

60V, 0.8A, 650mΩ N-channel Power Trench MOSFET

JMTL2N7002KSQ

Features

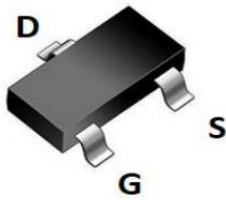
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Halogen-free; RoHS-compliant
- Pb-free plating
- ESD Protected: 2KV
- AEC-Q101 Qualified
- Pb-free plating

Applications

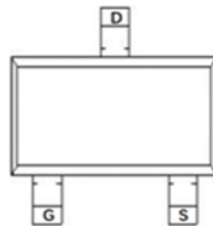
- Load Switch
- PWM Application
- General Automotive Application

Product Summary

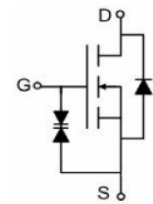
Parameters	Value	Unit
V_{DSS}	60	V
$V_{GS(th)}_{Typ}$	1.5	V
$I_D(@V_{GS}=10V)$	0.8	A
$R_{DS(ON)}_{Typ}(@V_{GS}=10V)$	577	mΩ
$R_{DS(ON)}_{Typ}(@V_{GS}=4.5V)$	650	mΩ



SOT-23 Top View



Pin Assignment



Schematic Diagram

Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMTL2N7002KSQ-7	72KSQ	1	Tape&Reel	SOT-23	3000	120000

Absolute Maximum Ratings (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-to-Source Voltage	60	V
V_{GS}	Gate-to-Source Voltage	± 20	V
I_D	Continuous Drain Current	$T_A = 25^\circ\text{C}$	0.8
		$T_A = 100^\circ\text{C}$	0.5
I_{DM}	Pulsed Drain Current ⁽¹⁾	Refer to Fig.4	A
P_D	Power Dissipation	$T_A = 25^\circ\text{C}$	1.0
		$T_A = 100^\circ\text{C}$	0.5
T_J, T_{STG}	Junction & Storage Temperature Range	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁽²⁾	211	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁽³⁾	153	

**Electrical Characteristics** ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$	60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 60\text{V}$, $V_{GS} = 0\text{V}$	-	-	1.0	μA
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}$, $V_{GS} = \pm 20\text{V}$	-	-	± 10	μA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	1.1	1.5	2.0	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance ⁽⁴⁾	$V_{GS} = 10\text{V}$, $I_D = 0.3\text{A}$	-	577	750	$\text{m}\Omega$
		$V_{GS} = 4.5\text{V}$, $I_D = 0.2\text{A}$	-	650	845	$\text{m}\Omega$
Dynamic Characteristics						
R_g	Gate Resistance	$f = 1\text{MHz}$	-	15	-	Ω
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}$, $V_{DS} = 30\text{V}$, $f = 1\text{MHz}$	-	55	-	pF
C_{oss}	Output Capacitance		-	12.2	-	pF
C_{riss}	Reverse Transfer Capacitance		-	6.8	-	pF
Q_g	Total Gate Charge	$V_{GS} = 0$ to 10V $V_{DS} = 30\text{V}$, $I_D = 1\text{A}$	-	1.9	-	nC
Q_{gs}	Gate Source Charge		-	0.5	-	nC
Q_{gd}	Gate Drain ("Miller") Charge		-	0.3	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}$, $V_{DD} = 30\text{V}$ $I_D = 0.3\text{A}$, $R_{GEN} = 3\Omega$	-	1.1	-	ns
t_r	Turn-On Rise Time		-	2.2	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	6.7	-	ns
t_f	Turn-Off Fall Time		-	8.9	-	ns
Body Diode Characteristics						
I_S	Maximum Continuous Body Diode Forward Current		-	-	0.8	A
I_{SM}	Maximum Pulsed Body Diode Forward Current		-	-	3.0	A
V_{SD}	Body Diode Forward Voltage	$V_{GS} = 0\text{V}$, $I_S = 0.3\text{A}$	-		1.2	V
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 1\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$	-	16	-	ns
Q_{rr}	Body Diode Reverse Recovery Charge		-	7.3	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 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.
 4. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$.



Typical Performance Characteristics

Figure 1: Power De-rating

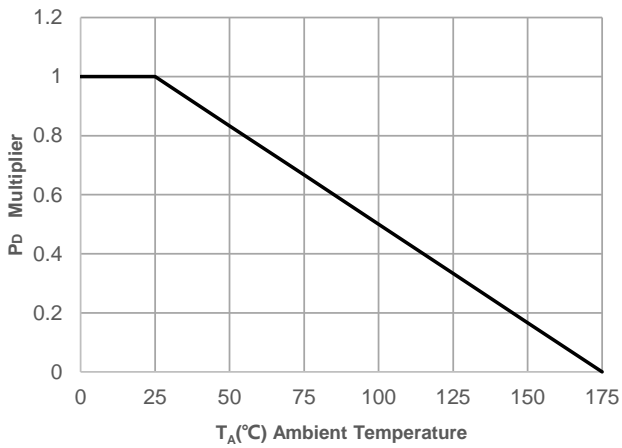


Figure 2: Current De-rating

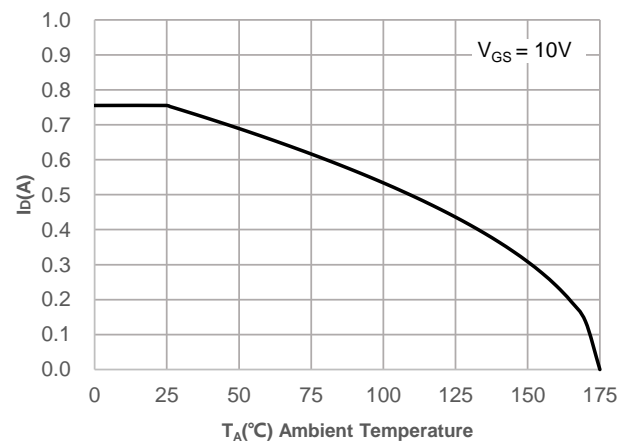


Figure 3: Normalized Maximum Transient Thermal Impedance

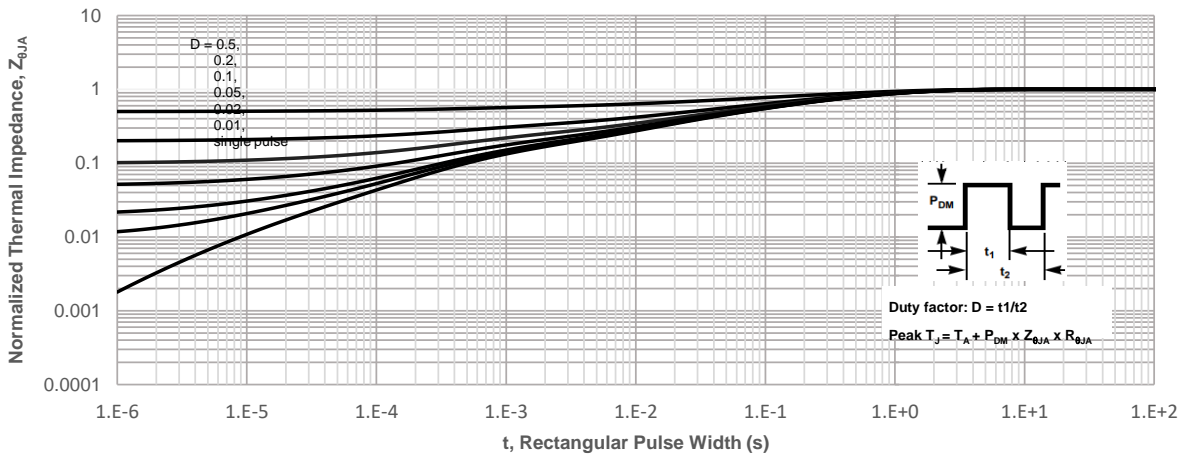
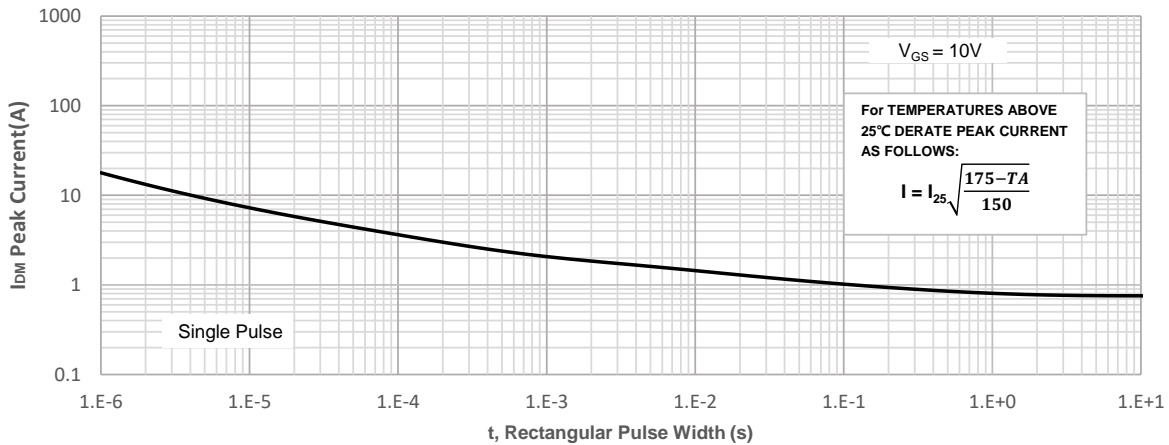
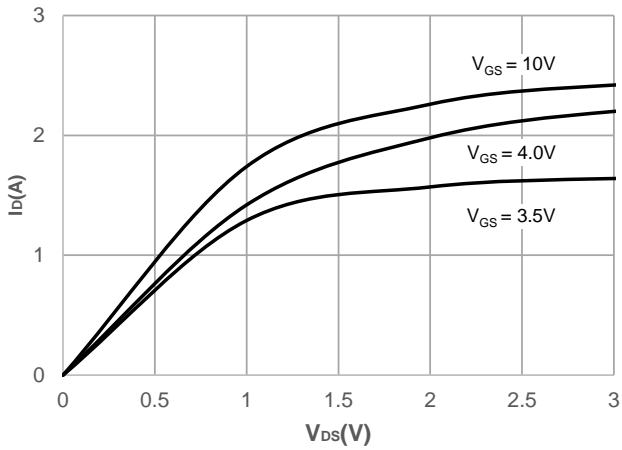
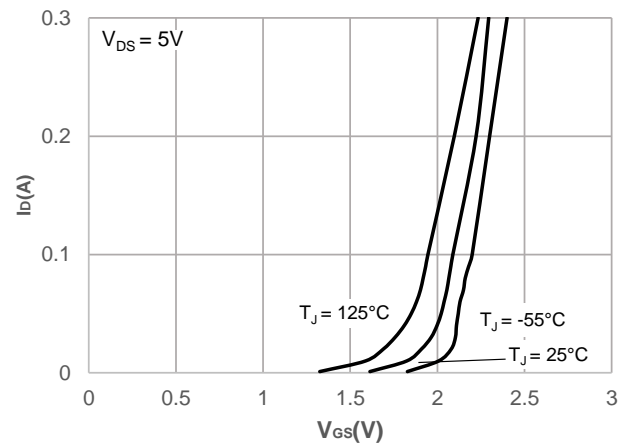
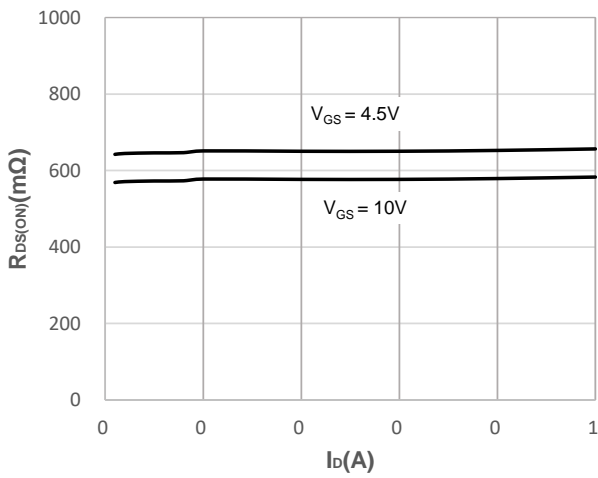
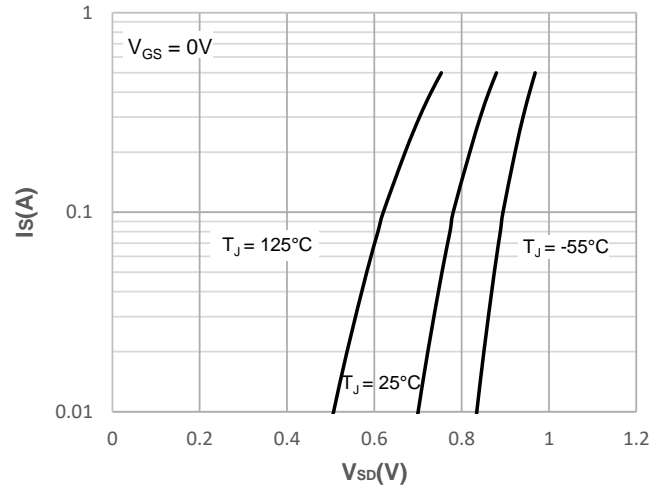
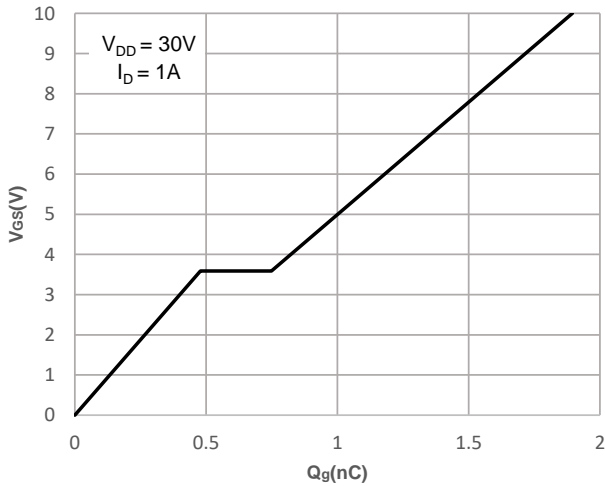
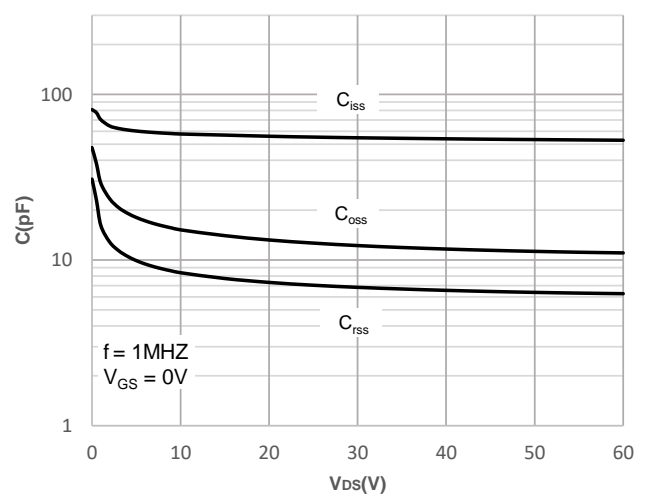


Figure 4: Peak Current Capacity



Typical Performance Characteristics

Figure 5: Output Characteristics

Figure 6: Typical Transfer Characteristics

Figure 7: On-resistance vs. Drain Current

Figure 8: Body Diode Characteristics

Figure 9: Gate Charge Characteristics

Figure 10: Capacitance Characteristics


Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

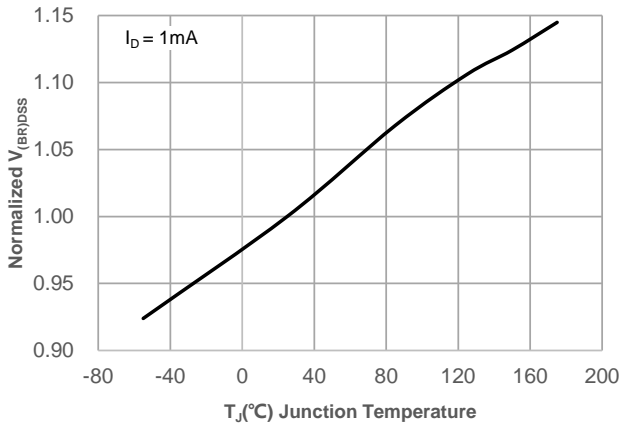


Figure 12: Normalized on Resistance vs. Junction Temperature

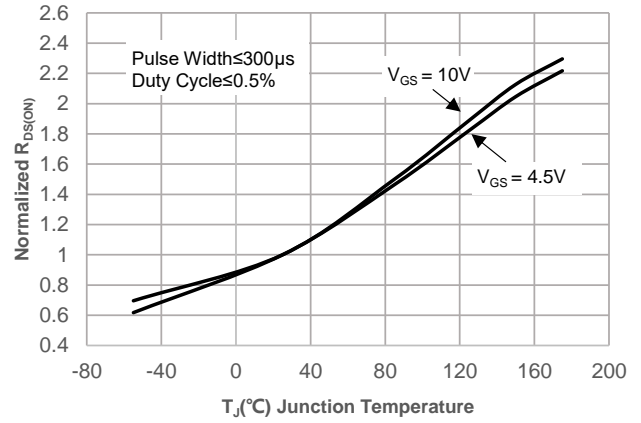


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

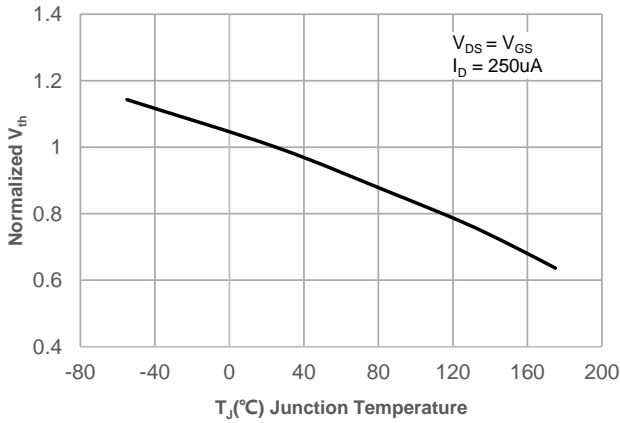


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

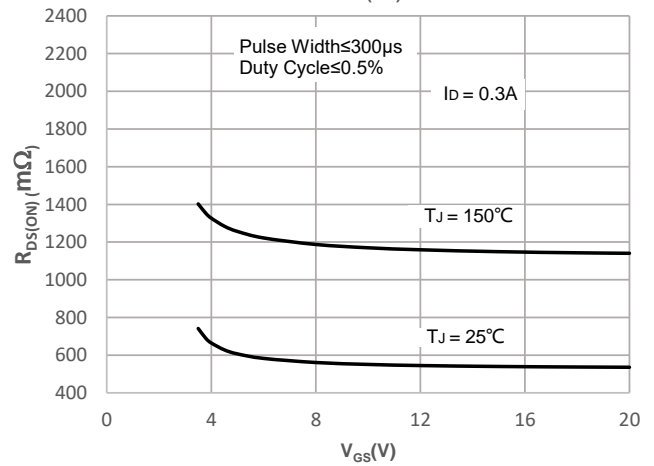
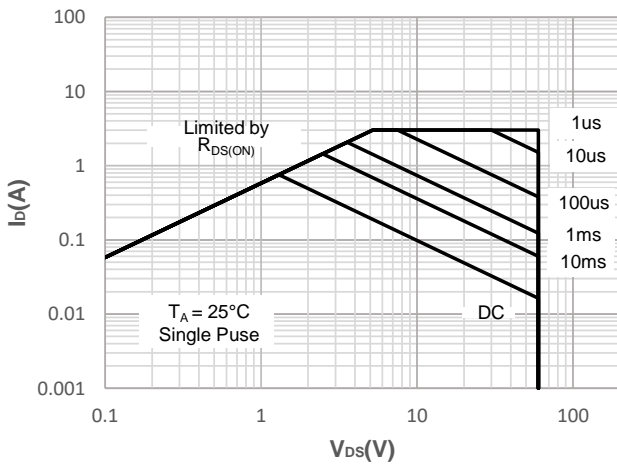
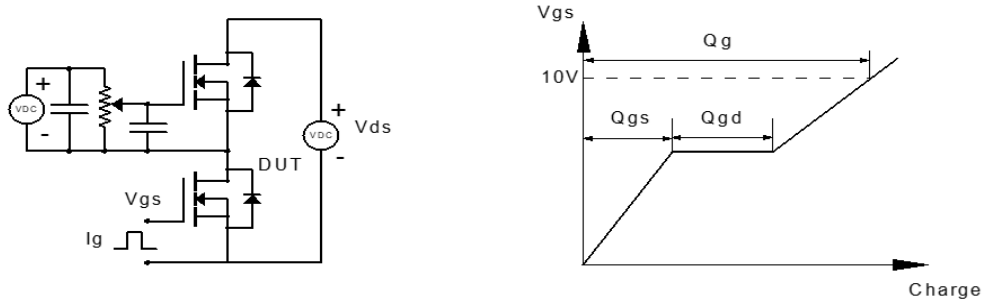
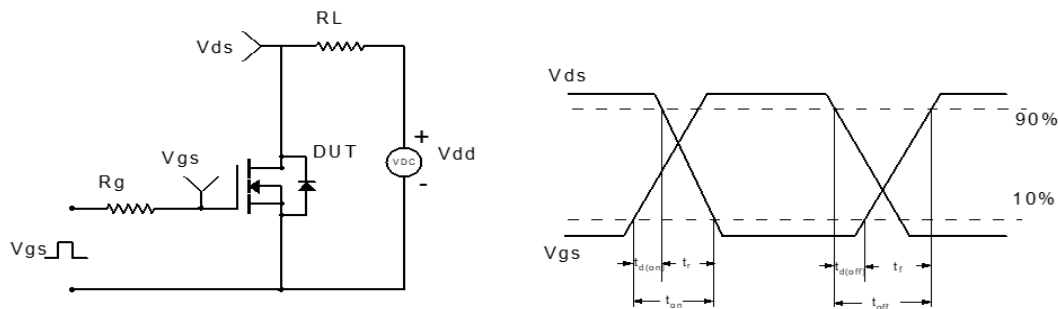
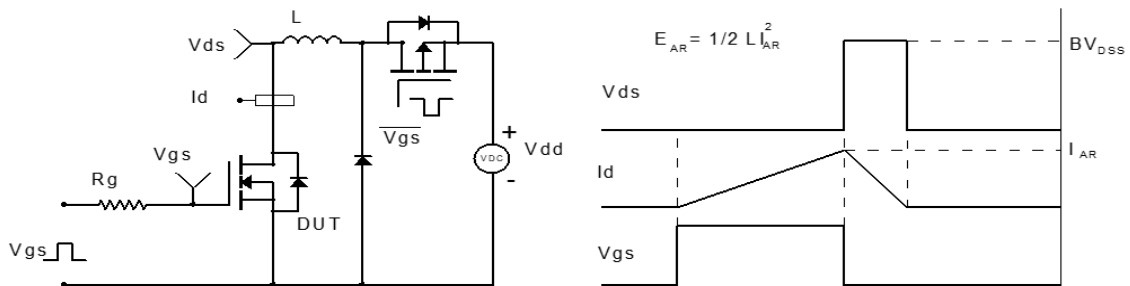
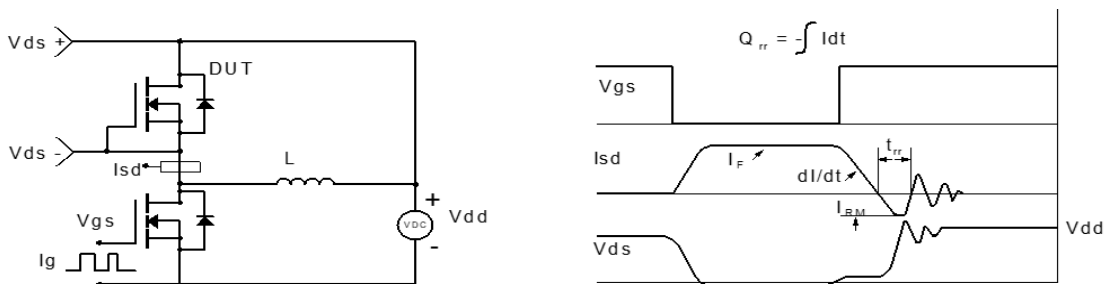
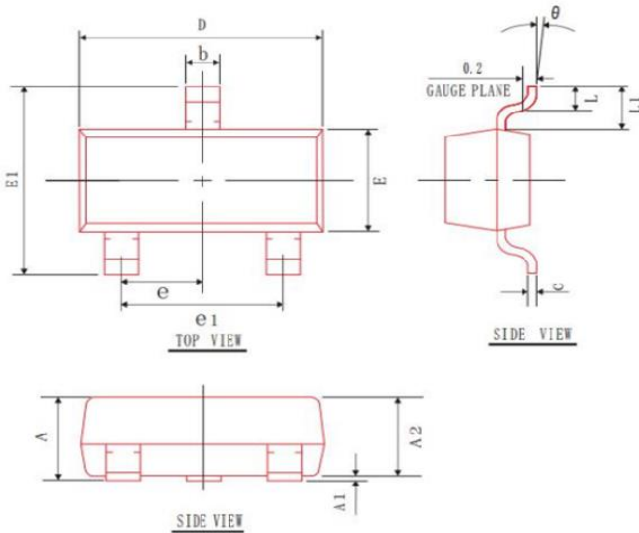


Figure 15: Maximum Safe Operating Area



Test Circuit

Figure 1: Gate Charge Test Circuit & Waveform

Figure 2: Resistive Switching Test Circuit & Waveform

Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

Figure 4: Diode Recovery Test Circuit & Waveform

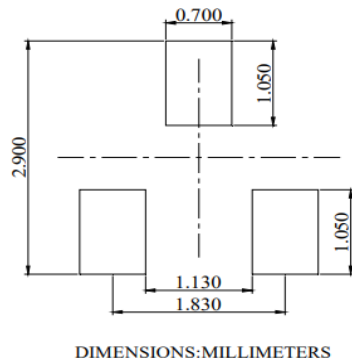

Package Mechanical Data(SOT-23)



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		

Recommended Footprint



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