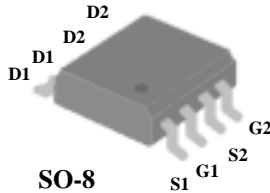


- ▼ Simple Drive Requirement
- ▼ Lower Gate Charge
- ▼ Fast Switching Performance

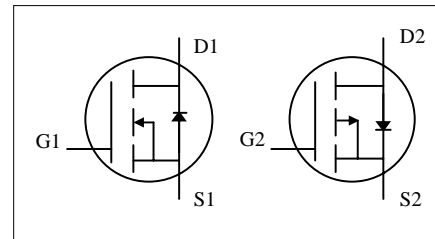


N-CH	$BV_{DSS}$	60V
	$R_{DS(ON)}$	64m $\Omega$
	$I_D$	4.5A
P-CH	$BV_{DSS}$	-60V
	$R_{DS(ON)}$	125m $\Omega$
	$I_D$	-3A

### 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.

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	60	-60	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	$\pm 20$	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current <sup>3</sup>	4.5	-3	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current <sup>3</sup>	3.6	-2.4	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
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	60	-	-	V
ΔBV <sub>DSS</sub> /ΔT <sub>j</sub>	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA	-	0.05	-	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =4A	-	55	64	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A	-	65	80	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	1	-	3	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =10V, I <sub>D</sub> =4A	-	7	-	S
I <sub>DSS</sub>	Drain-Source Leakage Current (T <sub>j</sub> =25°C)	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V	-	-	1	uA
	Drain-Source Leakage Current (T <sub>j</sub> =70°C)	V <sub>DS</sub> =48V, V <sub>GS</sub> =0V	-	-	25	uA
I <sub>GSS</sub>	Gate-Source Leakage	V <sub>GS</sub> =±20V	-	-	±100	nA
Q <sub>g</sub>	Total Gate Charge <sup>2</sup>	I <sub>D</sub> =4A	-	9	17	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =48V	-	3	-	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> =30V	-	9	-	ns
t <sub>r</sub>	Rise Time	I <sub>D</sub> =1A	-	5	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time	R <sub>G</sub> =3.3Ω, V <sub>GS</sub> =10V	-	22	-	ns
t <sub>f</sub>	Fall Time	R <sub>D</sub> =30Ω	-	7	-	ns
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V	-	730	1170	pF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> =25V	-	80	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance	f=1.0MHz	-	60	-	pF
R <sub>g</sub>	Gate Resistance	f=1.0MHz	-	1.8	2.7	Ω

**Source-Drain Diode**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V <sub>SD</sub>	Forward On Voltage <sup>2</sup>	I <sub>S</sub> =1.7A, V <sub>GS</sub> =0V	-	-	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> =4A, V <sub>GS</sub> =0V	-	28	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge	dI/dt=100A/μs	-	39	-	nC



**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	-60	-	-	V
ΔBV <sub>DSS</sub> /ΔT <sub>j</sub>	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =-1mA	-	-0.04	-	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-3A	-	100	125	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A	-	120	150	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA	-1	-	-3	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-10V, I <sub>D</sub> =-2A	-	5	-	S
I <sub>DSS</sub>	Drain-Source Leakage Current (T=25°C)	V <sub>DS</sub> =-60V, V <sub>GS</sub> =0V	-	-	-1	uA
	Drain-Source Leakage Current (T=70°C)	V <sub>DS</sub> =-48V, V <sub>GS</sub> =0V	-	-	-25	uA
I <sub>GSS</sub>	Gate-Source Leakage	V <sub>GS</sub> =±20V	-	-	±100	nA
Q <sub>g</sub>	Total Gate Charge <sup>2</sup>	I <sub>D</sub> =-3A	-	12	20	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =-48V	-	2	-	nC
Q <sub>gd</sub>	Gate-Drain ("Miller") Charge	V <sub>GS</sub> =-4.5V	-	6	-	nC
t <sub>d(on)</sub>	Turn-on Delay Time <sup>2</sup>	V <sub>DS</sub> =-30V	-	10	-	ns
t <sub>r</sub>	Rise Time	I <sub>D</sub> =-1A	-	6	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time	R <sub>G</sub> =3.3Ω, V <sub>GS</sub> =-10V	-	33	-	ns
t <sub>f</sub>	Fall Time	R <sub>D</sub> =30Ω	-	6	-	ns
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V	-	905	1450	pF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> =-25V	-	90	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance	f=1.0MHz	-	75	-	pF
R <sub>g</sub>	Gate Resistance	f=1.0MHz	-	12	18	Ω

**Source-Drain Diode**

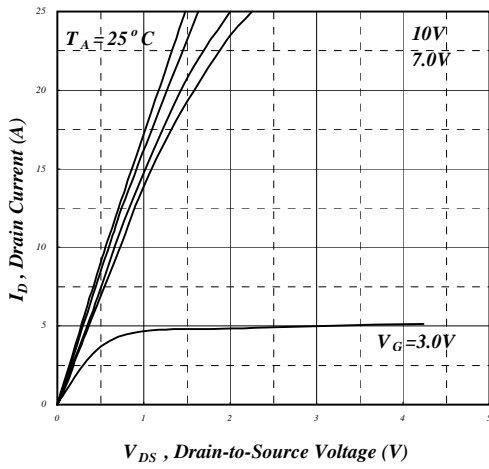
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V <sub>SD</sub>	Forward On Voltage <sup>2</sup>	I <sub>S</sub> =-1.7A, V <sub>GS</sub> =0V	-	-	-1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> =-3A, V <sub>GS</sub> =0V	-	36	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge	dI/dt=-100A/μs	-	55	-	nC

**Notes:**

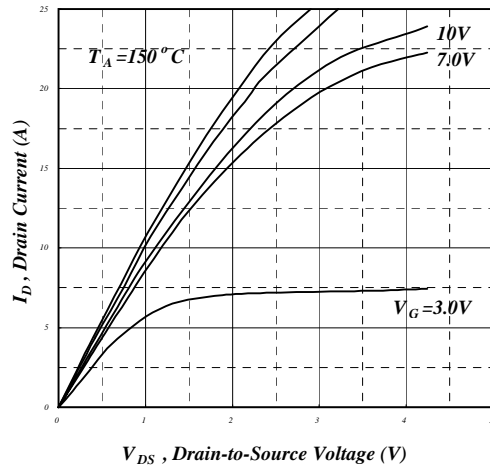
- 1.Pulse width limited by Max. junction temperature.
- 2.Pulse width ≤300us , duty cycle ≤2%.
- 3.Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board ; 135°C/W when mounted on min. copper pad.



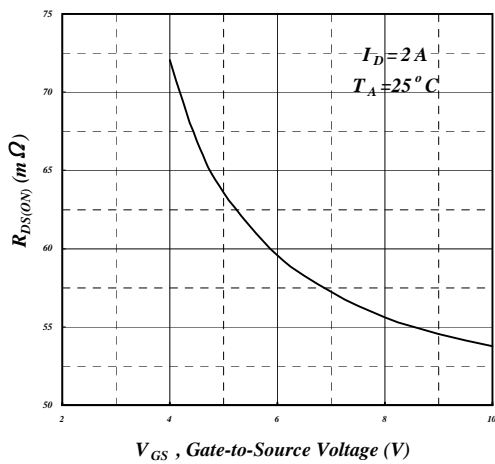
## N-Channel



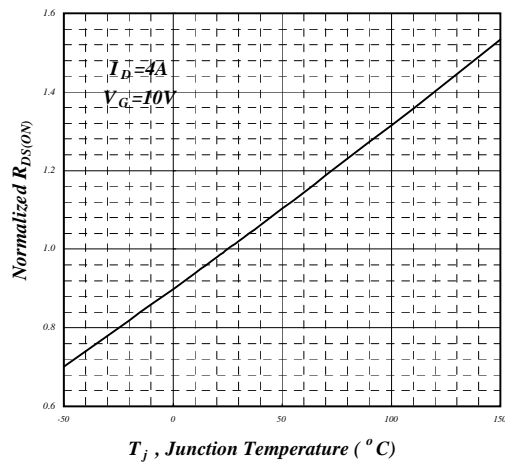
**Fig 1. Typical Output Characteristics**



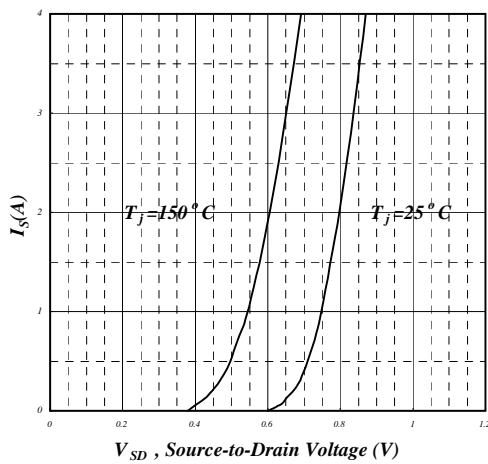
**Fig 2. Typical Output Characteristics**



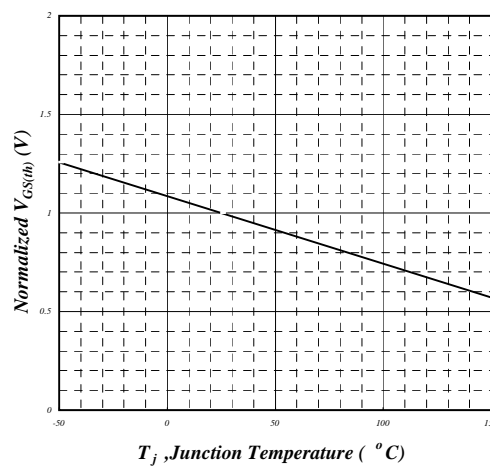
**Fig 3. On-Resistance v.s. Gate Voltage**



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



**Fig 5. Forward Characteristic of Reverse Diode**



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



N-Channel

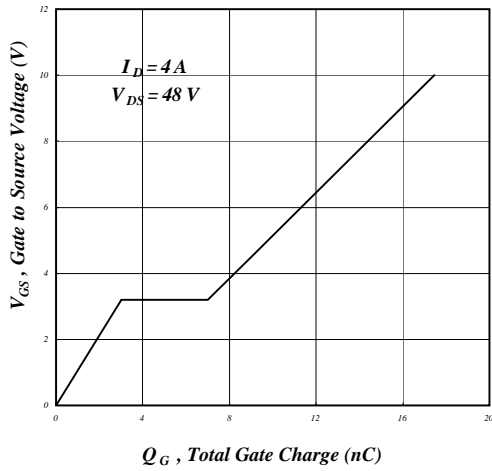


Fig 7. Gate Charge Characteristics

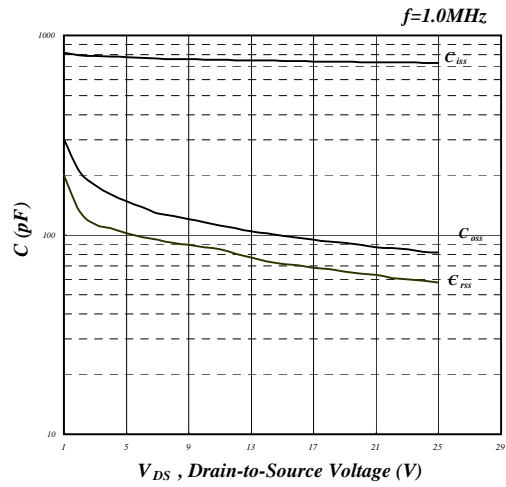


Fig 8. Typical Capacitance Characteristics

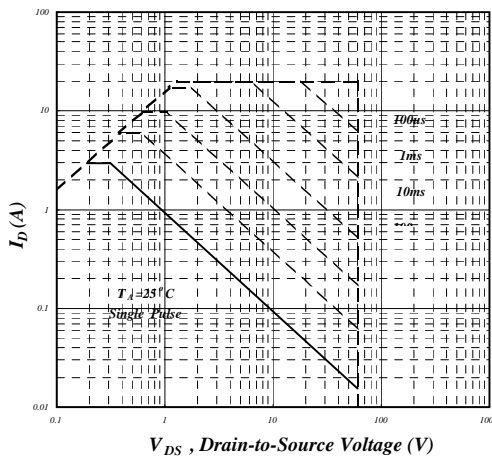


Fig 9. Maximum Safe Operating Area

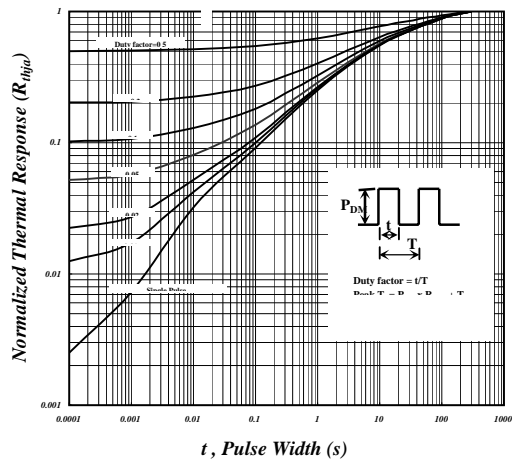


Fig 10. Effective Transient Thermal Impedance

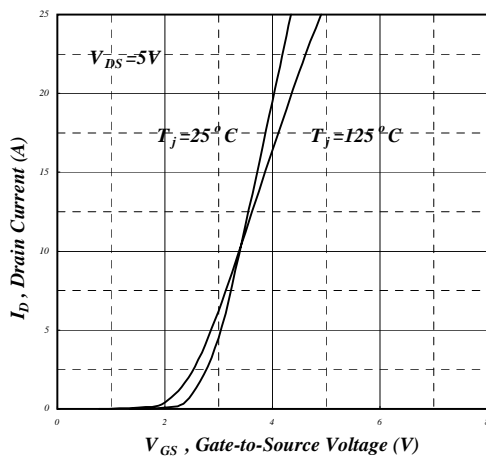


Fig 11. Transfer Characteristics

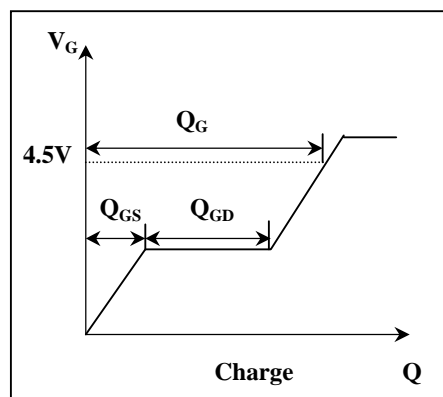
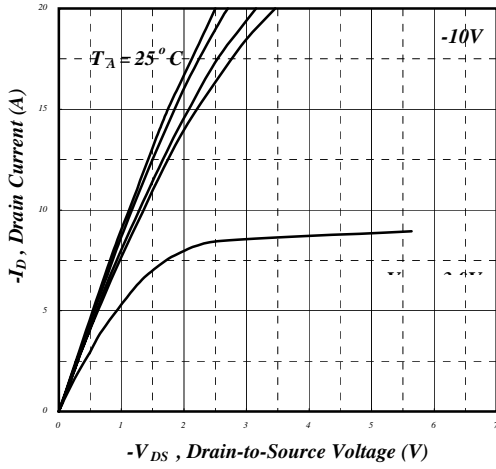
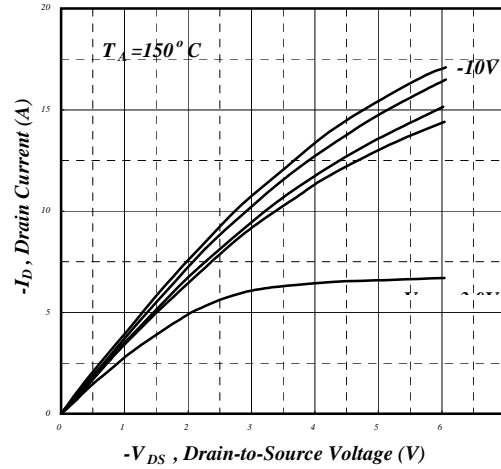


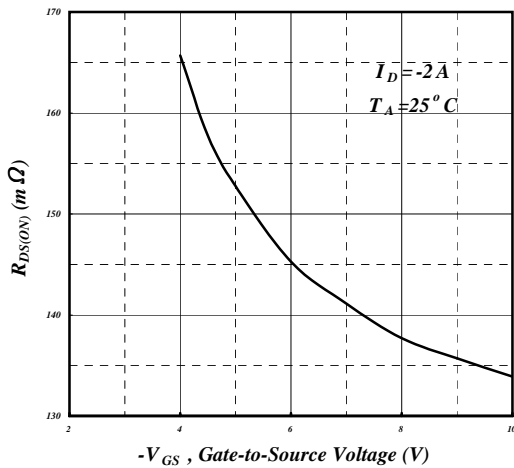
Fig 12. Gate Charge Waveform



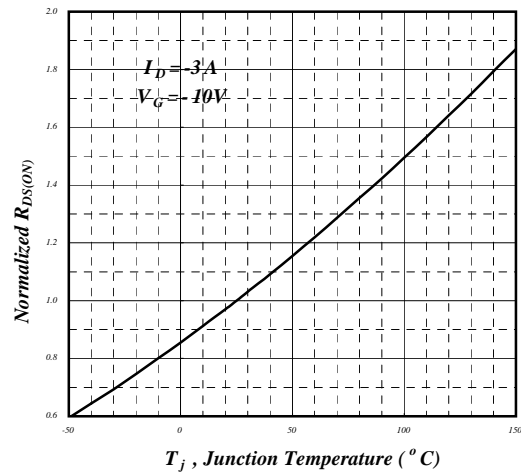
**Fig 1. Typical Output Characteristics**



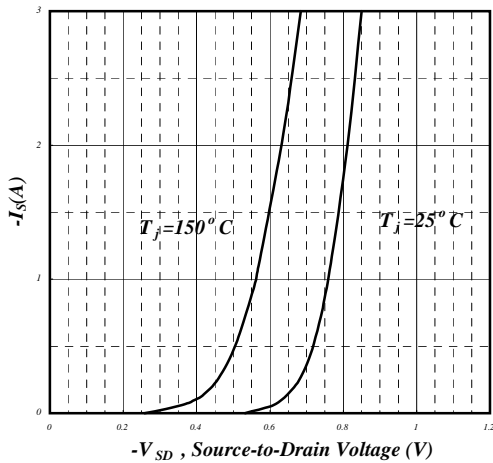
**Fig 2. Typical Output Characteristics**



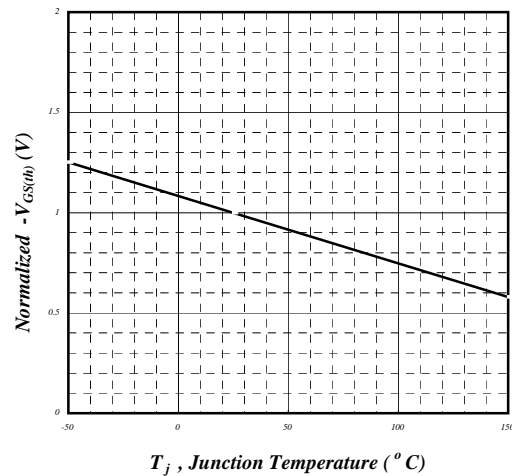
**Fig 3. On-Resistance v.s. Gate Voltage**



**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

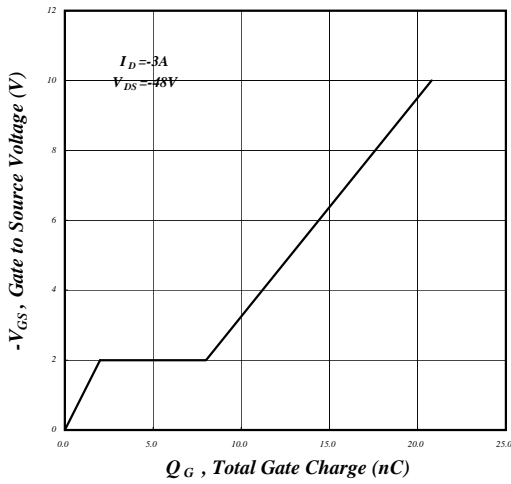


Fig 7. Gate Charge Characteristics

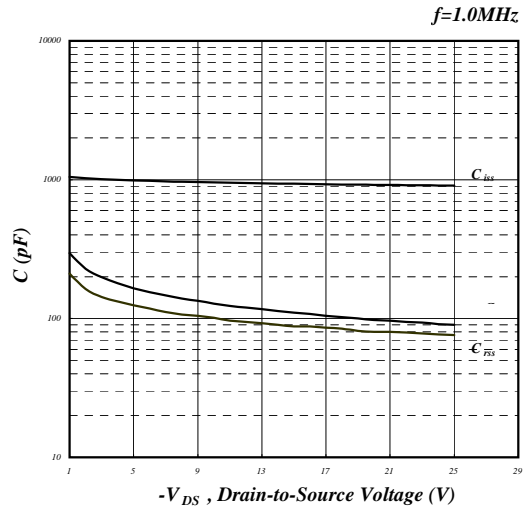


Fig 8. Typical Capacitance Characteristics

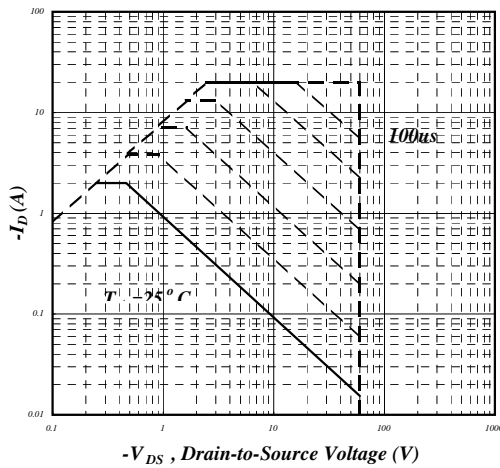


Fig 9. Maximum Safe Operating Area

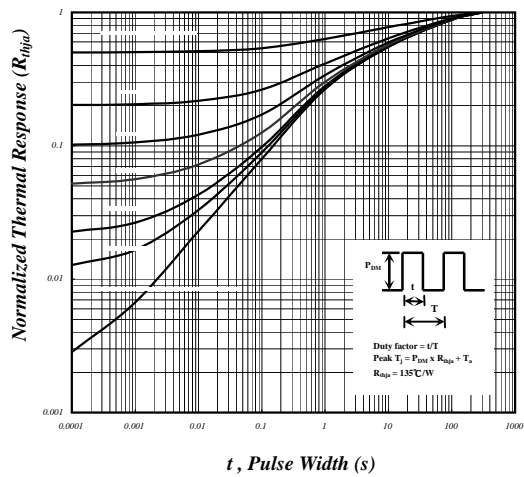


Fig 10. Effective Transient Thermal Impedance

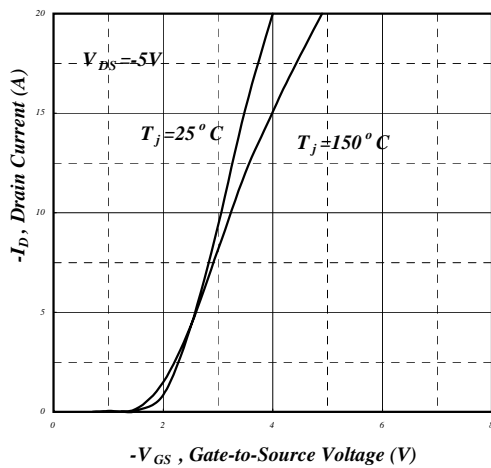


Fig 11. Transfer Characteristics

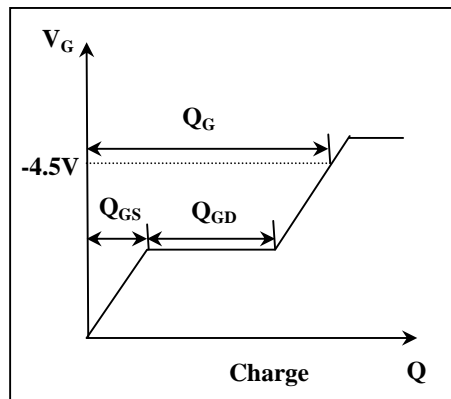


Fig 12. Gate Charge Waveform