



**Advanced Power
Electronics Corp.**

AP6950GMT-HF

Halogen-Free Product

*DUAL N-CHANNEL MOSFET WITH
SCHOTTKY DIODE*

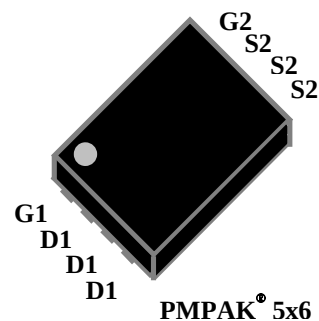
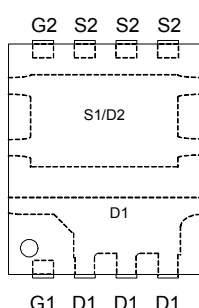
- ▼ Simple Drive Requirement
- ▼ Easy for Synchronous Buck Converter Application
- ▼ RoHS Compliant & Halogen-Free

Description

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 control MOSFET (CH-1) and synchronous MOSFET (CH-2) co-package for synchronous buck converters.

	CH-1	BV_{DSS}	30V
		$R_{DS(ON)}$	16m Ω
		I_D	21.6A
	CH-2	BV_{DSS}	30V
		$R_{DS(ON)}$	8.5m Ω
		I_D	42.4A



Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		CH-1	CH-2	
V_{DS}	Drain-Source Voltage	30	30	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
$I_D@T_C=25^\circ\text{C}$	Continuous Drain Current ⁵ (Chip Limited)	21.6	42.4	A
$I_D@T_A=25^\circ\text{C}$	Continuous Drain Current ³ , V_{GS} @ 10V	10.8	16.8	A
$I_D@T_A=70^\circ\text{C}$	Continuous Drain Current ³ , V_{GS} @ 10V	8.6	13.4	A
I_{DM}	Pulsed Drain Current ¹	40	60	A
$P_D@T_A=25^\circ\text{C}$	Total Power Dissipation	3.13	3.9	W
T_{STG}	Storage Temperature Range	-55 to 150		$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150		$^\circ\text{C}$

Thermal Data

Symbol	Parameter	Rating		Units
		CH-1	CH-2	
Rthj-c	Maximum Thermal Resistance, Junction-case	10	5	$^\circ\text{C}/\text{W}$
Rthj-a	Maximum Thermal Resistance, Junction-ambient ³	40	32	$^\circ\text{C}/\text{W}$
Rthj-a	Maximum Thermal Resistance, Junction-ambient ⁴	70	60	$^\circ\text{C}/\text{W}$



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CH-1 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	30	-	-	V
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =10A	-	12.7	16	mΩ
		V _{GS} =4.5V, I _D =6A	-	21.3	28	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250uA	1	1.5	3	V
g _{fs}	Forward Transconductance	V _{DS} =10V, I _D =10A	-	15	-	S
I _{DSS}	Drain-Source Leakage Current	V _{DS} =24V, V _{GS} =0V	-	-	10	uA
I _{GSS}	Gate-Source Leakage	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
Q _g	Total Gate Charge	I _D =10A	-	4.5	7.2	nC
Q _{gs}	Gate-Source Charge	V _{DS} =15V	-	1.5	-	nC
Q _{gd}	Gate-Drain ("Miller") Charge	V _{GS} =4.5V	-	2	-	nC
t _{d(on)}	Turn-on Delay Time	V _{DS} =15V	-	3	-	ns
t _r	Rise Time	I _D =1A	-	18	-	ns
t _{d(off)}	Turn-off Delay Time	R _G =3.3Ω	-	10	-	ns
t _f	Fall Time	V _{GS} =10V	-	18	-	ns
C _{iss}	Input Capacitance	V _{GS} =0V	-	440	700	pF
C _{oss}	Output Capacitance	V _{DS} =15V	-	80	-	pF
C _{rss}	Reverse Transfer Capacitance	f=1.0MHz	-	60	-	pF
R _g	Gate Resistance	f=1.0MHz	-	1.7	3.4	Ω

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V _{SD}	Forward On Voltage ²	I _S =10A, V _{GS} =0V	-	-	1.2	V
t _{rr}	Reverse Recovery Time	I _S =10A, V _{GS} =0V,	-	17	-	ns
Q _{rr}	Reverse Recovery Charge	dI/dt=100A/μs	-	10	-	nC

**CH-2 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	30	-	-	V
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =16A	-	6.8	8.5	mΩ
		V _{GS} =4.5V, I _D =10A	-	12.3	16	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250uA	1	1.5	3	V
g _{fs}	Forward Transconductance	V _{DS} =10V, I _D =16A	-	22	-	S
I _{DSS}	Drain-Source Leakage Current	V _{DS} =24V, V _{GS} =0V	-	-	100	uA
I _{GSS}	Gate-Source Leakage	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
Q _g	Total Gate Charge	I _D =16A	-	11	17.6	nC
Q _{gs}	Gate-Source Charge	V _{DS} =15V	-	3	-	nC
Q _{gd}	Gate-Drain ("Miller") Charge	V _{GS} =4.5V	-	6.5	-	nC
t _{d(on)}	Turn-on Delay Time	V _{DS} =15V	-	7	-	ns
t _r	Rise Time	I _D =1A	-	19	-	ns
t _{d(off)}	Turn-off Delay Time	R _G =3.3Ω	-	22	-	ns
t _f	Fall Time	V _{GS} =10V	-	19	-	ns
C _{iss}	Input Capacitance	V _{GS} =0V	-	870	1400	pF
C _{oss}	Output Capacitance	V _{DS} =15V	-	220	-	pF
C _{rss}	Reverse Transfer Capacitance	f=1.0MHz	-	160	-	pF
R _g	Gate Resistance	f=1.0MHz	-	1.2	2.4	Ω

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V _{SD}	Diode+Schottky Forward On Voltage ²	I _S =1A, V _{GS} =0V	-	0.48	0.5	V
t _{rr}	Body Diode+Schottky Reverse Recovery Time	I _S =10A, V _{GS} =0V,	-	23	-	ns
Q _{rr}	Body Diode+Schottky Reverse Recovery Charge	di/dt=100A/μs	-	15	-	nC

Notes:

- 1.Pulse width limited by Max. junction temperature.
- 2.Pulse test
- 3.Surface mounted on 1 in² copper pad of FR4 board, t_≤10sec.
- 4.Surface mounted on 1 in² copper pad of FR4 board, on steady-state.
- 5.Package limitation current is 30A

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.

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Channel-1

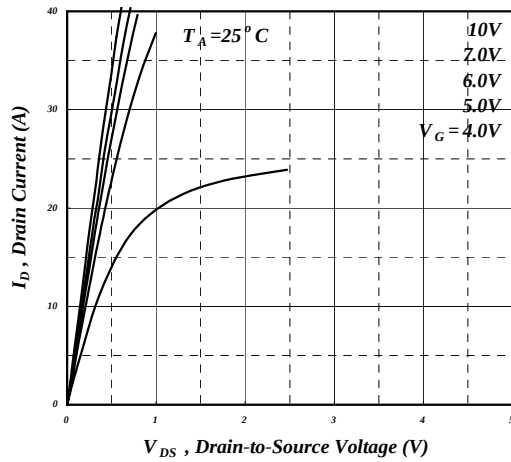


Fig 1. Typical Output Characteristics

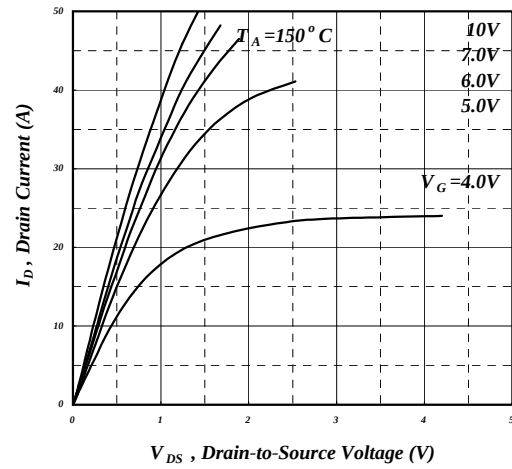


Fig 2. Typical Output Characteristics

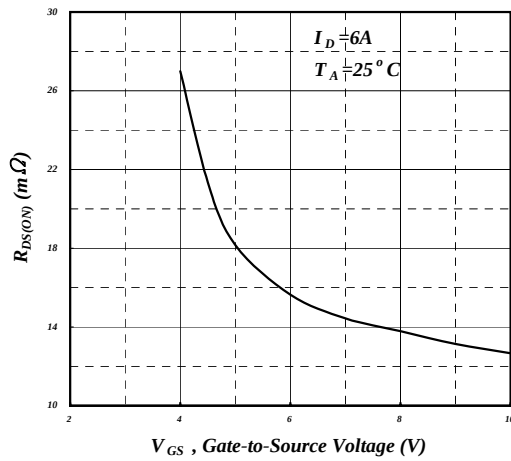


Fig 3. On-Resistance v.s. Gate Voltage

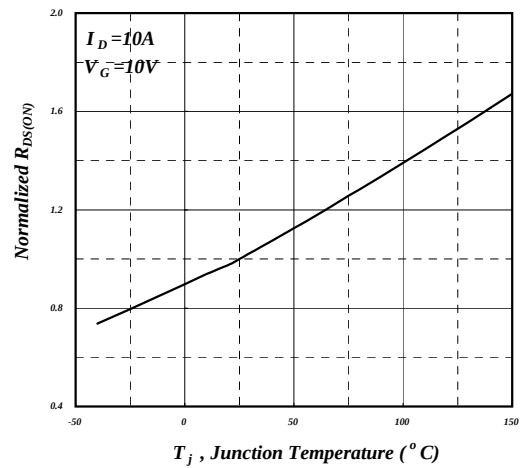


Fig 4. Normalized On-Resistance
v.s. Junction Temperature

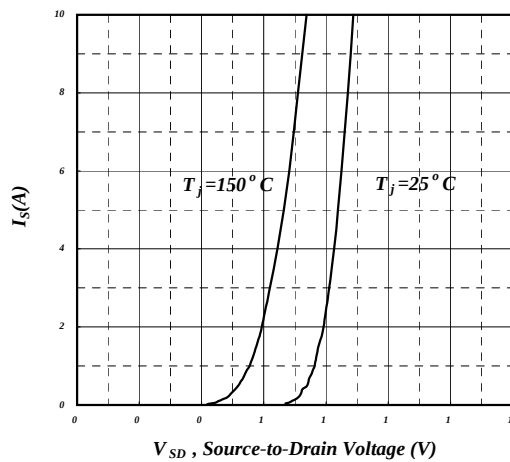


Fig 5. Forward Characteristic of
Reverse Diode

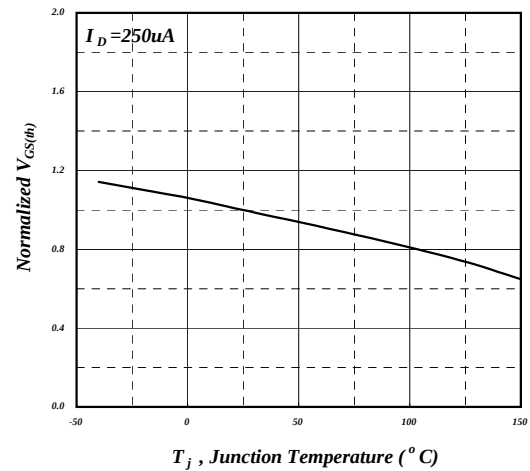


Fig 6. Gate Threshold Voltage v.s.
Junction Temperature



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Channel-1

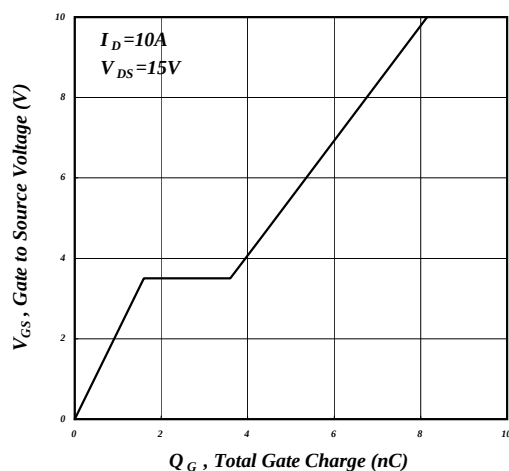


Fig 7. Gate Charge Characteristics

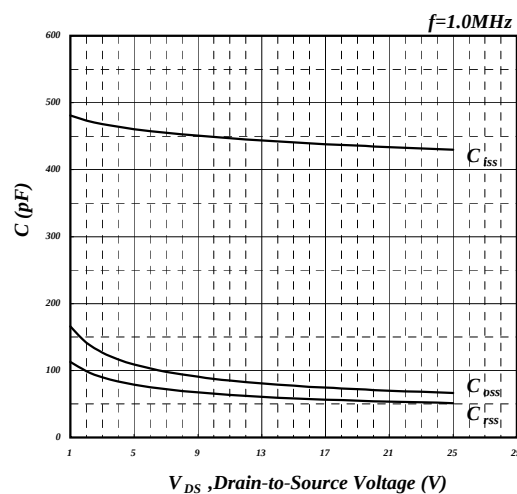


Fig 8. Typical Capacitance Characteristics

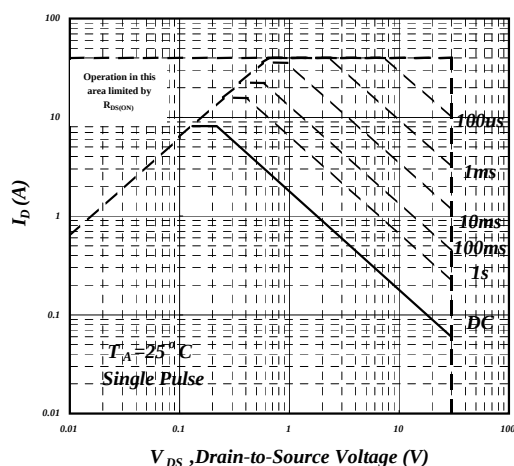


Fig 9. Maximum Safe Operating Area

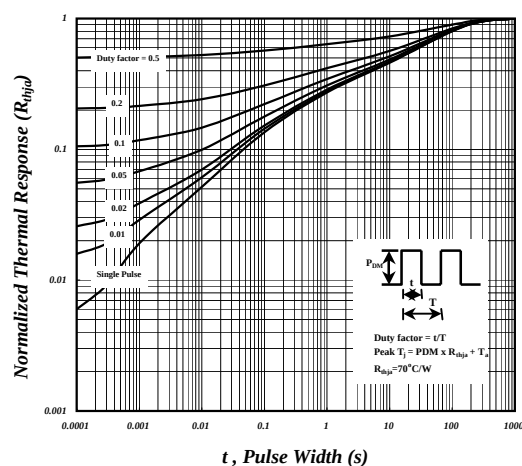


Fig 10. Effective Transient Thermal Impedance

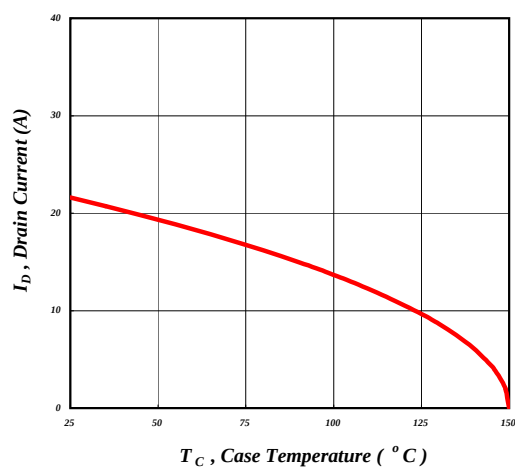


Fig 11. Maximum Continuous Drain Current v.s. Case Temperature

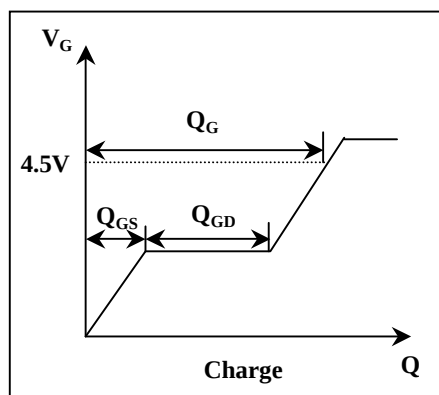
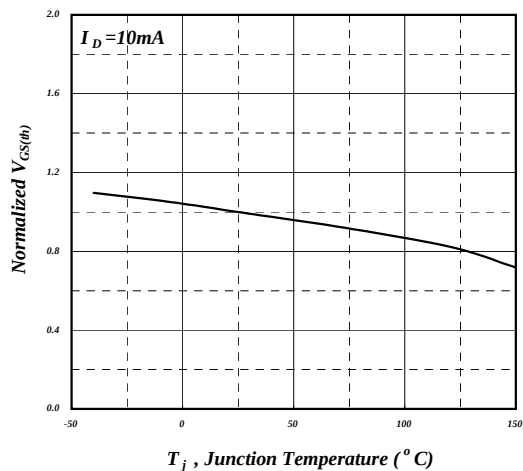
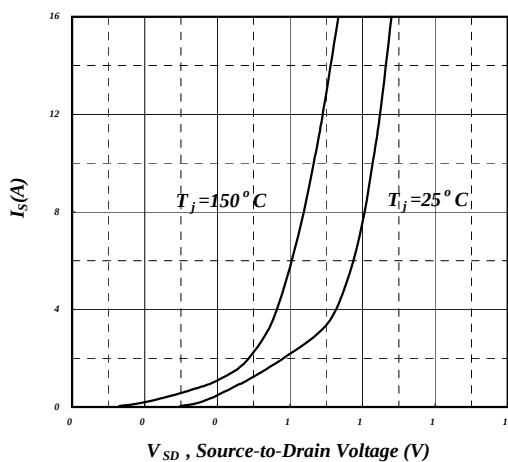
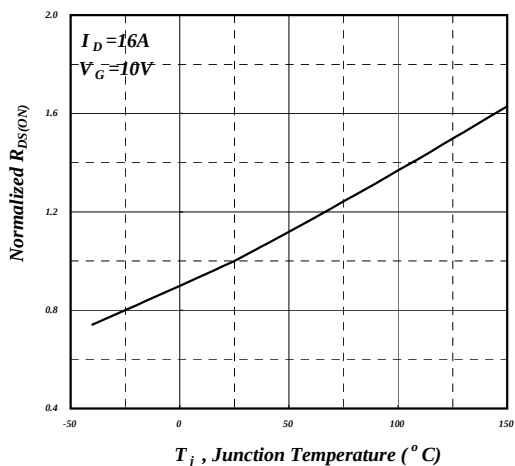
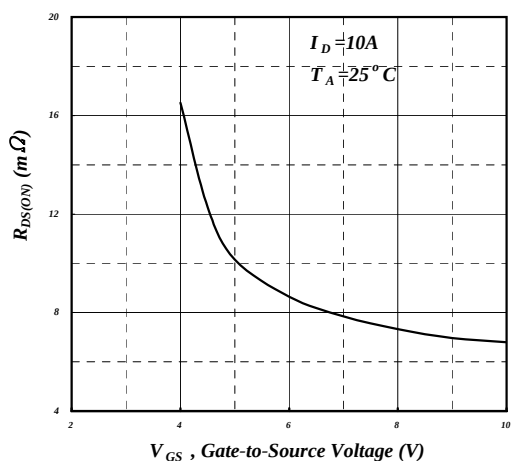
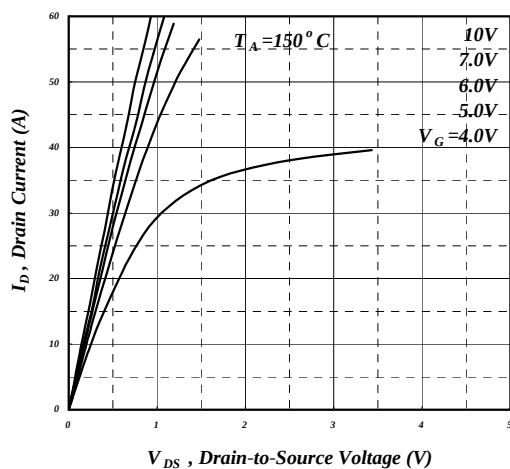
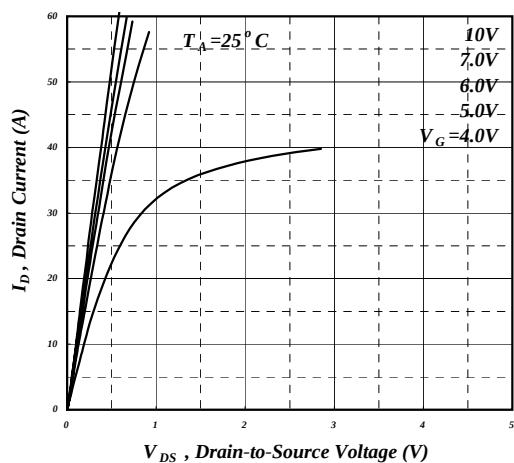


Fig 12. Gate Charge Waveform



Channel-2





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Channel-2

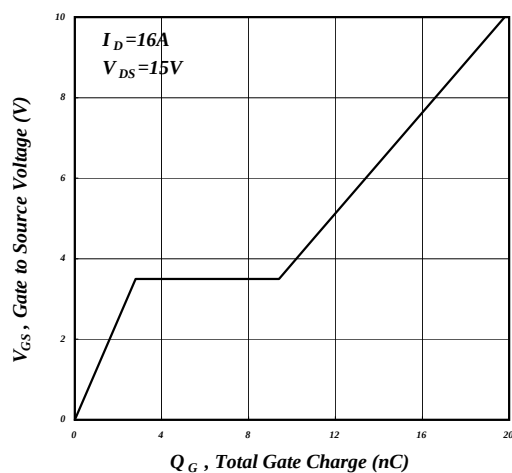


Fig 7. Gate Charge Characteristics

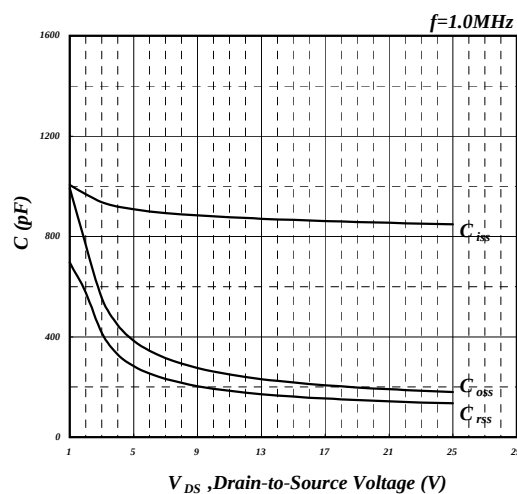


Fig 8. Typical Capacitance Characteristics

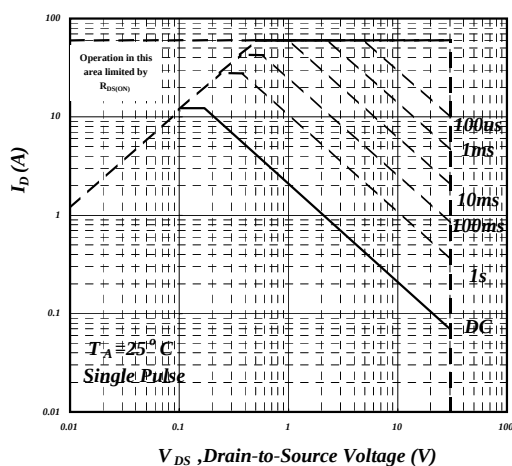


Fig 9. Maximum Safe Operating Area

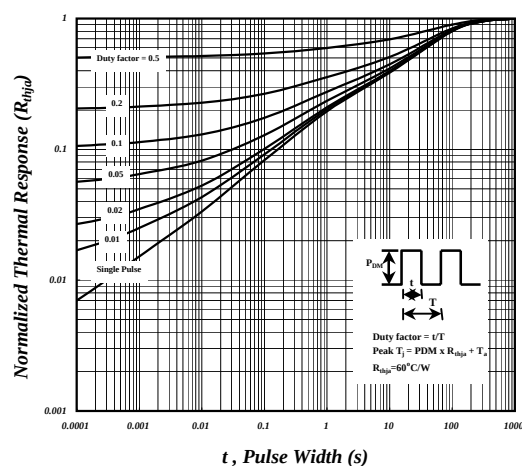


Fig 10. Effective Transient Thermal Impedance

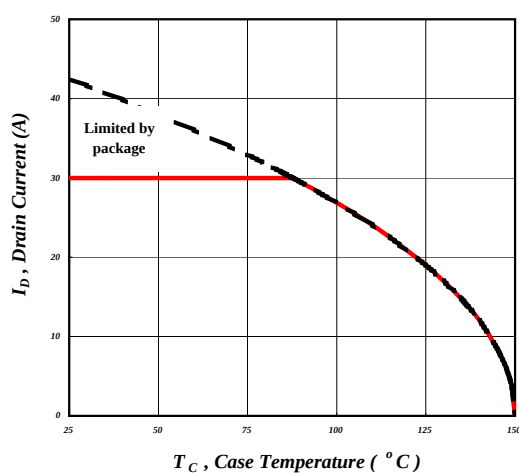


Fig 11. Maximum Continuous Drain Current v.s. Case Temperature

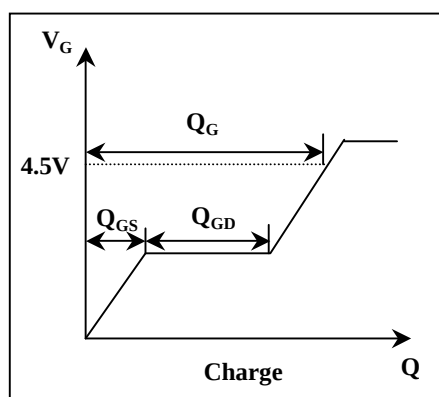


Fig 12. Gate Charge Waveform