

TN03N40SA

N-Channel Enhancement Mode Power MOSFET

Features

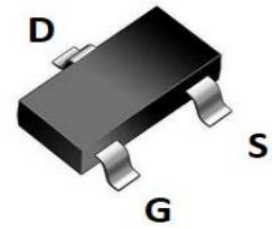
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Halogen-free; RoHS-compliant
- Pb-free plating

Applications

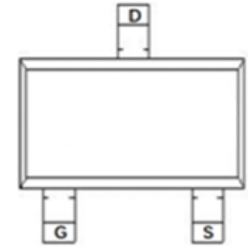
- Load Switch
- PWM Application
- Power Management

Product Summary

Parameters	Value	Unit
V_{DSS}	40	V
$V_{GS(th_Typ)}$	2.0	V
$I_D(@V_{GS}=10V)$	4	A
$R_{DS(ON_Typ)}(@V_{GS}=10V)$	30	mΩ
$R_{DS(ON_Typ)}(@V_{GS}=4.5V)$	40	mΩ

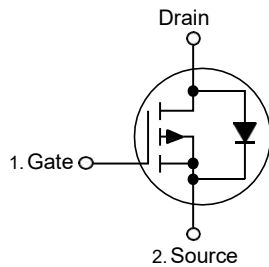


SOT-23 Top View



Pin Assignment

Schematic Diagram



Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
TN03N40SA	03N40	3	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	40	V
V_{GS}	Gate-to-Source Voltage	±20	V
I_D	Continuous Drain Current	$T_A = 25^\circ\text{C}$	A
		$T_A = 100^\circ\text{C}$	
I_{DM}	Pulsed Drain Current ⁽¹⁾	Refer to Fig.4	A
P_D	Power Dissipation	$T_A = 25^\circ\text{C}$	W
		$T_A = 100^\circ\text{C}$	
T_J, T_{STG}	Junction & Storage Temperature Range	-55 to 150	°C

Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁽²⁾	166	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁽³⁾	114	

Electrical Characteristics (T_J = 25°C unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	I _D = 250μA, V _{GS} = 0V	40	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 0V, V _{GS} = 40V	-	-	1.0	μA
I _{GSS}	Gate-Body Leakage Current	V _{DS} = 0V, V _{GS} = ±12V	-	-	±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	1.4	2.0	2.6	V
R _{DS(ON)}	Static Drain-Source ON-Resistance ⁽⁴⁾	V _{GS} = 10V, I _D = 4A	-	30	39	mΩ
		V _{GS} = 4.5V, I _D = 3A	-	40	52	mΩ
Dynamic Characteristics						
R _g	Gate Resistance	f = 1MHz	-	2.3	-	Ω
C _{iss}	Input Capacitance	V _{GS} = 0V, V _{DS} = 20V, f = 1MHz	383	536	723	pF
C _{oss}	Output Capacitance		30	42	57	pF
C _{rss}	Reverse Transfer Capacitance		24	33	45	pF
Q _g	Total Gate Charge	V _{GS} = 0 to 4.5V V _{DS} = 20V, I _D = 3A	-	11	-	nC
Q _{gs}	Gate Source Charge		-	2.2	-	nC
Q _{gd}	Gate Drain("Miller") Charge		-	2	-	nC
Switching Characteristics						
t _{d(on)}	Turn-On DelayTime	V _{GS} = 10V, V _{DD} = 20V I _D = 3A, R _{GEN} = 3Ω	-	4.6	-	ns
t _r	Turn-On Rise Time		-	2	-	ns
t _{d(off)}	Turn-Off DelayTime		-	45	-	ns
t _f	Turn-Off Fall Time		-	355	-	ns
Body Diode Characteristics						
I _S	Maximum Continuous Body Diode Forward Current		-	-	4	A
I _{SM}	Maximum Pulsed Body Diode Forward Current		-	-	15	A
V _{SD}	Body Diode Forward Voltage	V _{GS} = 0V, I _S = 30A	-		1.2	V
trr	Body Diode Reverse Recovery Time	I _F = 3A, di/dt = 100A/us	-	8.5	-	ns
Qrr	Body Diode Reverse Recovery Charge		-	3.8	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. R_{θJA} is measured with the device mounted on a minimum recommended pad of 2oz copper FR4 PCB.
 3. R_{θJA} is measured with the device mounted on a 1inch² pad of 2oz copper FR4 PCB.
 4. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%.

Typical Performance Characteristics

Figure 1: Power De-rating

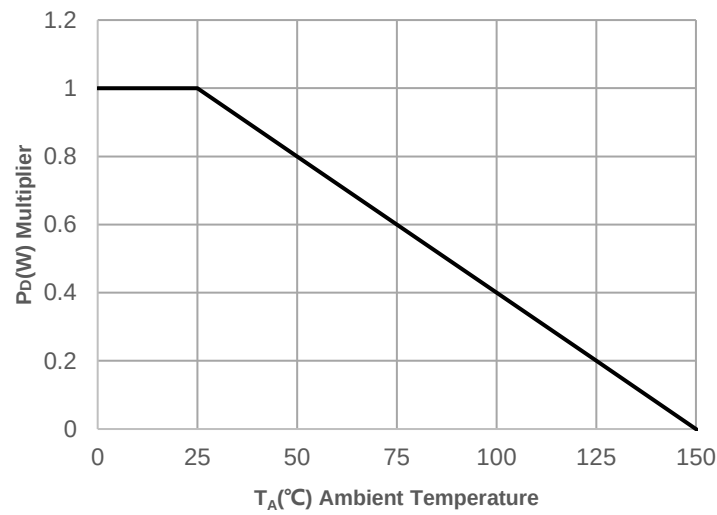


Figure 2: Current De-rating

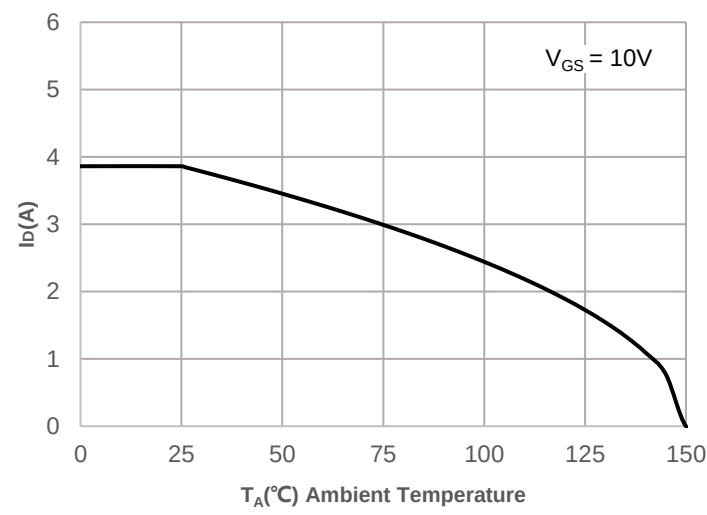


Figure 3: Normalized Maximum Transient Thermal Impedance

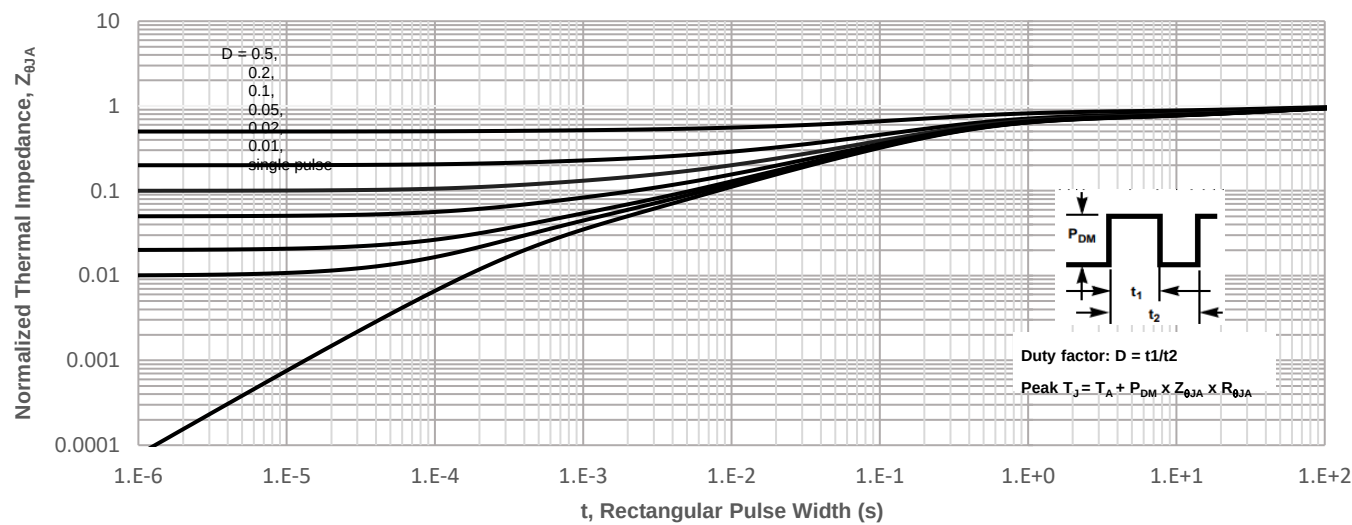


Figure 4: Peak Current Capacity

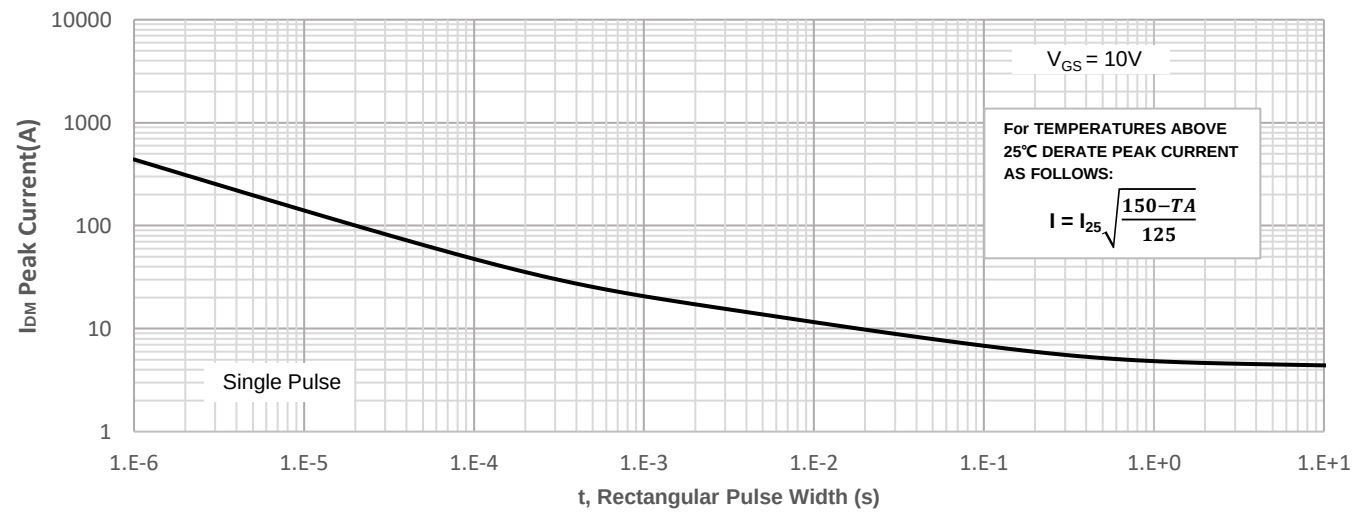


Figure 5: Output Characteristics

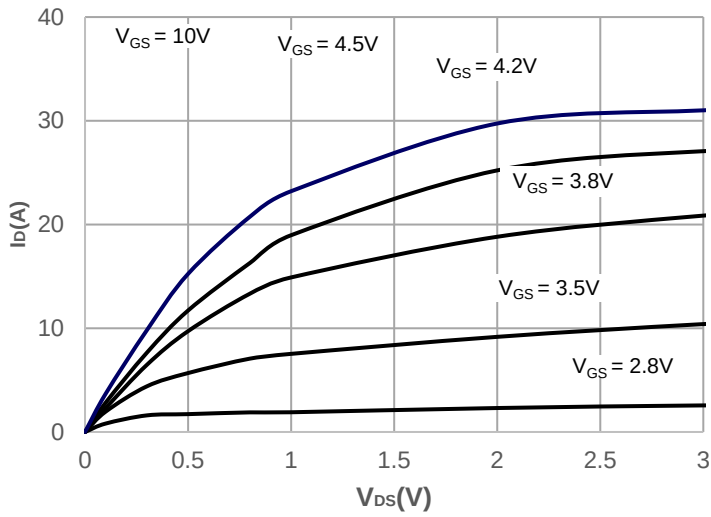


Figure 6: Typical Transfer Characteristics

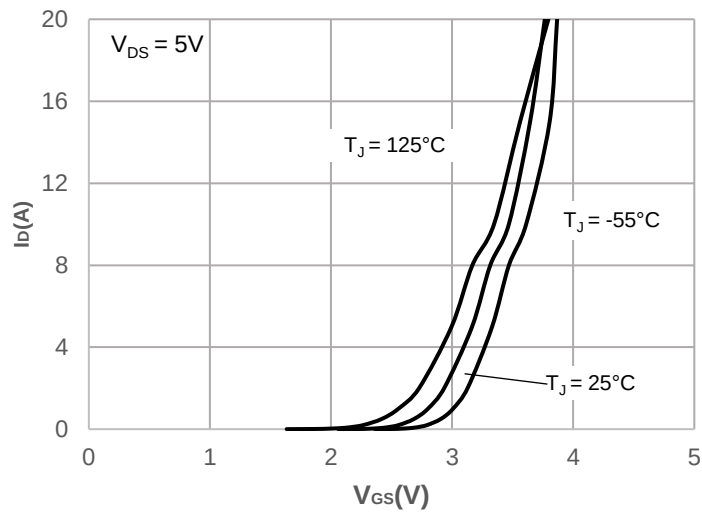


Figure 7: On-resistance vs. Drain Current

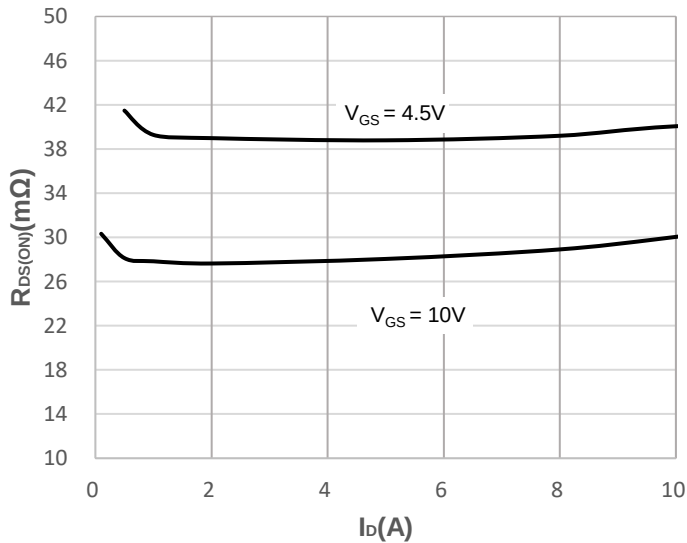


Figure 8: Body Diode Characteristics

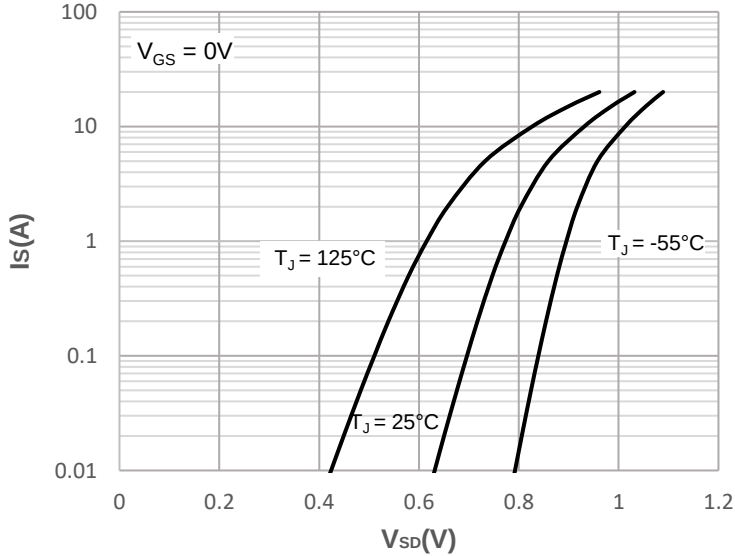


Figure 9: Gate Charge Characteristics

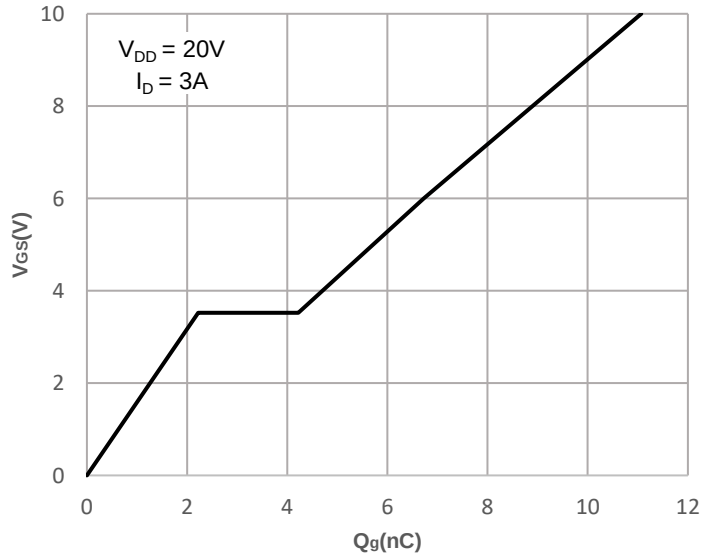


Figure 10: Capacitance Characteristics

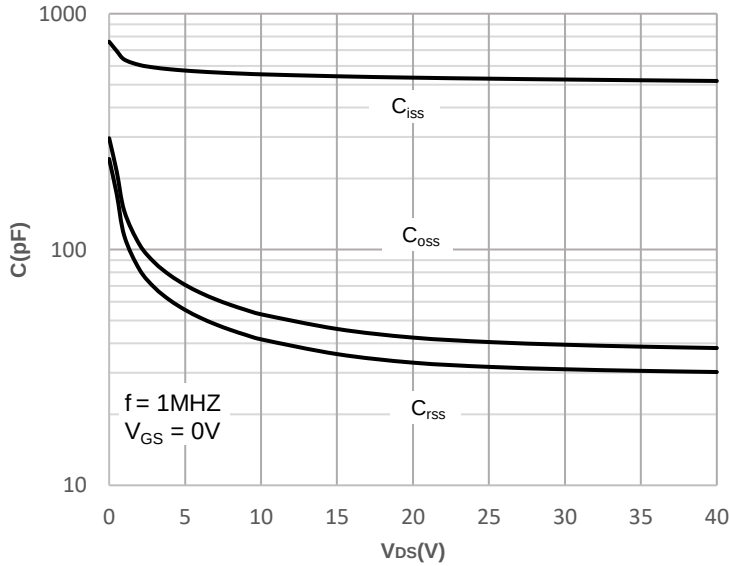


Figure 11: Normalized Breakdown voltage vs. Junction Temperature

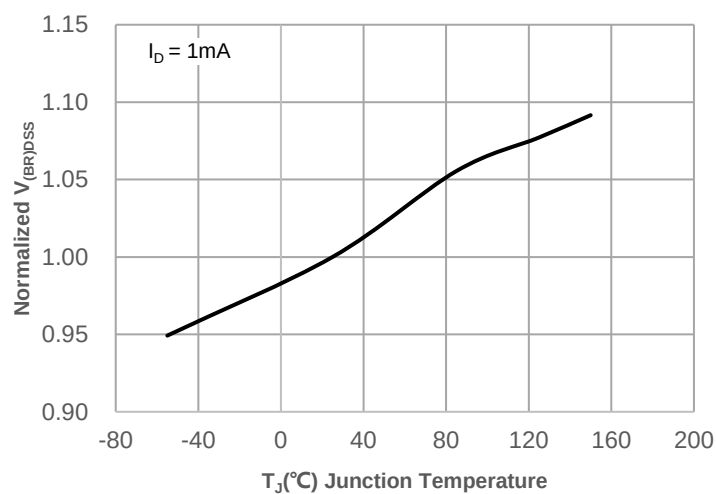


Figure 12: Normalized on Resistance vs. Junction Temperature

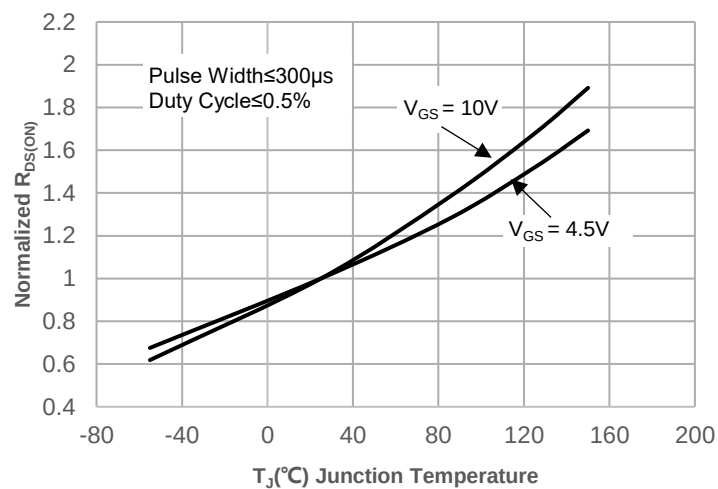


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

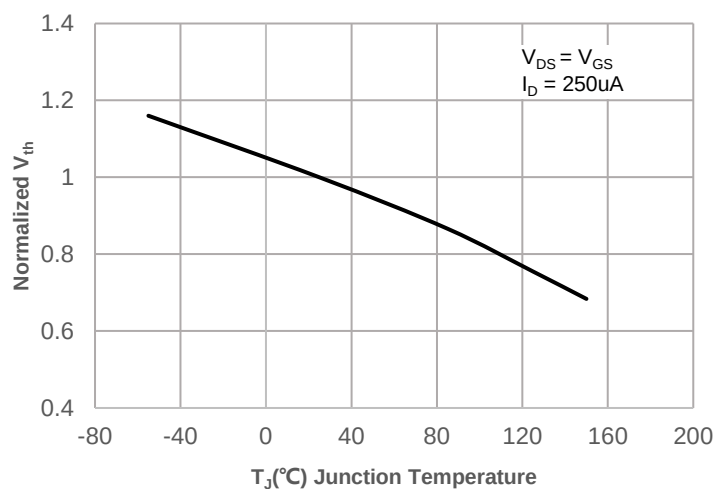


Figure 14: $R_{DS(on)}$ vs. V_{GS}

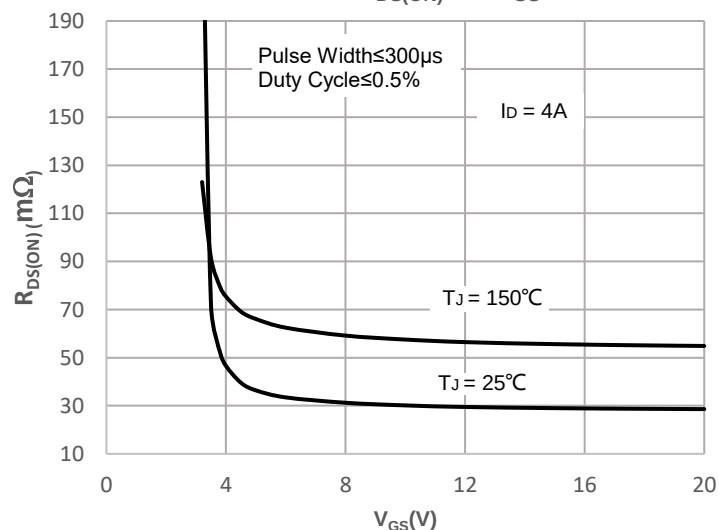
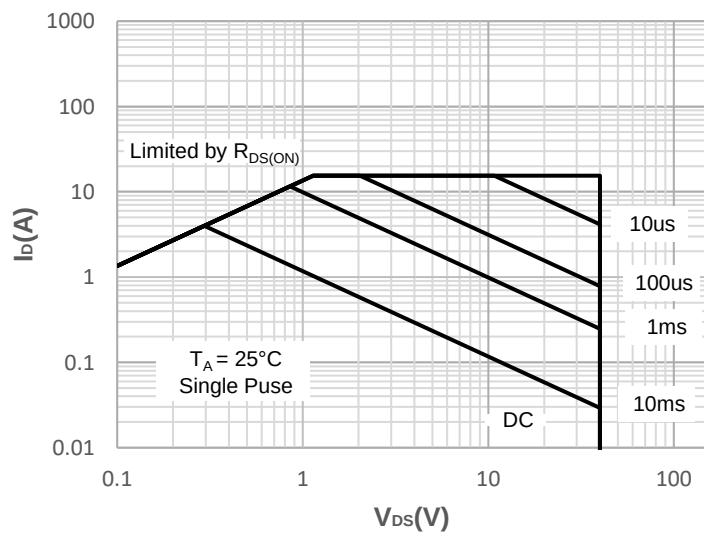


Figure 15: Maximum Safe Operating Area



Test Circuit

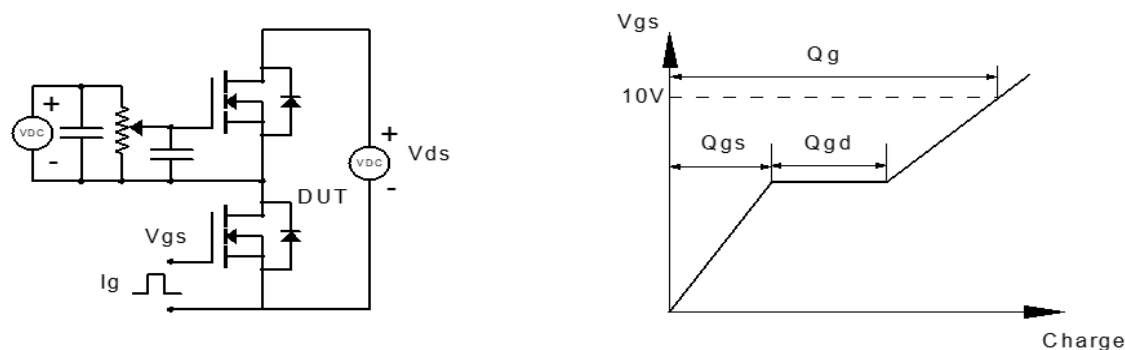


Figure 1: Gate Charge Test Circuit & Waveform

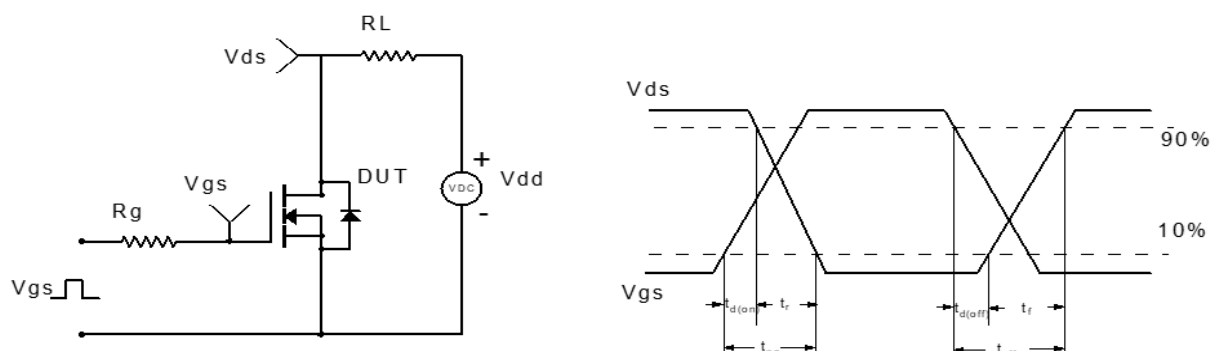


Figure 2: Resistive Switching Test Circuit & Waveform

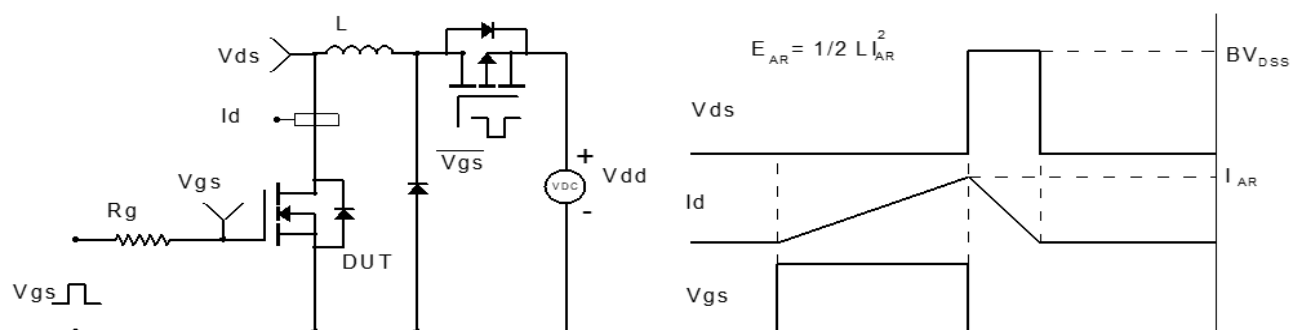


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

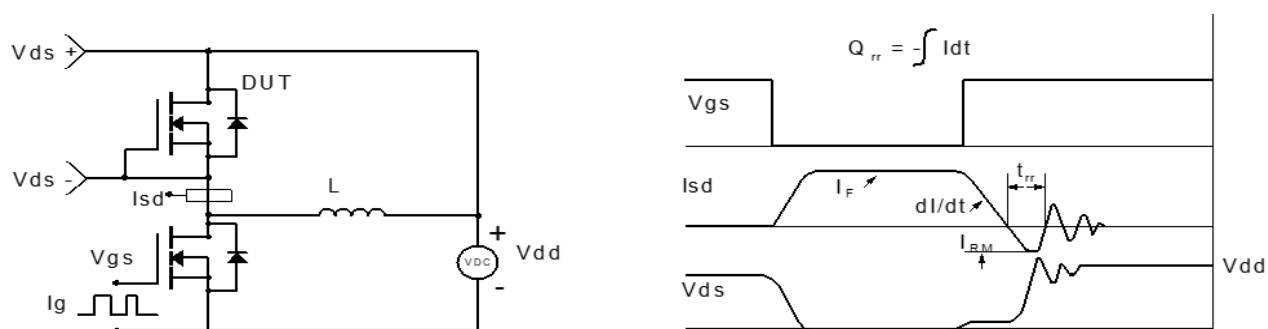
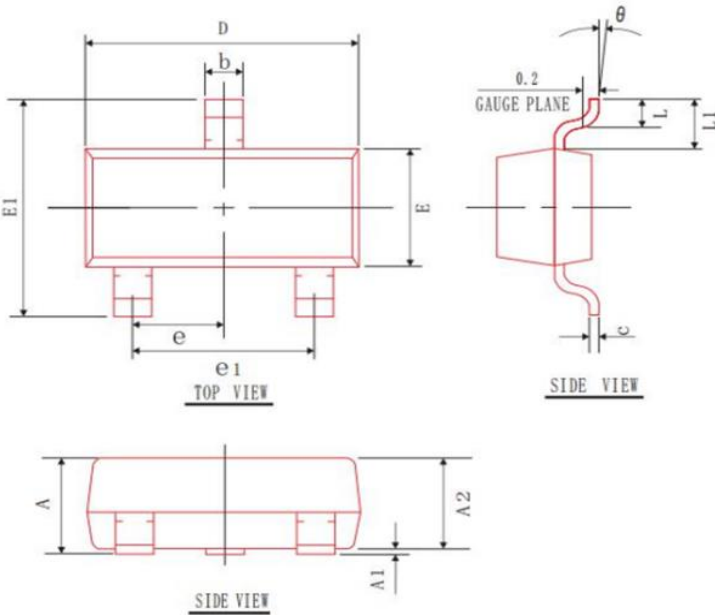


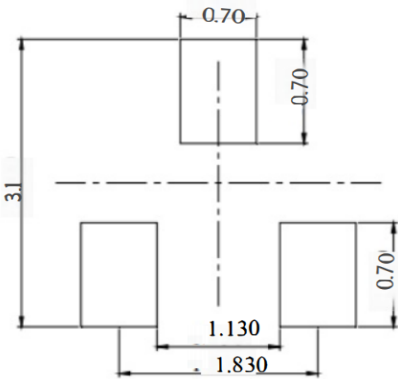
Figure 4: Diode Recovery Test Circuit & Waveform

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



DIMENSIONS:MILLIMETERS

Contact Information

TANI website: <http://www.tanisemi.com> Email:tani@tanisemi.com
For additional information, please contact your local Sales Representative.

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