

N-Ch and P-Ch Fast Switching MOSFETs

- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology



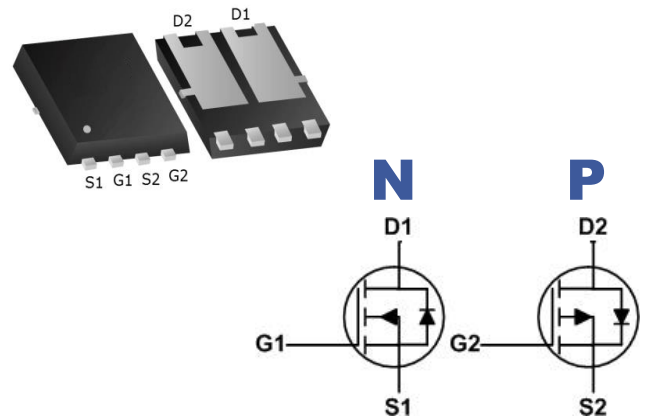
Product Summary

BVDSS	RDSON	ID
30V	8mΩ	40A
-30V	13mΩ	-40A

Description

The XR40G30D is th 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 XR40G30D meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

PDFN3333-8L Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V_{DS}	Drain-Source Voltage	30	-30	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
$I_D@Ta=25^{\circ}C$	Continuous Drain Current, $V_{GS} @ 10V^1$	40	-40	A
$I_D@Ta=100^{\circ}C$	Continuous Drain Current, $V_{GS} @ 10V^1$	26	-23	A
I_{DM}	Pulsed Drain Current ²	168	-120	A
EAS	Single Pulse Avalanche Energy ³	33	45	mJ
$P_D@T_C=25^{\circ}C$	Total Power Dissipation ⁴	30.5	29.7	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	$^{\circ}C$
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	$^{\circ}C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	48	$^{\circ}C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	5	$^{\circ}C/W$

N-Ch and P-Ch Fast Switching MOSFETs

N-Channel Electrical Characteristics $T = 25^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BVDSS Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$	---	---	---	$V/^{\circ}\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V, I_D=1A$	---	8.0	12	$\text{m}\Omega$
		$V_{GS}=4.5V, I_D=1A$	---	11	18	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.0	1.5	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	---	---	$\text{mV}/^{\circ}\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=24V, V_{GS}=0V, T_J=25^{\circ}\text{C}$	---	---	1	μA
		$V_{DS}=24V, V_{GS}=0V, T_J=55^{\circ}\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA
R_g	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$	---	---	---	Ω
Q_g	Total Gate Charge (4.5V)	$V_{DS}=15V, V_{GS}=4.5V, I_D=2A$	---	19	---	nC
Q_{gs}	Gate-Source Charge		---	6.3	---	
Q_{gd}	Gate-Drain Charge		---	4.5	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=15V, V_{GS}=10V, R_G=3.3\Omega, I_D=2A$	---	6	---	ns
T_r	Rise Time		---	5	---	
$T_{d(off)}$	Turn-Off Delay Time		---	25	---	
T_f	Fall Time		---	7	---	
C_{iss}	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$	---	1011	---	pF
C_{oss}	Output Capacitance		---	142	---	
C_{rss}	Reverse Transfer Capacitance		---	119	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	40	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	---	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V, I_S=1A, T_J=25^{\circ}\text{C}$	---	---	1.2	V

Note :

1. The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.
2. The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
3. The EAS data shows Max. rating. The test condition is $V_{DD}=25V, V_{GS}=10V, L=0.5\text{mH}, I_{AS}=11.5A$
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 ($T_J=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=-250\mu A$	-30	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1\text{mA}$	---	---	---	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=-10V$, $I_D=-1A$	---	13	17	$m\Omega$
		$V_{GS}=-4.5V$, $I_D=-1A$	---	19	25	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=-250\mu A$	-1	-1.6	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	---	---	$mV/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-30V$, $V_{GS}=0V$, $T_J=25^\circ\text{C}$	---	---	-1	μA
		$V_{DS}=-30V$, $V_{GS}=0V$, $T_J=100^\circ\text{C}$	---	---	---	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=-10V$, $I_D=-15A$	---	15	---	S
R_g	Gate Resistance	$V_{DS}=0V$, $V_{GS}=0V$, $f=1\text{MHz}$	---	11	---	Ω
Q_g	Total Gate Charge	$V_{DS}=-15V$, $V_{GS}=-10V$, $I_D=-15A$	---	30	---	nC
Q_{gs}	Gate-Source Charge		---	5.5	---	
Q_{gd}	Gate-Drain Charge		---	8	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{GS}=-10V$, $V_{DS}=-15V$, $R_L=1.5\Omega$, $R_{GEN}=3\Omega$	---	10	---	ns
T_r	Rise Time		---	15	---	
$T_{d(off)}$	Turn-Off Delay Time		---	110	---	
T_f	Fall Time		---	70	---	
C_{iss}	Input Capacitance	$V_{DS}=-15V$, $V_{GS}=0V$, $f=1\text{MHz}$	---	1405	---	pF
C_{oss}	Output Capacitance		---	177	---	
C_{rss}	Reverse Transfer Capacitance		---	147	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	-40	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=1A$, $T_J=25^\circ\text{C}$	---	---	-1.2	V

Note :

1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
2. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
3. The EAS data shows Max. rating . The test condition is $T_J = 25^\circ\text{C}$, $V_{DD}=-25V$, $V_{GS}=-10V$, $L=0.1\text{mH}$.
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.

Typical Performance Characteristics-N

Figure1: Output Characteristics

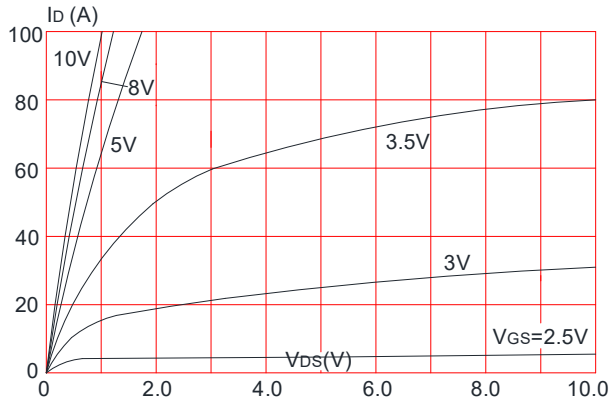


Figure 2: Typical Transfer Characteristics

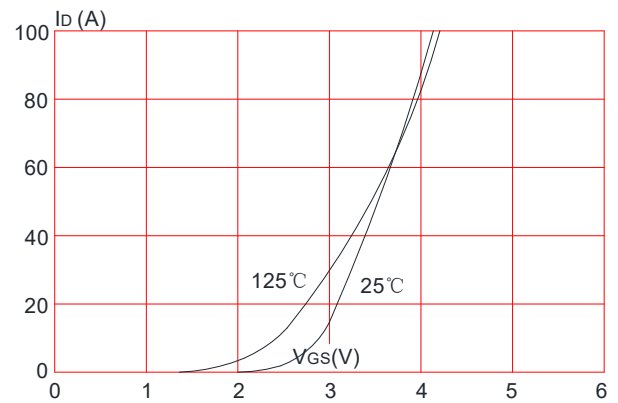


Figure 3: On-resistance vs. Drain Current

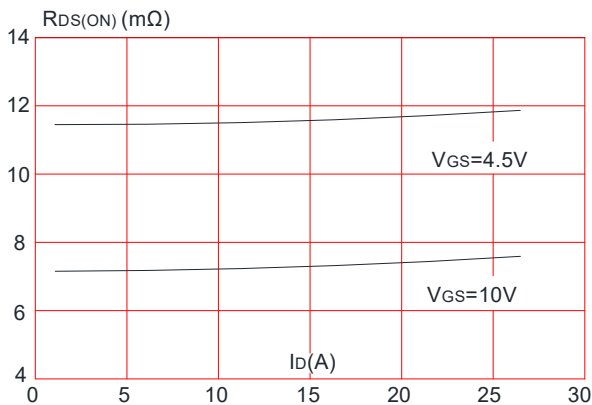


Figure 4: Body Diode Characteristics

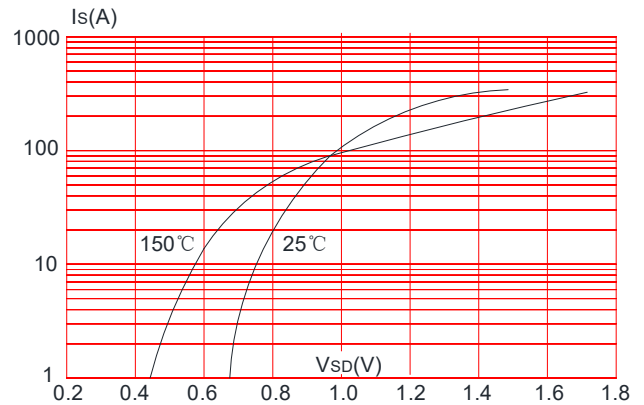


Figure 5: Gate Charge Characteristics

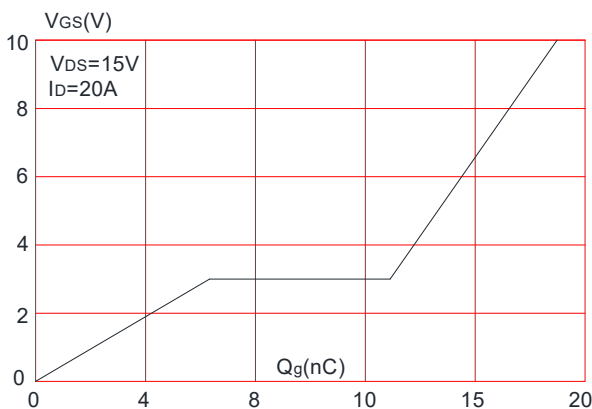
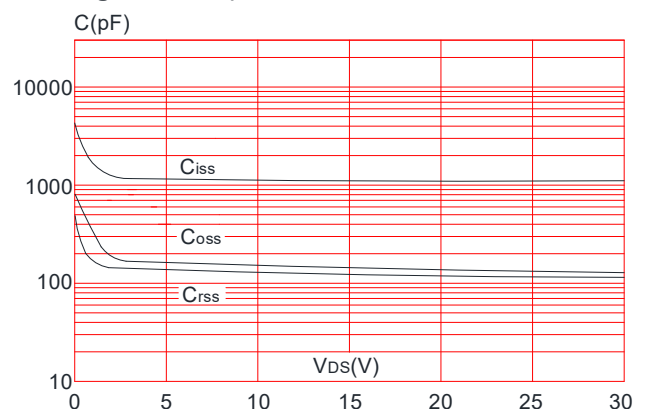


Figure 6: Capacitance Characteristics



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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

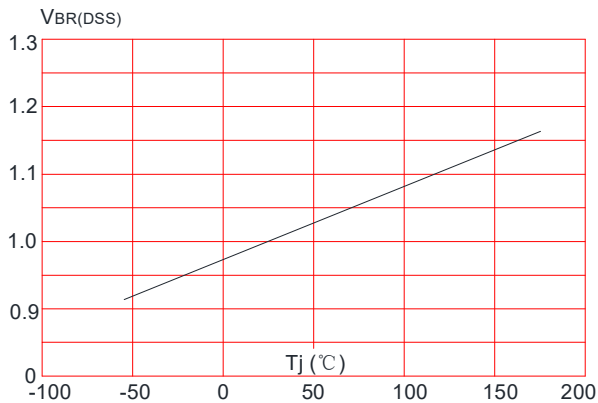


Figure 8: Normalized on Resistance vs. Junction Temperature

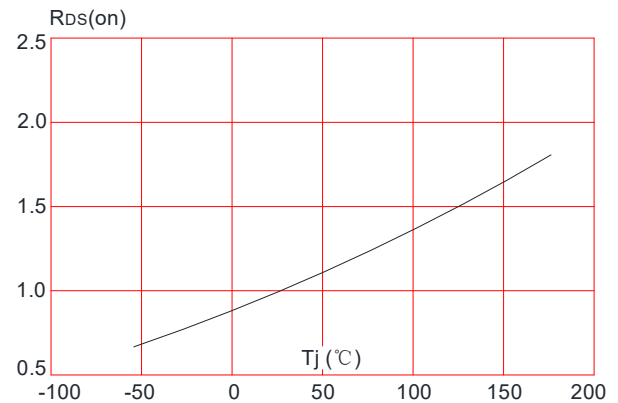
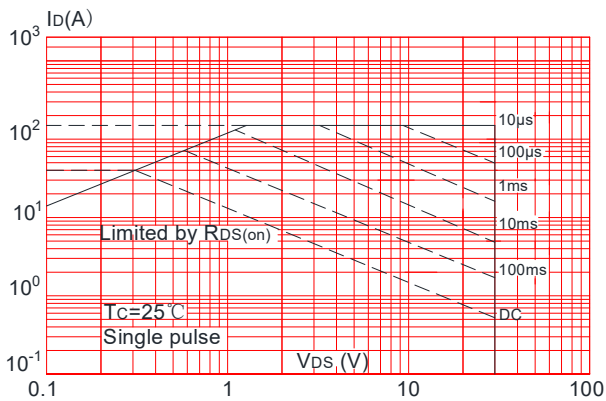


Figure 9: Maximum Safe Operating Area



Maximum Effective
Transient Thermal Impedance, Junction-to-Case

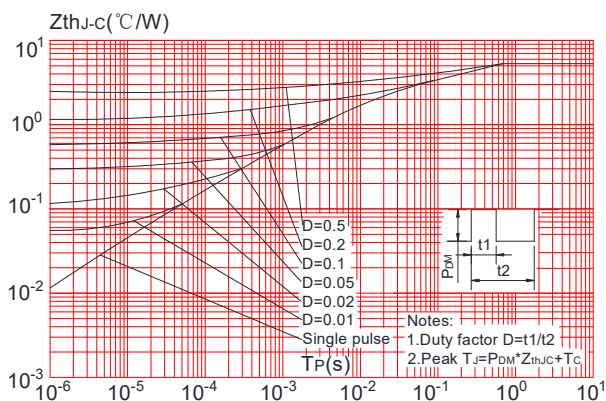
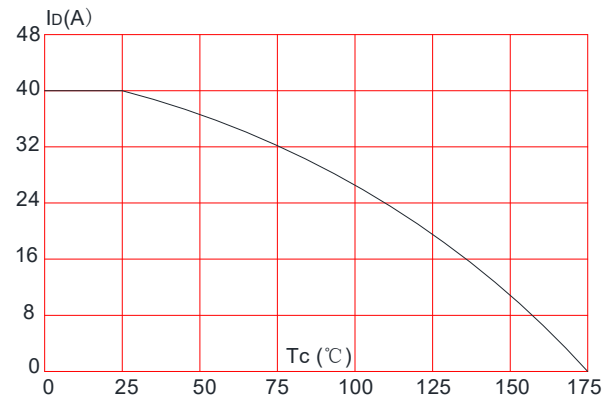


Figure 10: Maximum Continuous Drain Current vs. Case Temperature



Test Circuit-N

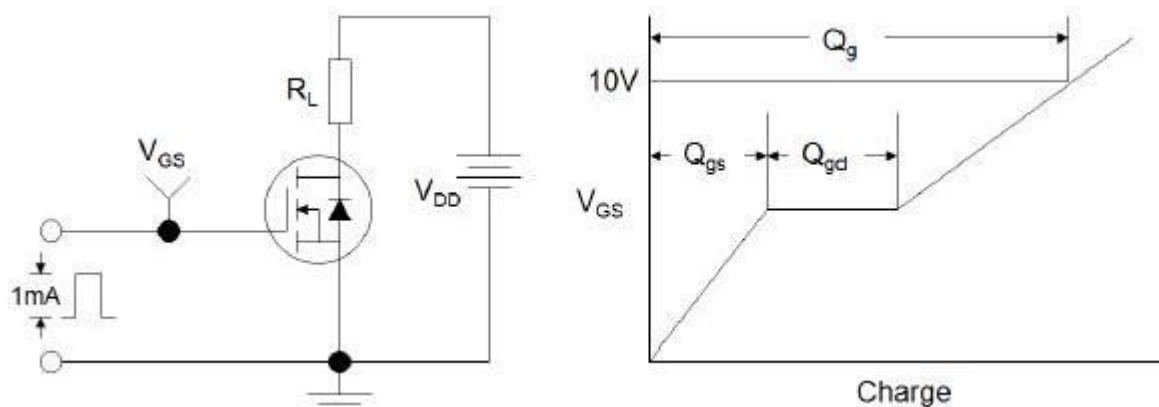


Figure1:Gate Charge Test Circuit & Waveform

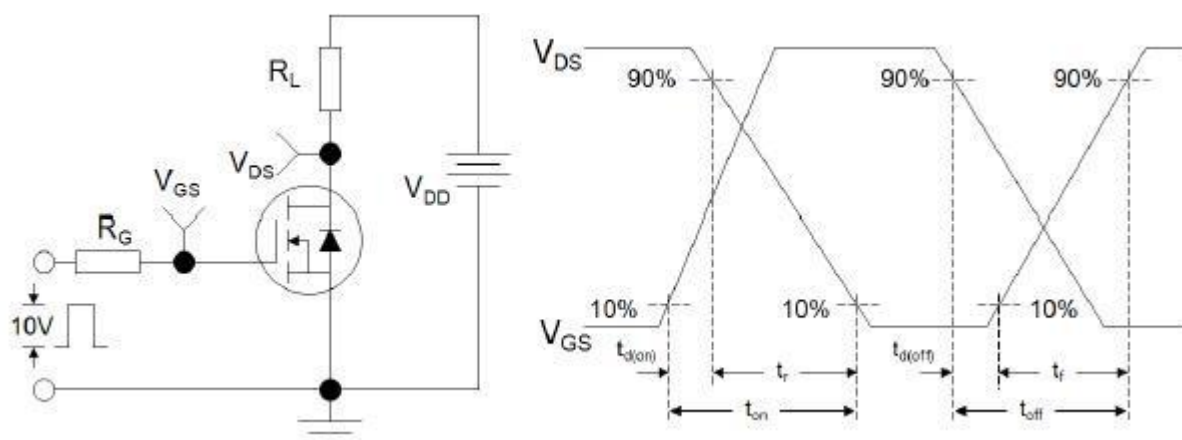


Figure 2: Resistive Switching Test Circuit & Waveforms

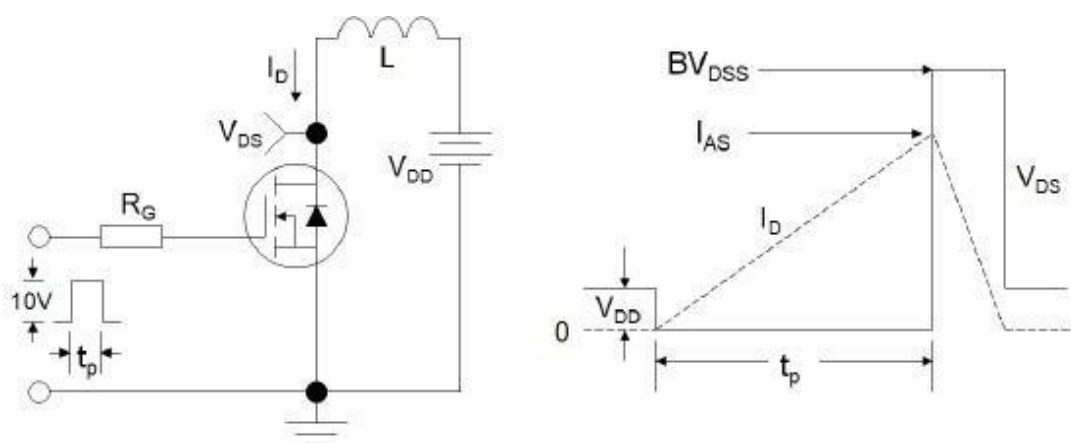


Figure 3:Unclamped Inductive Switching Test Circuit & Wavefor

Typical Performance Characteristics-P

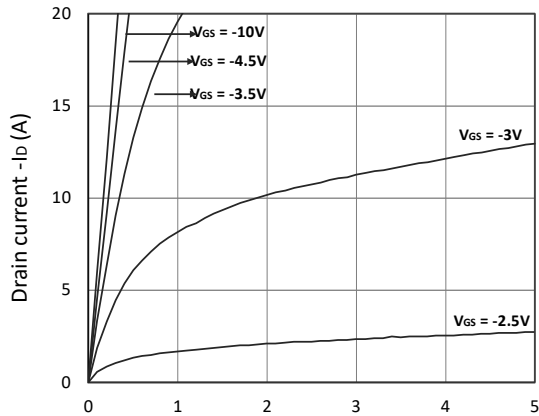


Figure 1. Output Characteristics

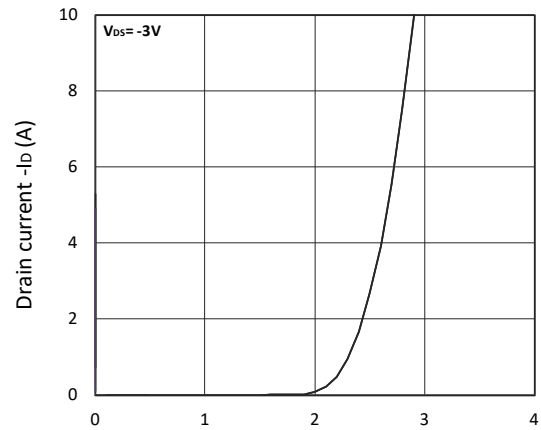


Figure 2. Transfer Characteristics

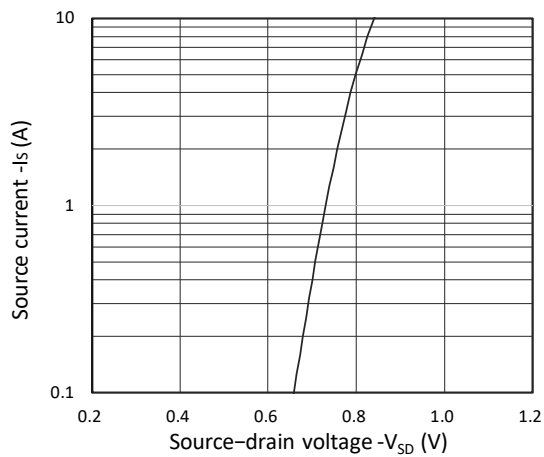


Figure 3. Forward Characteristics of Reverse

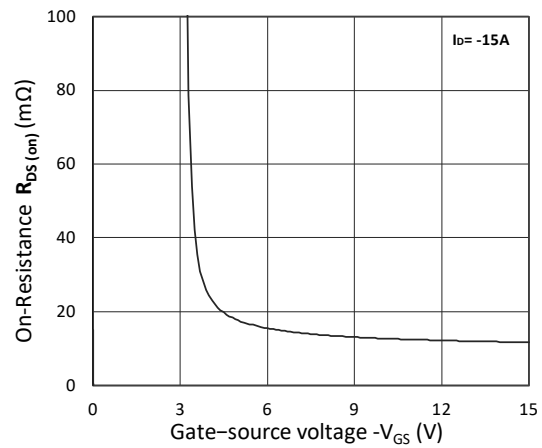


Figure 4. $R_{DS(ON)}$ vs. V_{GS}

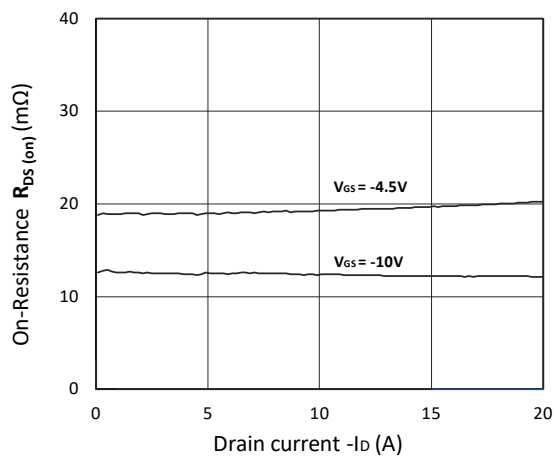


Figure 5. $R_{DS(ON)}$ vs. I_D

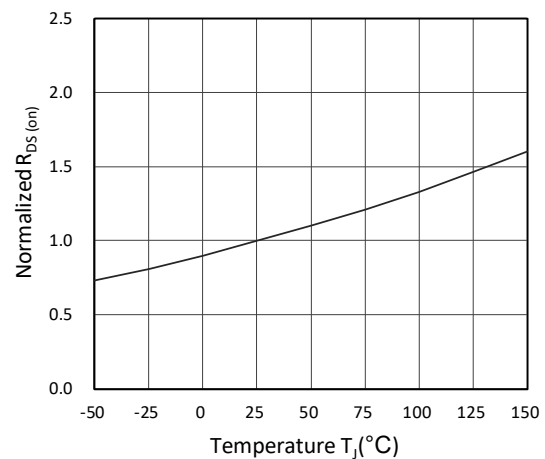


Figure 6. Normalized $R_{DS(ON)}$ vs. Temperature

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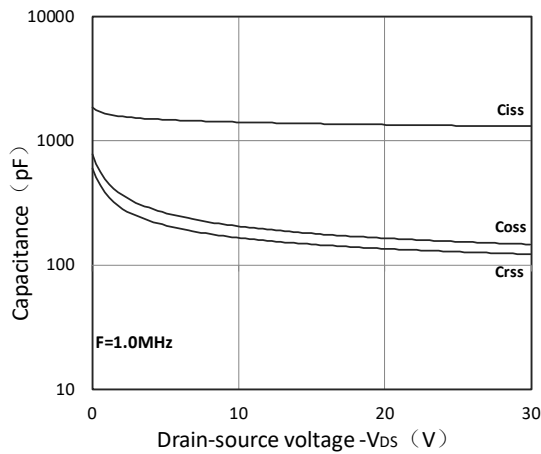


Figure 7. Capacitance Characteristics

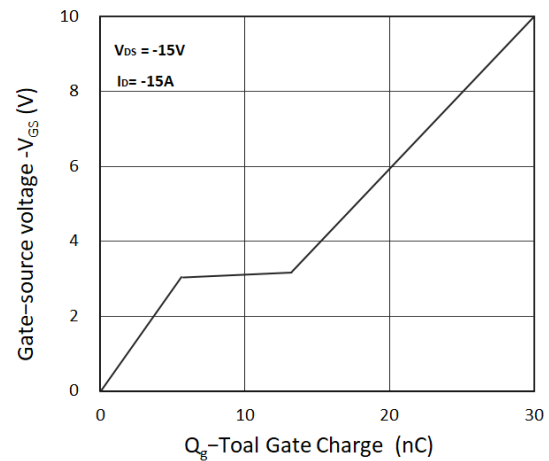


Figure 8. Gate Charge Characteristics

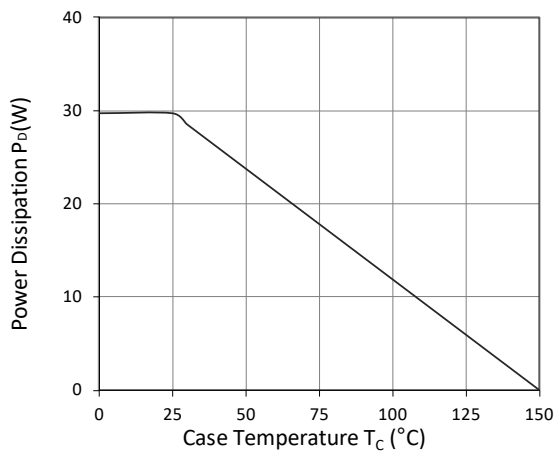


Figure 9. Power Dissipation

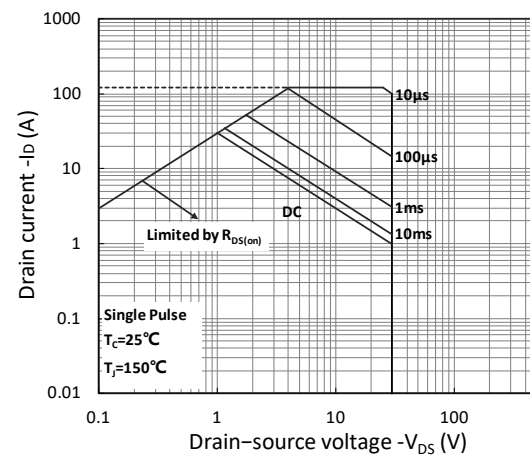


Figure 10. Safe Operating Area

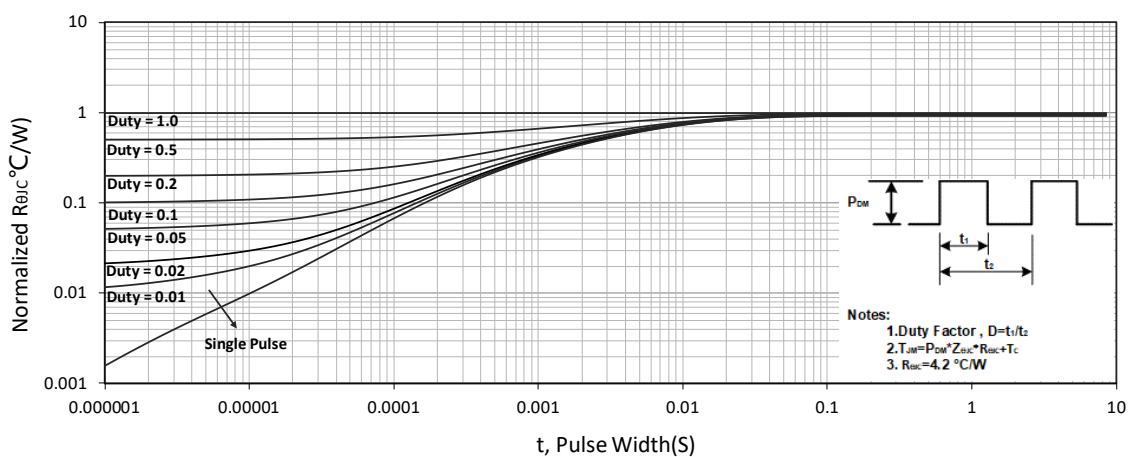
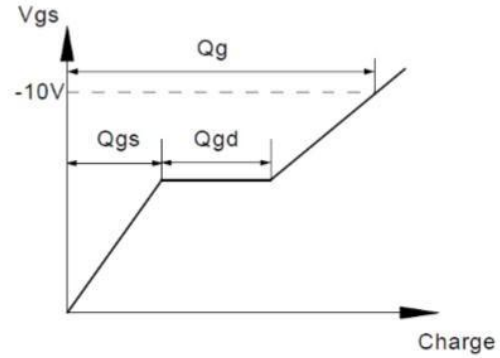
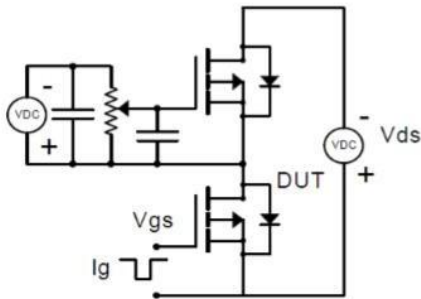


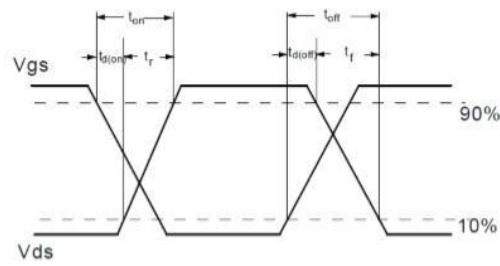
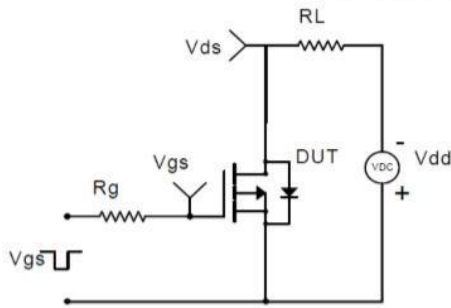
Figure 11. Normalized Maximum Transient Thermal Impedance

Test Circuit-P

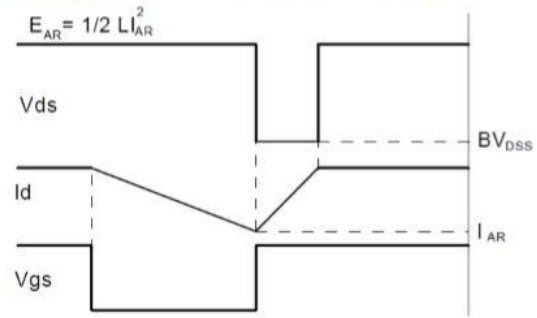
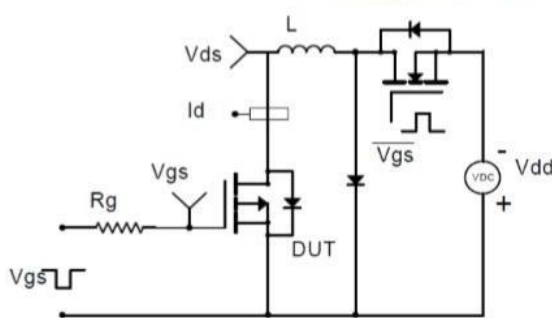
Gate Charge Test Circuit & Waveform



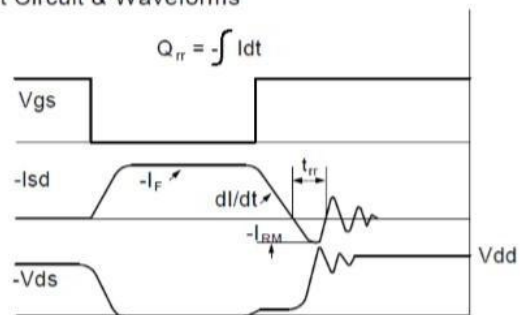
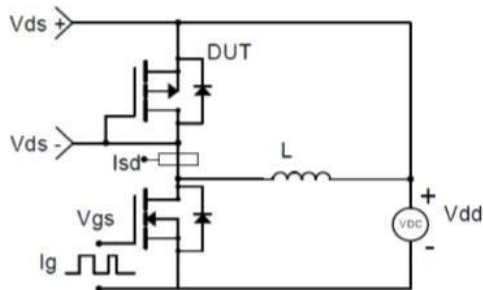
Resistive Switching Test Circuit & Waveforms



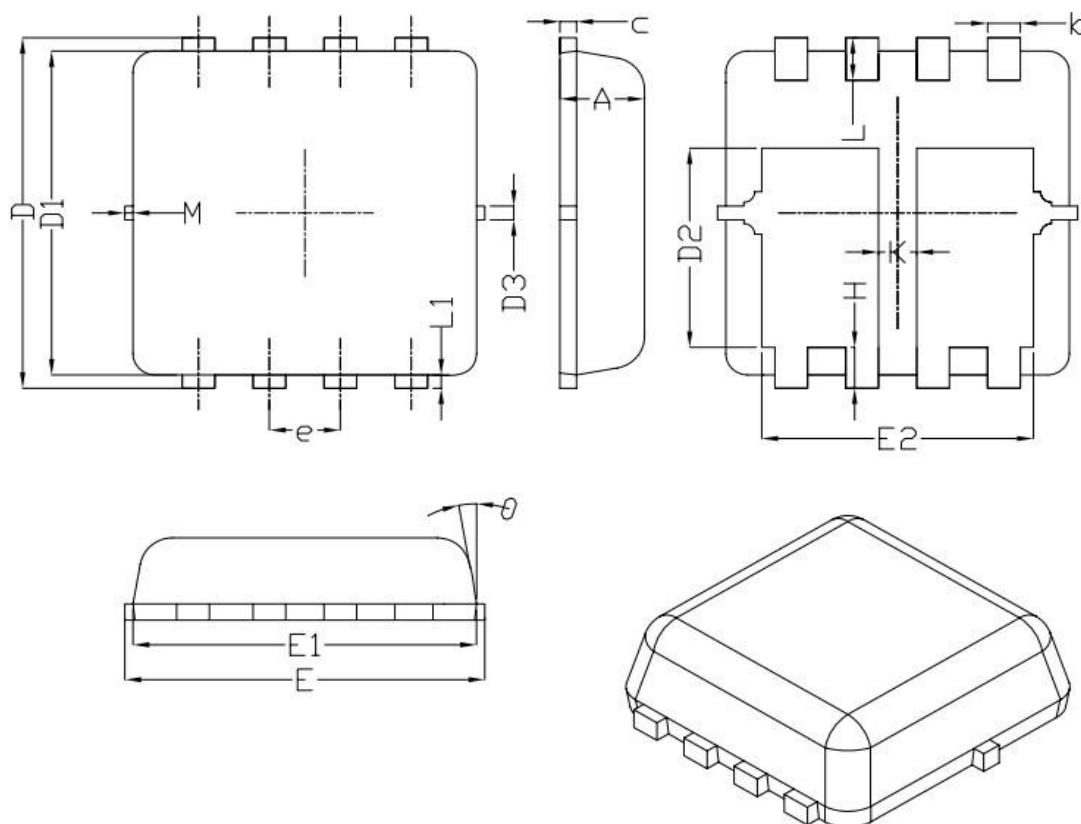
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



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.