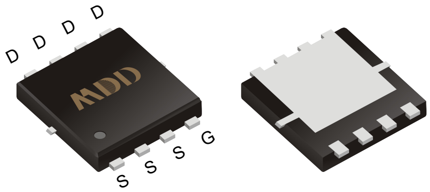
MDDG04R1P3G

40V N-Channel Enhancement Mode MOSFET

V_{DS}	40V
$I_{D(Tc=25℃)}$	160A
$R_{DS(on),max}$	2.6mΩ@V_{GS}=10V

PDFN5*6



Features

- N-channel, optimized for high speed smooth switching
- Excellent Gate charge×$R_{DS(on)}$ (FOM)
- Very low on-resistance $R_{DS(on)}$
- 100% UIS Tested

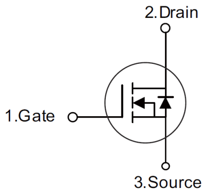
Application

- DC-DC conversion
- Hard switching and high speed circuit

Marking

XXX: Date Code

Equivalent Circuit



Absolute Maximum Ratings (T_A=25℃unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	±20	V
Continuous Drain Current	I_D	160	A
Pulsed Drain Current (Note 1)	$I_{D,pulse}$	320	A
Thermal Resistance, Junction-Case	$R_{θJC}$	1.2	°C/W
Thermal Resistance, Junction-Ambient	$R_{θJA}$	50	°C/W
Avalanche Energy Single Pulsed (Note 2)	E_{AS}	200	mJ
Power Dissipation	P_D	100	W
Junction Temperature	T_J	-55 ~+150	℃
Storage Temperature	T_{stg}	-55 ~+150	℃

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L=0.5mH, ID=49.2A, Start TJ=25℃

Ta = 25℃ unless otherwise specified

Symbol	Parameter		Condition	Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage		V_{GS}=0V, I_D=250μA	40	--	--	V
I_{GSS}	Gate-Source Leakage Current	Forward	V_{GS}=20V	--	--	100	nA
		Reverse	V_{GS}=-20V	--	--	-100	nA
I_{DSS}	Drain-Source Leakage Current		V_{DS}=40V, V_{GS}=0V	--	--	1	uA
$V_{GS(TH)}$	Gate Threshold Voltage		V_{DS}=V_{GS}, I_D=250μA	2	3	4	V
$R_{DS(ON)}$	Drain-Source On-State Resistance		V_{GS}=10V, I_D=20A	--	2	2.6	mΩ
	Drain-Source On-State Resistance		V_{GS}=6V, I_D=20A	--	3	4.5	mΩ

Dynamic Electrical Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	V_{GS}=0V V_{DS}=20V f=1.0MHz	--	3460	--	pF
C_{oss}	Output Capacitance		--	1150	--	pF
C_{rss}	Reverse Transfer Capacitance		--	50	--	pF
Q_g	Total Gate Charge	V_{GS}=10V, V_{DS}=20V, I_D=40A	--	87	--	nC
Q_{gs}	Gate Source Charge		--	20	--	nC
Q_{gd}	Gate Drain Charge		--	17	--	nC

Switching Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$t_{d(on)}$	Turn on Delay Time	V_{GS} =10V, V_{DS} =20V, I_D=40A, R_G=3Ω	--	16	--	ns
t_r	Turn on Rise Time		--	80	--	ns
$t_{d(off)}$	Turn Off Delay Time		--	27	--	ns
t_f	Turn Off Fall Time		--	53	--	ns

Source Drain Diode Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_{SD}	Drain-Source Diode Forward Voltage	I_S=40A, V_{GS}=0V	--	--	1.2	V
t_{rr}	Body Diode Reverse Recovery Time	I_F=40A, V_{GS}=0V, dIs/dt=100A/μs	--	46	--	ns
Q_{rr}	Body Diode Reverse Recovery Charge		--	87	--	nC

Electrical Characteristics Diagrams

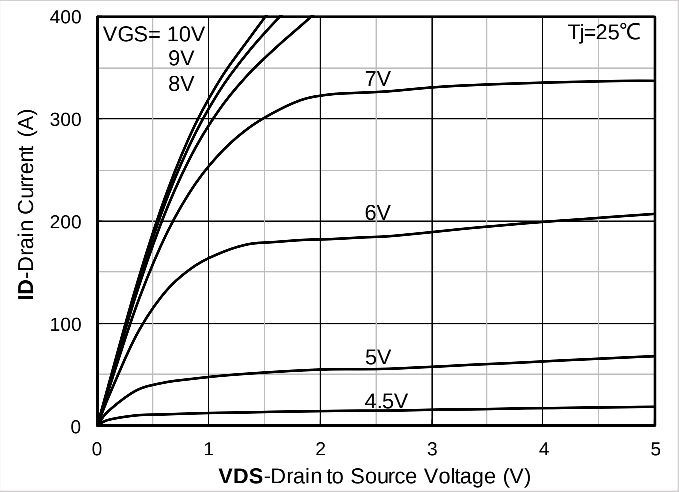


Figure 1. Output Characteristics

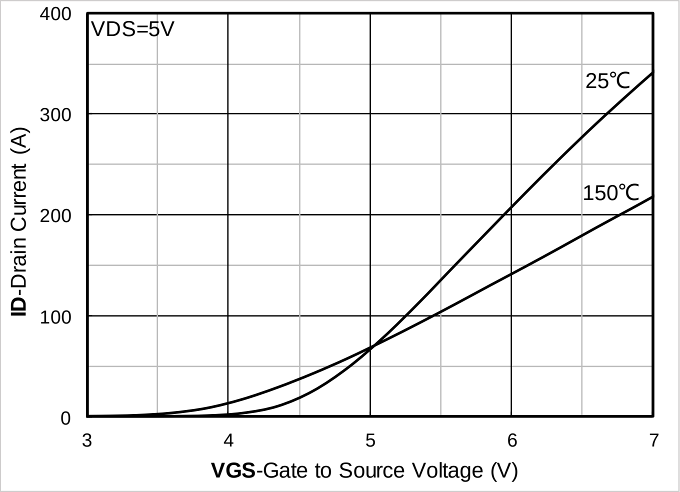


Figure 2. Transfer Characteristics

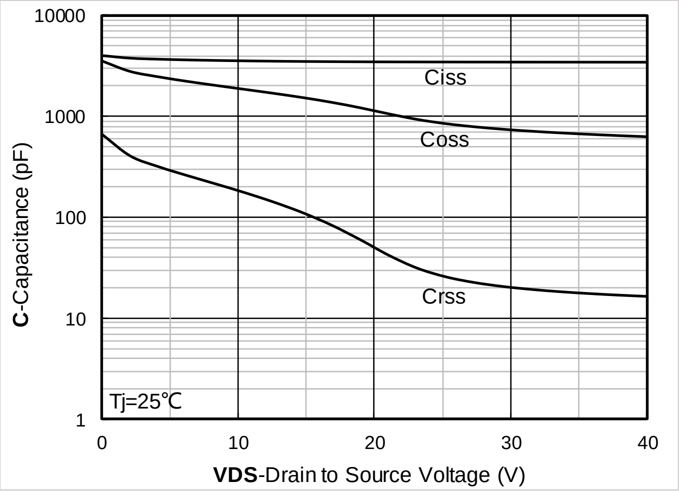


Figure 3. Capacitance Characteristics

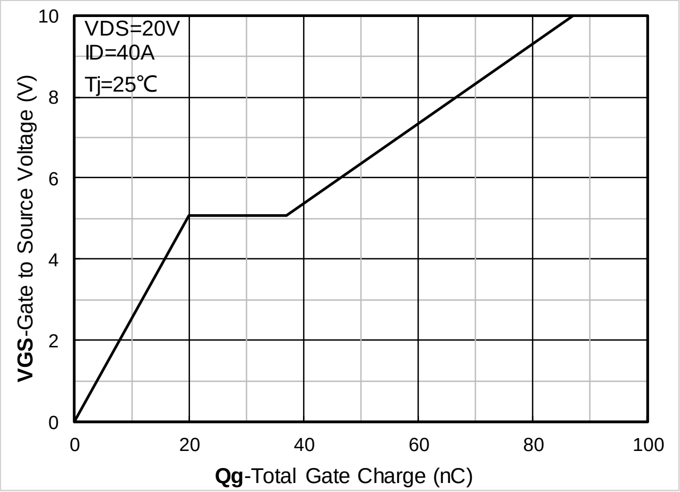


Figure 4. Gate Charge

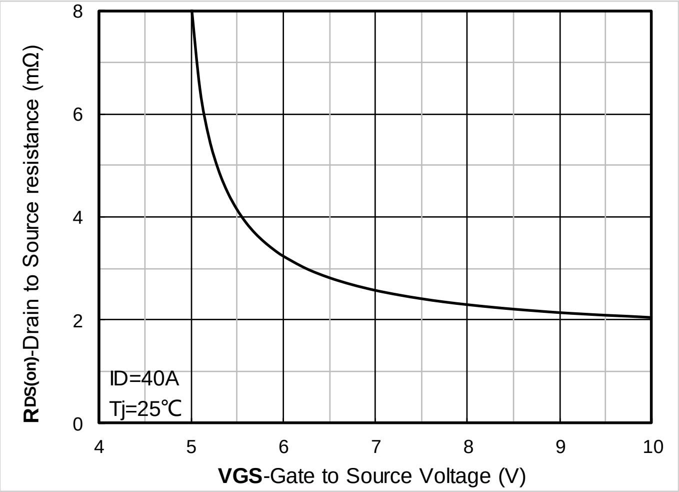


Figure 5. On-Resistance vs Gate to Source Voltage

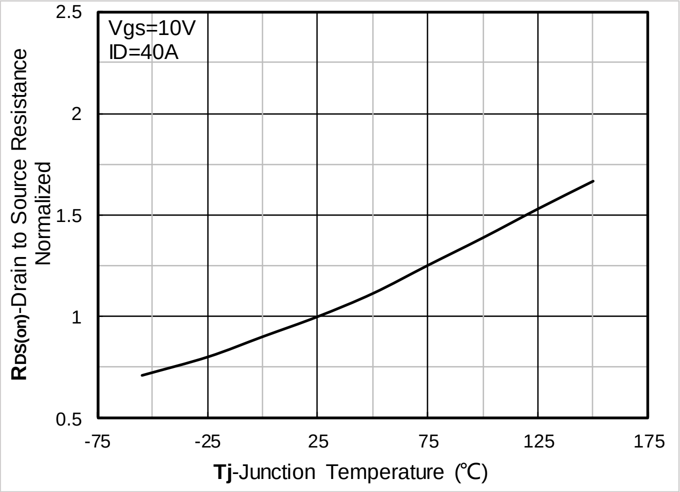


Figure 6. Normalized On-Resistance

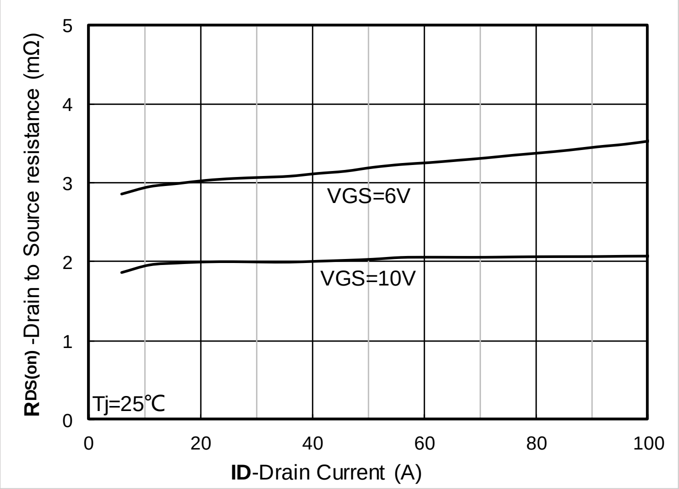


Figure 7. RDS(on) VS Drain Current

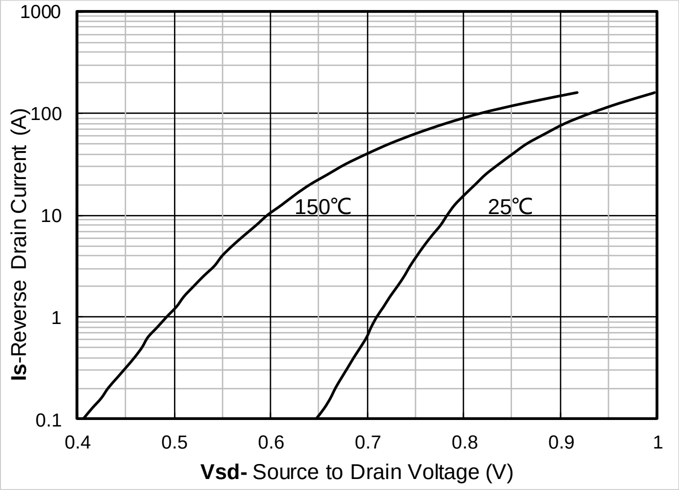


Figure 8. Forward characteristics of reverse diode

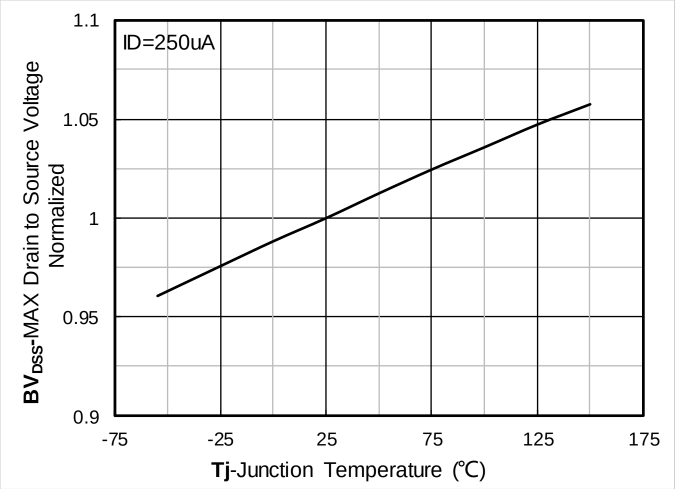


Figure 9. Normalized breakdown voltage

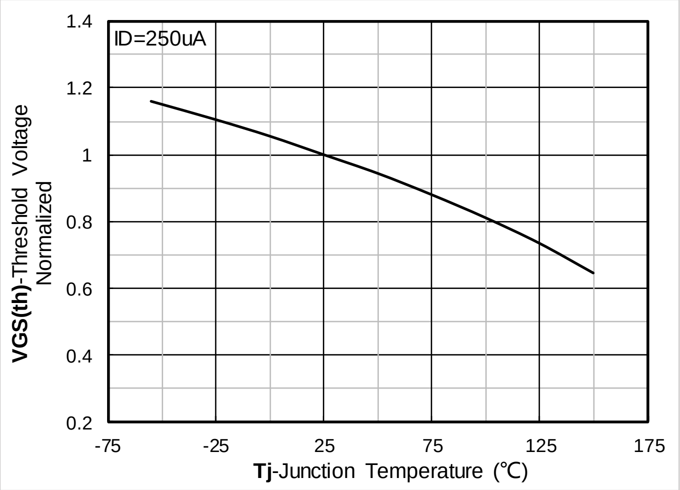


Figure 10. Normalized Threshold voltage

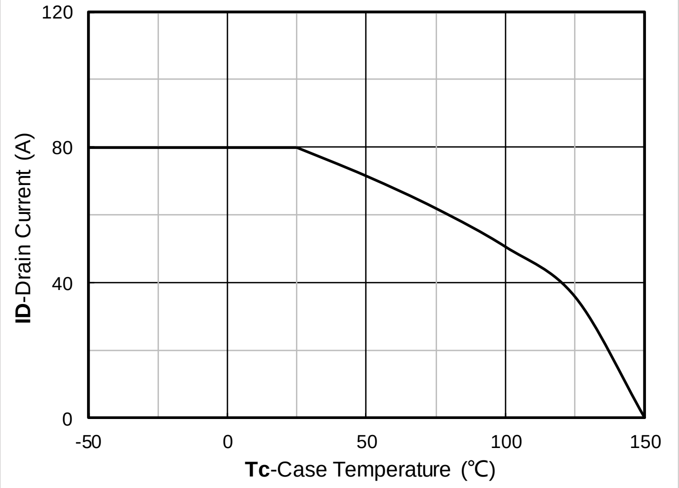


Figure 11. Current dissipation

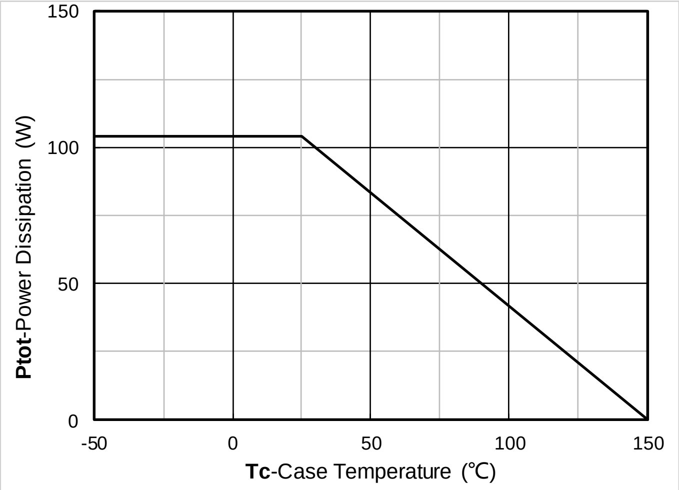


Figure 12. Power dissipation

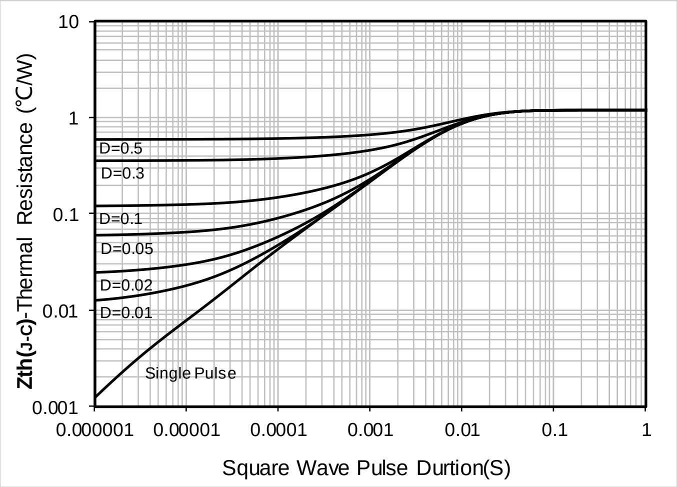


Figure 13. Maximum Transient Thermal Impedance

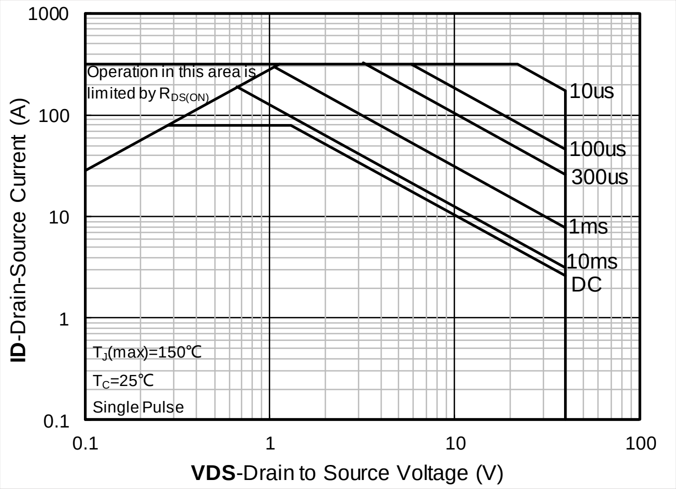


Figure 14. Safe Operation Area

■ TEST CIRCUITS AND WAVEFORMS

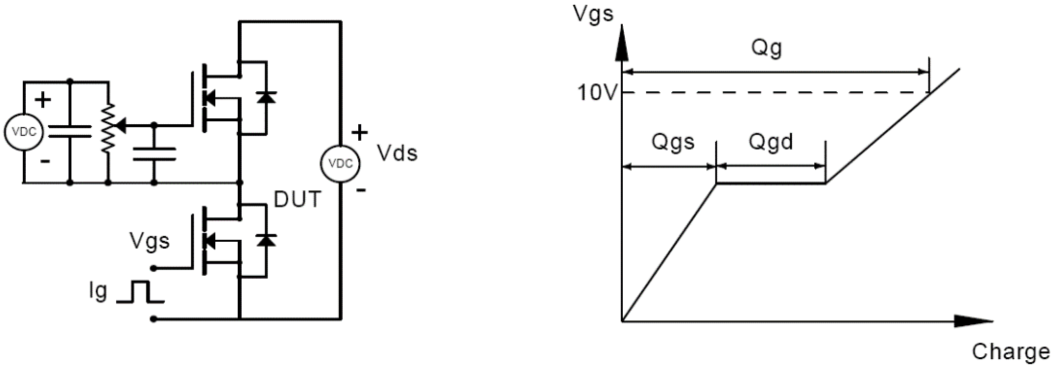


Figure 1. Gate charge test circuit & waveform

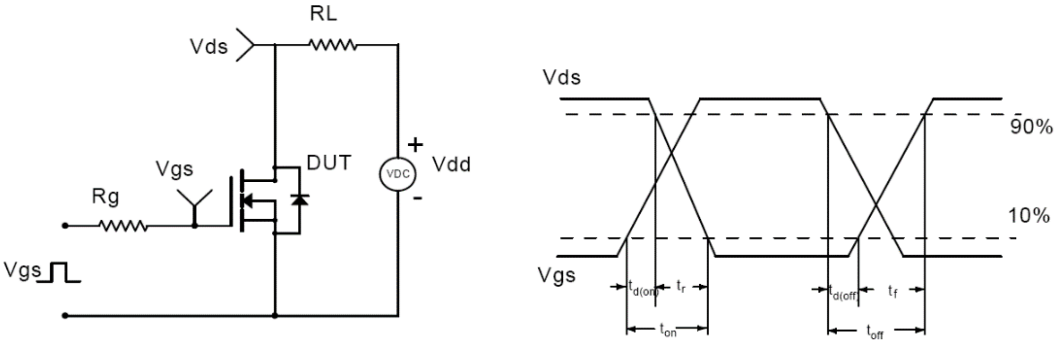


Figure 2. Switching time test circuit & waveforms

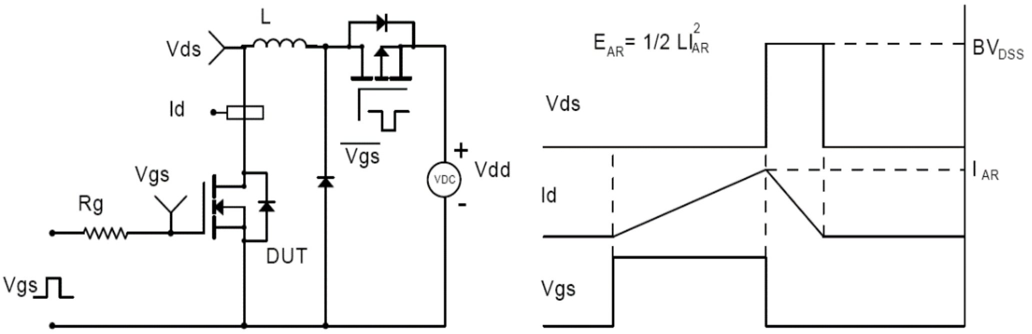


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

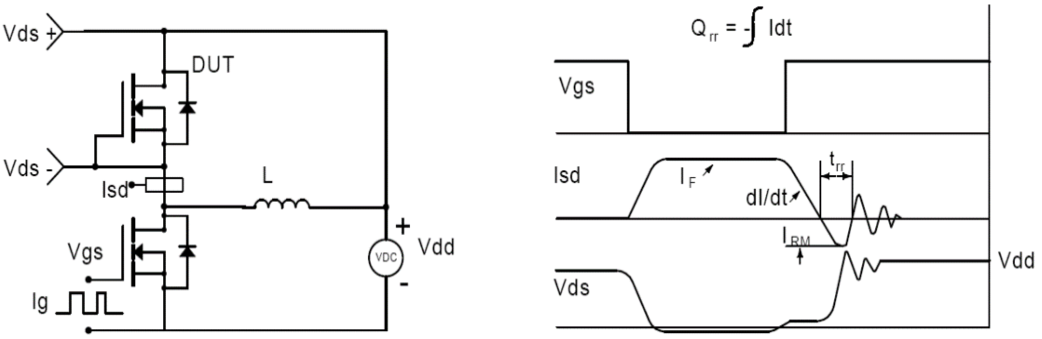
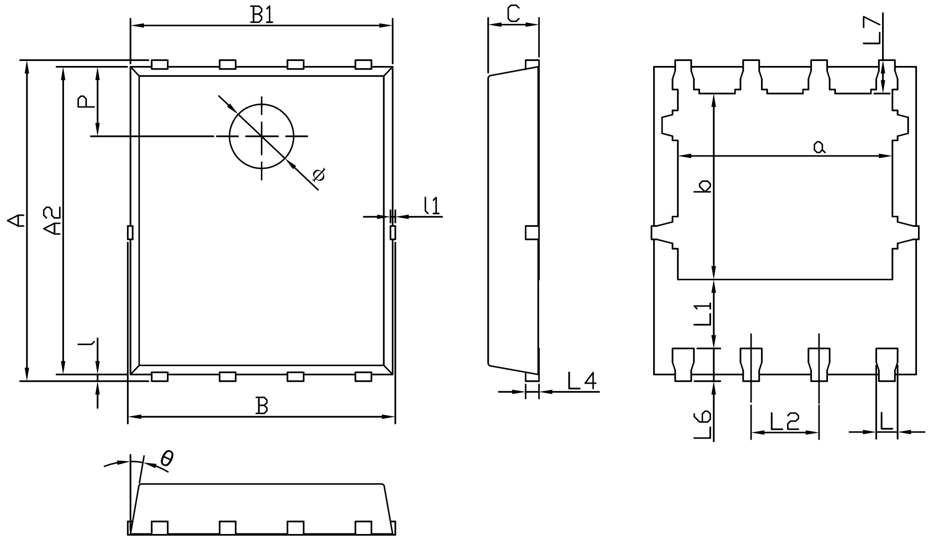


Figure 4. Diode reverse recovery test circuit & waveforms

The curve above is or reference only.

Outlitne Drawing

MOSFET PDFN5*6 Package Outline Dimensions



Symbol	Dimensions In Millimeters MIN	TYP	MAX
A	5.90	6.00	6.10
a	3.91	4.01	4.11
A2	5.70	5.75	5.80
B	4.90	5.00	5.10
b	3.375	3.475	3.575
B1	4.80	4.90	5.00
C	0.90	0.95	1.00
L	0.30	0.40	0.50
l	0.06	0.13	0.20
L1	1.10	-	-
l1	-	-	0.10
L2	1.17	1.27	1.37
L4	0.21	0.26	0.34
L6	0.51	0.61	0.71
L7	0.51	0.61	0.71
P	1.15	1.30	1.45
θ	8°	10°	12°
ϕ	1.10	1.20	1.30

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