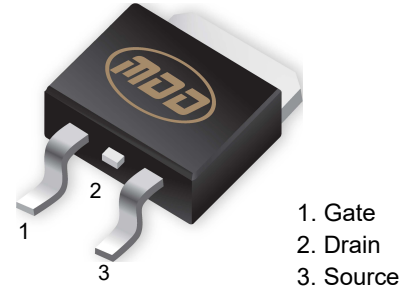


$V_{(BR)DSS}$	$R_{DS(on)Max}$	$I_D Max$
60V	17mΩ@10V	50A

### Features

- $R_{DS(ON)} \leq 17m\ \Omega$  @  $V_{GS}=10V, I_D=20A$
- High Switching Speed
- Improved dv/dt capability

### TO-252

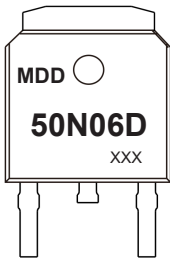


1. Gate
2. Drain
3. Source

### Application

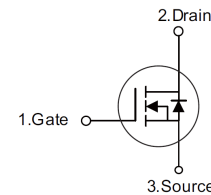
- Switching application

### Marking



XXX: Date Code

### Equivalent Circuit



### Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	50	A
Pulsed Drain Current (Note 2)	$I_{DM}$	200	A
Avalanche Energy Single Pulsed (Note 3)	$E_{AS}$	98	mJ
Peak Diode Recovery dv/dt	dv/dt	10	A
Power Dissipation	$P_D$	62.5	W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	62	$^\circ C/W$
Thermal Resistance from Junction to Case	$R_{\theta JC}$	2	$^\circ C/W$
Junction Temperature	$T_J$	150	$^\circ C$
Storage Temperature	$T_{stg}$	-50 ~+150	$^\circ C$

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2.Repetitive Rating : Pulse width limited by maximum junction temperature.

3.L=43mH, IAS=43A, VDD=25V, RG=20Ω, Starting  $T_J=25^\circ C$

4.ISD  $\leq 30A$ , VDS=0V, di/dt  $\leq 200A/\mu s$ , VDD  $\leq BVDSS$ , Starting  $T_J = 25^\circ C$



**Ta = 25°C unless otherwise specified**

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60	--	--	V
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	--	--	$\pm 100$	nA
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=60V, V_{GS}=0V$	--	--	1	$\mu A$
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2	1.8	2.5	V
$R_{DS(ON)}$	Drain-Source On-State Resistance	$V_{GS}=10V, I_D=20A$	--	12	17	m $\Omega$
		$V_{GS}=4.5V, I_D=20A$	--	17	23	m $\Omega$

### Dynamic Electrical Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{DS}=30V$ $V_{GS}=0V$ $f=1MHz$	--	1889	--	pF
$C_{oss}$	Output Capacitance		--	113	--	pF
$C_{rss}$	Reverse Transfer Capacitance		--	92	--	pF
$Q_g$	Total Gate Charge	$V_{DS}=30V,$ $V_{GS}=10V,$ $I_D=20A$ (Note1,2)	--	40	--	nC
$Q_{gs}$	Gate Source Charge		--	7.8	--	nC
$Q_{gd}$	Gate Drain Charge		--	8.3	--	nC

### Switching Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$t_{d(on)}$	Turn on Delay Time	$V_{DS}=30V,$ $V_{GS}=10V,$ $I_D=20A,$ $R_G=3\Omega$ (Note1,2)	--	13	--	ns
$t_r$	Turn on Rise Time		--	25	--	ns
$t_{d(off)}$	Turn Off Delay Time		--	60	--	ns
$t_f$	Turn Off Fall Time		--	9	--	ns

### Source Drain Diode Characteristics

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$I_{SD}$	Source drain current(Body Diode)		--	--	50	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$I_S=20A, V_{GS}=0V$	--	--	1.2	V
$t_{rr}$	Body Diode Reverse Recovery Time	$I_S=20A,$ $V_{GS}=0V,$ $dI_S/dt=100A/\mu s$	--	29	--	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge		--	21	--	nC

- Notes:**
1. Pulse test ; Pulse width 300us, duty cycle 2%.
  2. Essentially independent of operating temperature.

### Typical Characteristics $T_J = 25^\circ\text{C}$ , unless otherwise noted

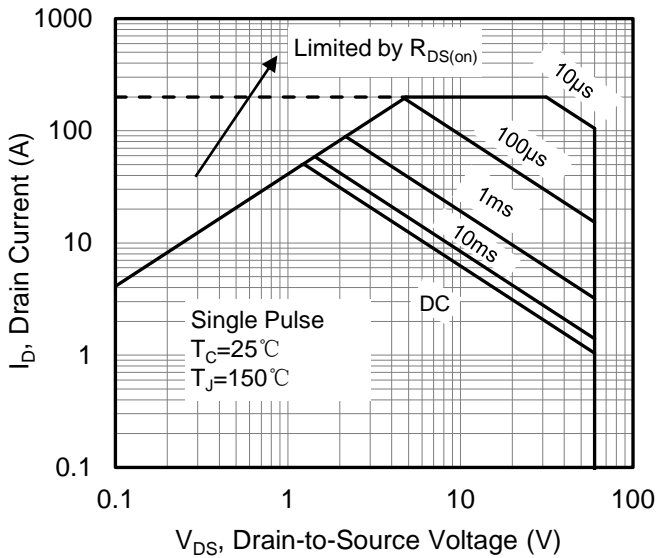


Figure 1. Maximum Safe Operating Area

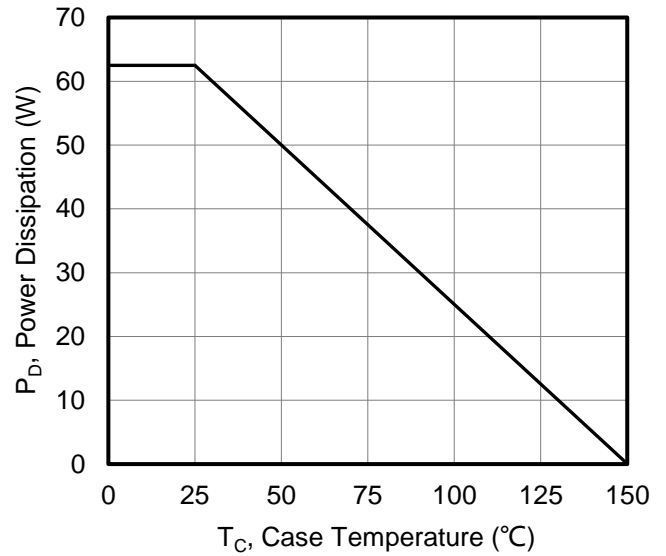


Figure 2. Maximum Power Dissipation vs. Case Temperature

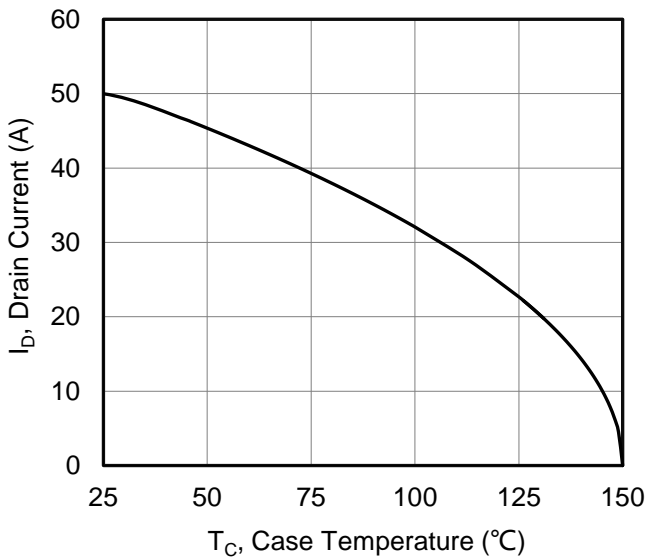


Figure 3. Maximum Continuous Drain Current vs. Case Temperature

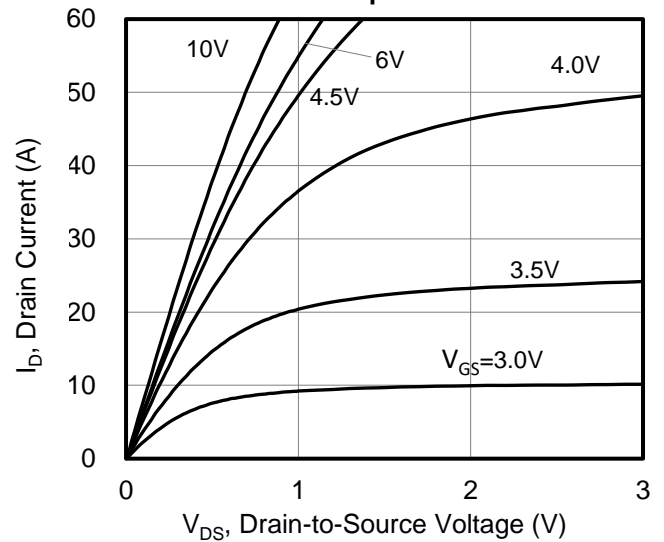


Figure 4. Typical output Characteristics

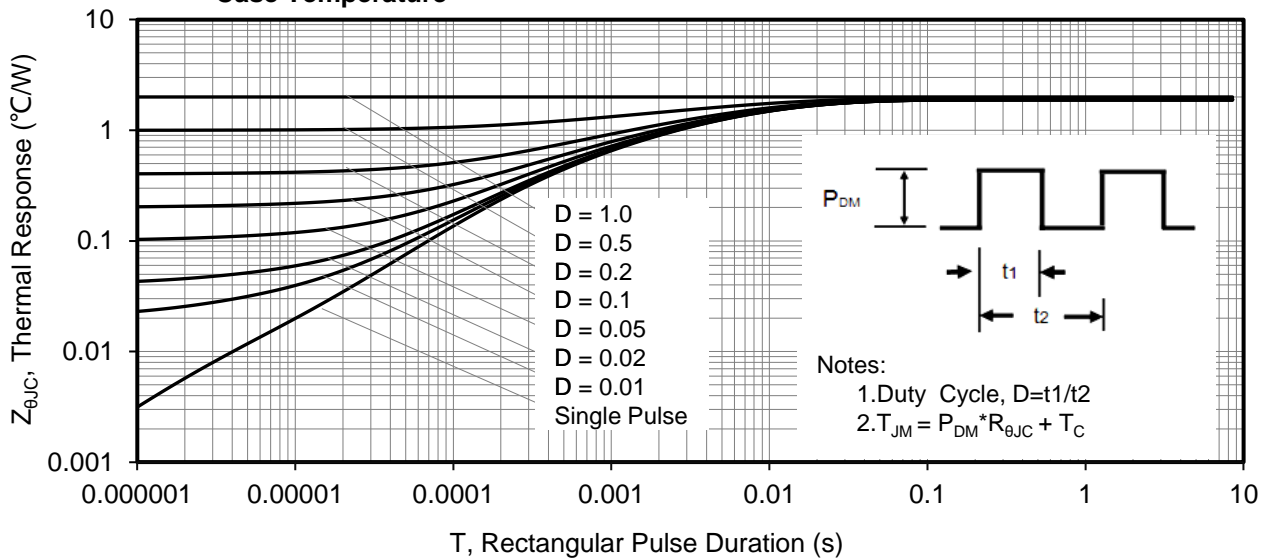


Figure 5. Maximum Effective Thermal Impedance, Junction to Case



# MDD50N06D

60V N-Channel Enhancement Mode MOSFET

Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

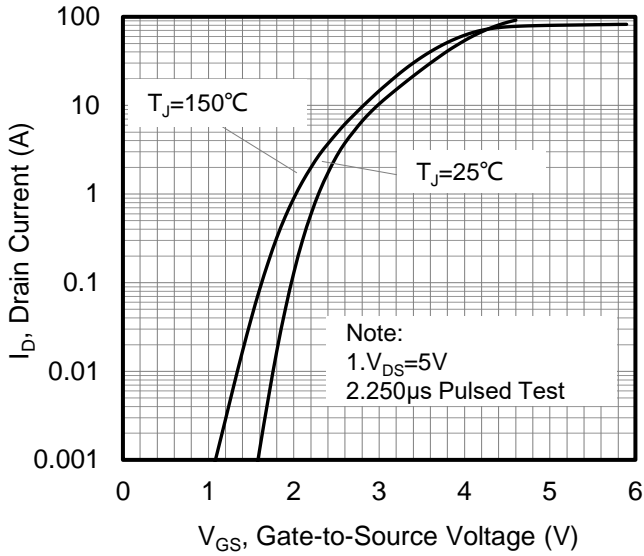


Figure 6. Typical Transfer Characteristics

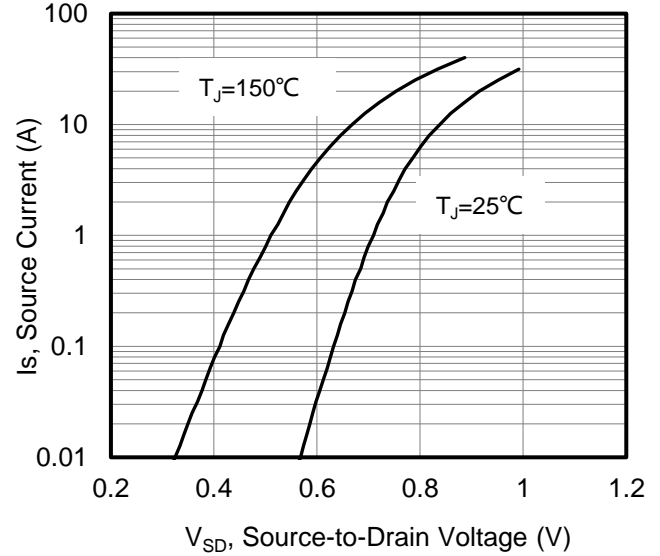


Figure 7. Typical Body Diode Transfer Characteristics

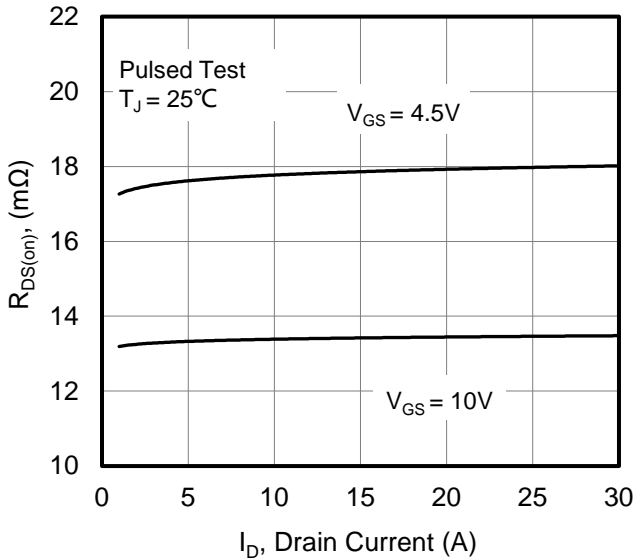


Figure 8. Drain-to-Source On Resistance vs Drain Current

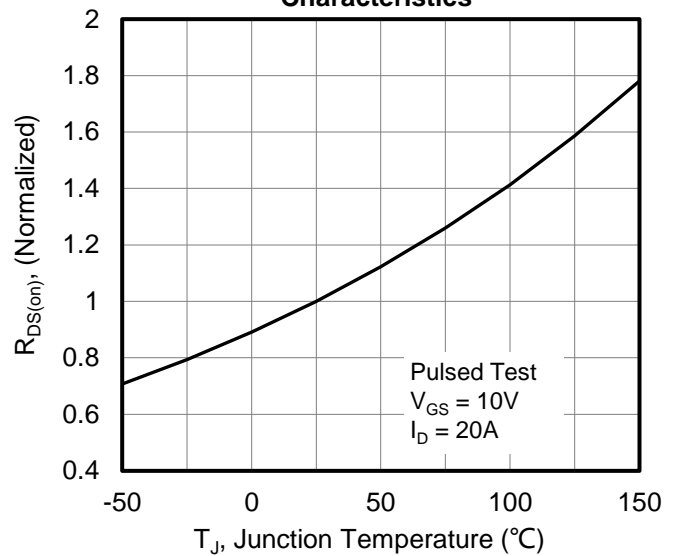


Figure 9. Normalized On Resistance vs Junction Temperature

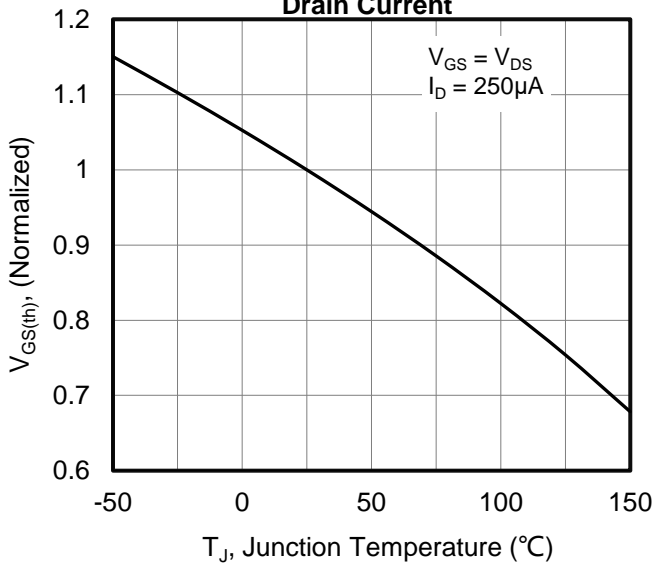


Figure 10. Normalized Threshold Voltage vs Junction Temperature

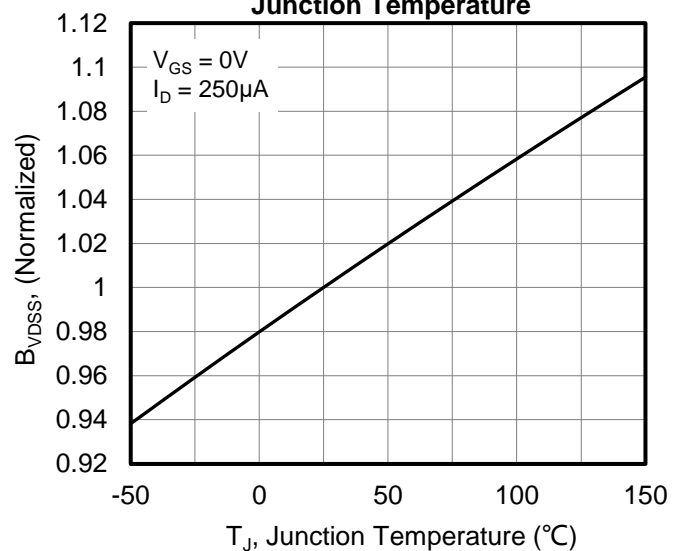


Figure 11. Normalized Breakdown Voltage vs Junction Temperature



# MDD50N06D

60V N-Channel Enhancement Mode MOSFET

Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

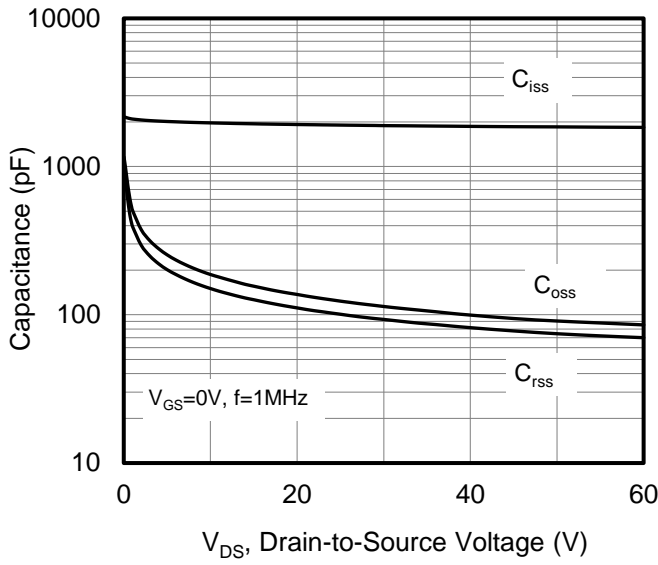


Figure 12. Capacitance Characteristics

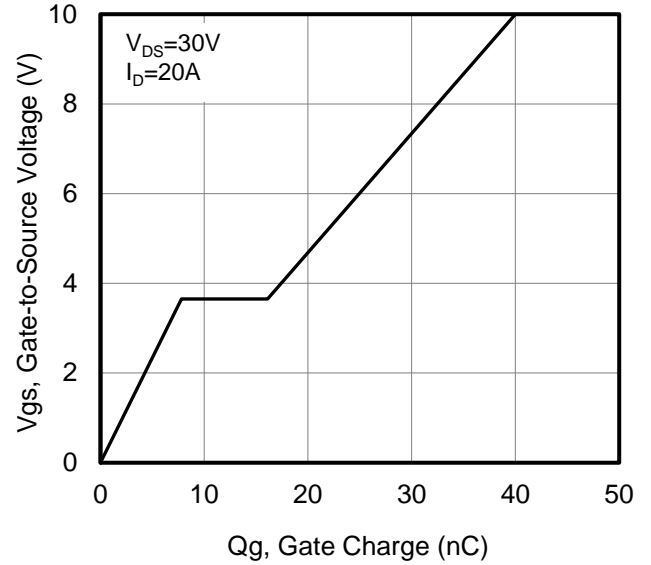


Figure 13. Typical Gate Charge vs Gate to Source Voltage

Figure A: Gate Charge Test Circuit and Waveform

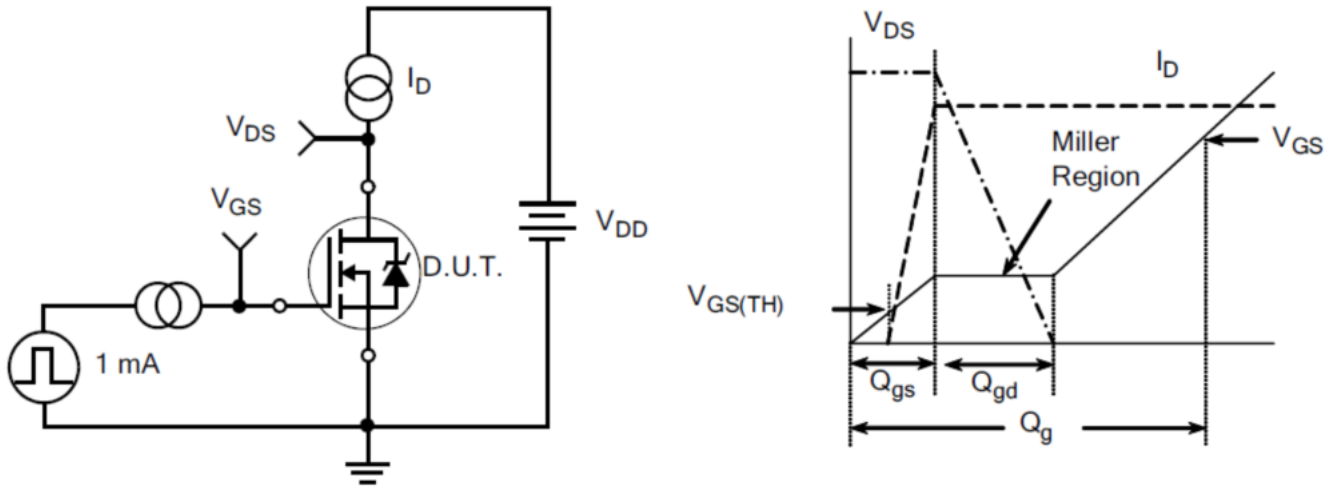


Figure B: Resistive Switching Test Circuit and Waveform

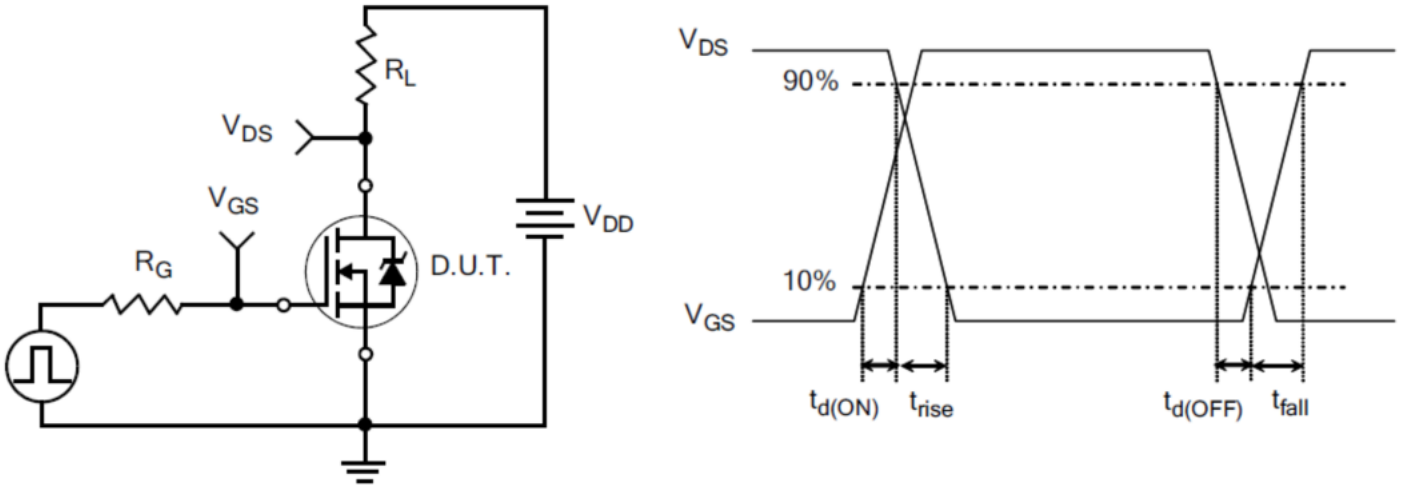
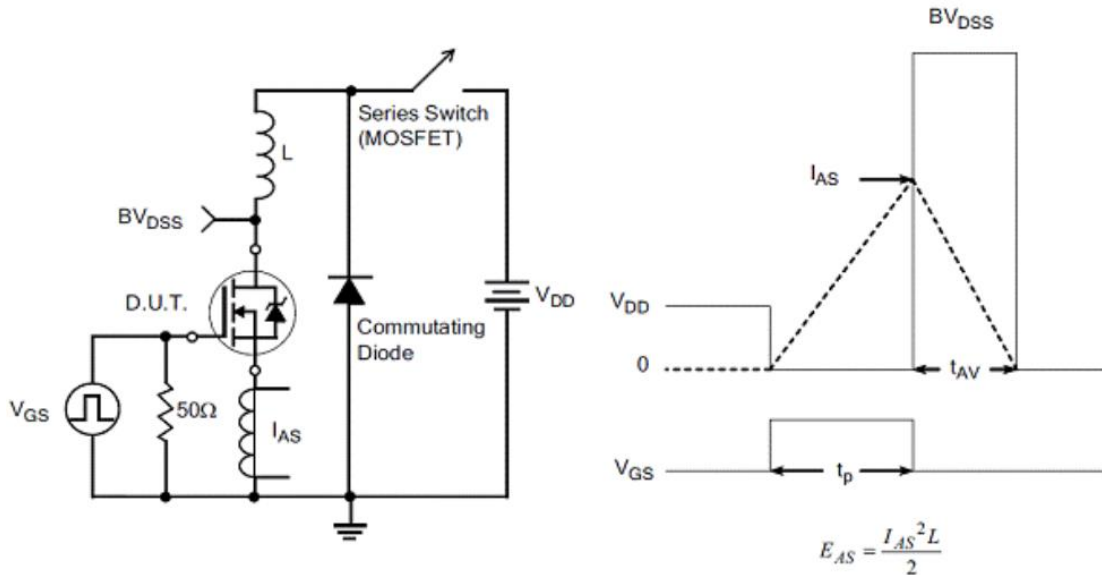
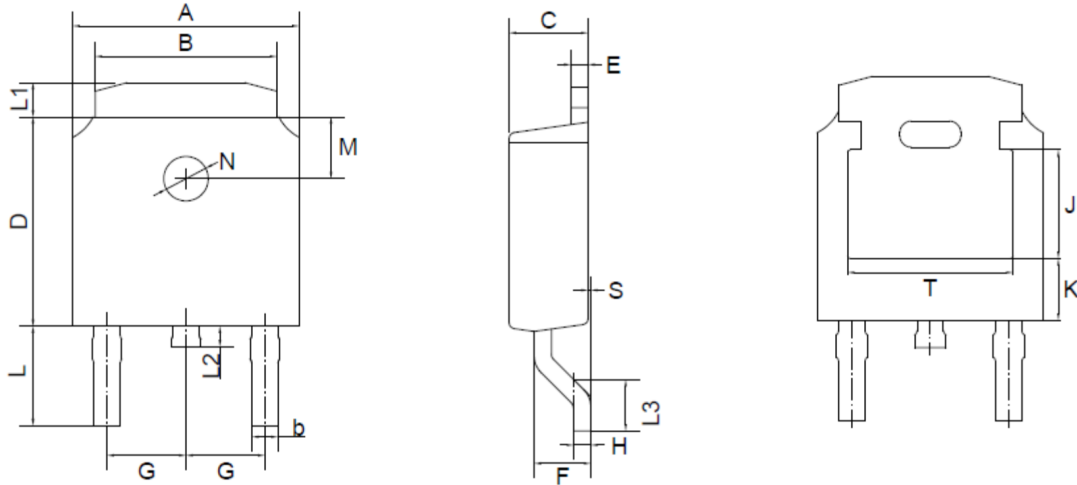


Figure C: Unclamped Inductive Switching Test Circuit and Waveform



### Outline Drawing

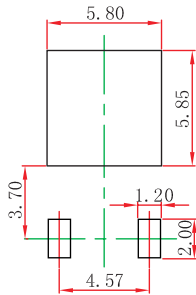
#### TO-252 Package Outline Dimensions



TO-252(D-PAK) mechanical data

UNIT		A	B	b	C	D	E	F	G	H	L	L1	L2	L3	S	M	N	J	K	T
mm	max	6.7	5.5	0.8	2.5	6.3	0.6	1.8	2.29	0.55	3.1	1.2	1.0	1.75	0.1	1.8	1.3	3.16	1.80	4.83
	min	6.3	5.1	0.3	2.1	5.9	0.4	1.3		TYPICAL	0.45	2.7	0.8	0.6	1.40					
mil	max	264	217	31	98	248	24	71	90	22	122	47	39	69	4	71	51	124	71	190
	min	248	201	12	83	232	16	51		TYPICAL	18	106	31	24	55					

### Suggested Pad Layout



Note:

1. Controlling dimension: in/millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.