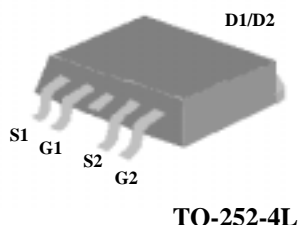


AP4511GH**Pb Free Plating Product**
**Advanced Power
Electronics Corp.**
N AND P-CHANNEL ENHANCEMENT
MODE POWER MOSFET

- ▼ Simple Drive Requirement
- ▼ Good Thermal Performance
- ▼ Fast Switching Performance

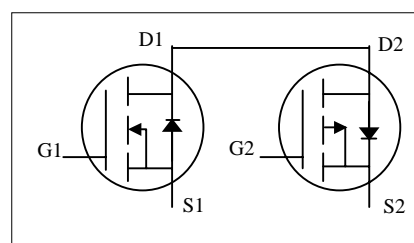


TO-252-4L

N-CH	BV_{DSS}	35V
	$R_{DS(ON)}$	30m Ω
	I_D	15A
P-CH	BV_{DSS}	-35V
	$R_{DS(ON)}$	48m Ω
	I_D	-12A

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	35	-35	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current ³	15	-12	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current ³	9	-7	A
I_{DM}	Pulsed Drain Current ¹	50	-50	A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation	10.4		W
	Linear Derating Factor	0.083		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	Units
Rthj-c	Thermal Resistance Junction-case ³	Max. 12	$^\circ C/W$
Rthj-a	Thermal Resistance Junction-ambient ³	Max. 110	$^\circ C/W$



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N-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	$V_{GS}=0V, I_D=250\mu A$	35	-	-	V
$\Delta BV_{DSS}/\Delta T_j$	Breakdown Voltage Temperature Coefficient	Reference to $25^{\circ}\text{C}, I_D=1\text{mA}$	-	0.03	-	$V/^{\circ}\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V, I_D=8A$	-	-	30	$\text{m}\Omega$
		$V_{GS}=4.5V, I_D=6A$	-	-	40	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1	-	3	V
g_{fs}	Forward Transconductance	$V_{DS}=10V, I_D=8A$	-	13	-	S
I_{DSS}	Drain-Source Leakage Current ($T_j=25^{\circ}\text{C}$)	$V_{DS}=35V, V_{GS}=0V$	-	-	1	μA
	Drain-Source Leakage Current ($T_j=150^{\circ}\text{C}$)	$V_{DS}=28V, V_{GS}=0V$	-	-	25	μA
I_{GSS}	Gate-Source Leakage	$V_{GS}=\pm 20V$	-	-	± 100	nA
Q_g	Total Gate Charge ²	$I_D=8A$	-	11	18	nC
Q_{gs}	Gate-Source Charge	$V_{DS}=28V$	-	3	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	$V_{GS}=4.5V$	-	6	-	nC
$t_{d(on)}$	Turn-on Delay Time ²	$V_{DS}=18V$	-	12	-	ns
t_r	Rise Time	$I_D=1A$	-	7	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=3.3\Omega, V_{GS}=10V$	-	22	-	ns
t_f	Fall Time	$R_D=18\Omega$	-	6	-	ns
C_{iss}	Input Capacitance	$V_{GS}=0V$	-	830	1330	pF
C_{oss}	Output Capacitance	$V_{DS}=25V$	-	150	-	pF
C_{rss}	Reverse Transfer Capacitance	$f=1.0\text{MHz}$	-	110	-	pF
R_g	Gate Resistance	$f=1.0\text{MHz}$	-	1.1	1.7	Ω

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Forward On Voltage ²	$I_S=8A, V_{GS}=0V$	-	-	1.2	V
t_{rr}	Reverse Recovery Time ²	$I_S=8A, V_{GS}=0V$	-	18	-	ns
Q_{rr}	Reverse Recovery Charge	$dI/dt=100A/\mu s$	-	12	-	nC



P-CH Electrical Characteristics @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	-35	-	-	V
ΔBV _{DSS} /ΔT _j	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I _D =-1mA	-	-0.03	-	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =-10V, I _D =-6A	-	-	48	mΩ
		V _{GS} =-4.5V, I _D =-4A	-	-	70	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 =-6A	-	10	-	S
I _{DSS}	Drain-Source Leakage Current (T=25°C)	V _{DS} =-35V, V _{GS} =0V	-	-	-1	uA
	Drain-Source Leakage Current (T=150°C)	V _{DS} =-28V, V _{GS} =0V	-	-	-25	uA
I _{GSS}	Gate-Source Leakage	V _{GS} =±20V	-	-	±100	nA
Q _g	Total Gate Charge ²	I _D =-6A	-	10	19	nC
Q _{gs}	Gate-Source Charge	V _{DS} =-28V	-	2	-	nC
Q _{gd}	Gate-Drain ("Miller") Charge	V _{GS} =-4.5V	-	6	-	nC
t _{d(on)}	Turn-on Delay Time ²	V _{DS} =-18V	-	10	-	ns
t _r	Rise Time	I _D =-1A	-	6	-	ns
t _{d(off)}	Turn-off Delay Time	R _G =3.3Ω, V _{GS} =-10V	-	26	-	ns
t _f	Fall Time	R _D =18Ω	-	7	-	ns
C _{iss}	Input Capacitance	V _{GS} =0V	-	690	1100	pF
C _{oss}	Output Capacitance	V _{DS} =-25V	-	165	-	pF
C _{rss}	Reverse Transfer Capacitance	f=1.0MHz	-	130	-	pF
R _g	Gate Resistance	f=1.0MHz	-	5	7.5	Ω

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V _{SD}	Forward On Voltage ²	I _S =-6A, V _{GS} =0V	-	-	-1.2	V
t _{rr}	Reverse Recovery Time ²	I _S =-6A, V _{GS} =0V	-	20	-	ns
Q _{rr}	Reverse Recovery Charge	dI/dt=-100A/μs	-	12	-	nC

Notes:

1. Pulse width limited by Max. junction temperature.
2. Pulse width ≤300us, duty cycle ≤2%.
3. N-CH, P-CH are same.



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N-Channel

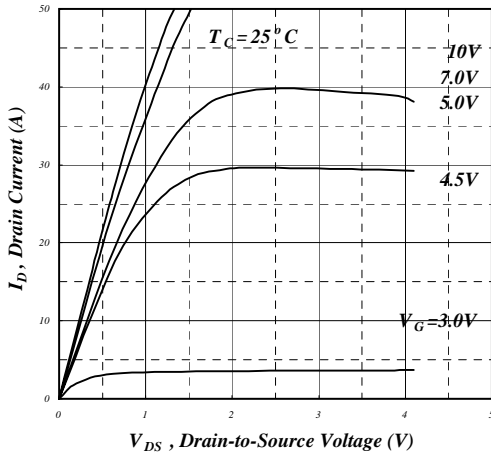


Fig 1. Typical Output Characteristics

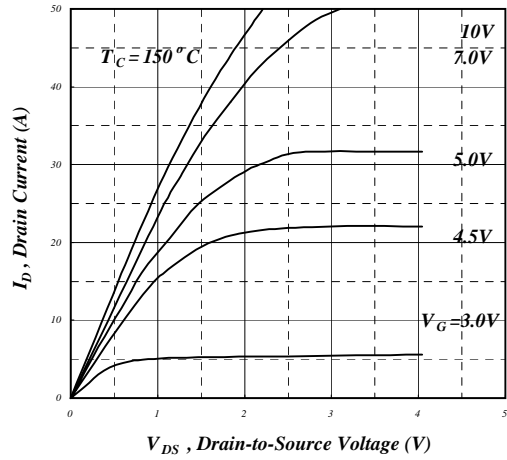


Fig 2. Typical Output Characteristics

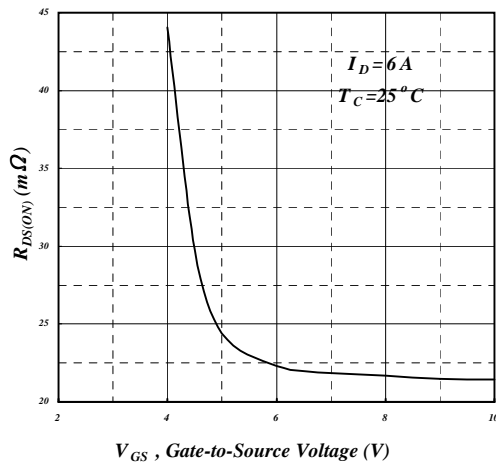


Fig 3. On-Resistance v.s. Gate Voltage

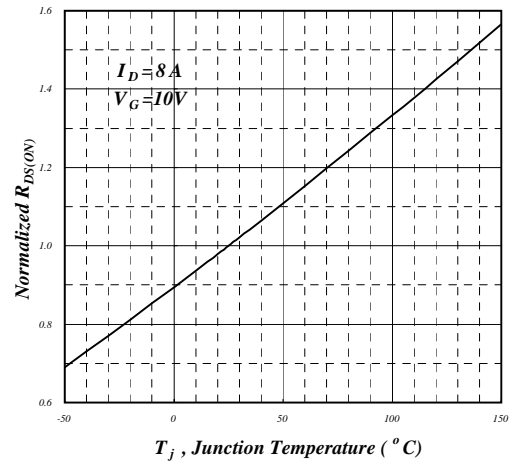


Fig 4. Normalized On-Resistance v.s. Junction Temperature

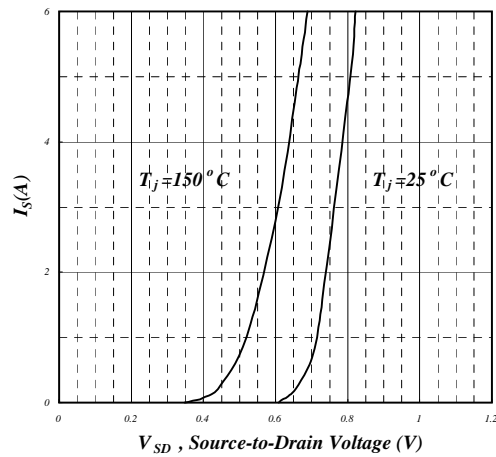


Fig 5. Forward Characteristic of Reverse Diode

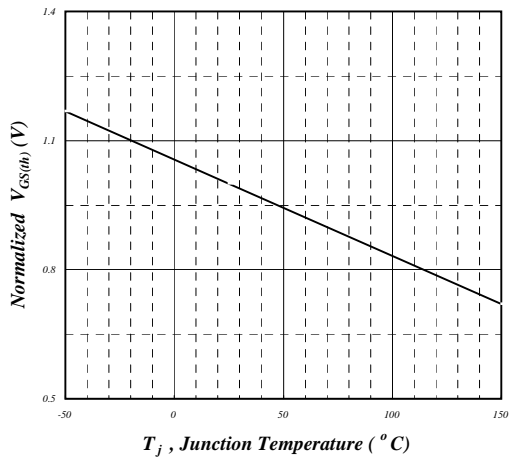


Fig 6. Gate Threshold Voltage v.s. Junction Temperature



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N-Channel

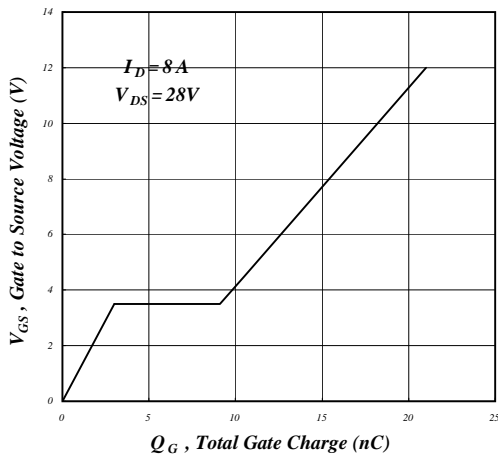


Fig 7. Gate Charge Characteristics

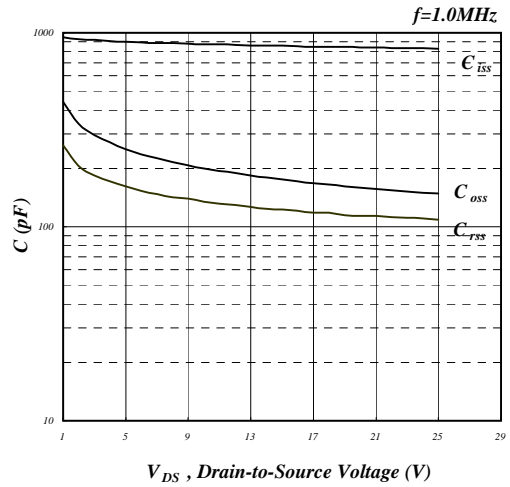


Fig 8. Typical Capacitance Characteristics

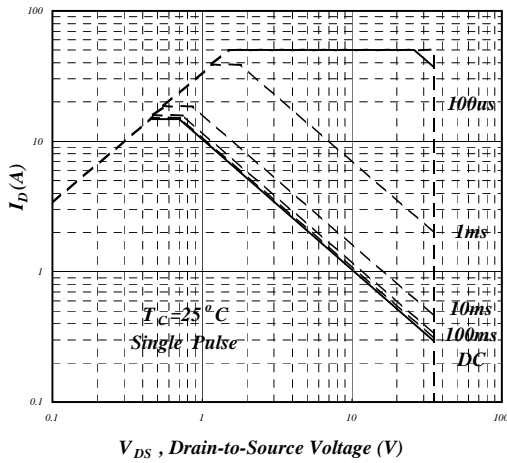


Fig 9. Maximum Safe Operating Area

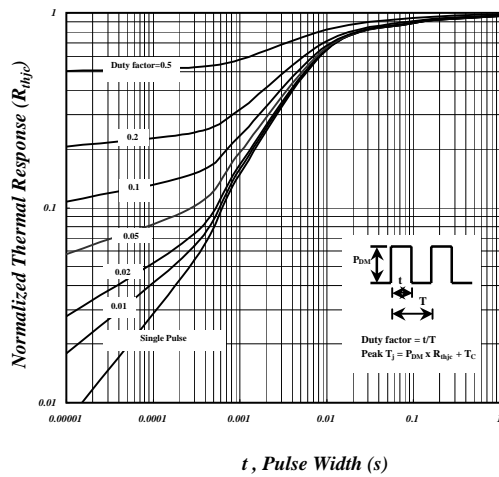


Fig 10. Effective Transient Thermal Impedance

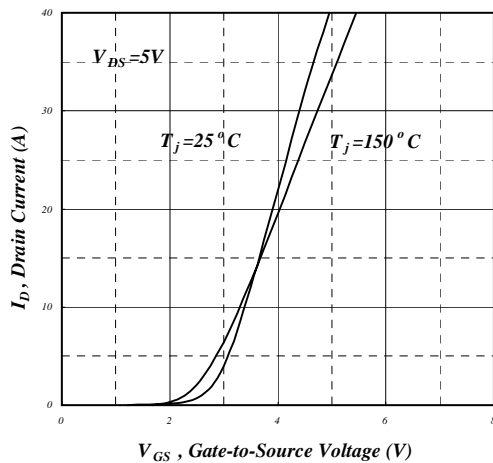


Fig 11. Transfer Characteristics

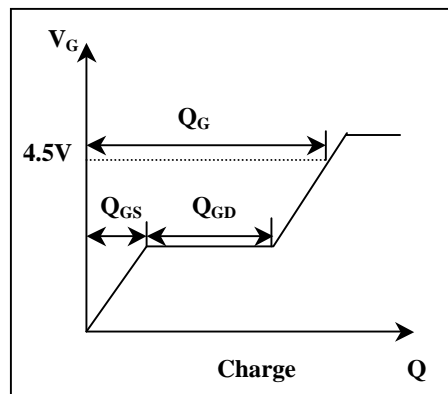


Fig 12. Gate Charge Waveform



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P-Channel

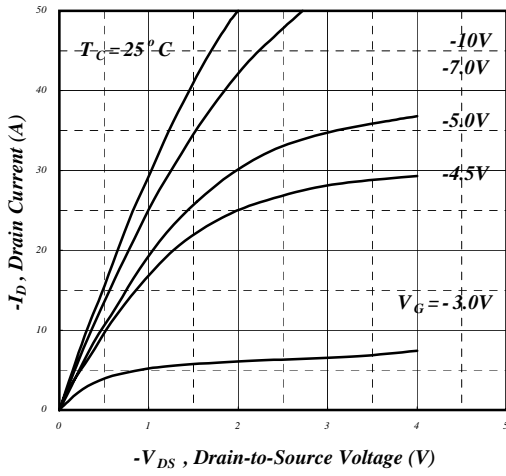


Fig 1. Typical Output Characteristics

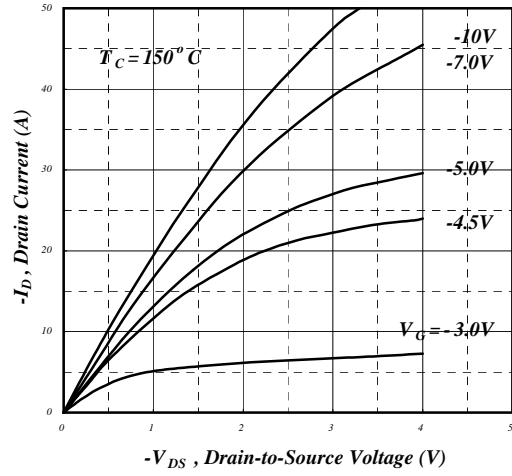


Fig 2. Typical Output Characteristics

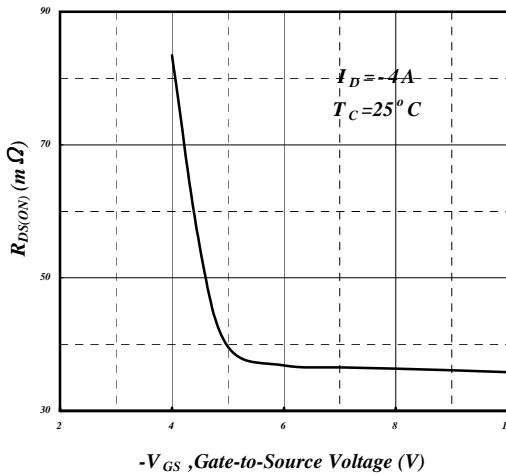


Fig 3. On-Resistance v.s. Gate Voltage

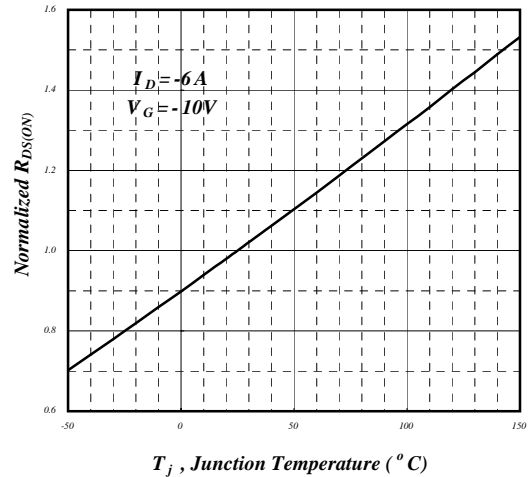


Fig 4. Normalized On-Resistance v.s. Junction Temperature

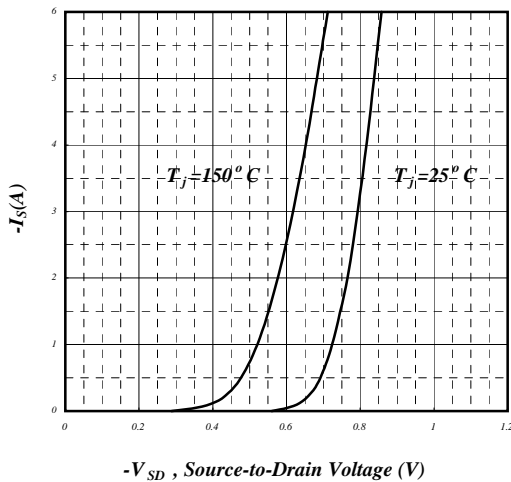


Fig 5. Forward Characteristic of Reverse Diode

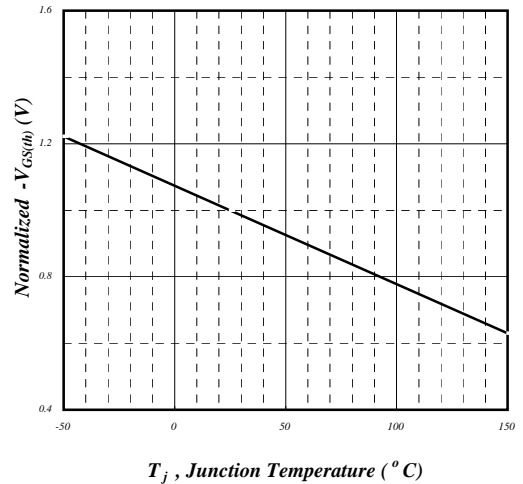


Fig 6. Gate Threshold Voltage v.s. Junction Temperature



P-Channel

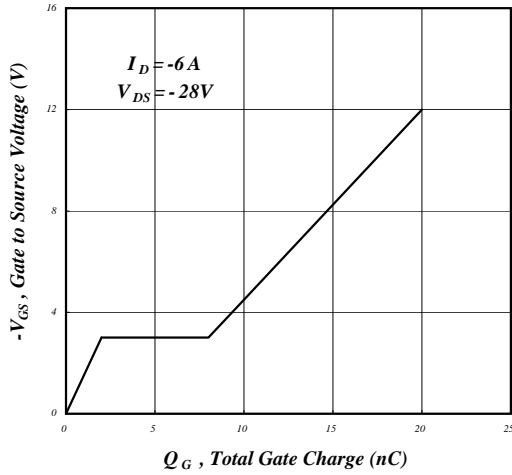


Fig 7. Gate Charge Characteristics

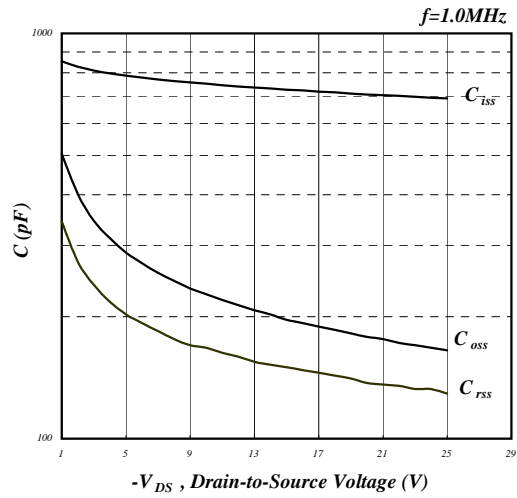


Fig 8. Typical Capacitance Characteristics

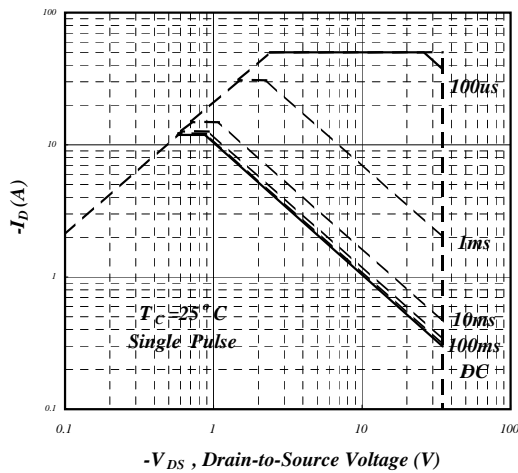


Fig 9. Maximum Safe Operating Area

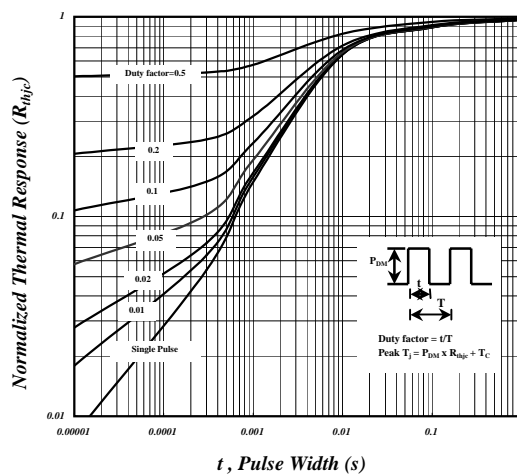


Fig 10. Effective Transient Thermal Impedance

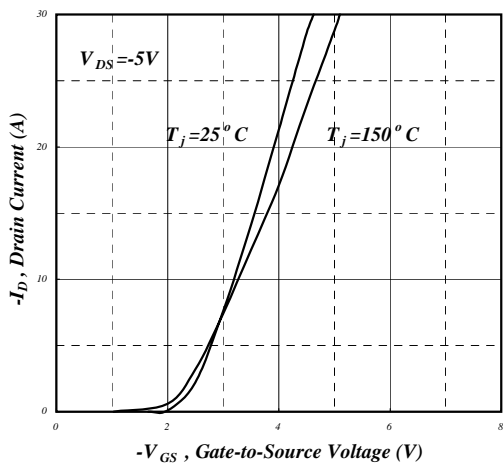


Fig 11. Transfer Characteristics

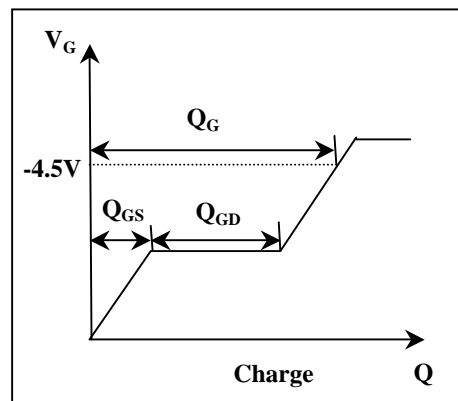


Fig 12. Gate Charge Waveform