

SDM040P02S

-20V P-Channel MOSFETs

Rev A.0

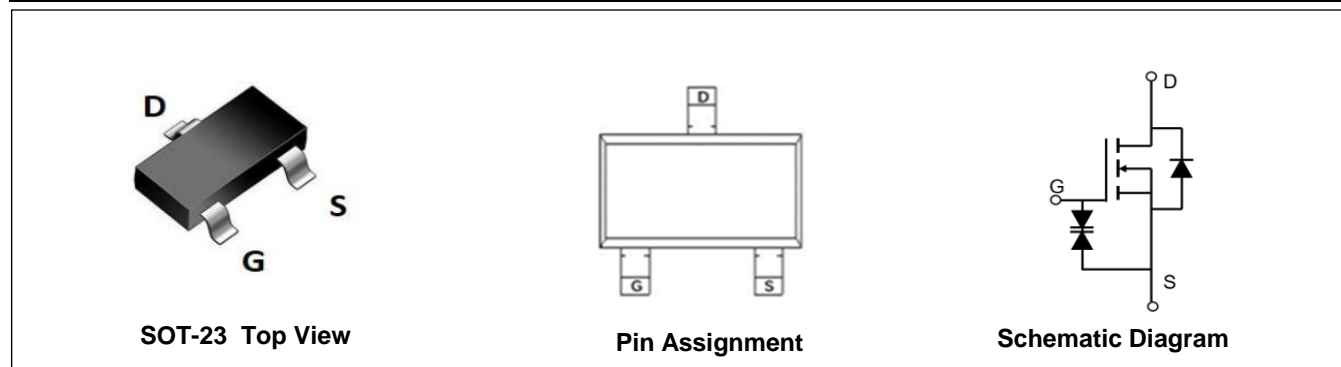
Feature

- ✧ Excellent $R_{DS(ON)}$
- ✧ Low Gate Charge
- ✧ High current Capability
- ✧ Green product (RoHS compliant), lead free
- ✧ AEC-Q101 qualified

Product Summary

V_{DS}	-20	V
$V_{GS(th)_{Typ}}$	-0.7	V
$R_{DS(ON)_{Typ}}$ (at $V_{GS} = -4.5V$)	23.8	m Ω
I_D (at $V_{GS} = -10V$) ⁽¹⁾	-4.1	A

Type	Package	Marking	Outline	Media	Quantity (pcs)
SDM040P02S	SOT-23	3415KL	Tape	7" Reel	3000



Absolute Maximum Ratings (Rating at $T_J=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Maximum	Unit
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	± 10	V
Continuous Drain Current	I_D	$T_A=25^\circ C$	-4.1
		$T_A=100^\circ C$	-2.9
Maximum Body-Diode Continuous Current	I_S	-4	A
Power Dissipation	P_D	$T_A=25^\circ C$	0.9
		$T_A=100^\circ C$	0.4
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^\circ C$

Electrical Characteristics (Rating at $T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-20	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-20\text{V}$, $V_{GS}=0\text{V}$	-	-	-1	μA
I_{GSS}	Gate-Body Leakage Current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$	-	-	± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-0.5	-0.7	-0.9	V
$R_{DS(ON)}^{(1)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5\text{V}$, $I_D=-4\text{A}$	-	23.8	40	m Ω
		$V_{GS}=-2.5\text{V}$, $I_D=-3\text{A}$	-	32.2	56	
V_{SD}	Diode Forward Voltage	$I_S=-4\text{A}$, $V_{GS}=0\text{V}$	-	-	-1.2	V
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-10\text{V}$, $f=1\text{MHz}$	639	895	1207	pF
C_{oss}	Output Capacitance		67	93	125	pF
C_{rss}	Reverse Transfer Capacitance		39	53	71	pF
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=-4.5\text{V}$, $V_{DD}=-10\text{V}$, $I_D=-4\text{A}$	-	11	-	nC
Q_{gs}	Gate Source Charge		-	3	-	nC
Q_{gd}	Gate Drain Charge		-	3	-	nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=-10\text{V}$, $V_{DS}=-10\text{V}$, $R_G=1\Omega$, $I_D=-4\text{A}$	-	13	-	ns
t_r	Turn-On Rise Time		-	37	-	ns
$t_{D(off)}$	Turn-Off Delay Time		-	31	-	ns
t_f	Turn-Off Fall Time		-	11	-	ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-4\text{A}$, $di/dt=100\text{A}/\mu\text{s}$	125	175	235	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-4\text{A}$, $di/dt=100\text{A}/\mu\text{s}$	-	64.3	-	nC

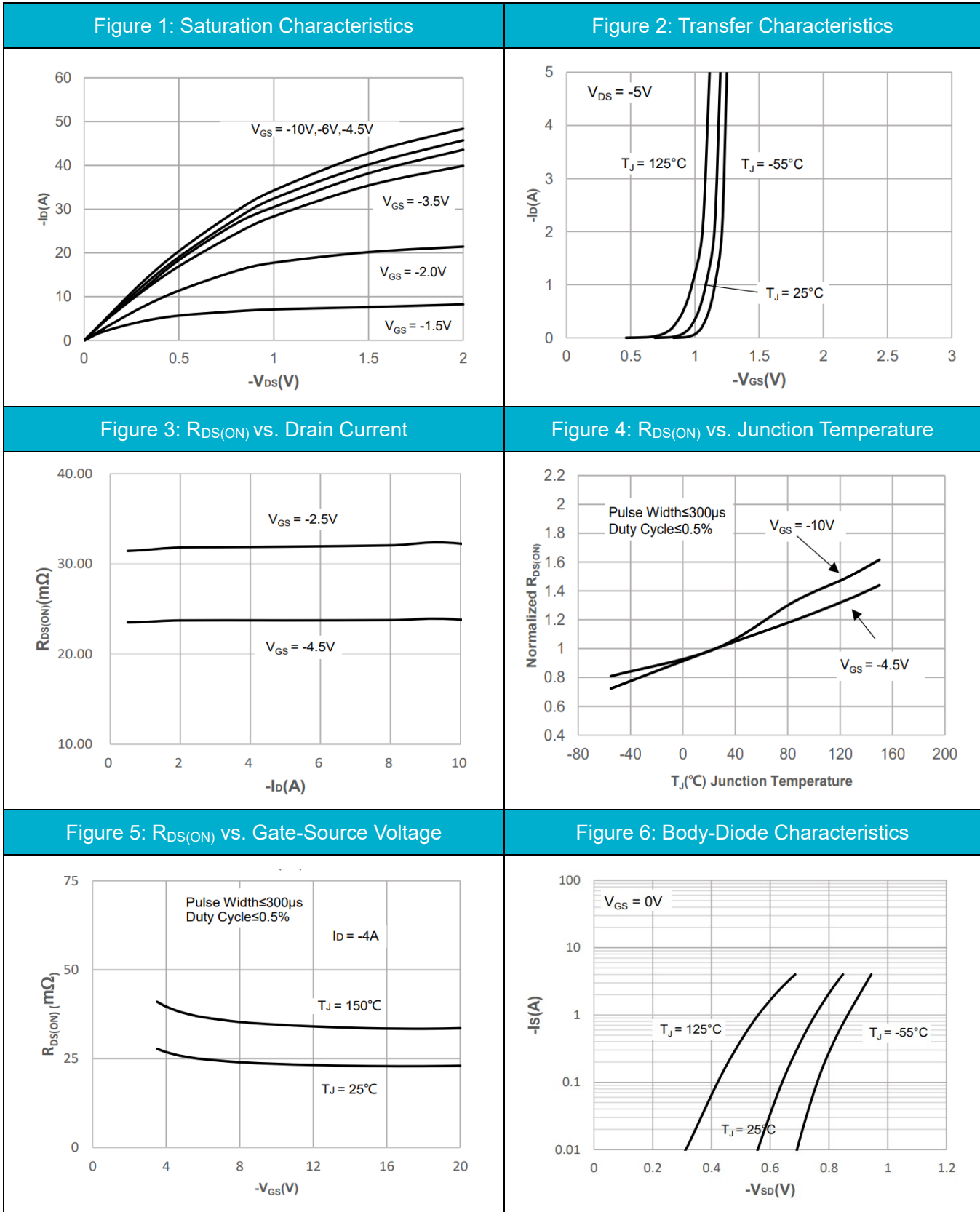
Thermal Resistances

Symbol	Parameter	Typ	Max	Unit
$R_{\theta JA}^{(2)}$	Thermal resistance from junction to ambient	-	187	°C /W
$R_{\theta JA}^{(3)}$	Thermal resistance from junction to ambient	-	133	°C /W

Notes:

1. Pulse Test: Pulse Width \leq 300 μ s, Duty Cycle \leq 0.5%.
2. $R_{\theta JA}$ is measured with the device mounted on a minimum recommended pad of 2oz copper FR4 PCB.
3. $R_{\theta JA}$ is measured with the device mounted on a 1inch² pad of 2oz copper FR4 PCB.

Typical Electrical and Thermal Characteristics



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Figure 7: Gate-Charge characteristics

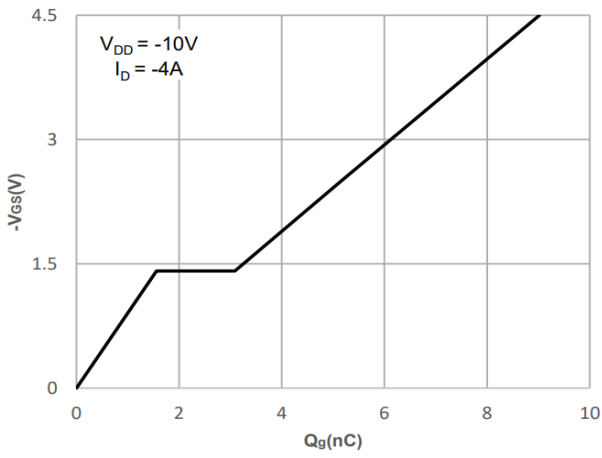


Figure 8: Capacitance characteristics

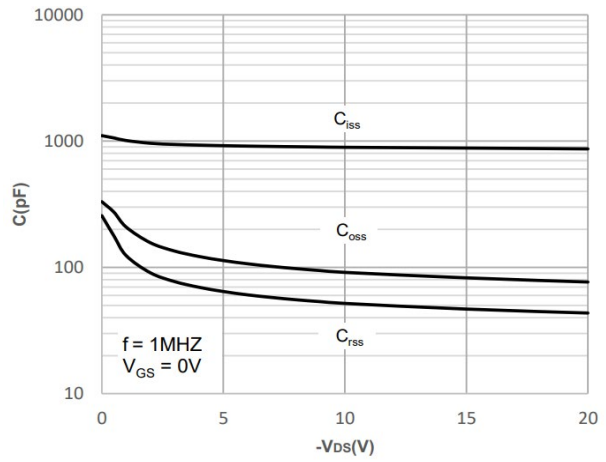


Figure 9: Current De-rating

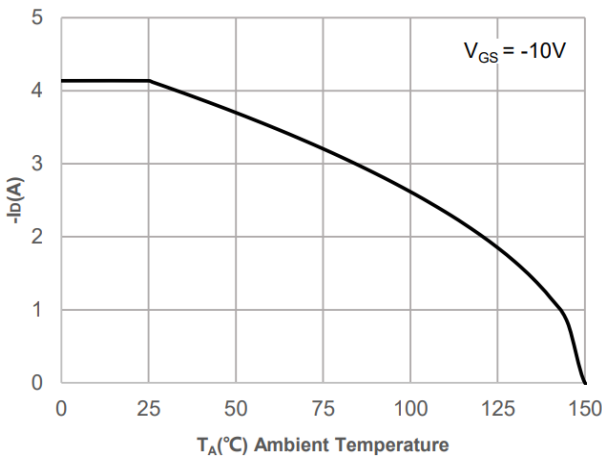


Figure 10: Power De-rating

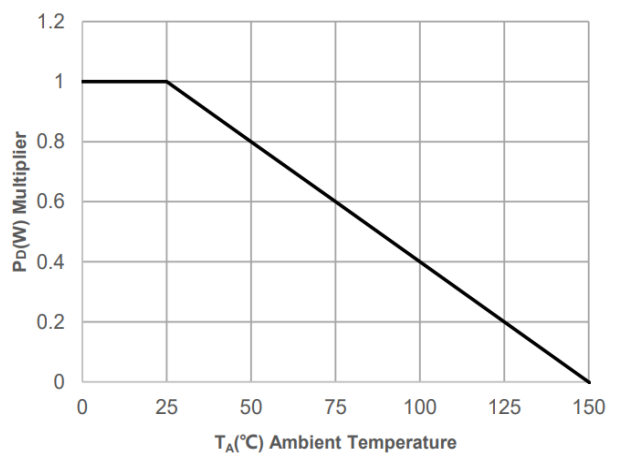


Figure 11: Maximum Safe Operating Area

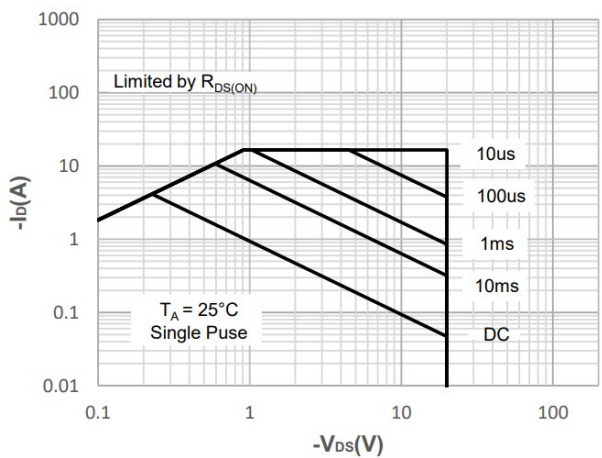
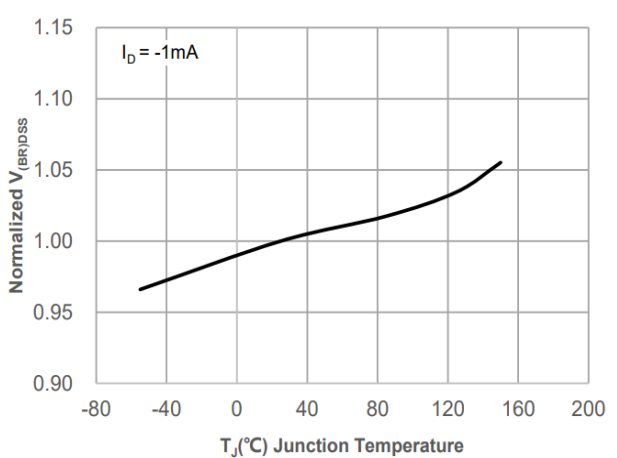
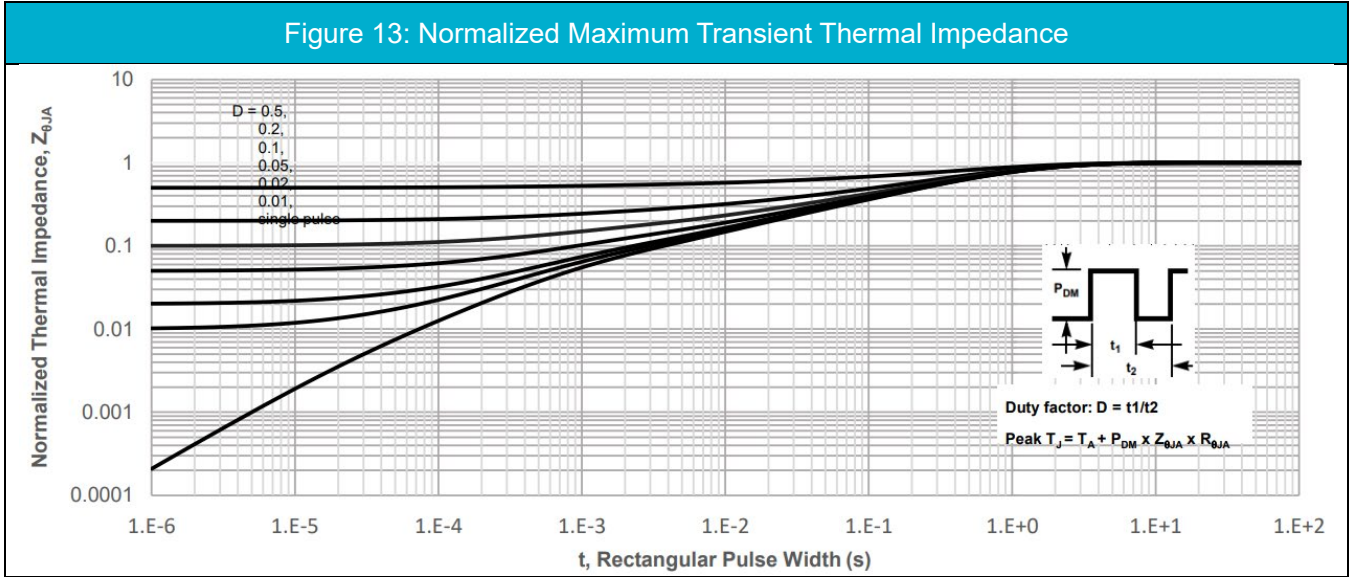


Figure 12: $V_{(BR)DSS}$ vs. Junction Temperature



Typical Electrical and Thermal Characteristics

Figure 13: Normalized Maximum Transient Thermal Impedance



Test Circuit

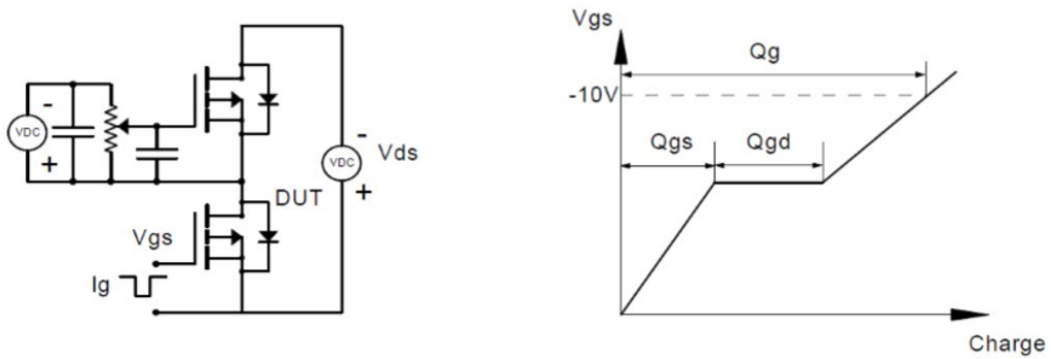


Figure1: Gate Charge Test Circuit & Waveforms

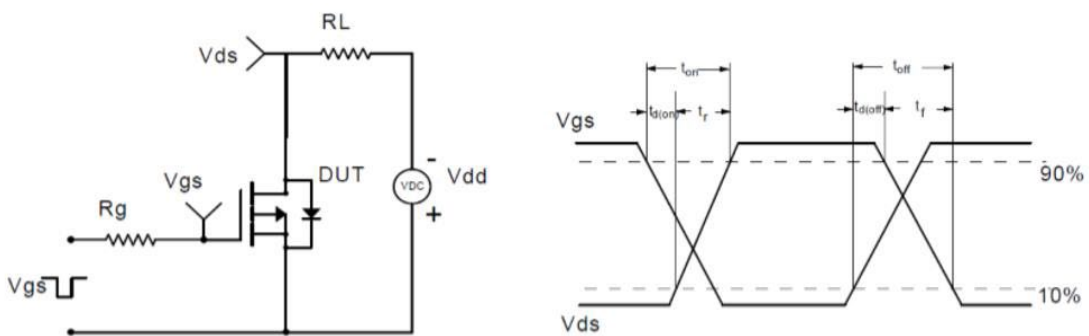


Figure2: Resistive Switching Test Circuit & Waveforms

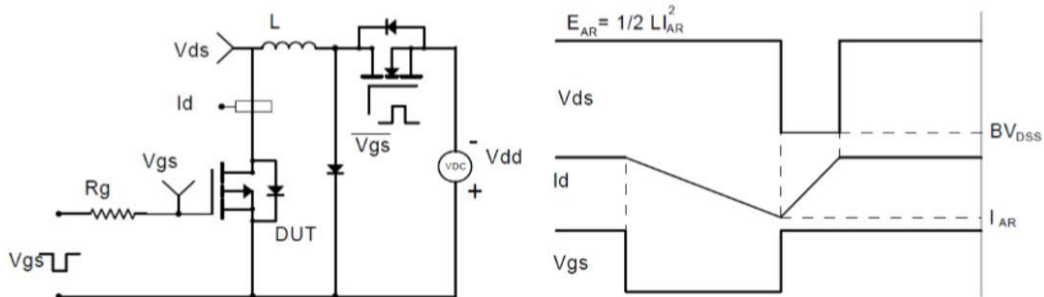


Figure3: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

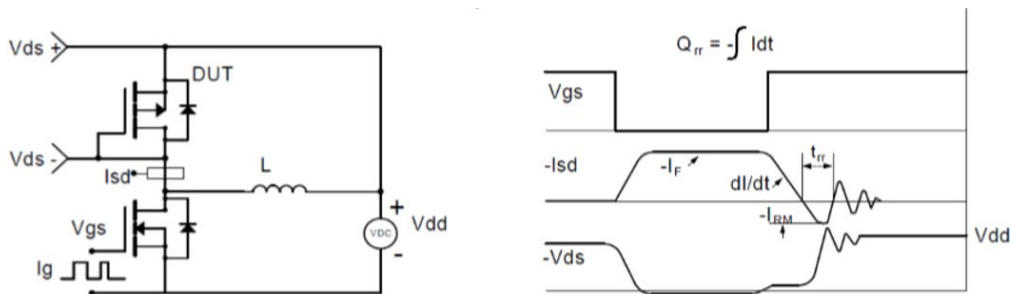
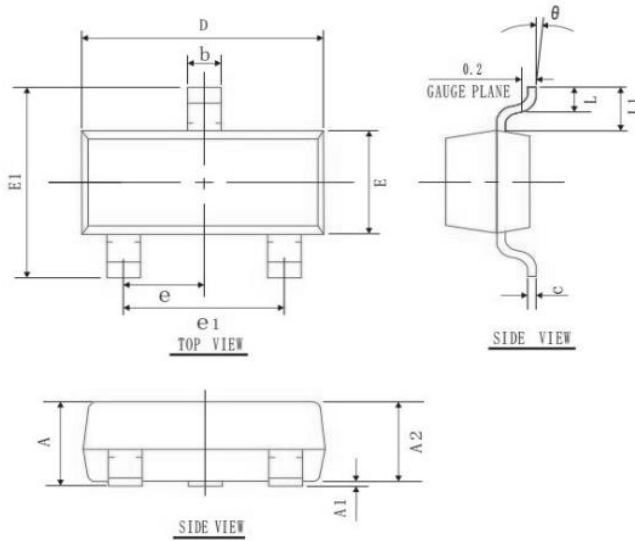


Figure4: Diode Recovery Test Circuit & Waveforms

SOT-23 Package Information



COMMON DIMENSIONS
(UNITS OF MEASURE=mm)

SYMBOL	MIN	NOM	MAX
A	0.90	1.05	1.20
A1	0.00	0.05	0.10
A2	0.90	1.00	1.10
b	0.30	0.40	0.50
c	0.08	0.10	0.15
D	2.80	2.90	3.00
E	1.20	1.30	1.40
E1	2.30	2.40	2.50
L	0.30	0.40	0.50
θ	0°	5°	10°
L1	0.55 REF		
e	0.95 BSC		
e1	1.90 REF		