KSD4012

N&P-Channel complementary Power MOSFET

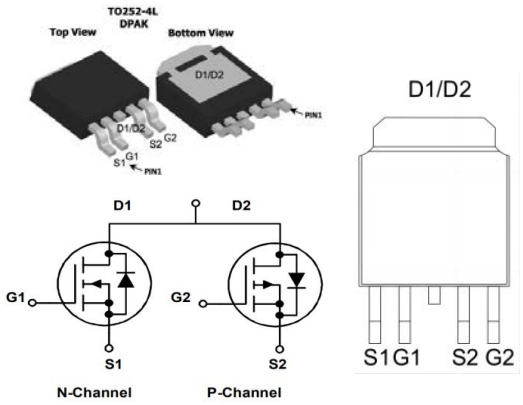
General Description

The KSD4012 uses advanced trench technology and design to provide excellent R_{DS}(ON) with low gate charge. It can be used in a wide variety of applications.

Product Summary

	V_{DS} (V)	$R_{DS(on)}$ (mΩ)	I_D (A)
N-ch	40	17 at V_{GS} = 10 V	30
		22 at V_{GS} = 4.5 V	27
P-ch	-40	26 at V_{GS} = 10 V	-24
		33 at V_{GS} = 4.5 V	-21

TO-252 Pin Configuration



Features

- High density cell design for ultra low R_{ds}on
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

Applications

- H-bridge
- Inverters

Absolute Maximum Ratings Tc=25℃ unless otherwise noted

Symbol	Parameter	N-ch Rating	P-ch Rating	Units
V_{DS}	Drain-Source Voltage	40	-40	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D	Drain Current – Continuous (T_C=25℃)	30	-24	A
	Drain Current – Continuous (T_C=100℃)	21	-17	A
I_{DM}	Drain Current – Pulsed[1]	90	-72	A
P_D	Power Dissipation (T_C=25℃)	28		W
	Power Dissipation (T_C=100℃)	1.3		W/℃
T_{STG}	Storage Temperature Range	-55 to 150		℃
T_J	Operating Junction Temperature Range	-55 to 150		℃

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	53	℃/W
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	5.2	℃/W

N-Channel Electrical Characteristics (TJ=25 ℃, unless otherwisenoted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	40	---	---	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=35V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=35V , V_{GS}=0V , T_J=125℃	---	---	10	uA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V, V_{DS}=0V	---	---	±100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V , I_D=10A	---	17	21	mΩ
		V_{GS}=4.5V , I_D=10A	---	22	27	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	1.0	1.5	2	V
gfs	Forward Transconductance	V_{DS}=10V , I_S=5A	---	20	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge[2,3]	V_{DS}=15V , V_{GS}=10V , I_D=6A	---	12	---	nC
Q_{gs}	Gate-Source Charge[2,3]		---	4	---	
Q_{gd}	Gate-Drain Charge[2,3]		---	3	---	
$T_{d(on)}$	Turn-On Delay Time[2,3]	V_{DS}=15V, R_L=2.5Ω V_{GS}=10V,R_G=3Ω	---	7	---	ns
T_r	Rise Time[2,3]		---	15	---	
$T_{d(off)}$	Turn-Off Delay Time[2,3]		---	30	---	
T_f	Fall Time[2,3]		---	9	---	
C_{iss}	Input Capacitance	V_{DS}=15V , V_{GS}=0V , F=1MHz	---	813	---	pF
C_{oss}	Output Capacitance		---	210	---	
C_{rss}	Reverse Transfer Capacitance		---	120	---	

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	V_G=V_D=0V , Force Current	---	---	30	A
I_{SM}	Pulsed Source Current		---	---	60	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_S=1A , T_J=25℃	---	---	1.2	V

N-Channel Typical Electrical and Thermal Characteristics (Curves)

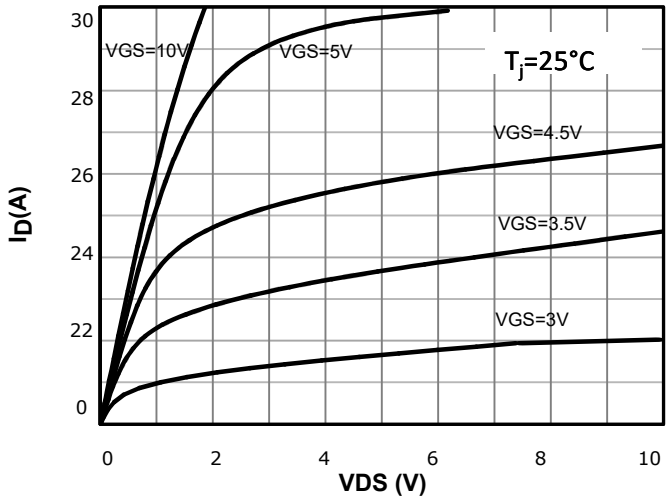


Fig1:Output Characteristics

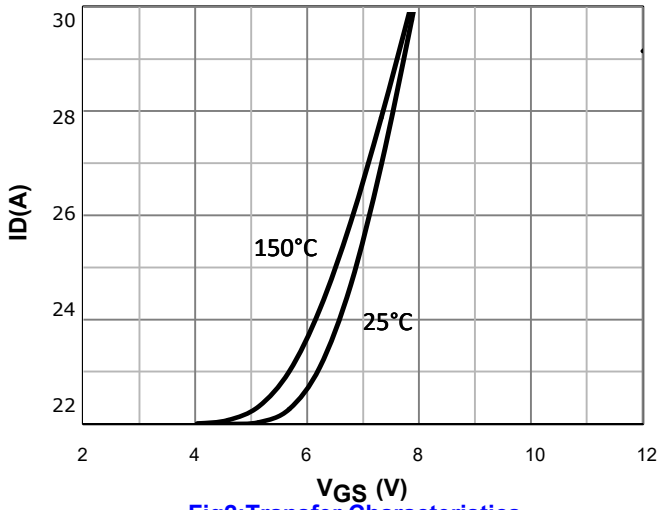


Fig2:Transfer Characteristics

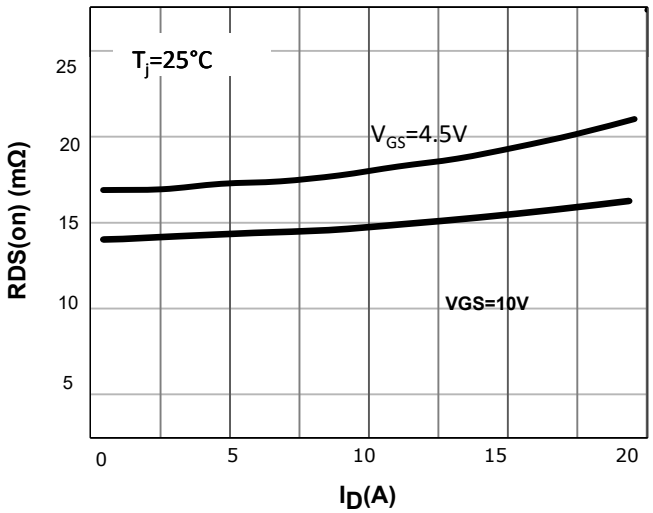


Fig3:Rdson- Drain Current

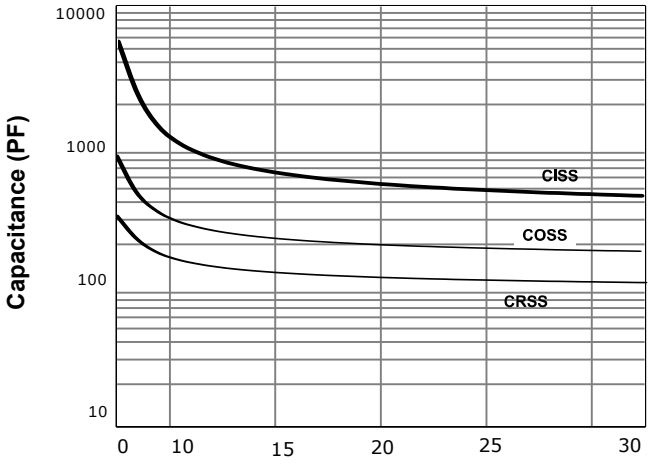


Fig4:Capacitance vs Vds

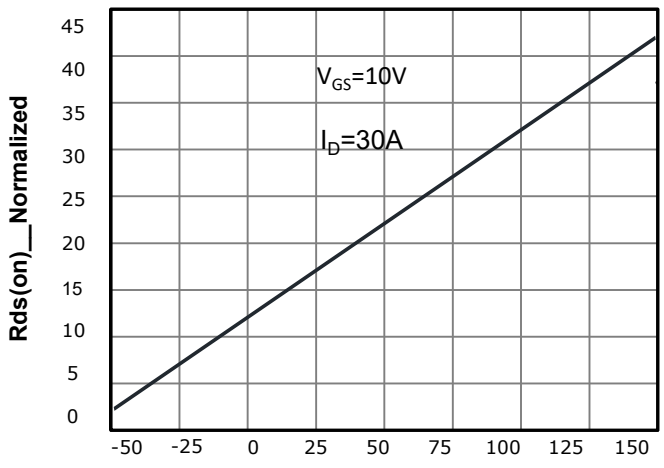


Fig5:Rds(on) vs. Temperature

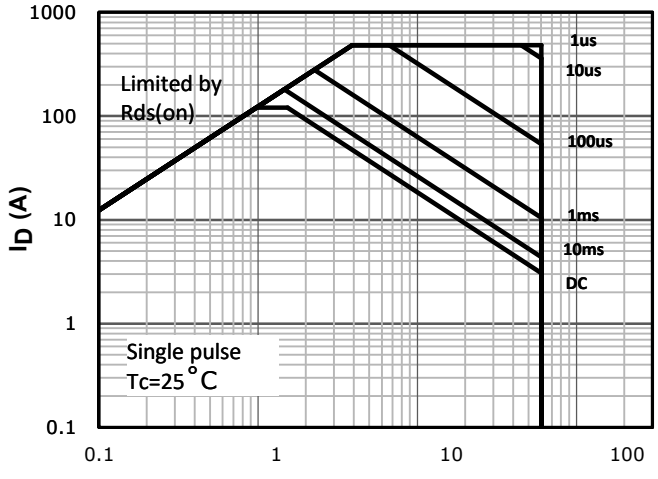


Fig6:Safe Operating Area

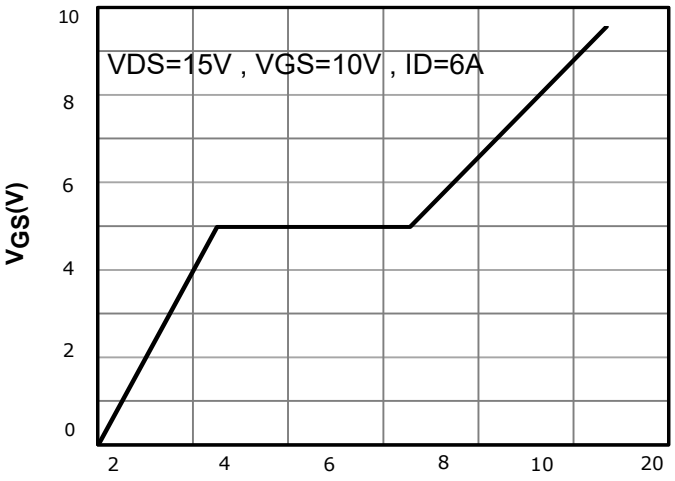


Fig7:Gate Charge

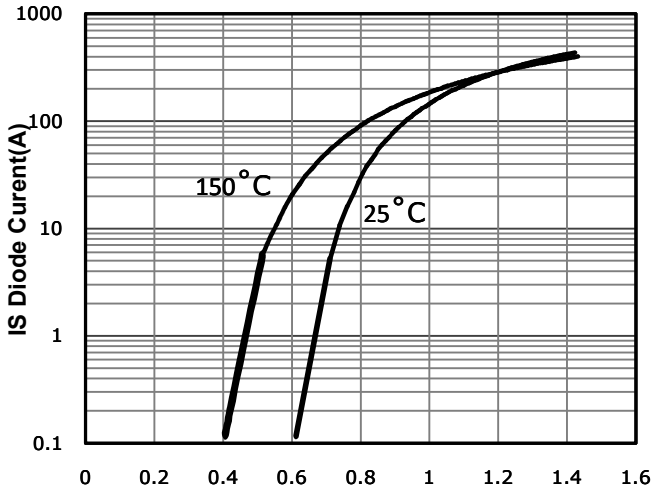


Fig8:Source- Drain Diode Forwrd

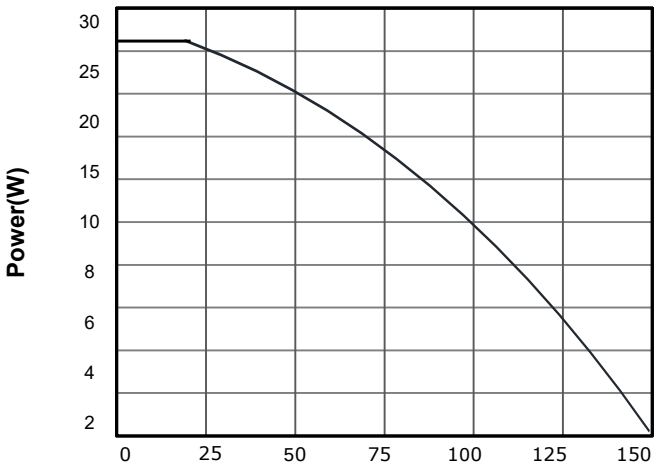


Fig9:Power Disipation

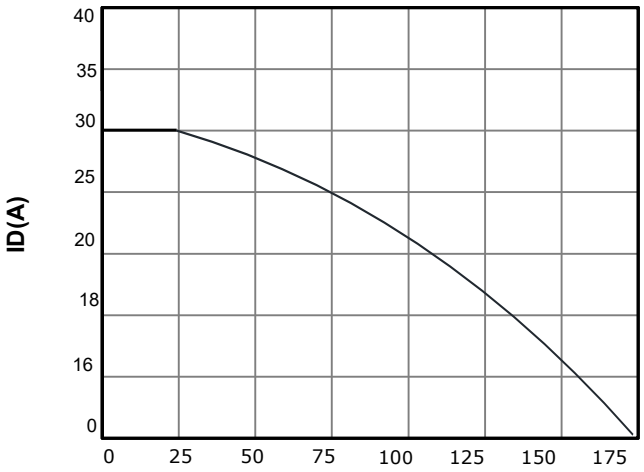


Fig10：IDCurrent- Junction Temperature

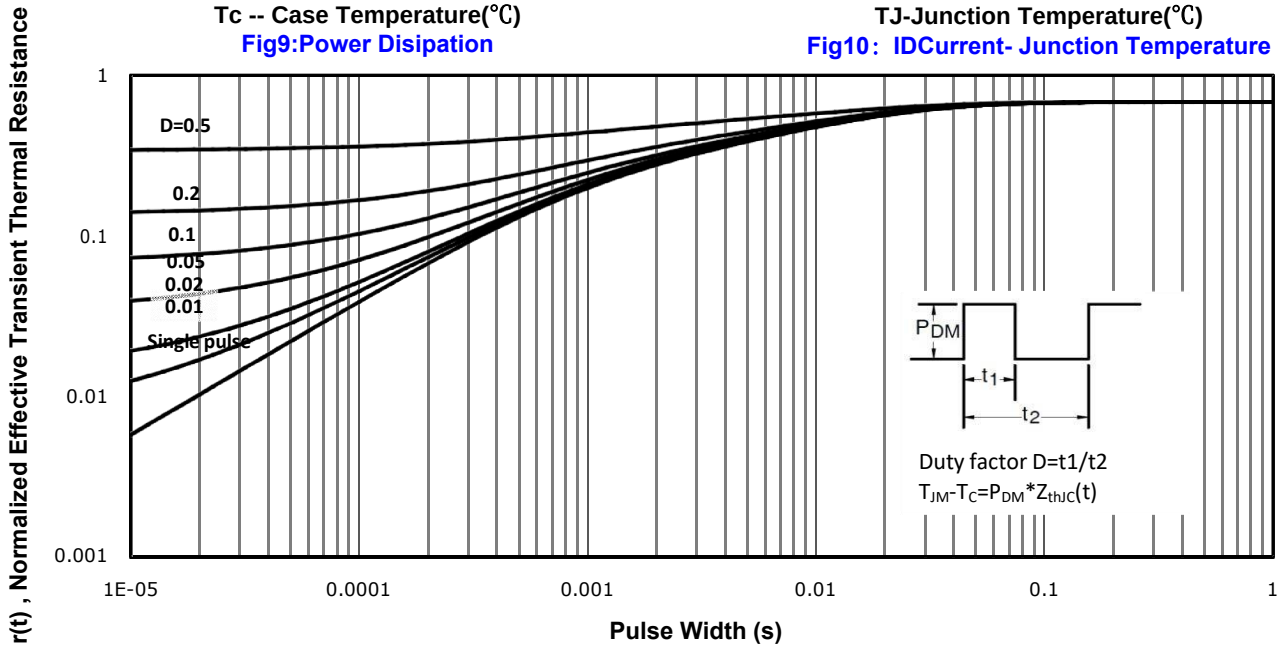


Fig11: Normalized Maximum Transient Thermal Impedance

P-Channel Electrical Characteristics (T_J=25 ℃, unless otherwisenoted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=-250uA	-40	---	---	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=-35V , V_{GS}=0V , T_J=25℃	---	---	-1	uA
		V_{DS}=-35V , V_{GS}=0V , T_J=125℃	---	---	-10	uA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V , I_D=-10A	---	26	31	mΩ
		V_{GS}=-4.5V , I_D=-10A	---	33	39	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	-1.0	-1.5	-2	V
gfs	Forward Transconductance	V_{DS}=-5V , I_S=-5A	---	20	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge	V_{DS}=-15V , V_{GS}=-10V , I_D=-6A	---	20	---	nC
Q_{gs}	Gate-Source Charge		---	4.8	---	
Q_{gd}	Gate-Drain Charge		---	6.2	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DS}=-15V, R_L=2.5Ω V_{GS}=-10V,R_G=3Ω	---	11	---	ns
T_r	Rise Time		---	40	---	
$T_{d(off)}$	Turn-Off Delay Time		---	28	---	
T_f	Fall Time		---	33	---	
C_{iss}	Input Capacitance	V_{DS}=-15V , V_{GS}=0V , F=1MHz	---	925	---	pF
C_{oss}	Output Capacitance		---	170	---	
C_{rss}	Reverse Transfer Capacitance		---	120	---	

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	V_G=V_D=0V , Force Current	---	---	-24	A
I_{SM}	Pulsed Source Current		---	---	-48	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_S=-1A , T_J=25℃	---	---	-1.2	V

Note :

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. E_{AS} condition: Tj=25℃,V_{DD}=-15V,V_G=-10V,L=0.5mH,Rg=25Ω,I_{AS}=-26A

P-Channel Typical Electrical and Thermal Characteristics (Curves)

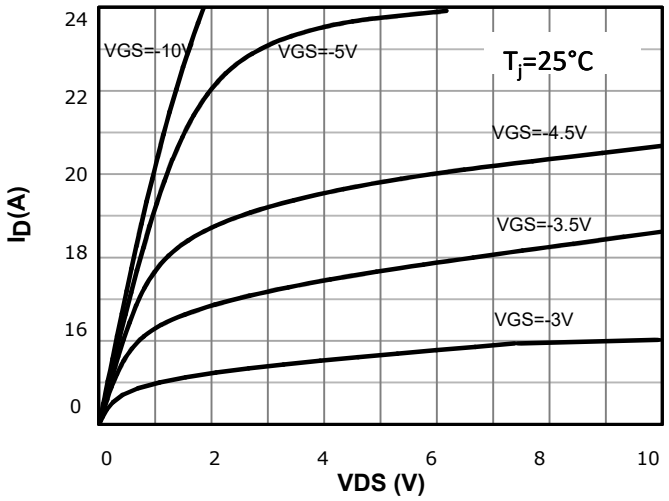
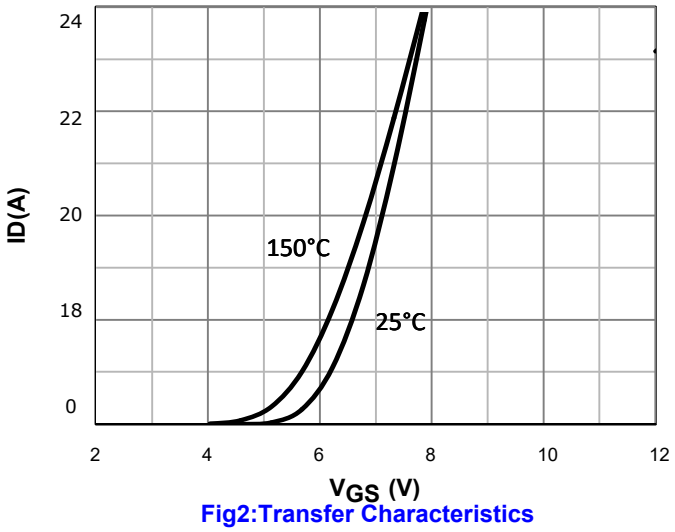


Fig1:Output Characteristics



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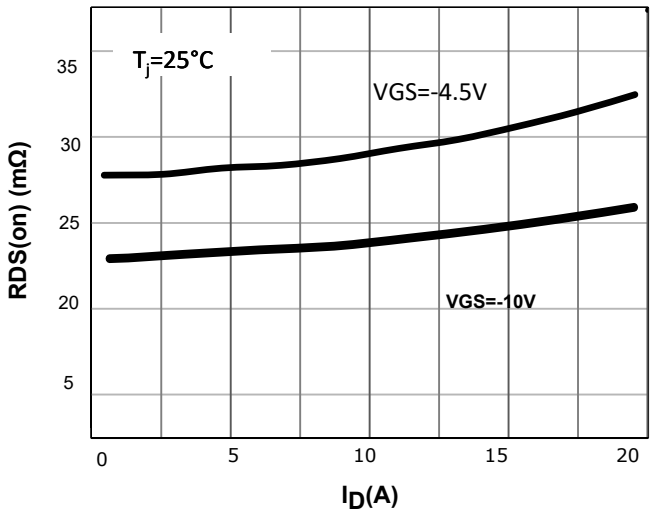

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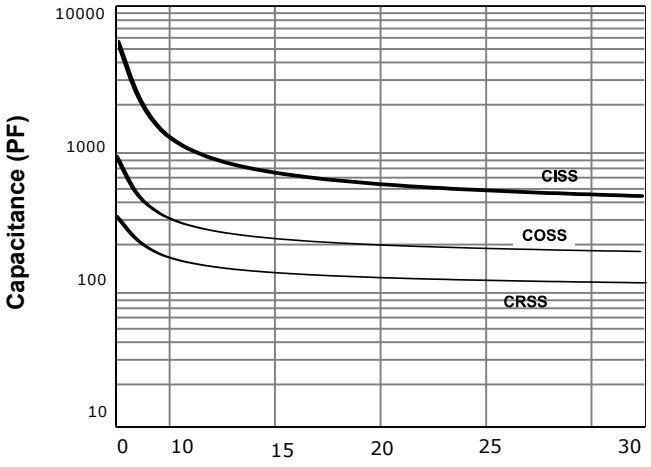

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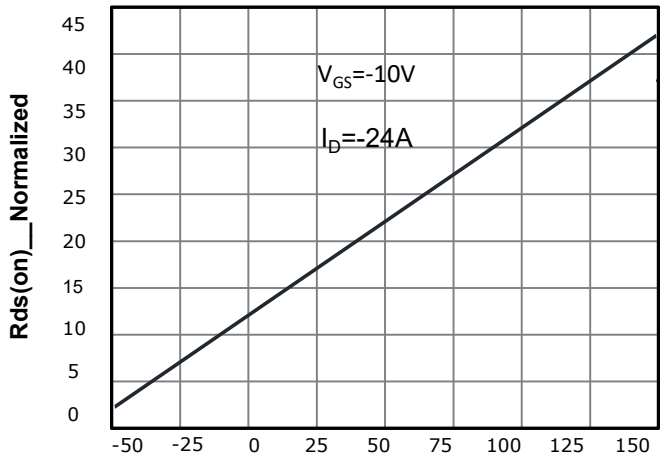

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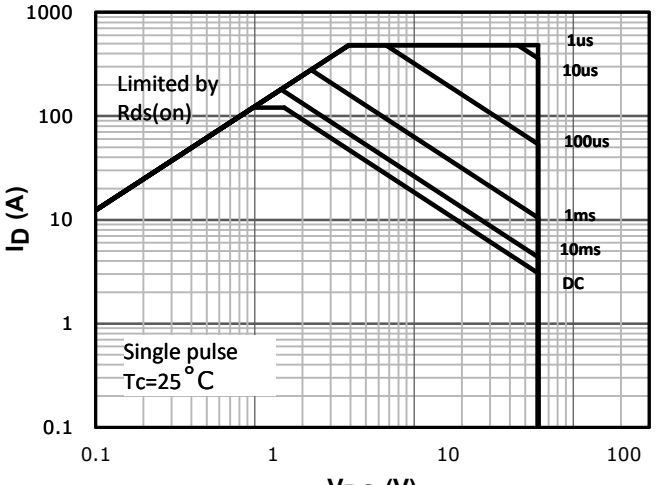

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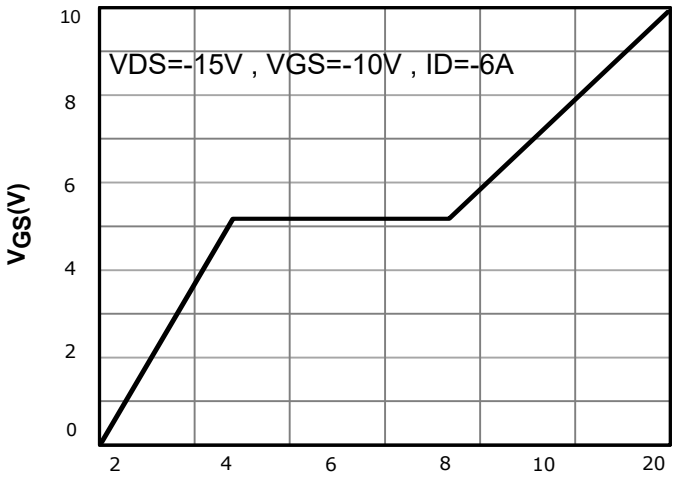
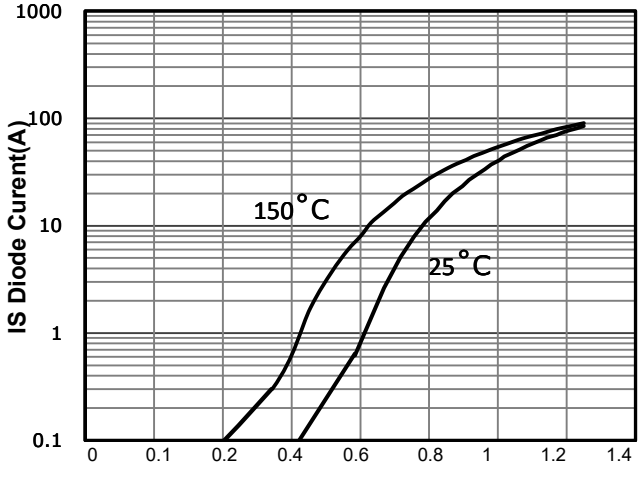


Fig7:Gate Charge



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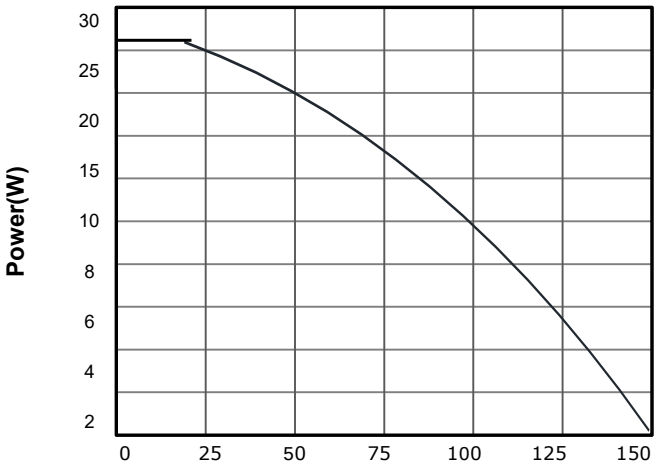
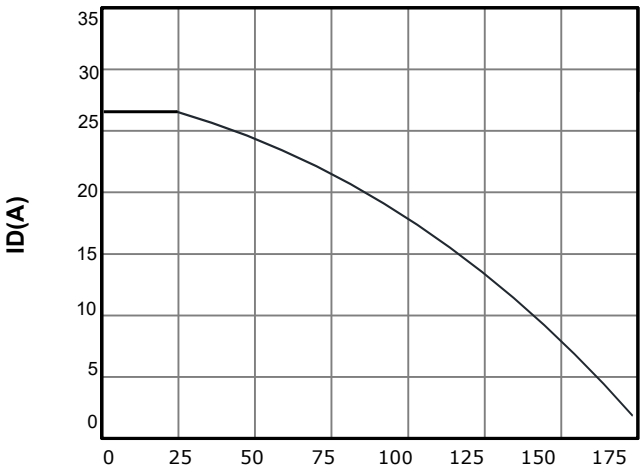


Fig9:Power Disipation



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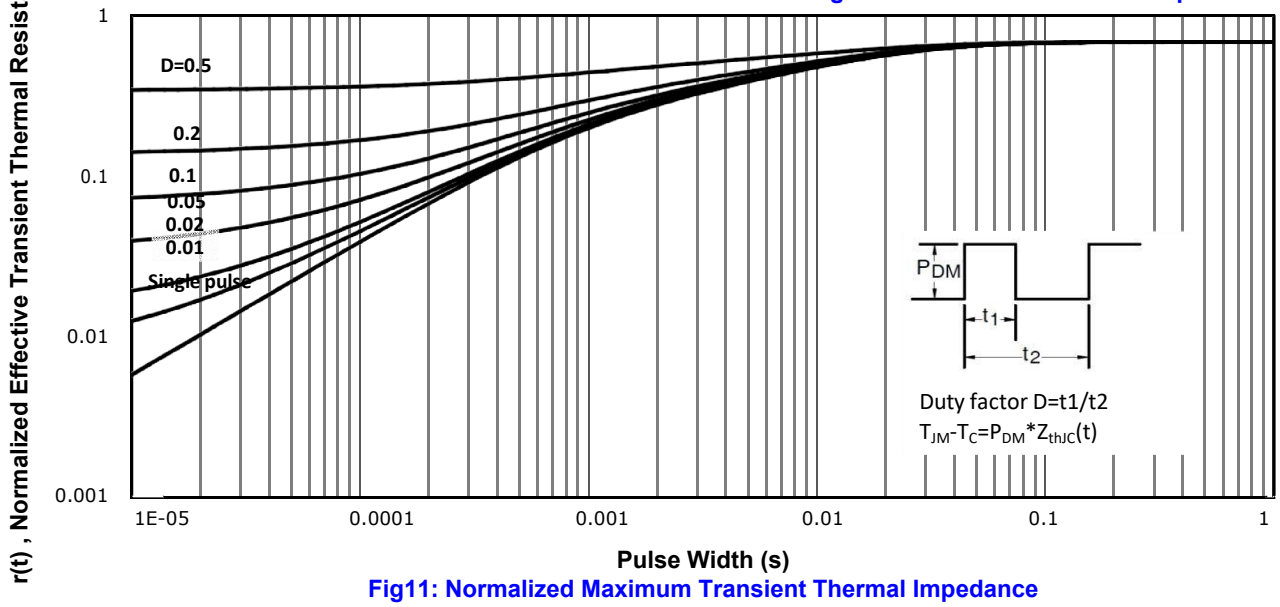

Fig11: Normalized Maximum Transient Thermal Impedance

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