TM3010NF

N+P-Channel Enhancement Mode Mosfet

General Description

- Low $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

Applications

- Load switch
- PWM

General Features

N Channel

V_{DS} =30V, I_D =30A

$R_{DS(ON)}$=9.5mΩ (typ.) @ V_{GS}=10V

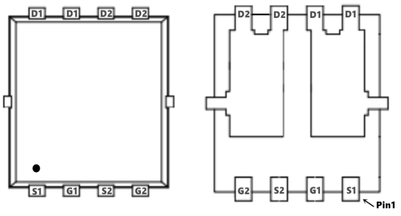
P Channel

V_{DS} = -30V, I_D = -20A

$R_{DS(ON)}$=21mΩ (typ.) @ V_{GS}=-10V

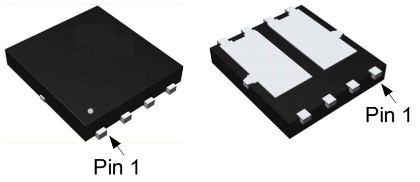
100% UIS Tested

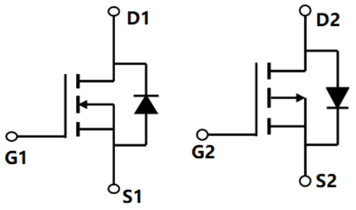
100% R_g Tested



Marking: 30G30 OR 3030

NF:DFN5x6-8L





Absolute Maximum Ratings (T_A=25°C Unless Otherwise Noted)

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V_{DS}	Drain-Source Voltage	30	-20	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D@Ta=25˚C	Continuous Drain Current, V_{GS} @ 10V[1]	30	-30	A
I_D@Ta=100˚C	Continuous Drain Current, V_{GS} @ 10V[1]	15	-16	A
I_{DM}	Pulsed Drain Current[2]	46	-40	A
EAS	Single Pulse Avalanche Energy[3]	28	66	mJ
P_D@T_C=25˚C	Total Power Dissipation[4]	15	21.3	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
$R_{\theta JA}$	Thermal Resistance Junction-Ambient [1]	---	48	˚C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case[1]	---	5	˚C/W

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N-Channel Electrical Characteristics T =25℃ unless otherwise specified

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=250μA	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=30V, V_{GS}=0V,	-	-	1.0	μA
I_{GSS}	Gate to Body Leakage Current	V_{DS}=0V, V_{GS}=±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250μA	1.0	1.5	2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance note3	V_{GS}=10V, I_D=10A	-	9.5	13	mΩ
		V_{GS}=4.5V, I_D=5A	-	16	22.5	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}=15V, V_{GS}=0V, f=1.0MHz	-	633	-	pF
C_{oss}	Output Capacitance		-	120	-	pF
C_{rss}	Reverse Transfer Capacitance		-	99	-	pF
Q_g	Total Gate Charge	V_{DS}=15V, I_D=10A, V_{GS}=10V	-	15	-	nC
Q_{gs}	Gate-Source Charge		-	4.7	-	nC
Q_{gd}	Gate-Drain(“Miller”) Charge		-	3.6	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DS}=30V,I_D=18A, R_{GEN}=3Ω, V_{GS}=10V	-	5	-	ns
t_r	Turn-on Rise Time		-	8	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	21	-	ns
t_f	Turn-off Fall Time		-	7	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	30	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	72	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS}=0V, I_S=18A	-	-	1.2	V
trr	Body Diode Reverse Recovery Time	I_F=18A,dI/dt=100A/μs	-	7	-	ns
Qrr	Body Diode Reverse Recovery Charge		-	5.9	-	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 isV_{DD}=25V,V_{GS}=10V,L=0.1mH,I_{AS}=20A
4. The power dissipation is limited by 150℃ junctiontemperature
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	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D= -250μA	-30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}= -30V, V_{GS}=0V	-	-	-1	μA
I_{GSS}	Gate to Body Leakage Current	V_{DS}=0V, V_{GS}=±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D= -250μA	-1.0	-1.6	-2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance note3	V_{GS}= -10V, I_D= -10A	-	21	25	mΩ
		V_{GS}= -4.5V, I_D= -5A	-	31	40	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}= -15V, V_{GS}=0V, f=1.0MHz	-	1240	-	pF
C_{oss}	Output Capacitance		-	151	-	pF
C_{rss}	Reverse Transfer Capacitance		-	138	-	pF
Q_g	Total Gate Charge	V_{DS}= -15V, I_D= -6A, V_{GS}= -10V	-	24	-	nC
Q_{gs}	Gate-Source Charge		-	3.7	-	nC
Q_{gd}	Gate-Drain(“Miller”) Charge		-	4.8	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DD}= -15V, I_D= -10A, V_{GS}= -10V, R_{GEN}=3Ω	-	11	-	ns
t_r	Turn-on Rise Time		-	5.5	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	3.5	-	ns
t_f	Turn-off Fall Time		-	4.6	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-20	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-40	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS}=0V, I_S= -10A	-	-	-1.2	V

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition: T_J=25℃, V_{DD}=-15V, V_G=-10V, R_G=25Ω, L=0.1mH, I_{AS}= -27A

3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

Typical Performance Characteristics-N

Figure1: Output Characteristics

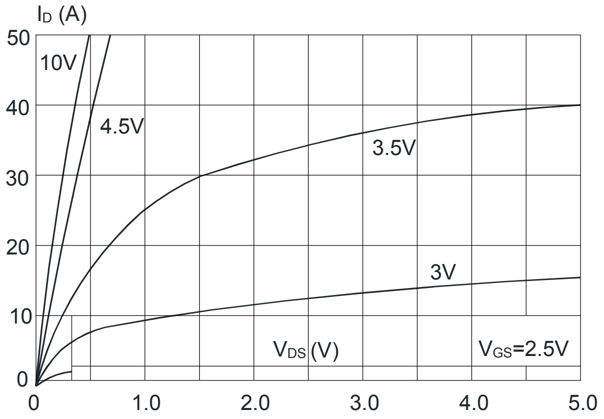

Figure 2: Typical Transfer Characteristics

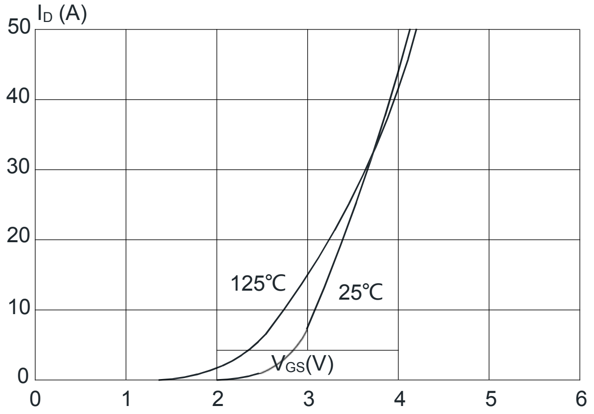

Figure 3: On-resistance vs. Drain Current

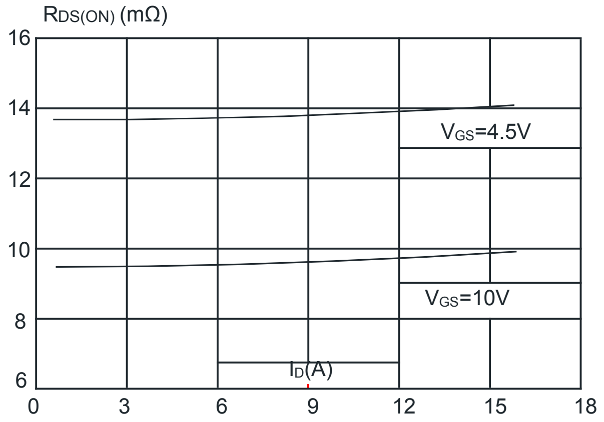

Figure 4: Body Diode Characteristics

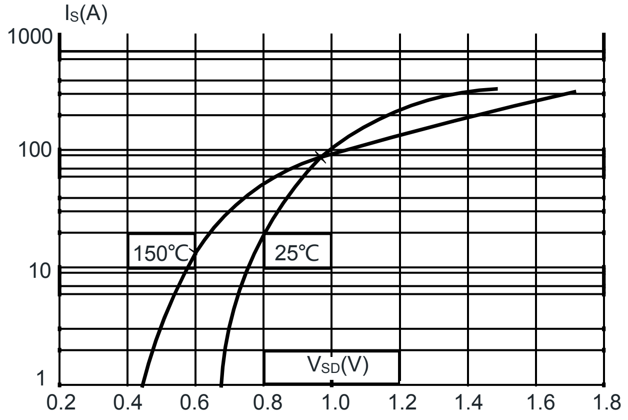

Figure 5: Gate Charge Characteristics

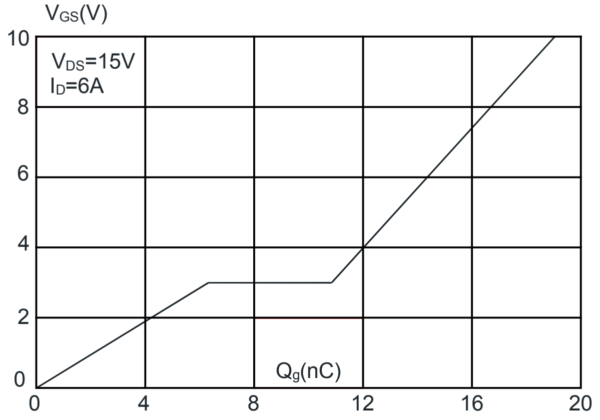

Figure 6: Capacitance Characteristics

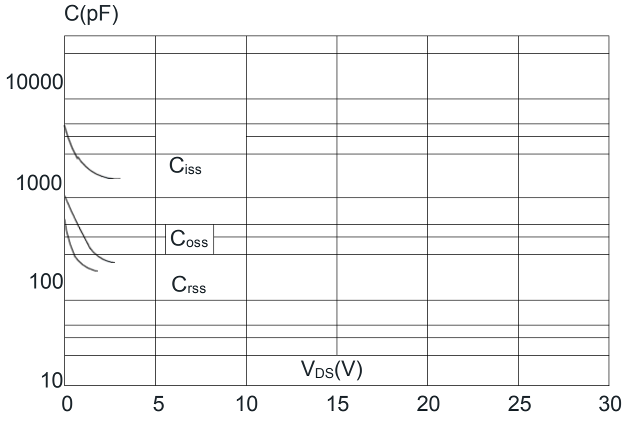

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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

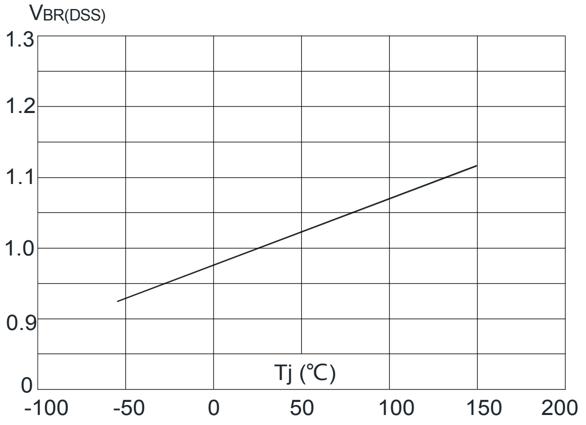


Figure 8: Normalized on Resistance vs. Junction Temperature

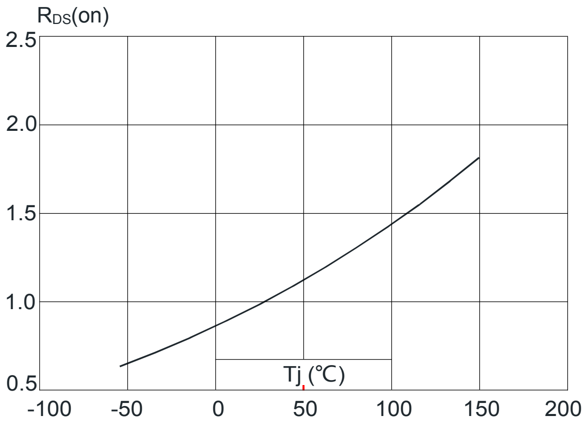


Figure 9: Maximum Safe Operating Area

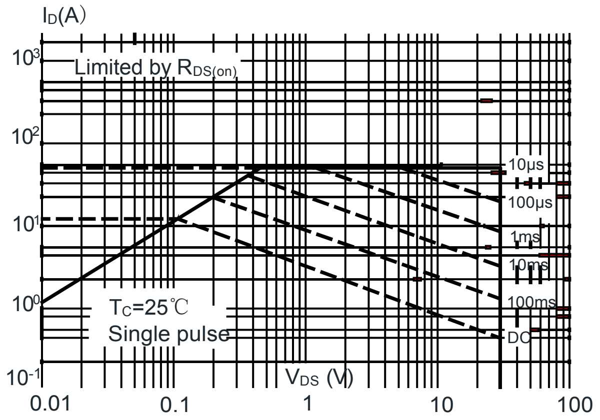


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

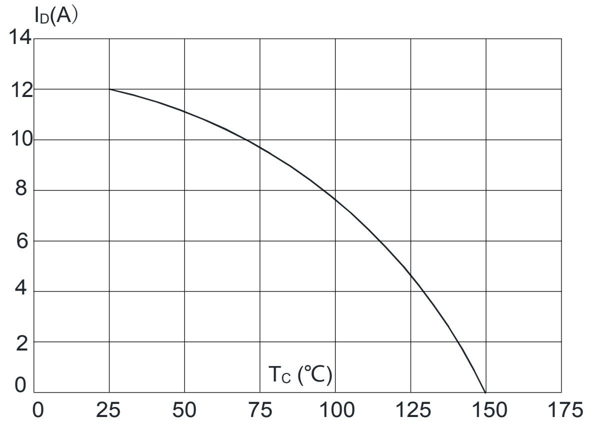
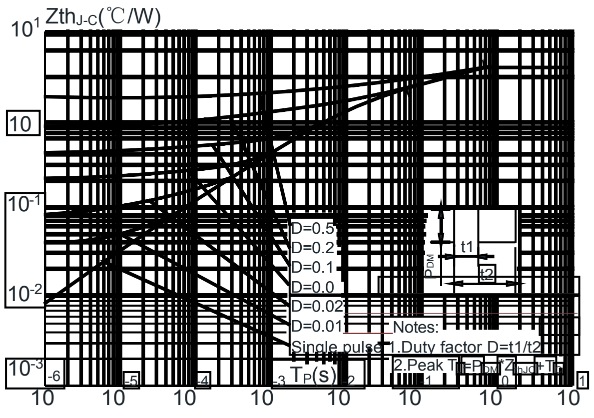


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



Test Circuit-N

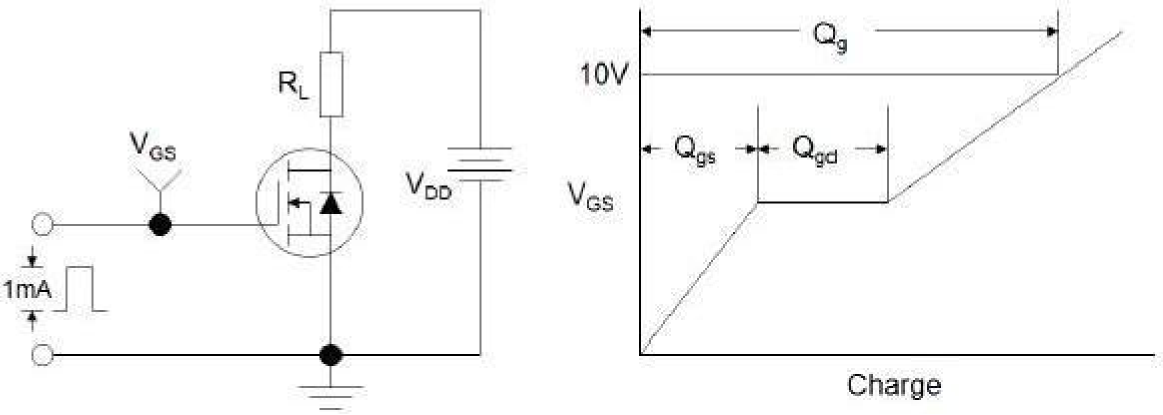


Figure1:Gate Charge Test Circuit & Waveform

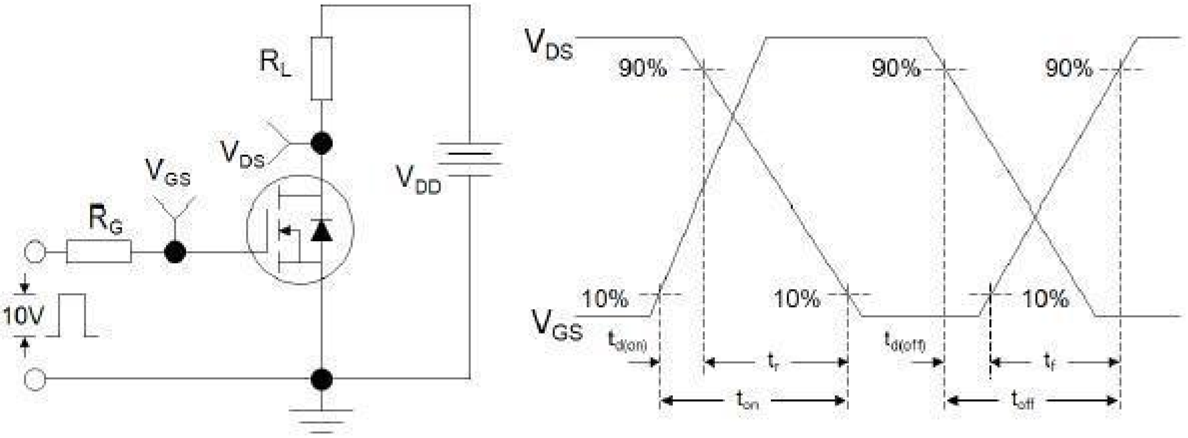


Figure 2: Resistive Switching Test Circuit & Waveforms

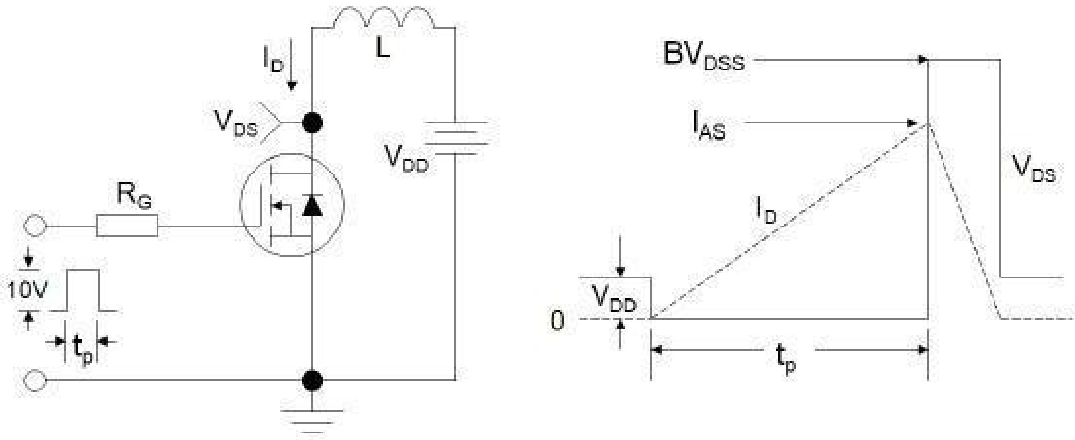


Figure 3:Unclamped Inductive Switching Test Circuit & Wavefor

Typical Performance Characteristics-P

Figure1: Output Characteristics

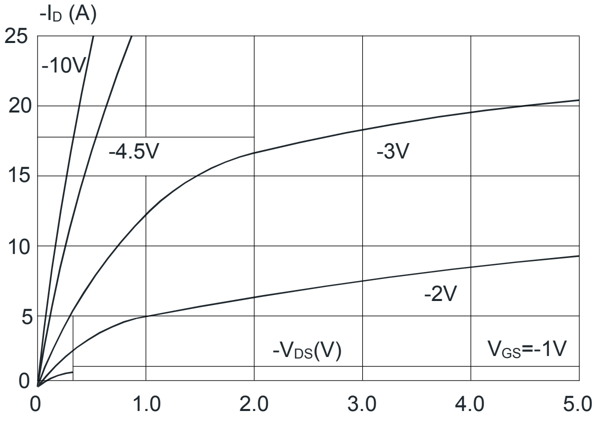


Figure 2: Typical Transfer Characteristics

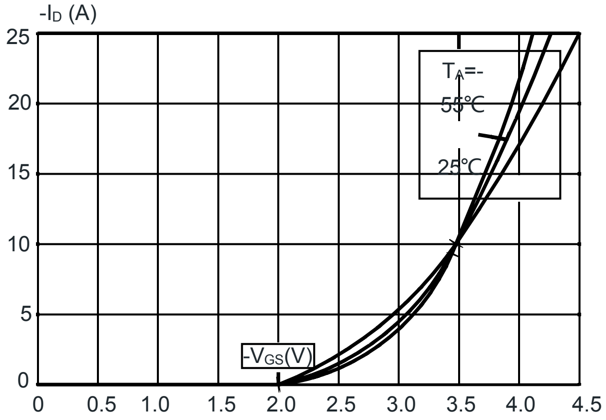


Figure 3: On-resistance vs. Drain Current

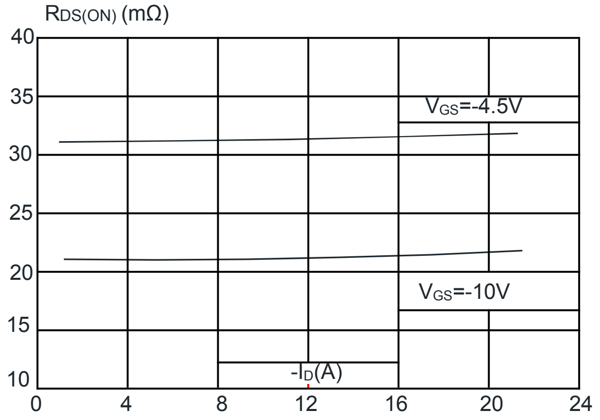


Figure 4: Body Diode Characteristics

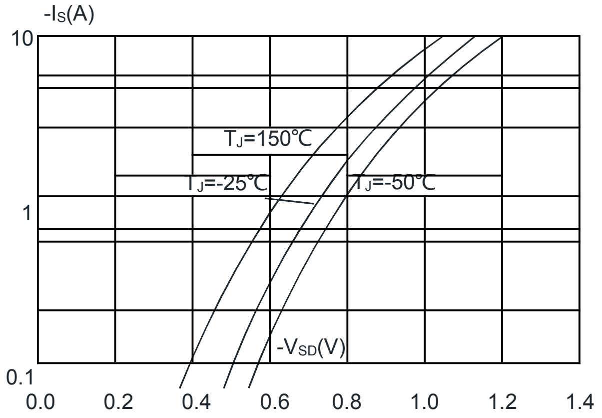


Figure 5: Gate Charge Characteristics

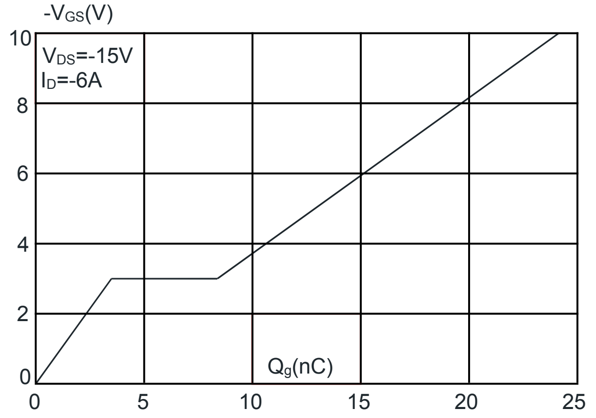


Figure 6: Capacitance Characteristics

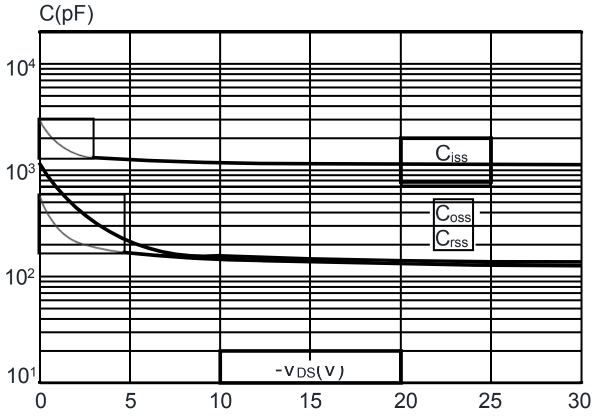


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

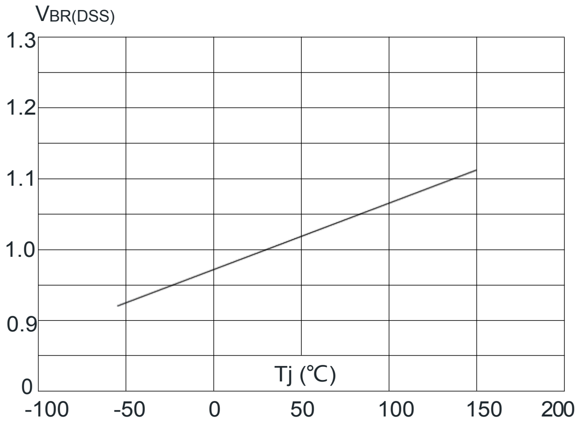


Figure 8: Normalized on Resistance vs. Junction Temperature

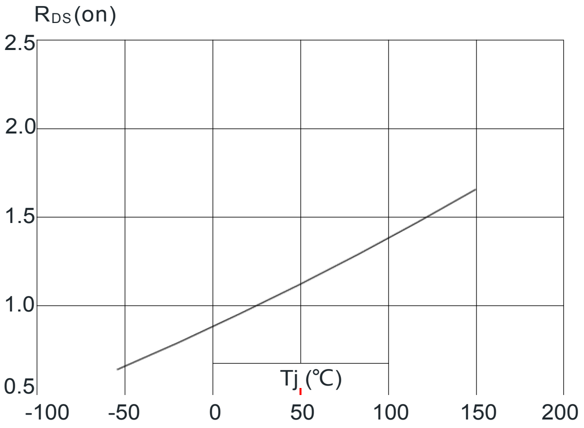


Figure 9: Maximum Safe Operating Area

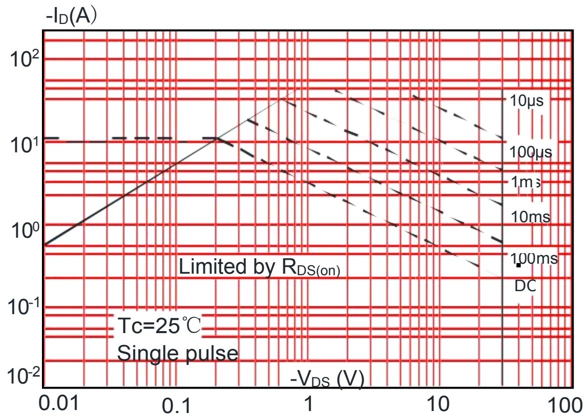


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

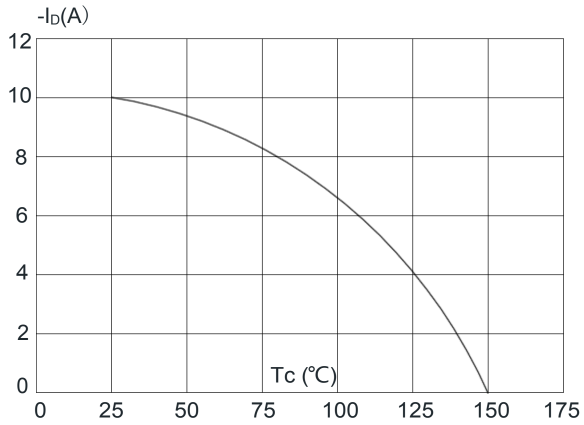
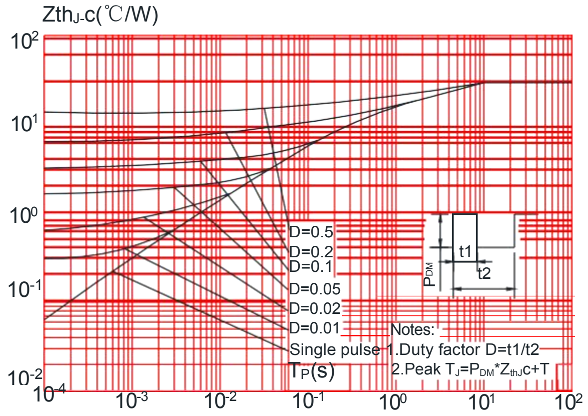


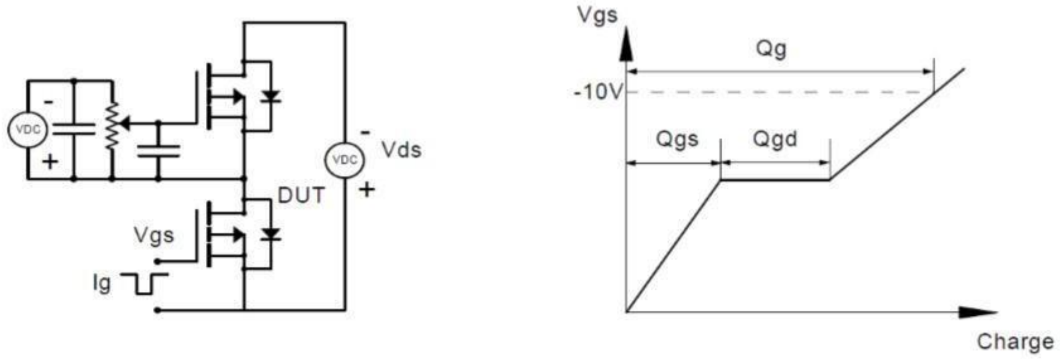
Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



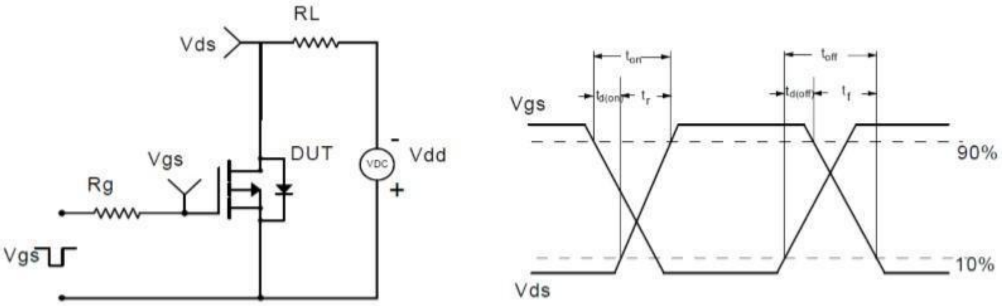
Notes:
1.Duty factor D=t1/t2
2.Peak $T_J=P_{DM}*Z_{thJ}c+T$

Test Circuit-P

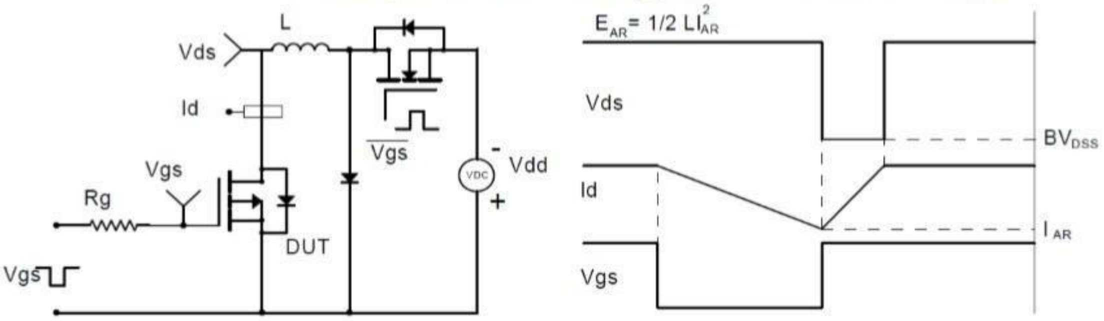
Gate Charge Test Circuit & Waveform



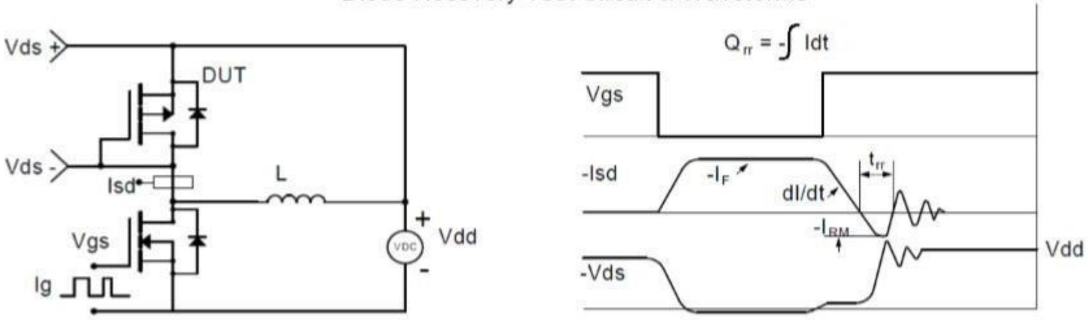
Resistive Switching Test Circuit & Waveforms



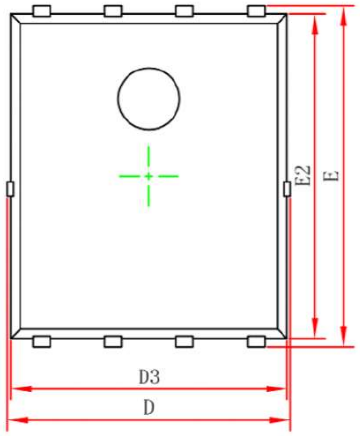
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

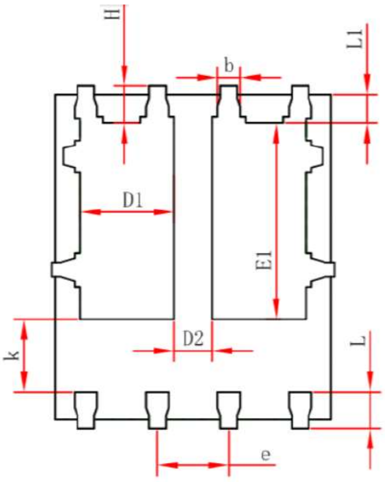


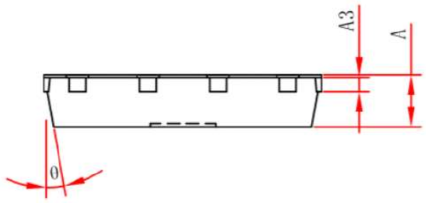
Diode Recovery Test Circuit & Waveforms



Package Mechanical Data:DFN5x6-8L







Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.154REF.		0.006REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	1.470	1.870	0.058	0.074
D2	0.470	0.870	0.019	0.034
E1	3.375	3.575	0.133	0.141
D3	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270TYP.		0.050TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	10°	12°	10°	12°