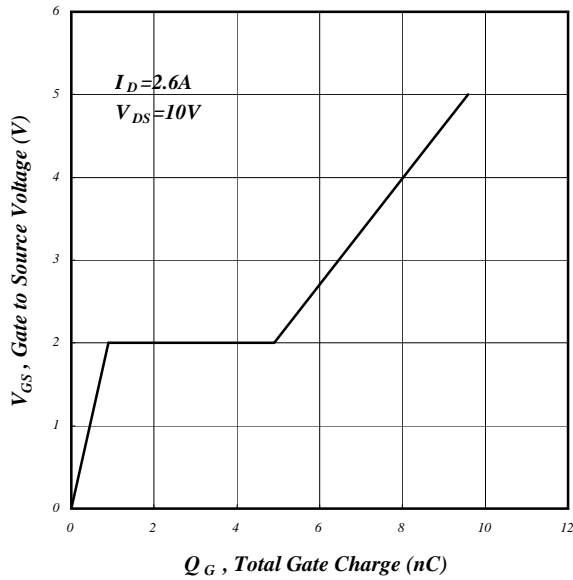


Fig 9. Gate Charge Characteristics

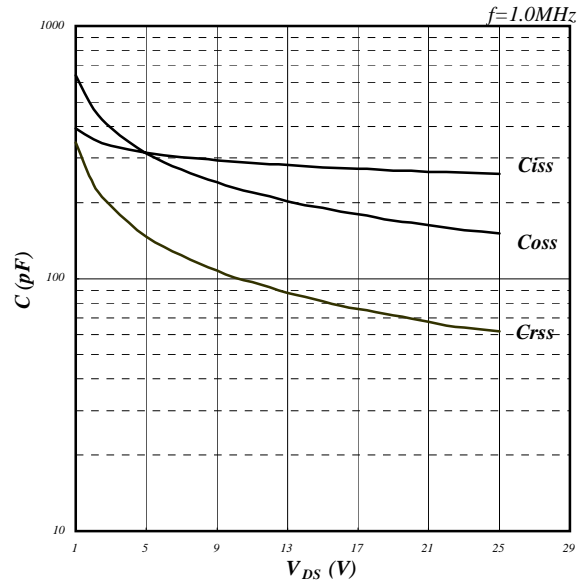


Fig 10. Typical Capacitance Characteristics

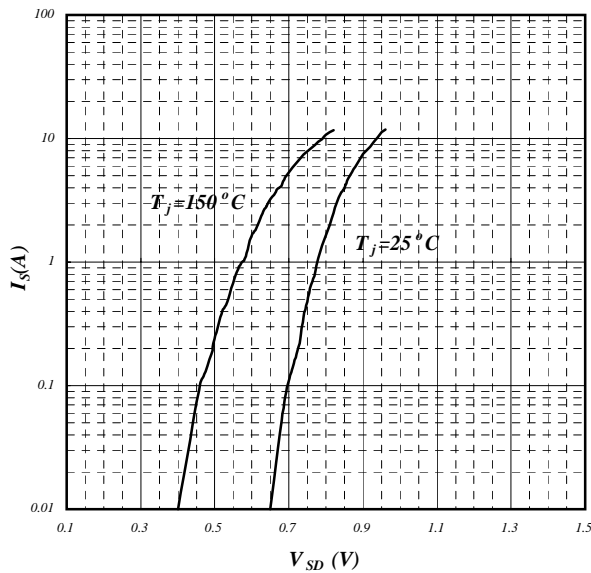


Fig 11. Forward Characteristic of Reverse Diode

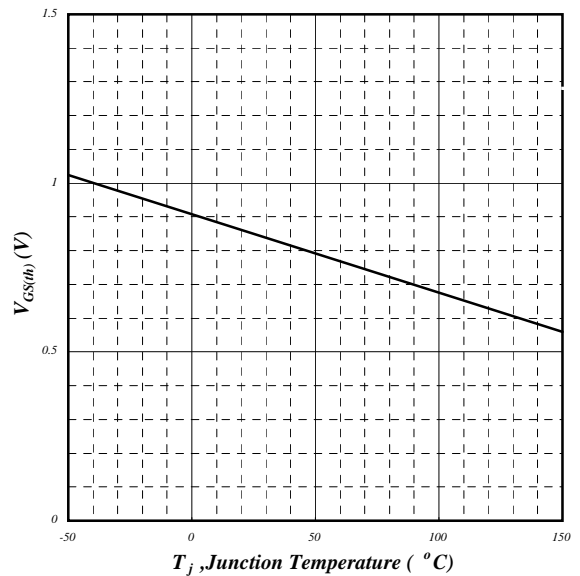


Fig 12. Gate Threshold Voltage v.s. Junction Temperature



N-Channel

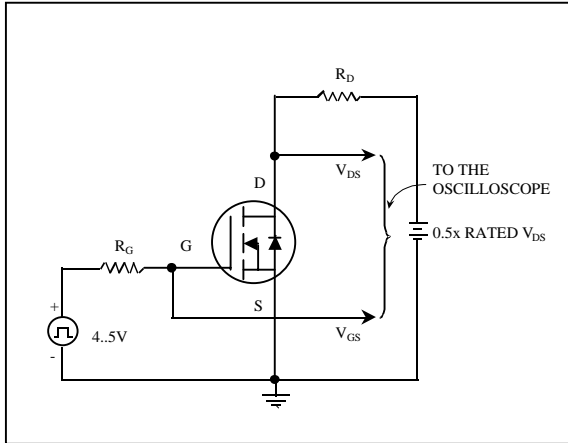


Fig 13. Switching Time Circuit

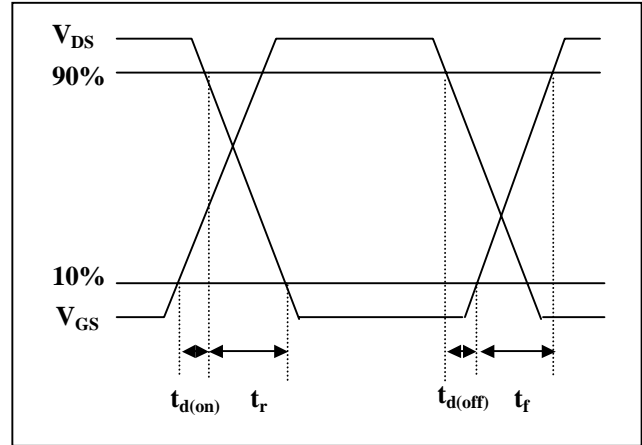


Fig 14. Switching Time Waveform

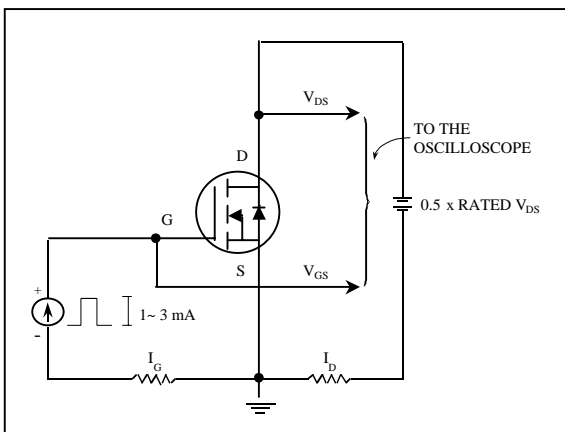


Fig 15. Gate Charge Circuit

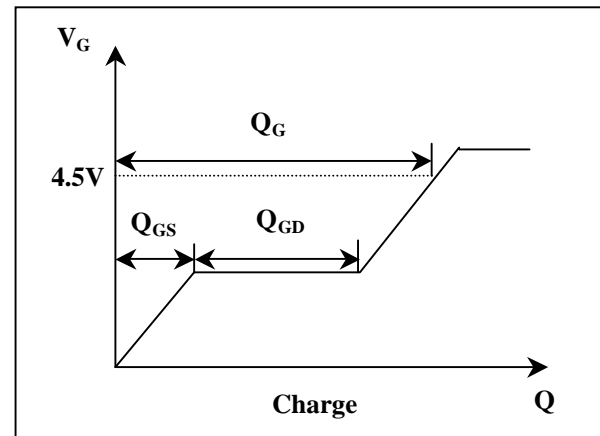


Fig 16. Gate Charge Waveform



P-Channel

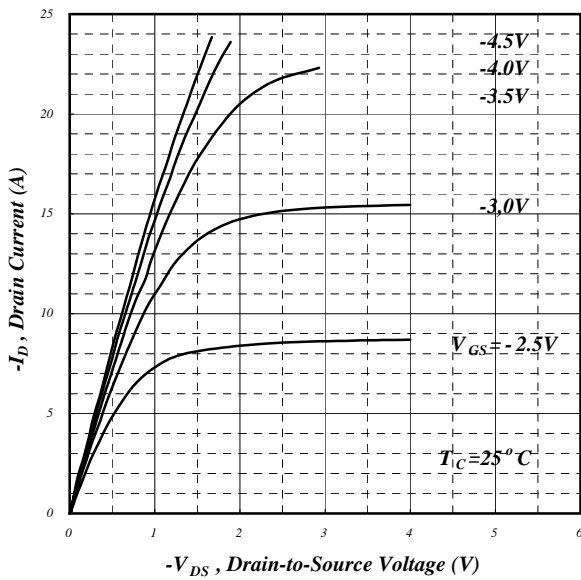


Fig 1. Typical Output Characteristics

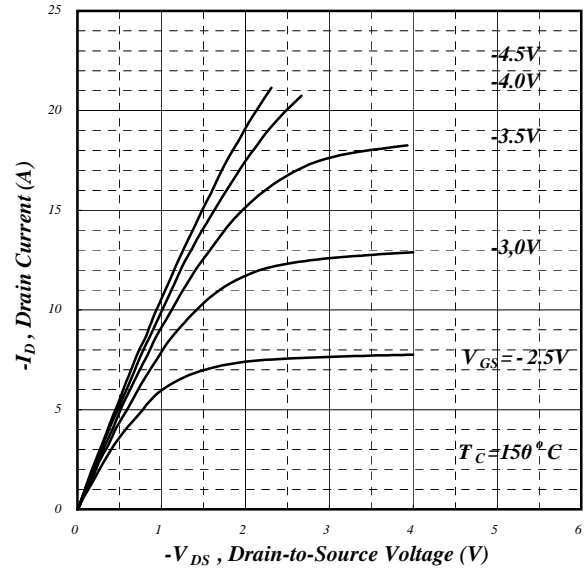


Fig 2. Typical Output Characteristics

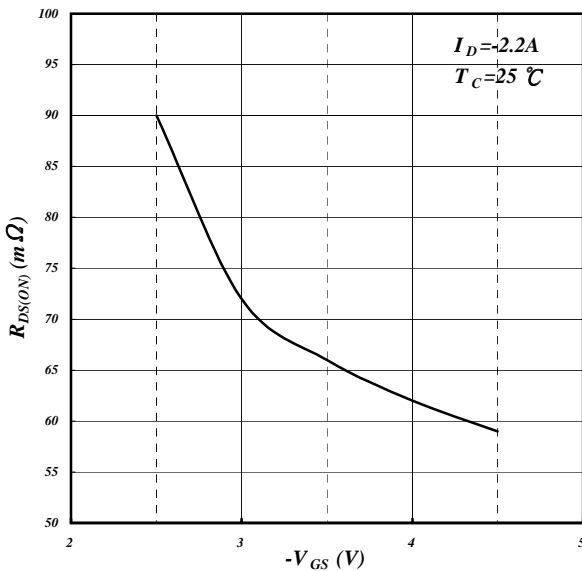


Fig 3. On-Resistance v.s. Gate Voltage

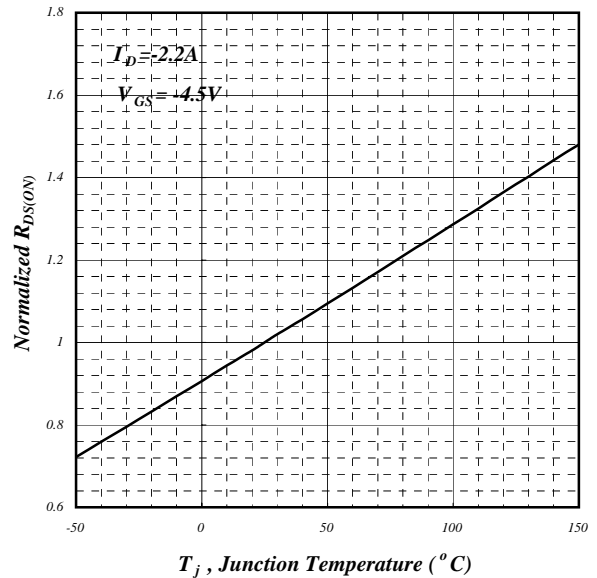


Fig 4. Normalized On-Resistance v.s. Junction Temperature





P-Channel

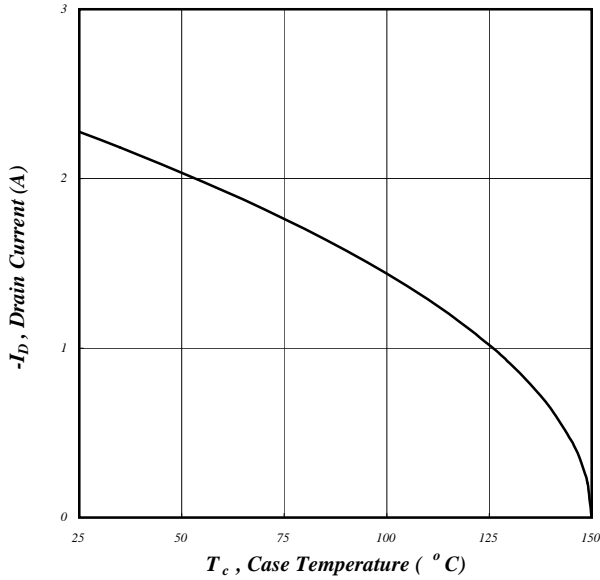


Fig 5. Maximum Drain Current v.s. Case Temperature

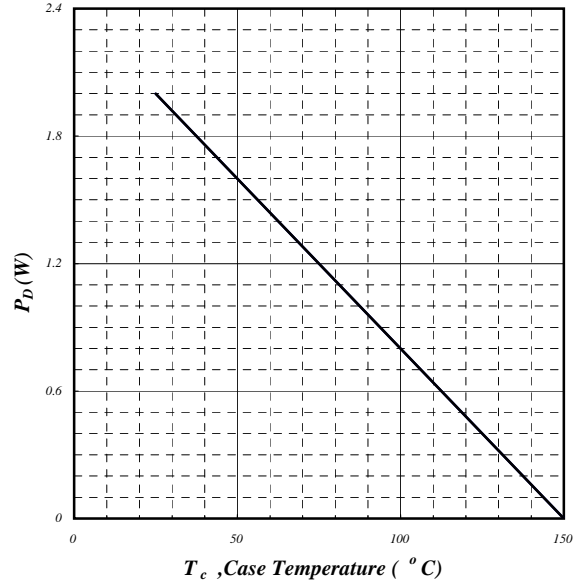


Fig 6. Typical Power Dissipation

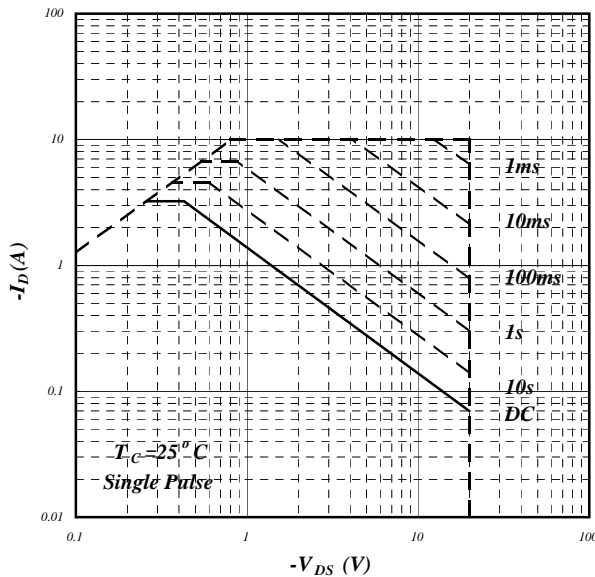


Fig 7. Maximum Safe Operating Area

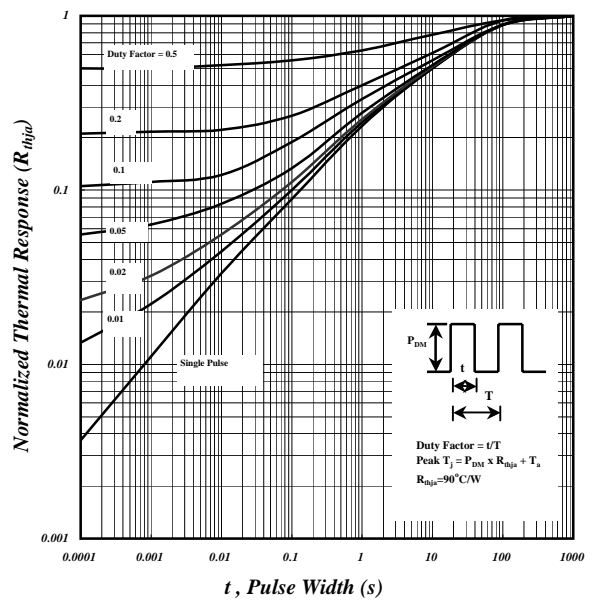


Fig 8. Effective Transient Thermal Impedance



P-Channel

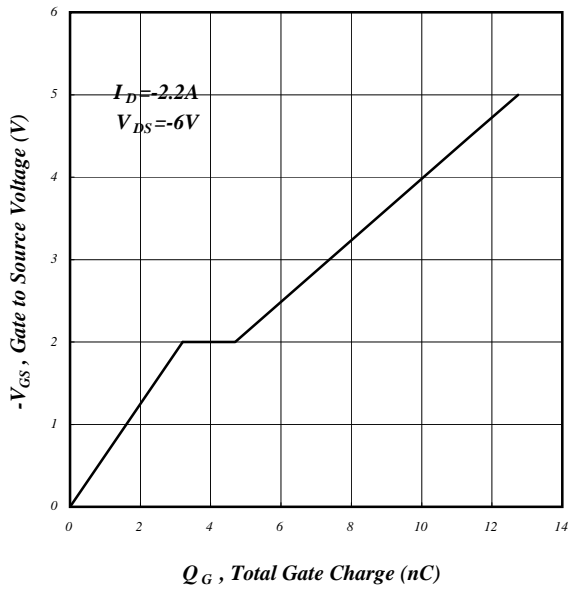


Fig 9. Gate Charge Characteristics

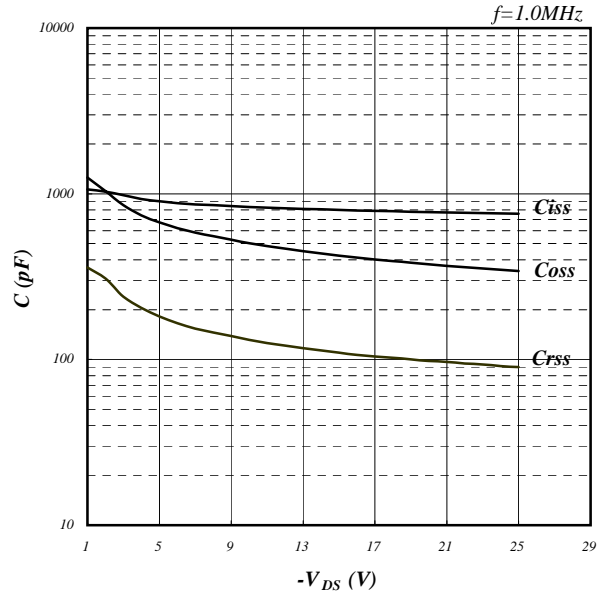


Fig 10. Typical Capacitance Characteristics

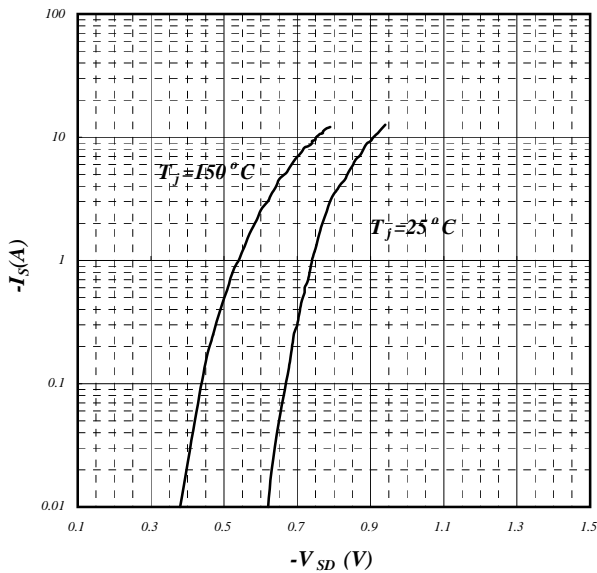


Fig 11. Forward Characteristic of Reverse Diode

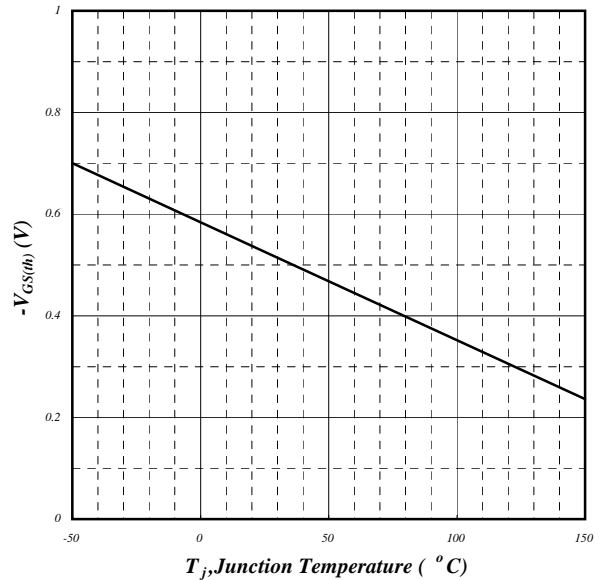


Fig 12. Gate Threshold Voltage v.s. Junction Temperature



P-Channel

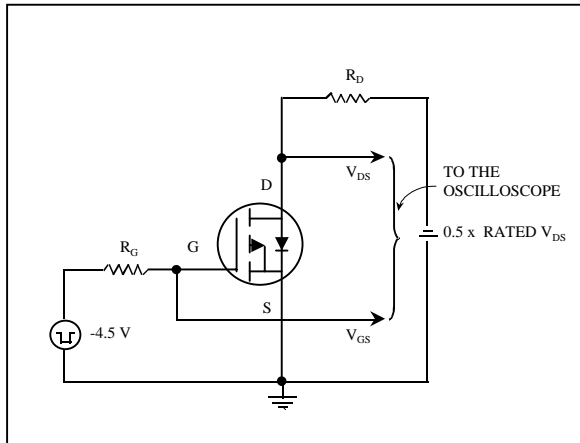


Fig 13. Switching Time Circuit

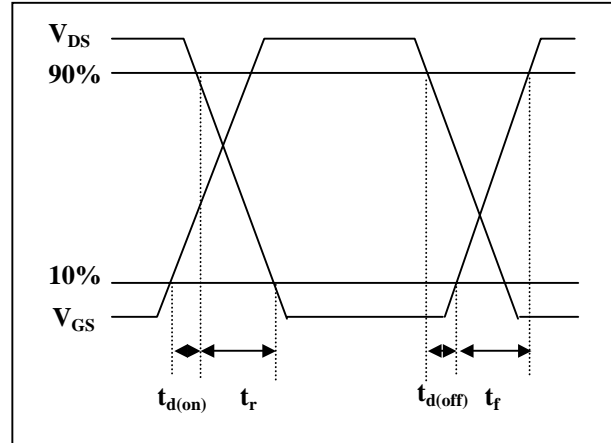


Fig 14. Switching Time Waveform

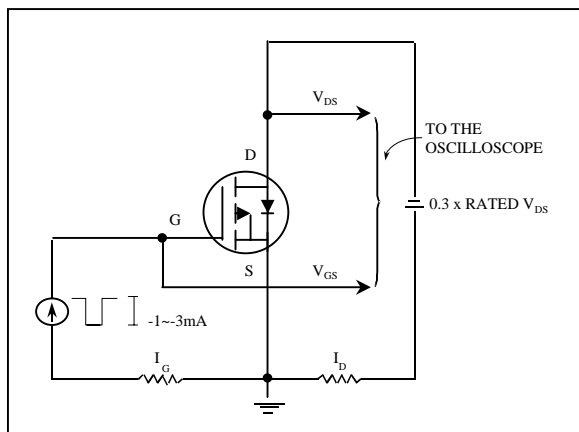


Fig 15. Gate Charge Circuit

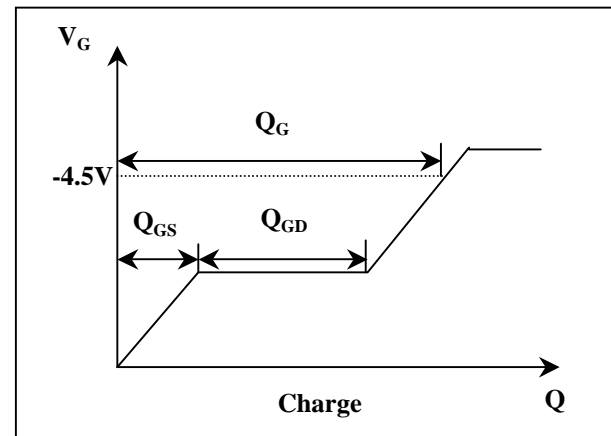


Fig 16. Gate Charge Waveform