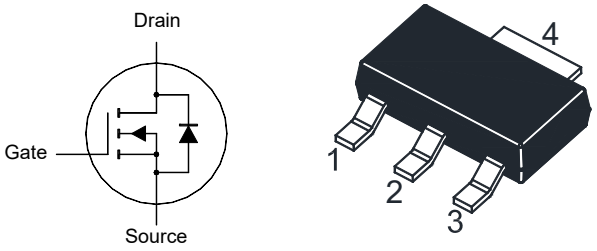
WTQ10N1K1LS-HAF

N-Channel Enhancement Mode MOSFET

Features

- Surface-mounted package
- Halogen and Antimony Free(HAF), RoHS compliant



1.Gate 2.Drain 3.Source 4.Drain
SOT-223 Plastic Package

Applications

- BLDC Motor drive applications
- Battery powered circuits
- Synchronous rectifier applications
- Resonant mode power supplies

Key Parameters

Parameter	Value	Unit
BV_{DSS}	100	V
$R_{DS(ON)}$ Max	115 @ V_{GS} = 10 V	mΩ
	125 @ V_{GS} = 4.5 V	
$V_{GS(th)}$ typ	1.6	V
Q_g typ	20 @ V_{GS} = 10 V	nC

Absolute Maximum Ratings (at T_a = 25℃ unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	100	V
Gate-Source Voltage		V_{GS}	± 20	V
Drain Current	T_c = 25℃ T_c = 100℃	I_D	5 3.5	A
Peak Drain Current, Pulsed [1]		I_{DM}	20	A
Single-Pulse Avalanche Current		I_{AS}	5	A
Single-Pulse Avalanche Energy [2]		E_{AS}	3.7	mJ
Total Power Dissipation	T_c = 25℃	P_{tot}	10	W
Operating Junction and Storage Temperature Range		T_j, T_{stg}	- 55 to + 175	℃

Thermal Characteristics

Parameter		Symbol	Max.	Unit
Thermal Resistance from Junction to Case		$R_{\theta JC}$	15	℃/W
Thermal Resistance - Junction to Ambient [3]		$R_{\theta JA}$	45	℃/W
Thermal Resistance - Junction to Ambient [4]	Steady State	$R_{\theta JA}$	100	℃/W

[1] Pulse Test: Pulse Width ≤ 100 μs, Duty Cycle ≤ 2%, Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$ = 175°C.

[2] Limited by $T_{J(MAX)}$, starting T_J = 25°C, L = 0.3 mH, R_g = 25 Ω, I_{AS} = 5 A, V_{GS} = 10 V.

[3] Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate, t < 10 s.

[4] Device mounted on FR-4 substrate PC board, minimum recommended footprint.

Dated: 10/01/2024 Rev: 03

Characteristics at T_a = 25℃ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at I_D = 250 µA	BV_{DSS}	100	-	-	V
Drain-Source Leakage Current at V_{DS} = 80 V	I_{DSS}	-	-	1	µA
Gate Leakage Current at V_{GS} = ± 20 V	I_{GSS}	-	-	± 100	nA
Gate-Source Threshold Voltage at V_{DS} = V_{GS}, I_D = 250 µA	$V_{GS(th)}$	1.2	-	2.5	V
Drain-Source On-State Resistance at V_{GS} = 10 V, I_D = 4 A at V_{GS} = 4.5 V, I_D = 3 A	$R_{DS(on)}$	- -	106 -	115 125	mΩ
DYNAMIC PARAMETERS					
Forward Transconductance at V_{DS} = 5 V, I_D = 4 A	g_{fs}	-	8	-	S
Gate Resistance at V_{DS} = 0 V, V_{GS} = 0 V, f = 1 MHz	R_g	-	1.1	-	Ω
Input Capacitance at V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz	C_{iss}	-	1155	-	pF
Output Capacitance at V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz	C_{oss}	-	28	-	pF
Reverse Transfer Capacitance at V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz	C_{rss}	-	25	-	pF
Gate Charge Total at V_{DS} = 50 V, V_{GS} = 10 V, I_D = 4 A at V_{DS} = 50 V, V_{GS} = 4.5 V, I_D = 4 A	Q_g	- -	20 9	- -	nC
Gate to Source Charge at V_{DS} = 50 V, V_{GS} = 10 V, I_D = 4 A	Q_{gs}	-	4	-	nC
Gate to Drain Charge at V_{DS} = 50 V, V_{GS} = 10 V, I_D = 4 A	Q_{gd}	-	2	-	nC
Turn-On Delay Time at V_{DS} = 50 V, V_{GS} = 10 V, I_D = 4 A, R_g = 3.3 Ω	$t_{d(on)}$	-	14	-	ns
Turn-On Rise Time at V_{DS} = 50 V, V_{GS} = 10 V, I_D = 4 A, R_g = 3.3 Ω	t_r	-	4	-	ns
Turn-Off Delay Time at V_{DS} = 50 V, V_{GS} = 10 V, I_D = 4 A, R_g = 3.3 Ω	$t_{d(off)}$	-	13	-	ns
Turn-Off Fall Time at V_{DS} = 50 V, V_{GS} = 10 V, I_D = 4 A, R_g = 3.3 Ω	t_f	-	2	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at I_S = 1 A, V_{GS} = 0 V	V_{SD}	-	-	1.2	V
Body-Diode Continuous Current	I_S	-	-	5	A
Body-Diode Continuous Current, Pulsed	I_{SM}	-	-	20	A
Body Diode Reverse Recovery Time at I_S = 4 A, di/dt = 100 A / µs	t_{rr}	-	21	-	ns
Body Diode Reverse Recovery Charge at I_S = 4 A, di/dt = 100 A / µs	Q_{rr}	-	22	-	nC

Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

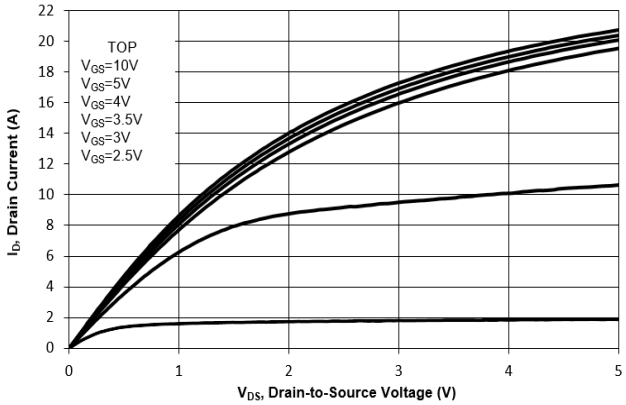


Fig. 2 Typical Transfer Characteristics

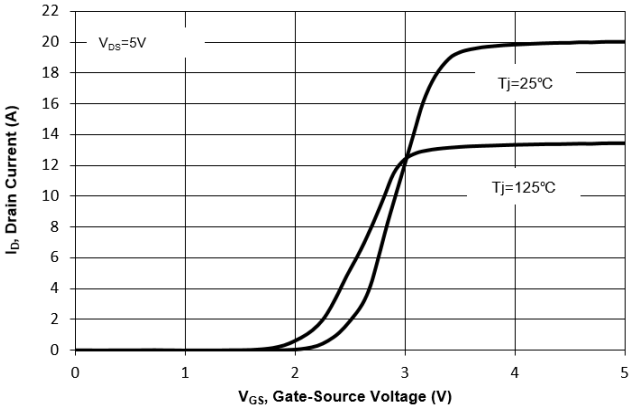


Fig. 3 on-Resistance vs Drain Current

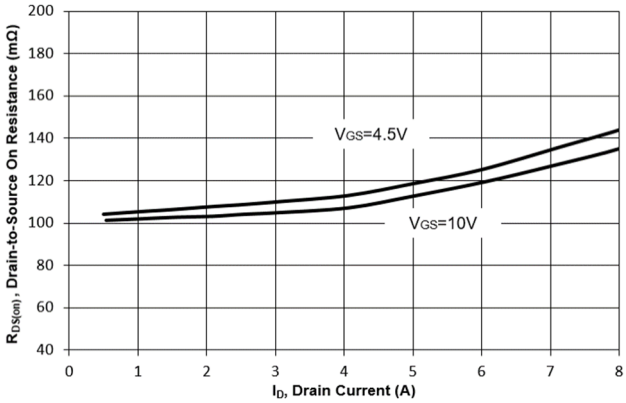


Fig. 4 on-Resistance vs. Gate to Source Voltage

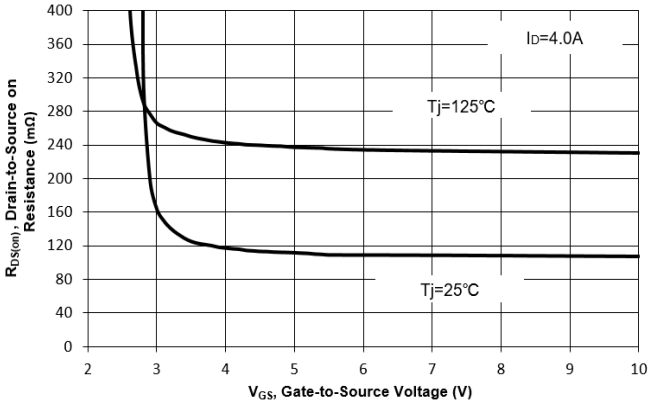


Fig. 5 on-Resistance vs.T_j

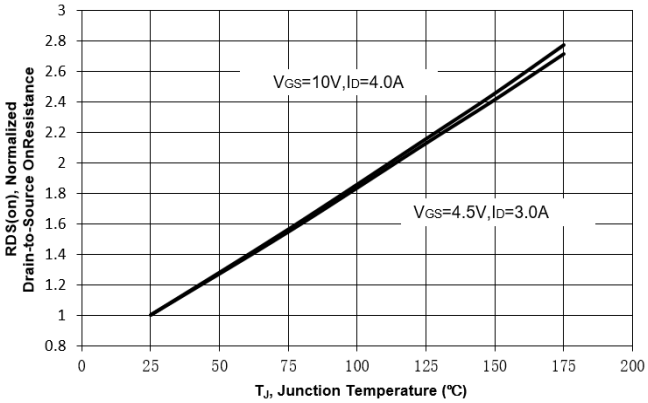
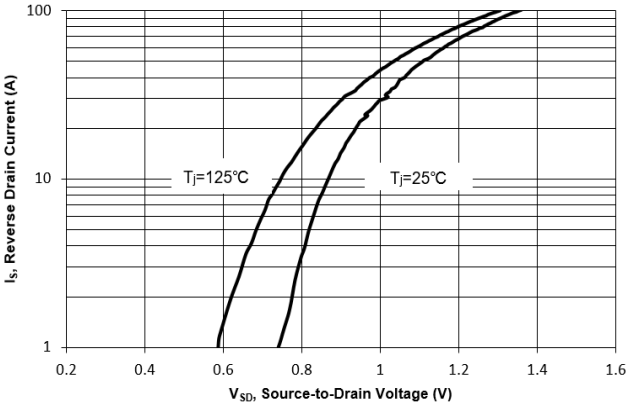


Fig. 6 Typical Body Diode Forward Characteristics



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

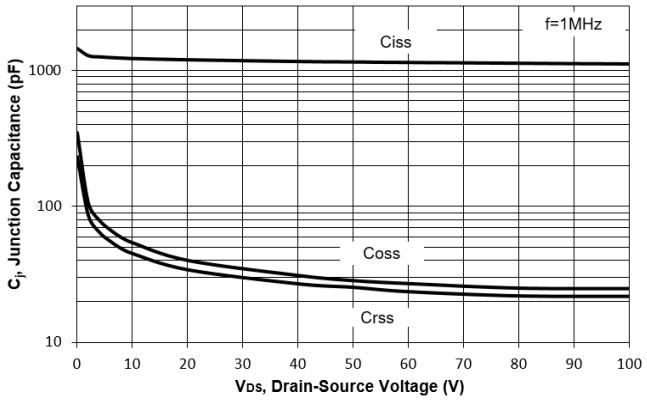


Fig. 8 Drain-Source Leakage Current vs. T_j

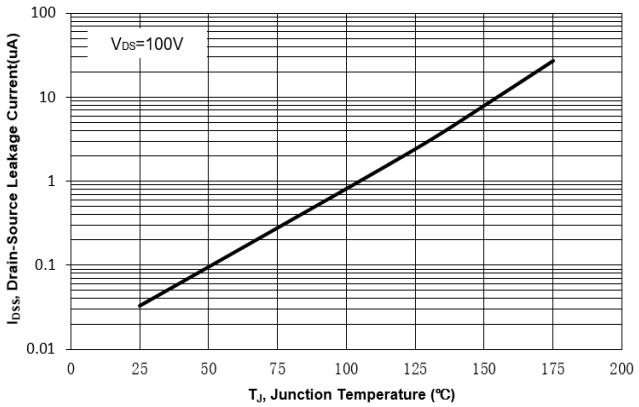


Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

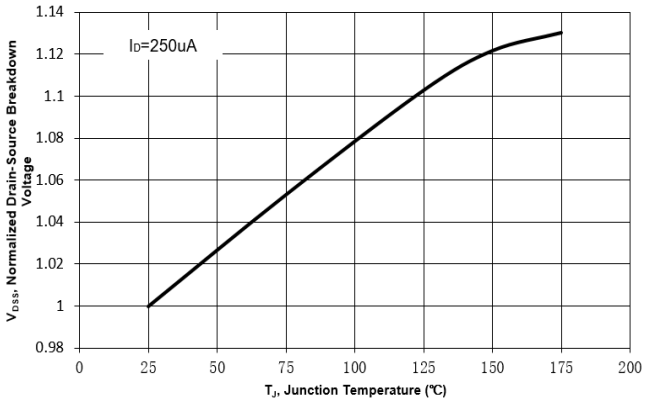


Fig. 10 Gate Threshold Variation vs. T_j

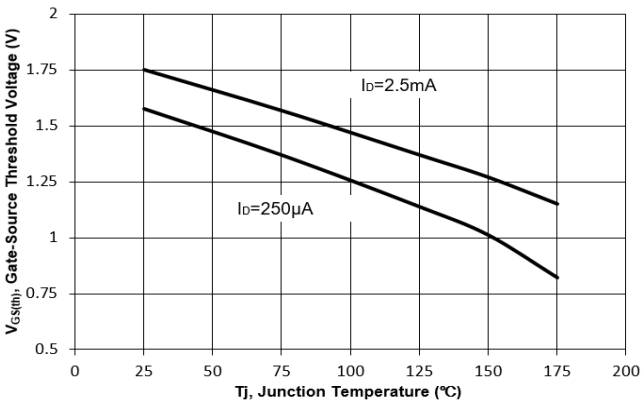


Fig. 11 Gate Charge

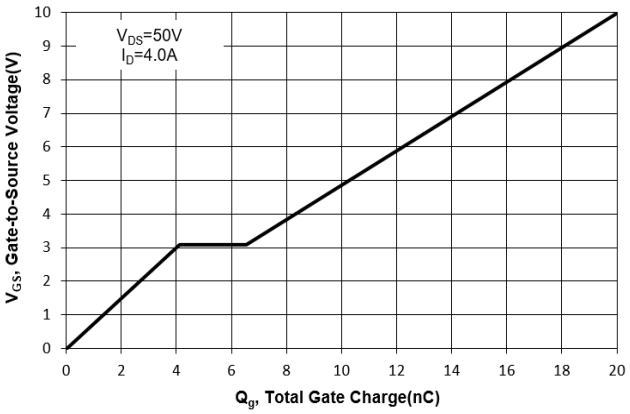
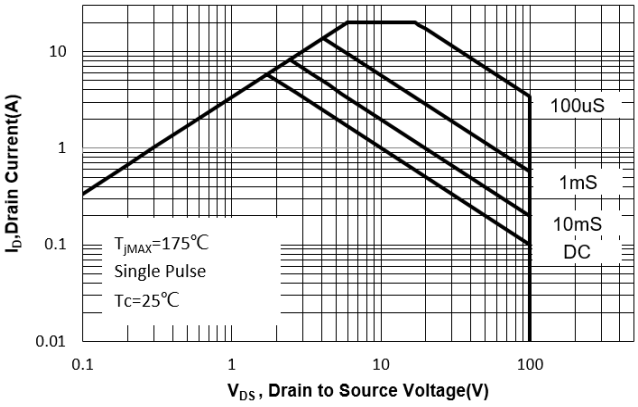


Fig. 12 Safe Operation Area



Electrical Characteristics Curves

Fig. 13 Normalized Maximum Transient Thermal Impedance($z_{\Theta JC}$)

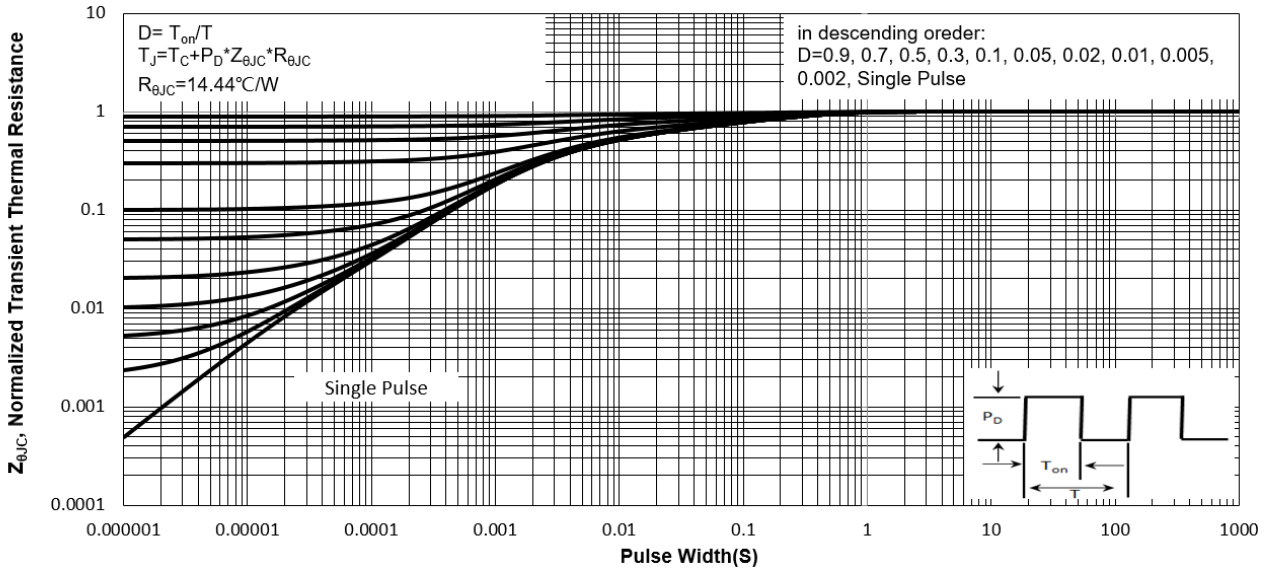
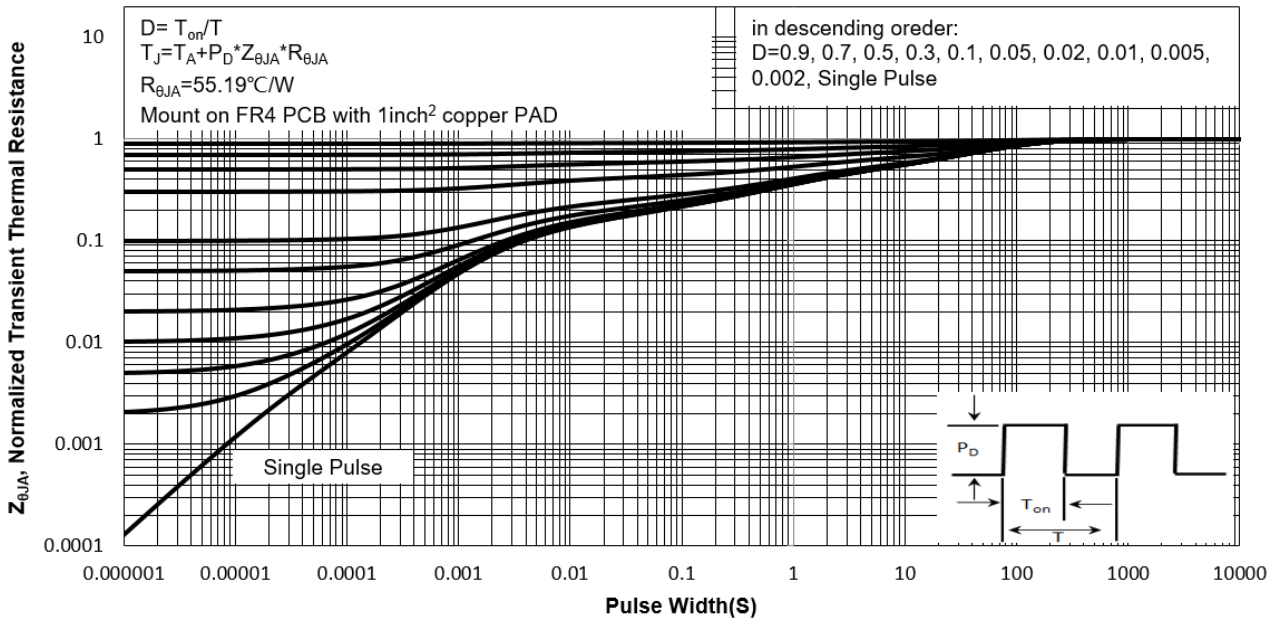


Fig. 14 Normalized Maximum Transient Thermal Impedance($z_{\Theta JA}$)



Test Circuits

Fig.1-1 Switching times test circuit

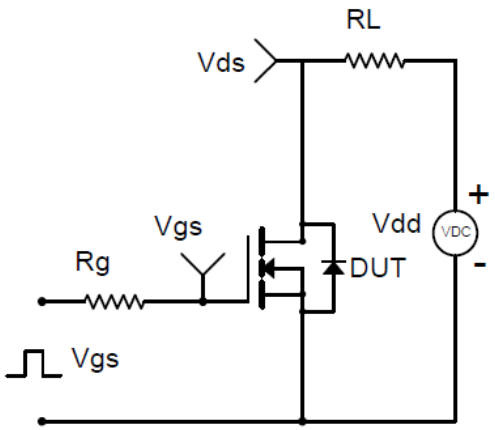


Fig.1-2 Switching Waveform

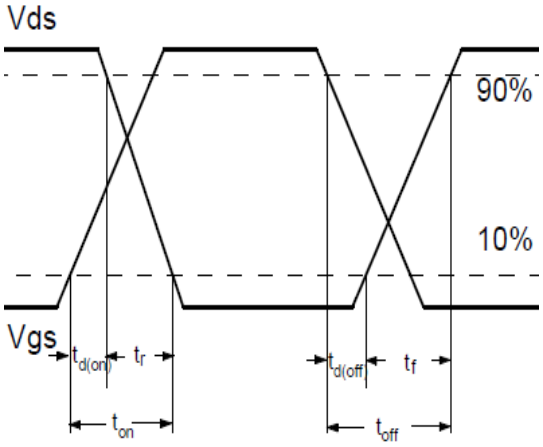


Fig.2-1 Gate charge test circuit

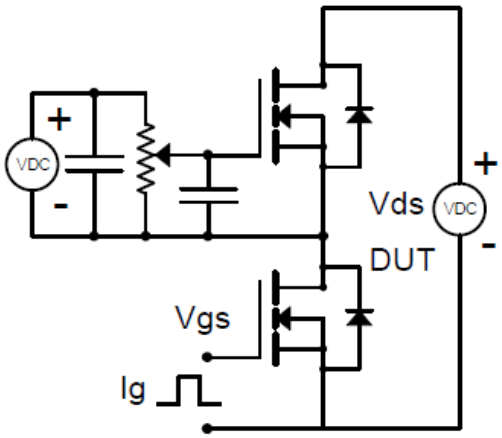


Fig.2-2 Gate charge waveform

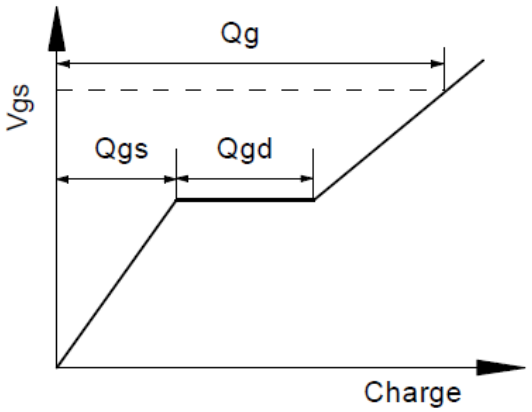


Fig.3-1 Avalanche test circuit

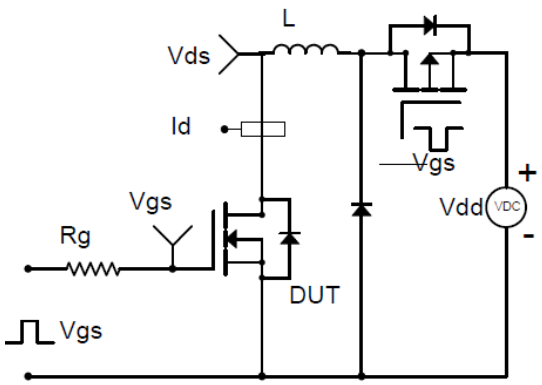
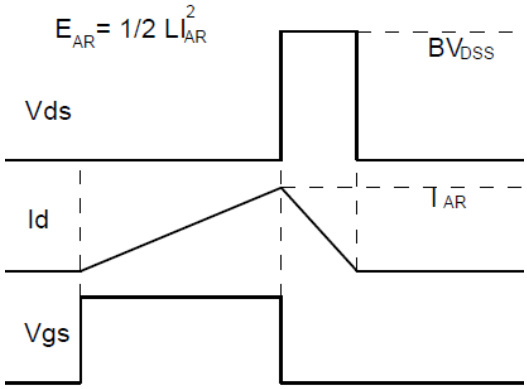
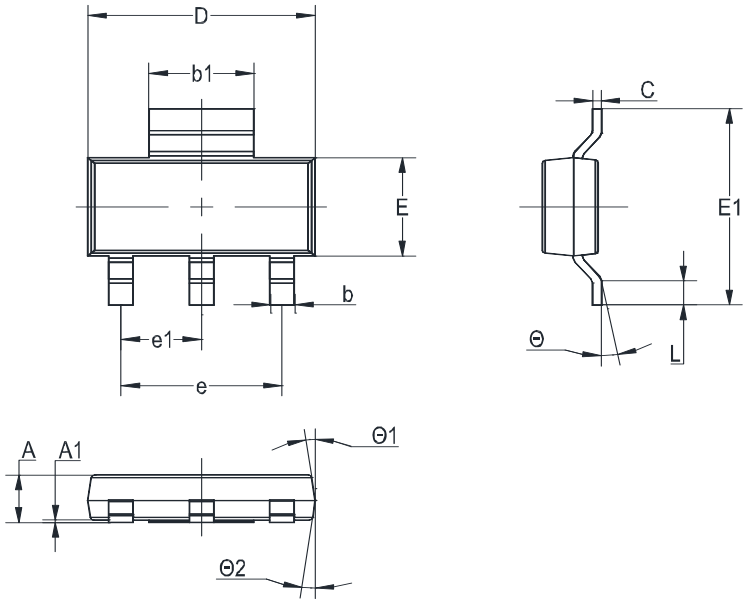


Fig.3-2 Avalanche waveform

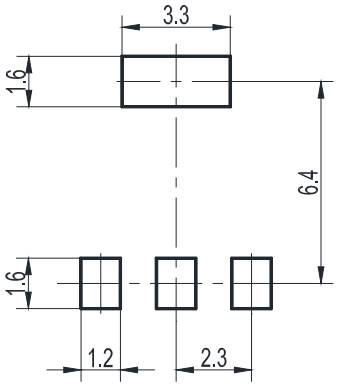


Package Outline (Dimensions in mm) SOT-223



Unit	A	A1	b	b1	C	D	E	E1	e	e1	L	Θ	Θ1	Θ2
mm	1.8 1.5	0.1 MAX	0.8 0.6	3.1 2.9	0.32 0.22	6.7 6.3	3.7 3.3	7.3 6.7	4.6 TYP	2.3 TYP	1.1 0.7	10° 0°	7° 0°	7° 0°

Recommended Soldering Footprint



Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
SOT-223	12	8 ± 0.1	0.315 ± 0.004	330	13	3,000

Marking information

" TQ10N1K1LS " = Part No.

" ****** " = Date Code Marking

Font type: Arial

Dated: 10/01/2024 Rev: 03