N-Ch and P-Ch Fast Switching MOSFETs

- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

Product Summary

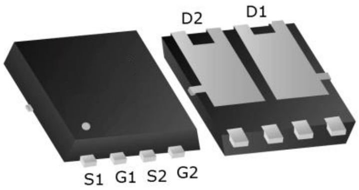
BVDSS	RDSON	ID
40V	17mΩ	20A
-40V	30mΩ	-20A

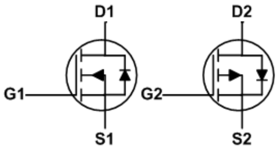
Description

The XR40G20D is the high performance complementary N-ch and P-ch MOSFETs with high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The XR40G20D meet the RoHS and Green

PDFN3333-8L Pin Configuration





Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V_{DS}	Drain-Source Voltage	40	-40	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D@T_C=25˚C	Continuous Drain Current, V_{GS} @ 10V[1]	20	-20	A
I_D@T_C=100˚C	Continuous Drain Current, V_{GS} @ 10V[1]	10	-11	A
I_{DM}	Pulsed Drain Current[2]	80	-95	A
EAS	Single Pulse Avalanche Energy[3]	19	27.5	mJ
I_{AS}	Avalanche Current	---	---	A
P_D@T_C=25˚C	Total Power Dissipation[4]	3.5	7.5	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	˚C
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	˚C

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R_{dJA}	Thermal Resistance Junction-Ambient [1]	---	60	˚C/W
R_{dJC}	Thermal Resistance Junction-Case[1]	---	3.3	˚C/W

N-Channel Electrical Characteristics (T_J=25℃ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	40	---	---	V
△BV_{DSS}/△T_J	BV_{DSS} Temperature Coefficient	Reference to 25˚C , I_D=1mA	---	---	---	V/˚C
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=10V , I_D=1A	---	17	22	mΩ
		V_{GS}=4.5V , I_D=1A	---	22	28	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	1.0	1.5	2.5	V
△$V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	---	---	mV/˚C
I_{DSS}	Drain-Source Leakage Current	V_{DS}=40V , V_{GS}=0V , T_J=25˚C	---	---	1	uA
		V_{DS}=40V, V_{GS}=0V , T_J=100˚C	---	---	100	
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
gfs	Forward Transconductance	V_{DS}=5V , I_D=8A	---	---	---	S
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1MHz	---	---	---	Ω
Q_g	Total Gate Charge	V_{DS}=20V , V_{GS}=10V , I_D=10A	---	11	---	nC
Q_{gs}	Gate-Source Charge		---	1.9	---	
Q_{gd}	Gate-Drain Charge		---	2.2	---	
$T_{d(on)}$	Turn-On Delay Time	VGS=10V, VDD=20V, RG=3Ω, ID=10A	---	11	---	ns
T_r	Rise Time		---	13	---	
$T_{d(off)}$	Turn-Off Delay Time		---	36	---	
T_f	Fall Time		---	9	---	
C_{iss}	Input Capacitance	V_{DS}=20V , V_{GS}=0V , f=1MHz	---	980	---	pF
C_{oss}	Output Capacitance		---	86.2	---	
C_{rss}	Reverse Transfer Capacitance		---	68.5	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current[1,4]	V_G=V_D=0V , Force Current	---	---	20	A
V_{SD}	Diode Forward Voltage[2]	V_{GS}=0V , I_S=3A , T_J=25C	---	---	1.2	V
t_{rr}	Reverse Recovery Time	IF=10A , di/dt=100A/ μs , T_J= 2 5 C	---	19	---	nS
Q_{rr}	Reverse Recovery Charge		---	11	---	nC

Note :

1.The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.

2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3.The EAS data shows Max. rating . The test condition is TJ=25℃,VDD=40V,VG=10V, Rg=25Ω, L=0.5mH.

4.The power dissipation is limited by 150˚C junction temperature

5.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

P-Channel Electrical Characteristics (T_J=25℃ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=-250uA	-40	---	---	V
$\triangle BV_{DSS}/\triangle T_J$	BV_{DSS} Temperature Coefficient	Reference to 25˚C , I_D=-1mA	---	-0.012	---	V/˚C
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=-10V , I_D=-8A	---	30	39	mΩ
		V_{GS}=-4.5V , I_D=-4A	---	37	48	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =-250uA	-1.0	-1.6	-2.5	V
$\triangle V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	4.32	---	mV/˚C
I_{DSS}	Drain-Source Leakage Current	V_{DS}=-32V , V_{GS}=0V , T_J=25˚C	---	---	1	uA
		V_{DS}=-32V , V_{GS}=0V , T_J=55˚C	---	---	5	
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
gfs	Forward Transconductance	V_{DS}=-5V , I_D=-8A	---	12.6	---	S
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1MHz	---	13	16	Ω
Q_g	Total Gate Charge (-4.5V)	V_{DS}=-20V , V_{GS}=-4.5V , I_D=-12A	---	9	---	nC
Q_{gs}	Gate-Source Charge		---	2.54	---	
Q_{gd}	Gate-Drain Charge		---	3.1	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=-15V , V_{GS}=-10V , R_G=3.3Ω, I_D=-1A	---	19.2	---	ns
T_r	Rise Time		---	12.8	---	
$T_{d(off)}$	Turn-Off Delay Time		---	48.6	---	
T_f	Fall Time		---	4.6	---	
C_{iss}	Input Capacitance	V_{DS}=-15V , V_{GS}=0V , f=1MHz	---	1004	---	pF
C_{oss}	Output Capacitance		---	108	---	
C_{rss}	Reverse Transfer Capacitance		---	80	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current[1,5]	V_G=V_D=0V , Force Current	---	---	-20	A
I_{SM}	Pulsed Source Current[2,5]		---	---	-40	A
V_{SD}	Diode Forward Voltage[2]	V_{GS}=0V , I_S=-1A , T_J=25˚C	---	---	-1	V

Note :

1.The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.

2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3.The EAS data shows Max. rating . The test condition is V_{DD}=-25V,V_{GS}=-10V,L=0.1mH

.The power dissipation is limited by 150˚C junction temperature

5.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Typical Performance Characteristics-N

Figure1: Output Characteristics

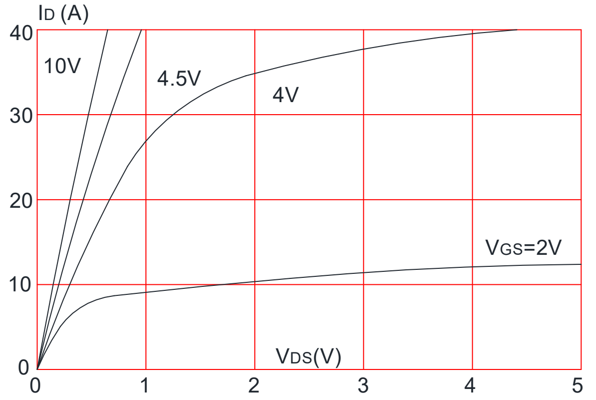


Figure 2: Typical Transfer Characteristics

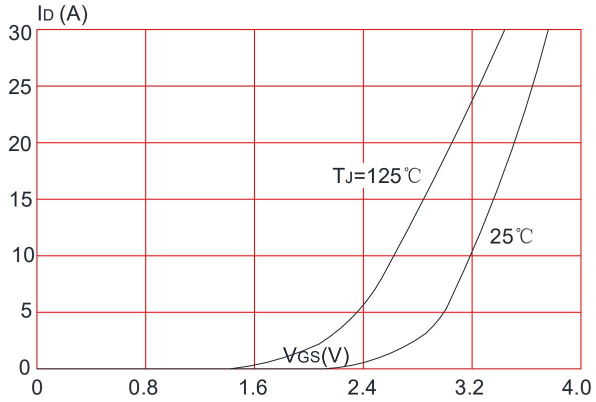


Figure 3: On-resistance vs. Drain Current

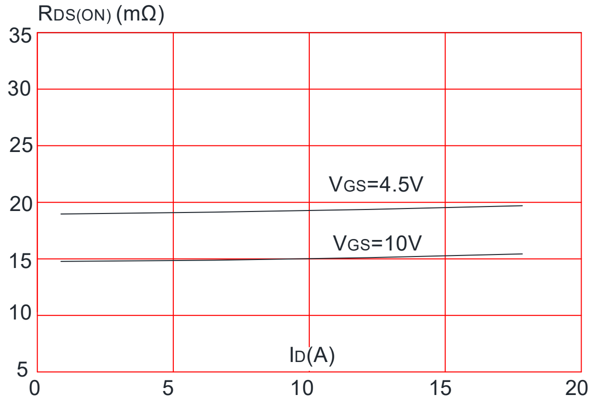


Figure 4: Body Diode Characteristics

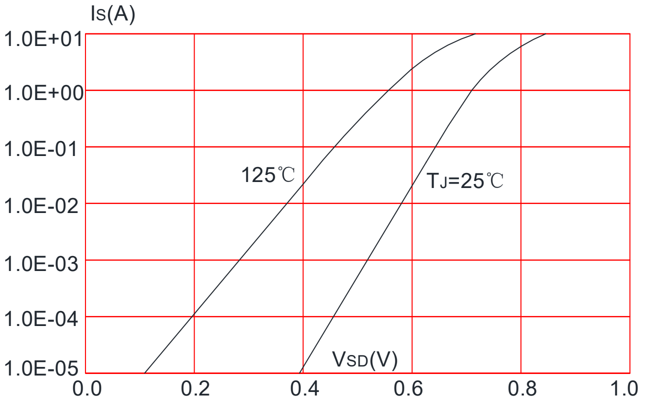


Figure 5: Gate Charge Characteristics

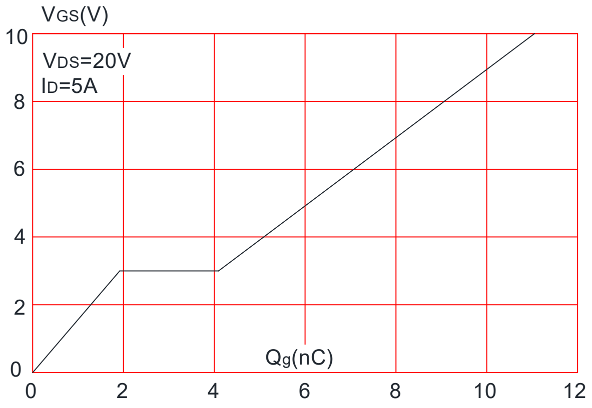


Figure 6: Capacitance Characteristics

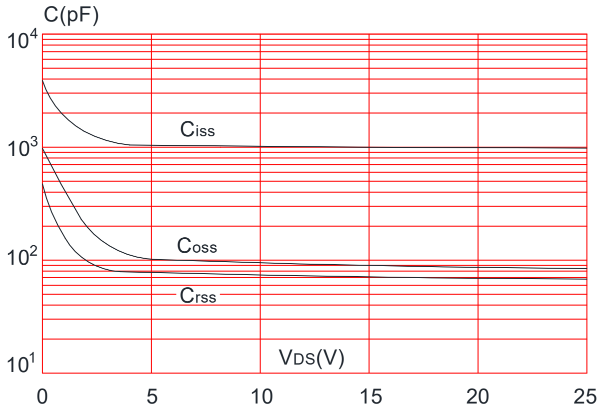


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

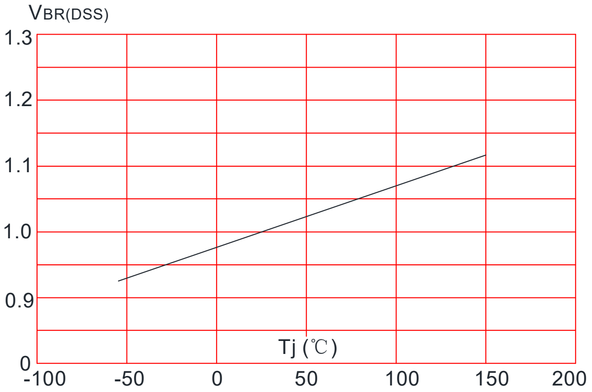


Figure 8: Normalized on Resistance vs. Junction Temperature

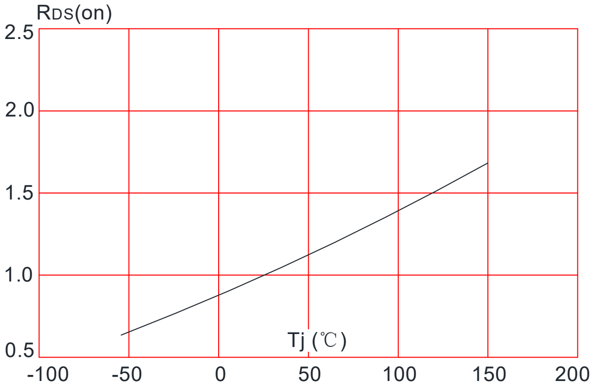


Figure 9: Maximum Safe Operating Area

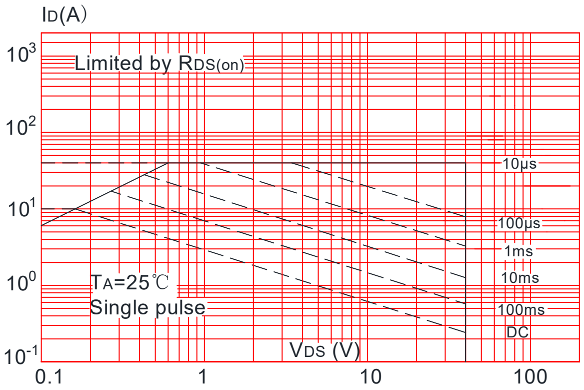


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

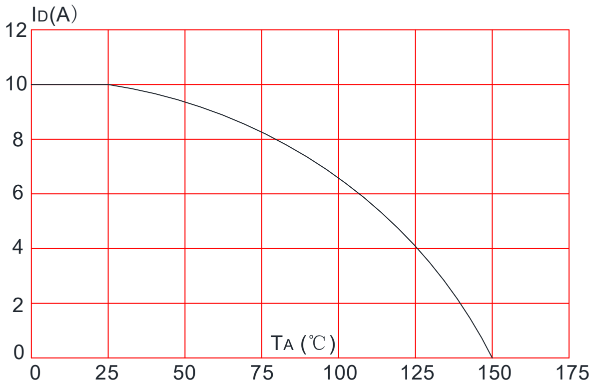
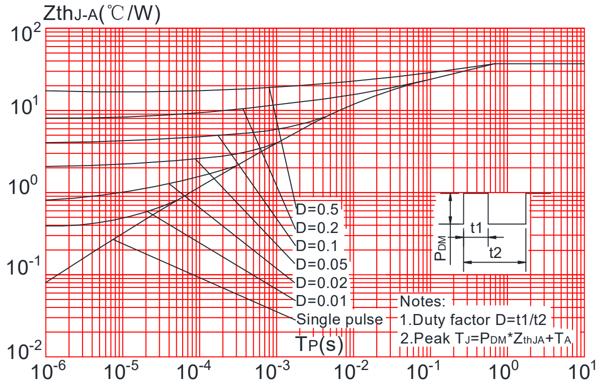


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



Notes:
1.Duty factor D=t1/t2
2.Peak $T_J=P_{DM}*Z_{thJA}+T_A$

Test Circuit-N

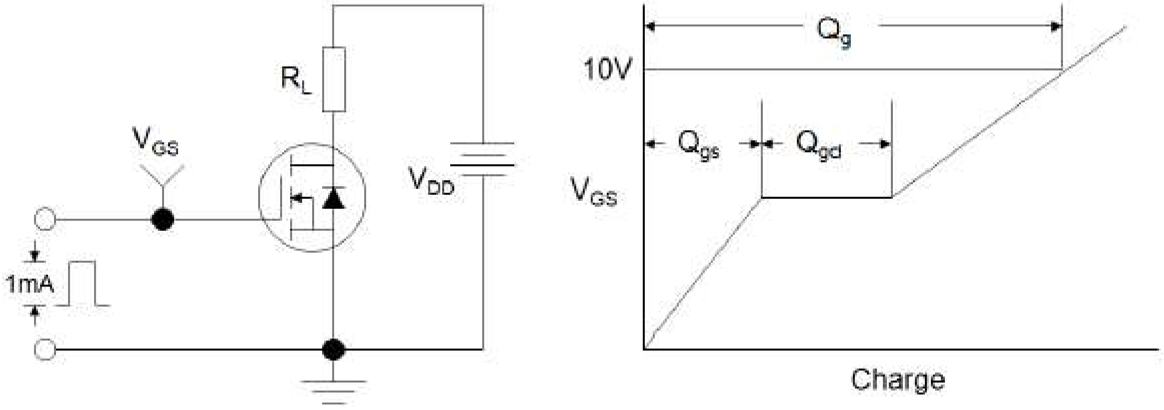


Figure1:Gate Charge Test Circuit & Waveform

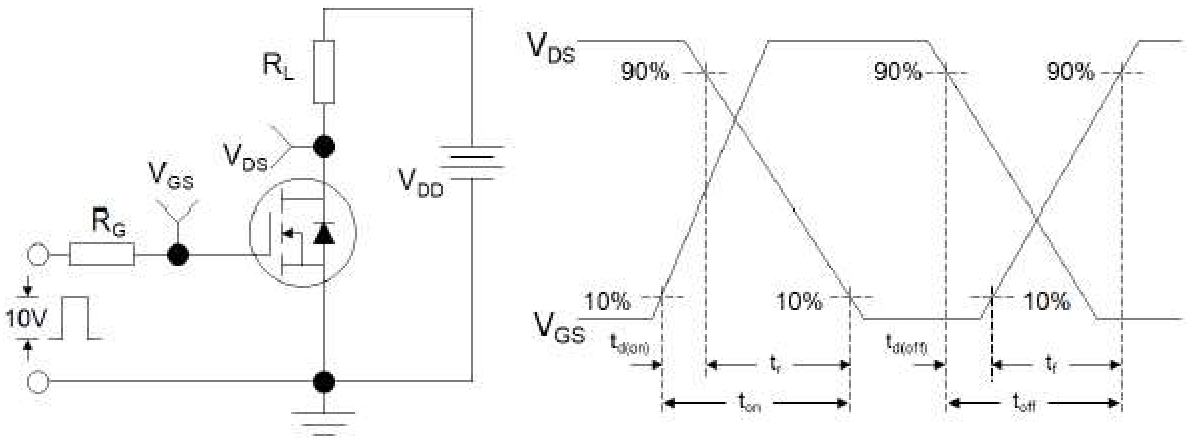


Figure 2: Resistive Switching Test Circuit & Waveforms

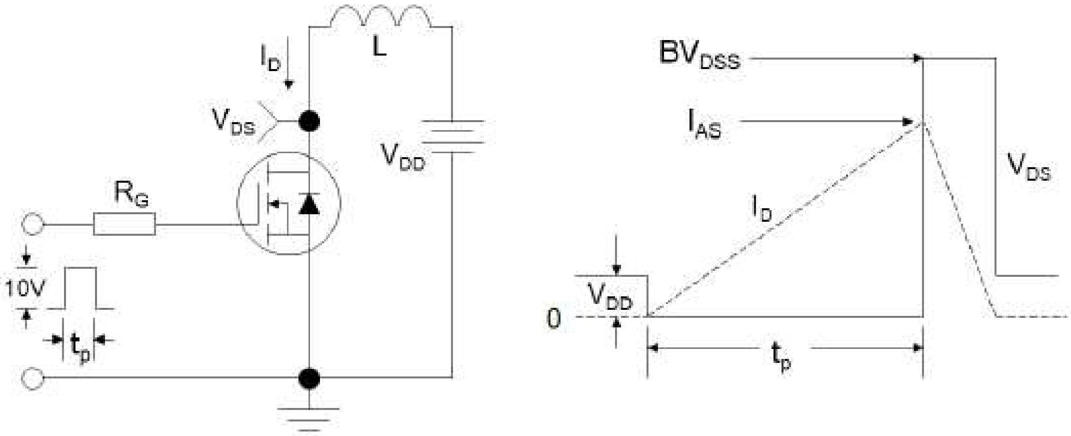


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

Typical Performance Characteristics-P

Figure1: Output Characteristics

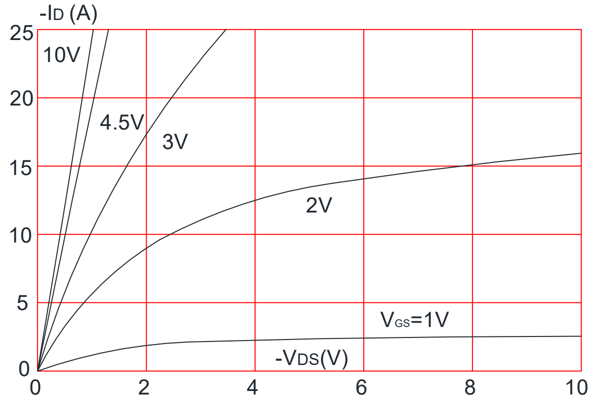


Figure 2: Typical Transfer Characteristics

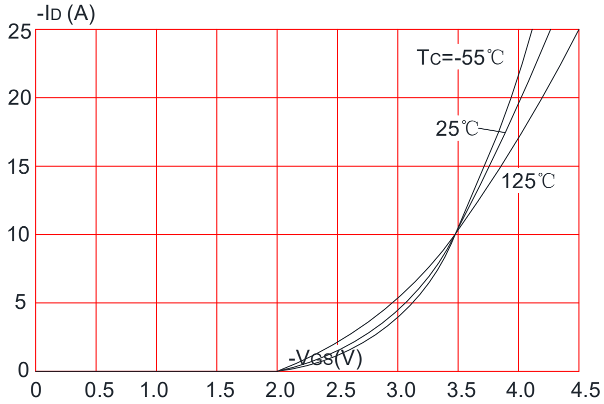


Figure 3: On-resistance vs. Drain Current

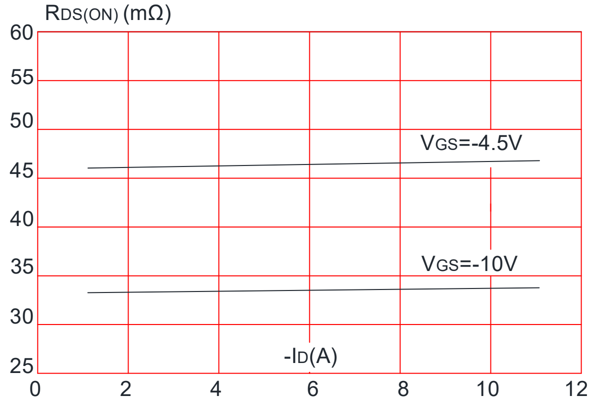


Figure 4: Body Diode Characteristics

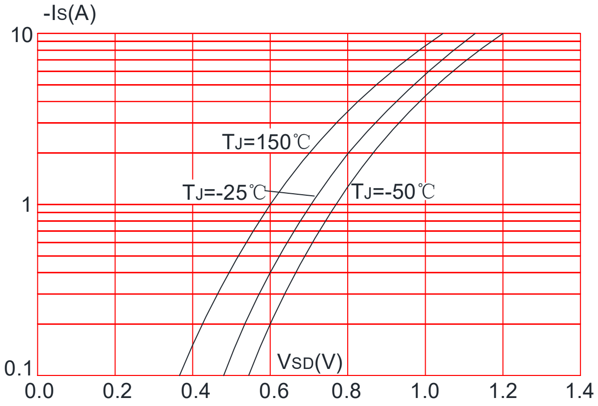


Figure 5: Gate Charge Characteristics

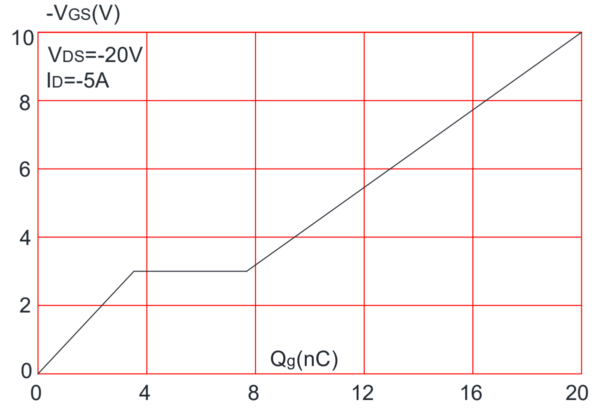


Figure 6: Capacitance Characteristics

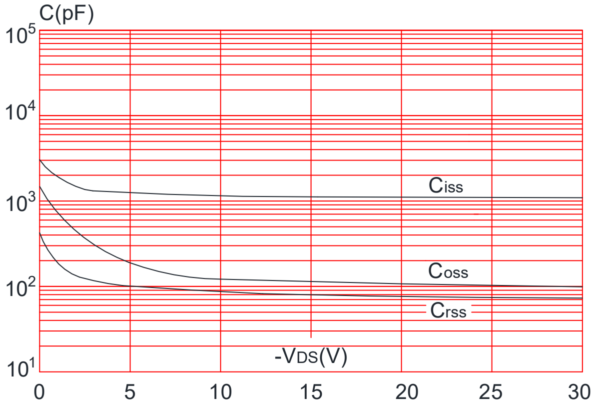


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

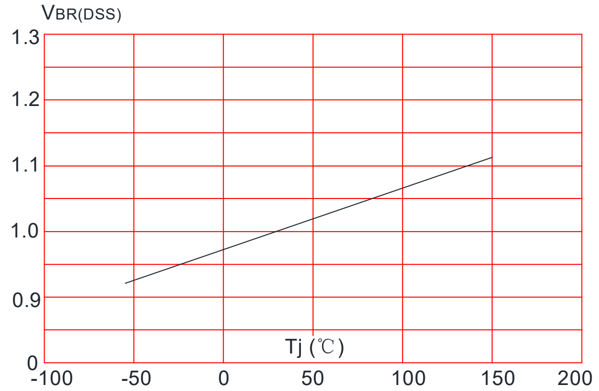


Figure 8: Normalized on Resistance vs. Junction Temperature

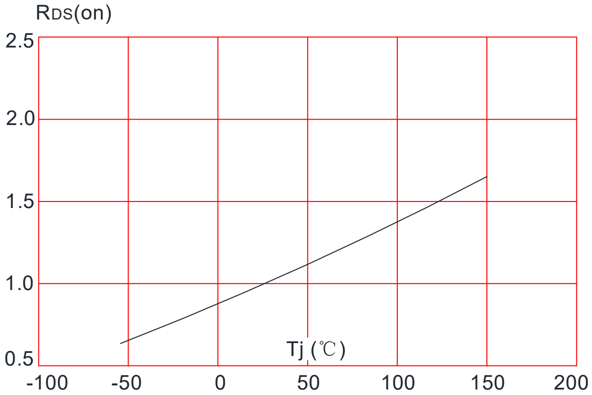


Figure 9: Maximum Safe Operating Area

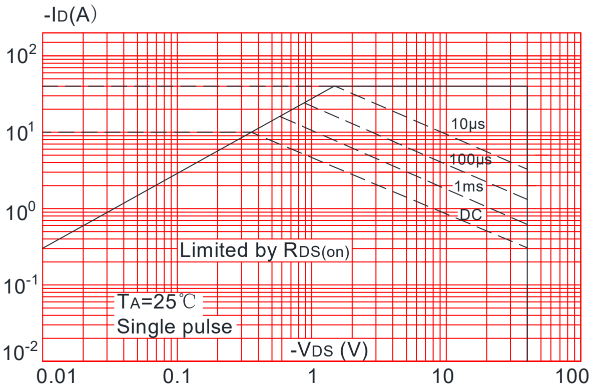


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

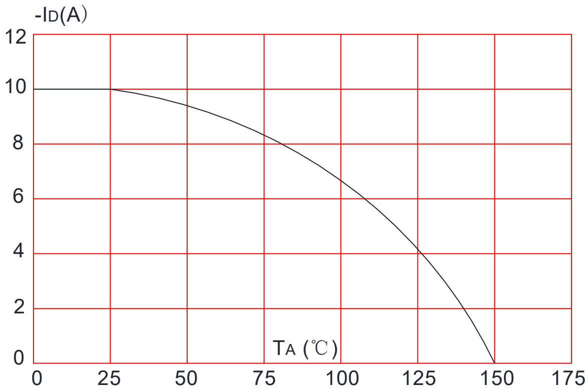
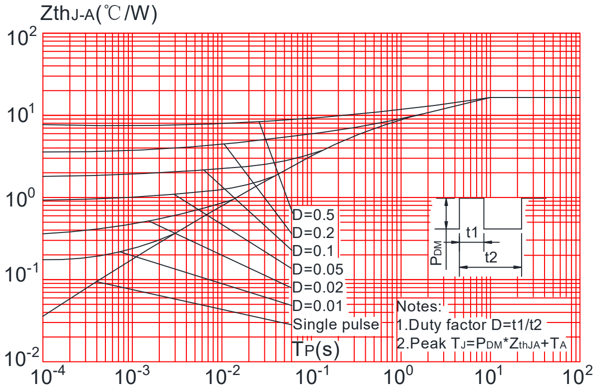


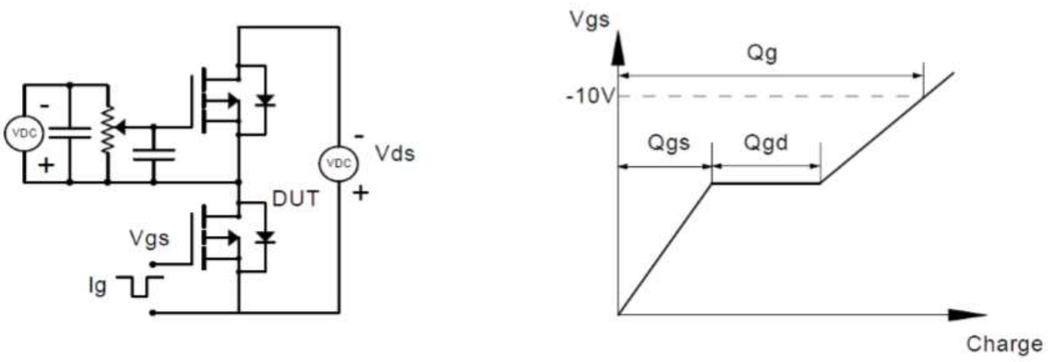
Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



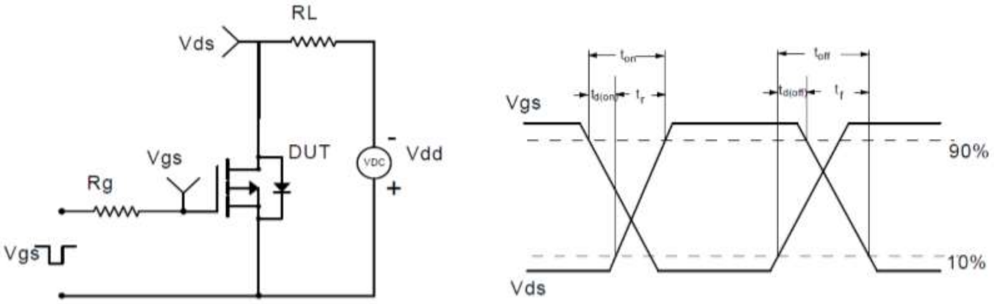
Notes:
1.Duty factor D=t1/t2
2.Peak $T_J=P_{DM}*Z_{thJA}+T_A$

Test Circuit-P

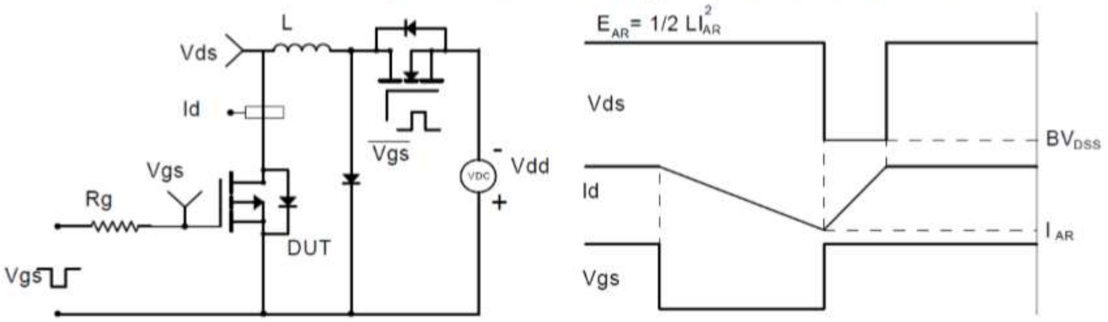
Gate Charge Test Circuit & Waveform



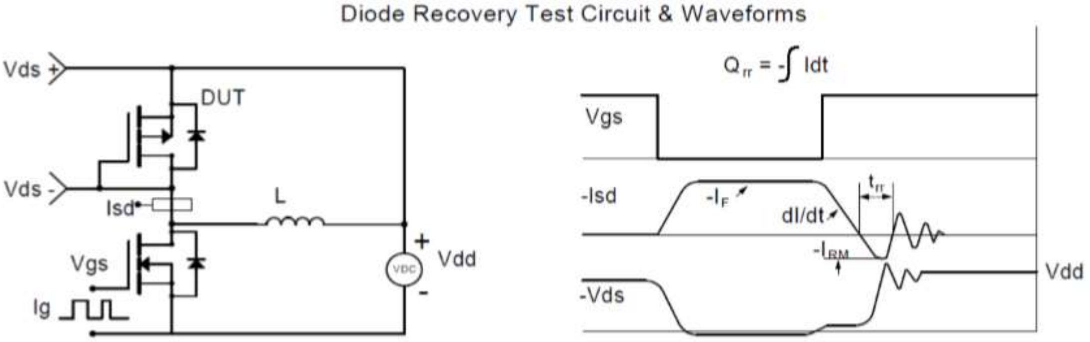
Resistive Switching Test Circuit & Waveforms



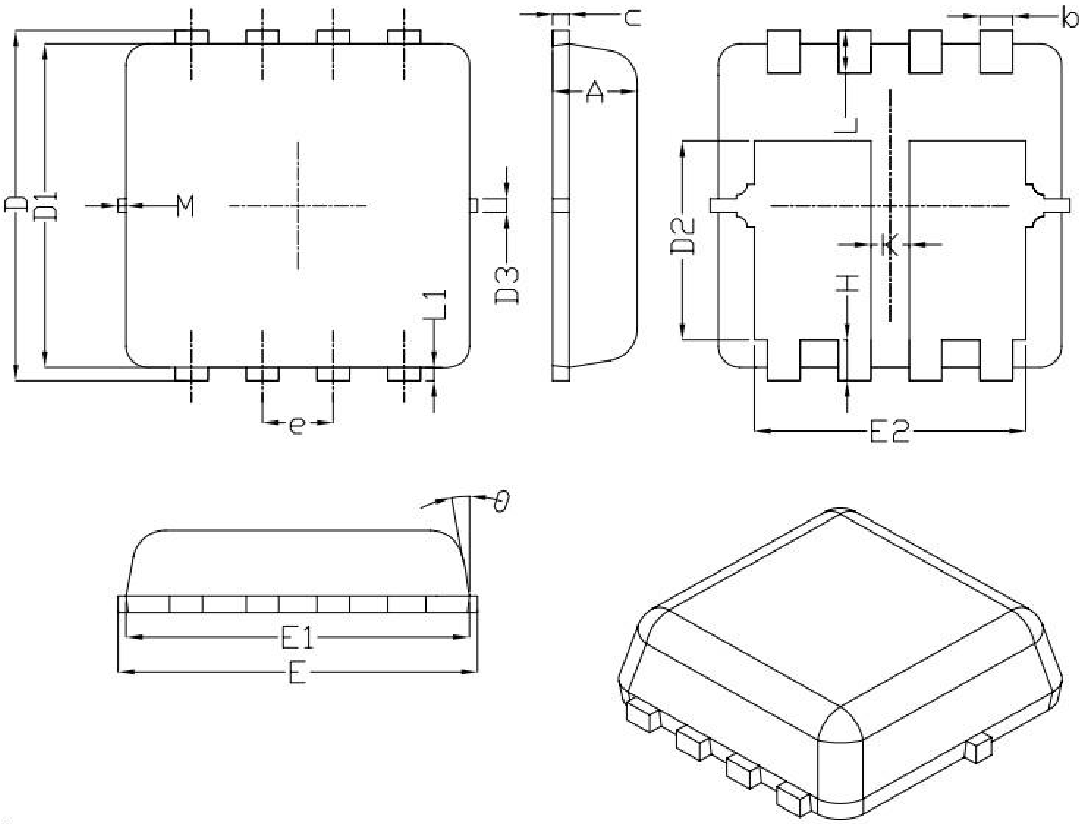
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Dual PDFN3333-8L Package Outline Data



Symbol	Dimensions (unit: mm)		
	Min	Typ	Max
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.78	1.88	1.98
D3	--	0.13	--
E	3.20	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65 BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	--	0.13	--
K	0.30	--	--
θ	--	10°	12°
M	*	*	0.15
* Not Specified			

Notes:

1. Refer to JEDEC MO-240 variation CA.
2. Dimensions "D1" and "E1" do NOT include mold flash protrusions or gate burrs.
3. Dimensions "D1" and "E1" include interterminal flash or protrusion.