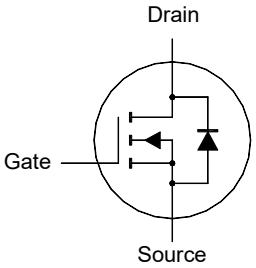
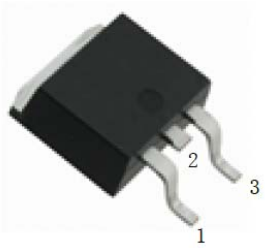
WTR03N039L-HAF

N-Channel Enhancement Mode MOSFET





1.Gate 2.Drain 3.Source

TO-252 Plastic Package

Features

- Low $R_{DS(ON)}$
- Low Input Capacitance
- Low Input/Output Leakage
- Halogen and Antimony Free(HAF), RoHS compliant

Application

- Motor/Body Load Control
- Load Switch
- DC-DC converters and Off-line UPS

Key Parameters

Parameter	Value	Unit
BV_{DSS}	30	V
$R_{DS(ON)}$ Max	3.9 @ V_{GS} = 10 V	mΩ
	4.5 @ V_{GS} = 4.5 V	
$V_{GS(th)}$ typ	1.4	V
Q_g typ	74 @ V_{GS} = 10 V	nC

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

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current	T_c = 25℃ T_c = 100℃	I_D	80 50	A
Peak Drain Current, Pulsed [1]		I_{DM}	350	A
Avalanche Current		I_{AS}	39	A
Single Pulse Avalanche Energy [2]		E_{AS}	76	mJ
Power Dissipation	T_c = 25℃ T_c = 100℃	P_D	41.6 16.6	W
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to + 150	℃

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	3	℃/W
Thermal Resistance from Junction to Ambient [3]	$R_{\theta JA}$	35	℃/W

[1] Pulse Test: Pulse Width ≤ 100 μs, Duty Cycle ≤ 2%, Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$ = 150°C.

[2] Limited by $T_{J(MAX)}$, starting T_J = 25 °C, L = 0.1 mH, R_g = 25 Ω, I_D = 39 A, V_{GS} = 10 V.

[3] Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air.

Dated: 02/12/2020 Rev: 01

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}	30	-	-	V
Drain-Source Leakage Current at V_{DS} = 24 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	-	2.3	V
Drain-Source On-State Resistance at V_{GS} = 10 V, I_D = 13 A at V_{GS} = 4.5 V, I_D = 8 A	$R_{DS(on)}$	- -	3 -	3.9 4.5	mΩ
DYNAMIC PARAMETERS					
Forward Transconductance at V_{DS} = 5 V, I_D = 10 A	g_{fs}	-	29	-	S
Gate resistance at V_{DS} = 0 V, f = 1 MHz	R_g	-	0.5	-	Ω
Input Capacitance at V_{GS} = 0 V, V_{DS} = 15 V, f = 1 MHz	C_{iss}	-	2946	-	pF
Output Capacitance at V_{GS} = 0 V, V_{DS} = 15 V, f = 1 MHz	C_{oss}	-	359	-	pF
Reverse Transfer Capacitance at V_{GS} = 0 V, V_{DS} = 15 V, f = 1 MHz	C_{rss}	-	291	-	pF
Gate charge total at V_{DS} = 15 V, I_D = 13 A, V_{GS} = 10 V at V_{DS} = 15 V, I_D = 13 A, V_{GS} = 4.5 V	Q_g	- -	74 36	- -	nC
Gate to Source Charge at V_{DS} = 15 V, I_D = 13 A, V_{GS} = 10 V	Q_{gs}	-	8	-	nC
Gate to Drain Charge at V_{DS} = 15 V, I_D = 13 A, V_{GS} = 10 V	Q_{gd}	-	15	-	nC
Turn-On Delay Time at V_{DS} = 15 V, I_D = 13 A, V_{GS} = 10 V, R_g = 3.3 Ω	$t_{d(on)}$	-	23	-	ns
Turn-On Rise Time at V_{DS} = 15 V, I_D = 13 A, V_{GS} = 10 V, R_g = 3.3 Ω	t_r	-	40	-	ns
Turn-Off Delay Time at V_{DS} = 15 V, I_D = 13 A, V_{GS} = 10 V, R_g = 3.3 Ω	$t_{d(off)}$	-	24	-	ns
Turn-Off Fall Time at V_{DS} = 15 V, I_D = 13 A, V_{GS} = 10 V, R_g = 3.3 Ω	t_f	-	3	-	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	-	-	80	A
Body-Diode Continuous Current, Pulsed	I_{SM}	-	-	350	A
Body Diode Reverse Recovery Time at I_S = 13 A, di/dt = 100 A / µs	t_{rr}	-	15	-	ns
Body Diode Reverse Recovery Charge at I_S = 13 A, di/dt = 100 A / µs	Q_{rr}	-	5	-	nC

Electrical Characteristics Curves

Fig. 1 Typical Output Characteristic

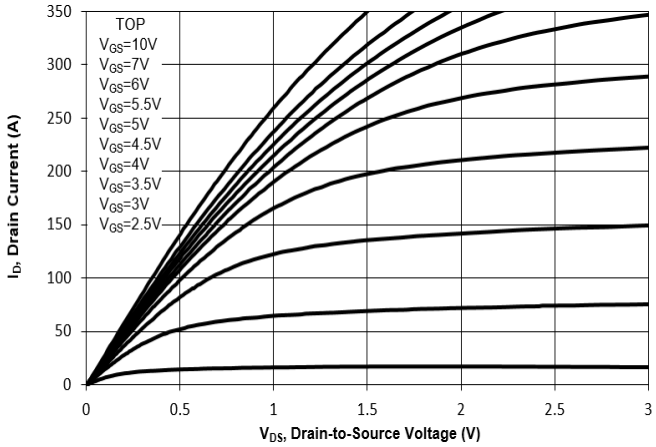


Fig. 2 Typical Transfer Characteristic

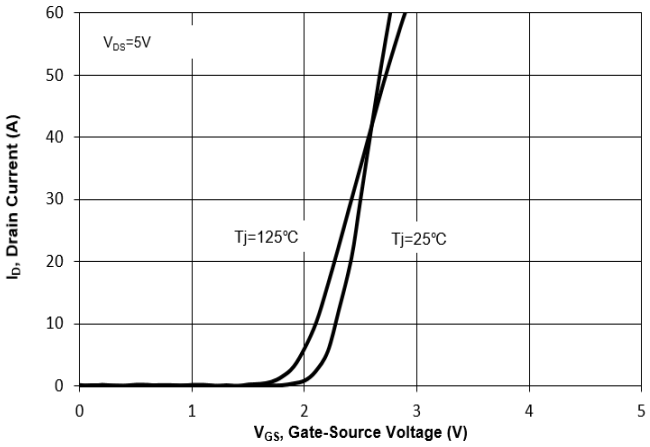


Fig. 3 On-Resistance vs. Drain Current

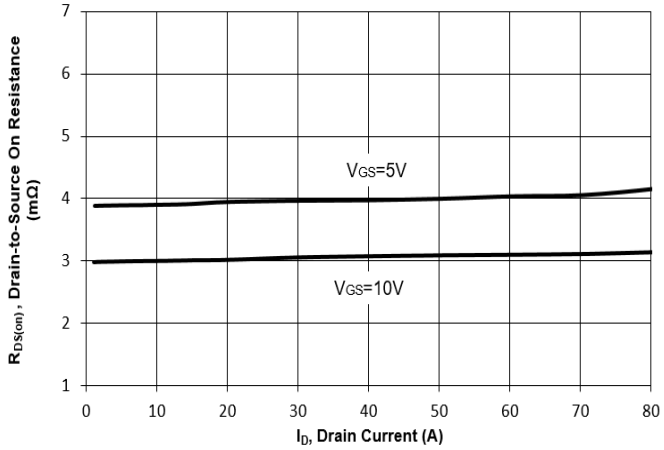


Fig. 4 On-Resistance vs. Gate Voltage

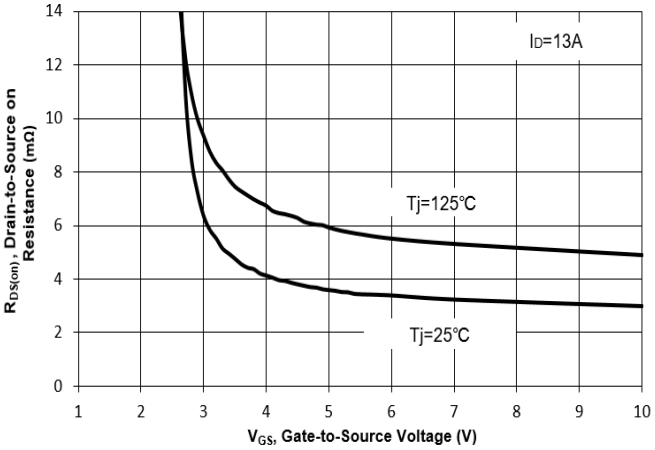


Fig. 5 On-Resistance vs.T_j

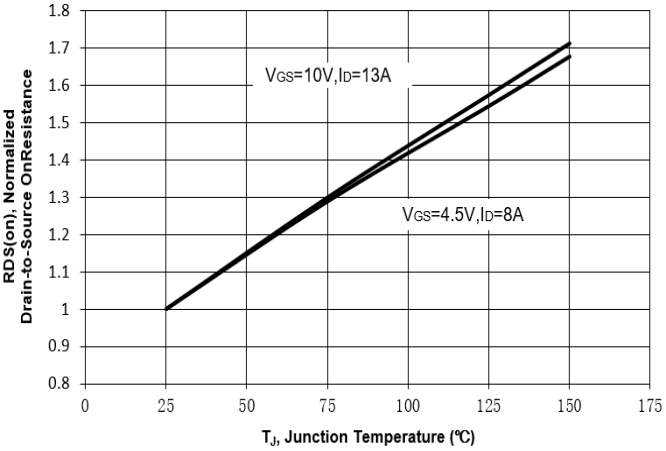
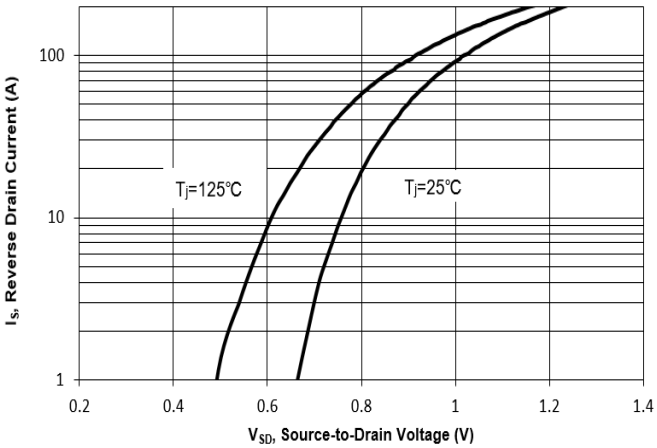


Fig. 6 Typical Forward Characteristic



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

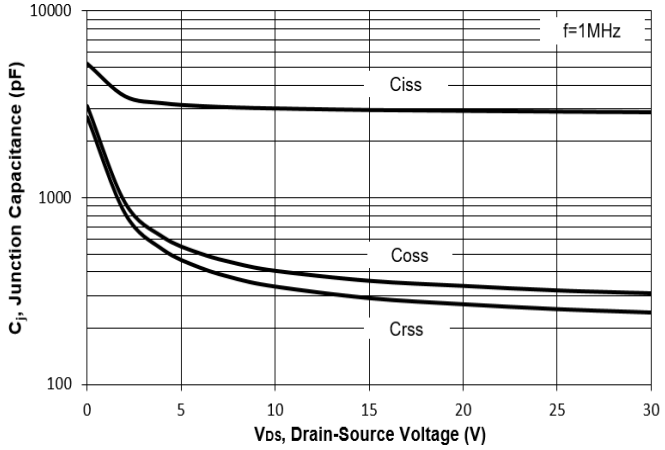


Fig. 8 Drain-Source Leakage Current vs. T_j

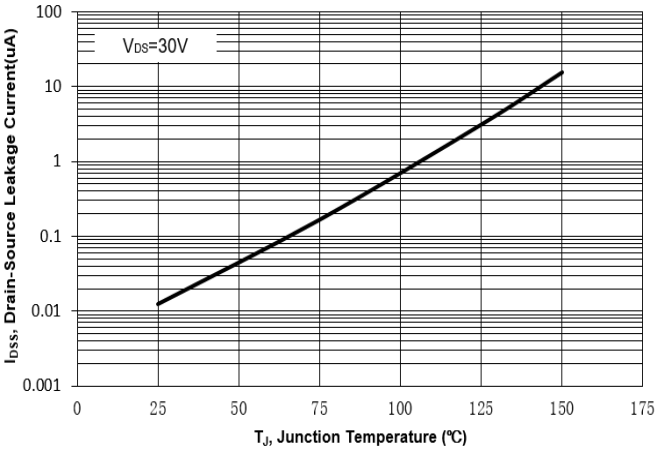


Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

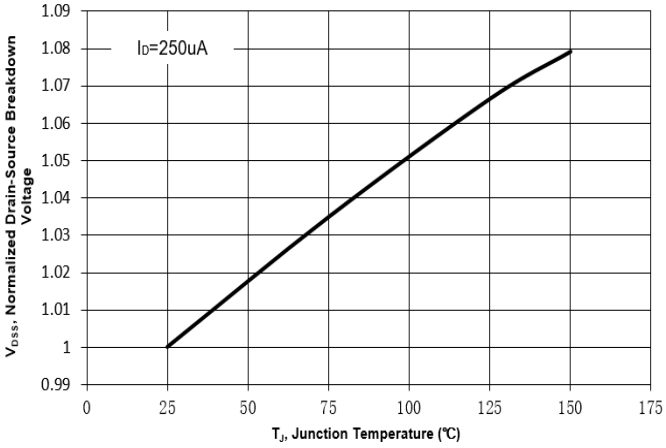


Fig. 10 Gate Threshold Variation vs. T_j

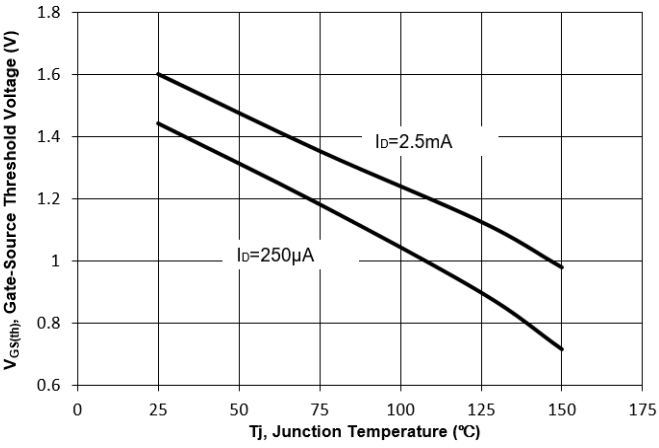


Fig. 11 Gate Charge

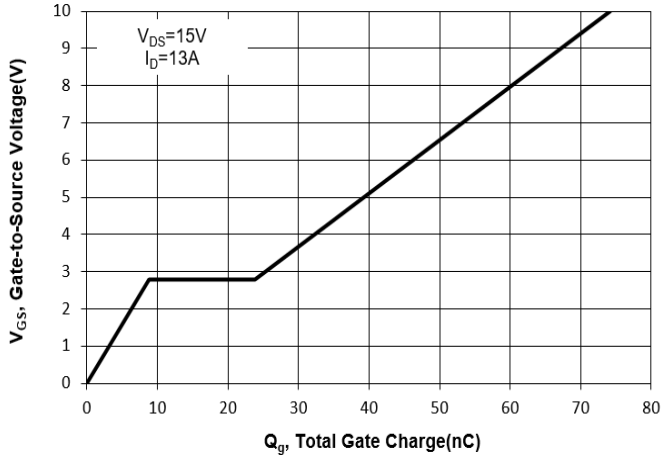
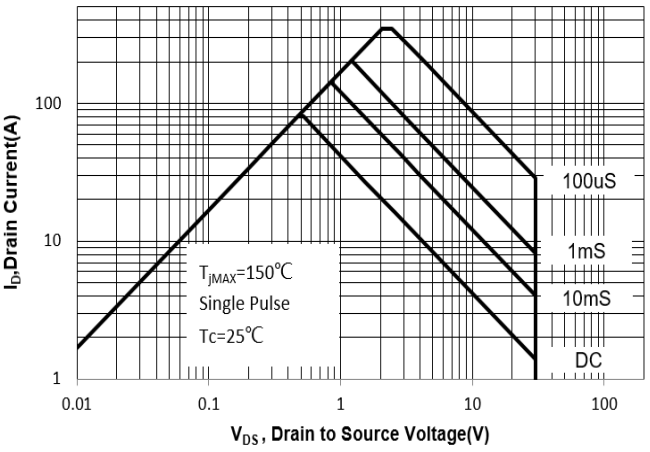


Fig. 12 Safe Operation Area



Electrical Characteristics Curves

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

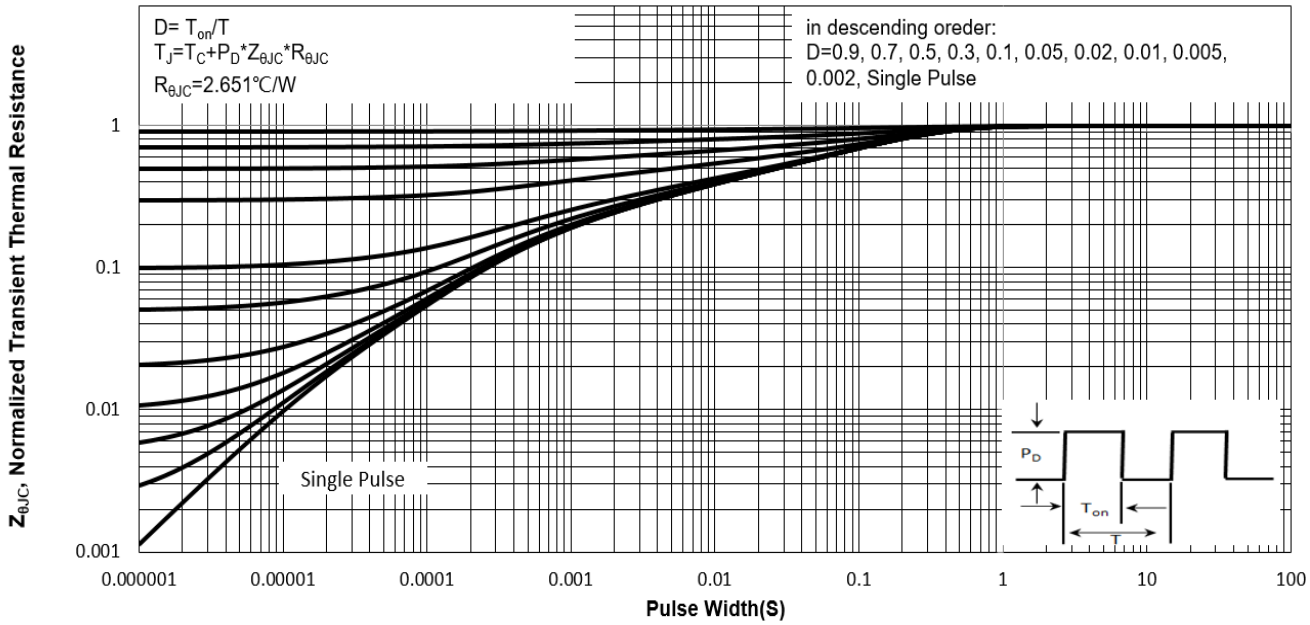
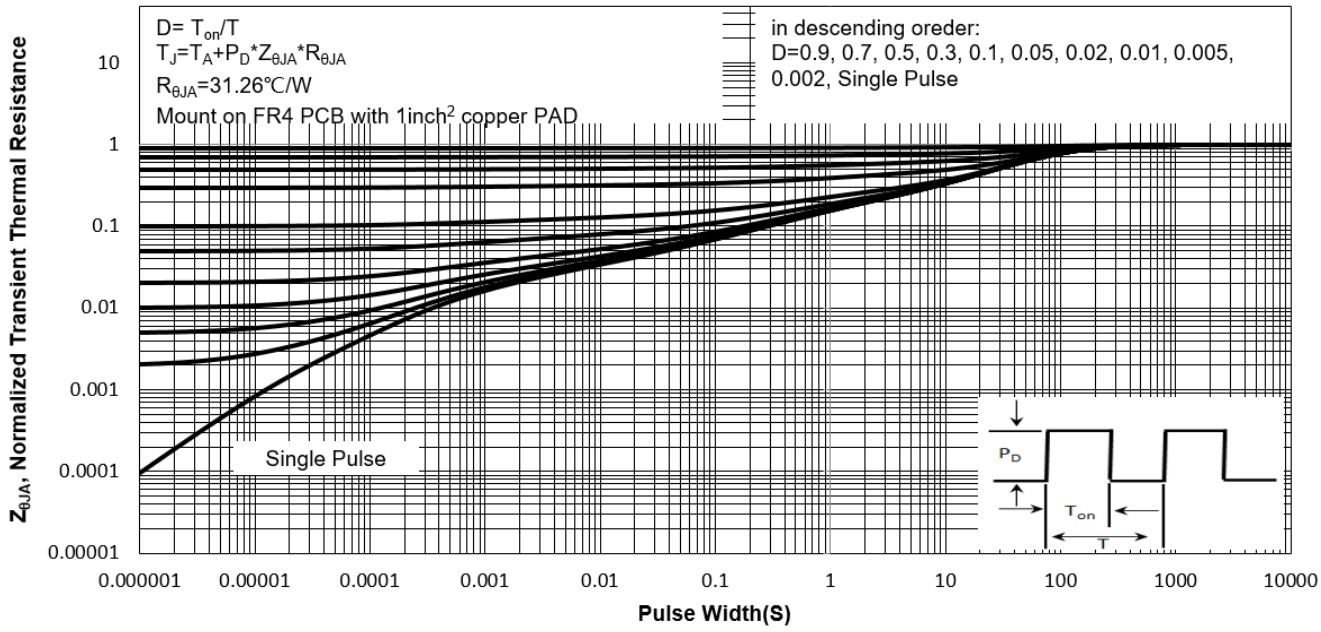


Fig. 14 Normalized Maximum Transient Thermal Impedance($z_{\Theta JA}$)



Test Circuits

Fig.1-1 Switching times test circuit

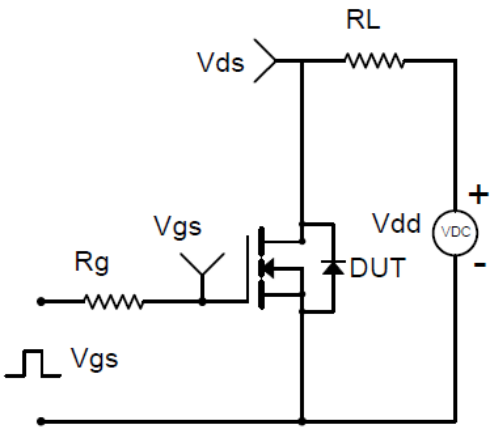


Fig.1-2 Switching Waveform

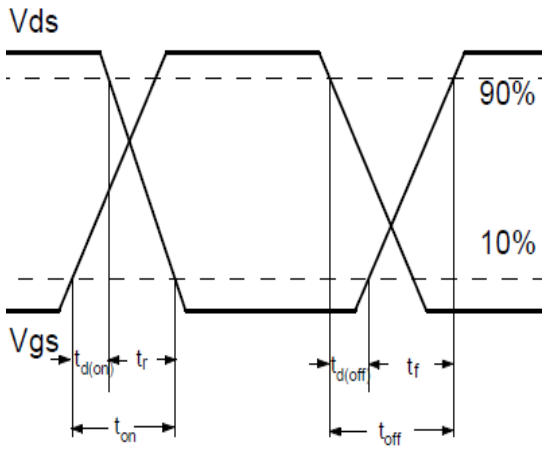


Fig.2-1 Gate charge test circuit

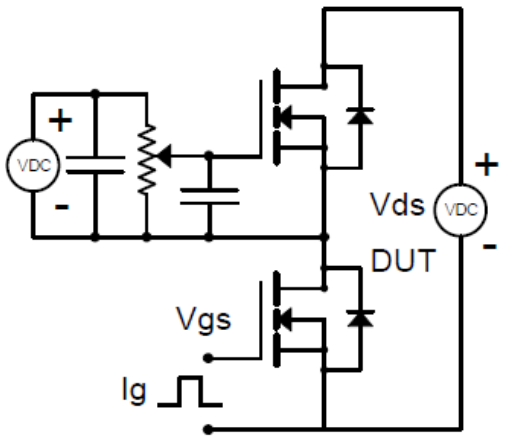


Fig.2-2 Gate charge waveform

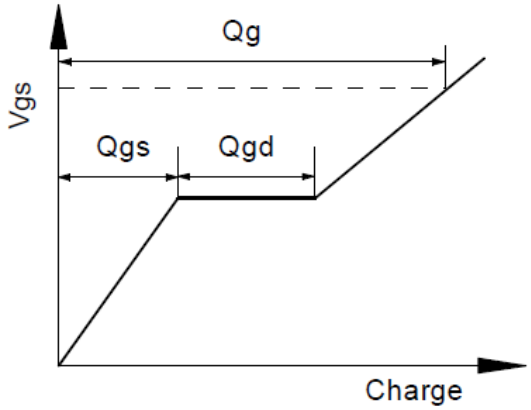


Fig.3-1 Avalanche test circuit

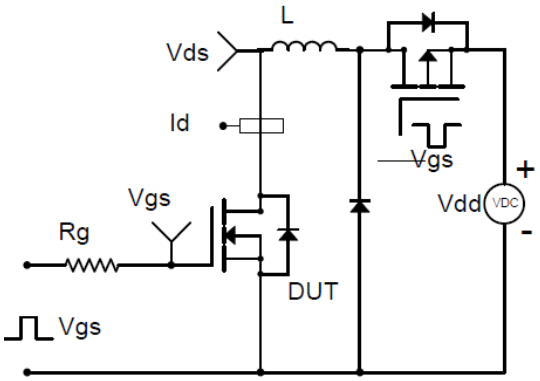
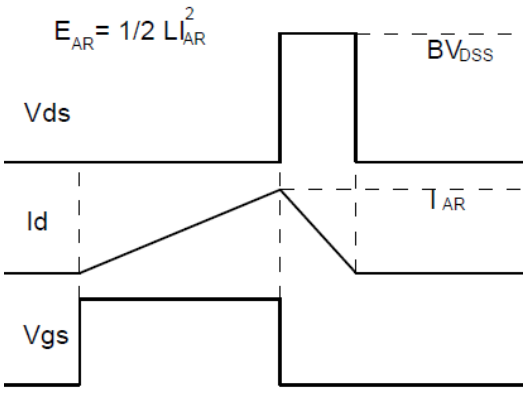
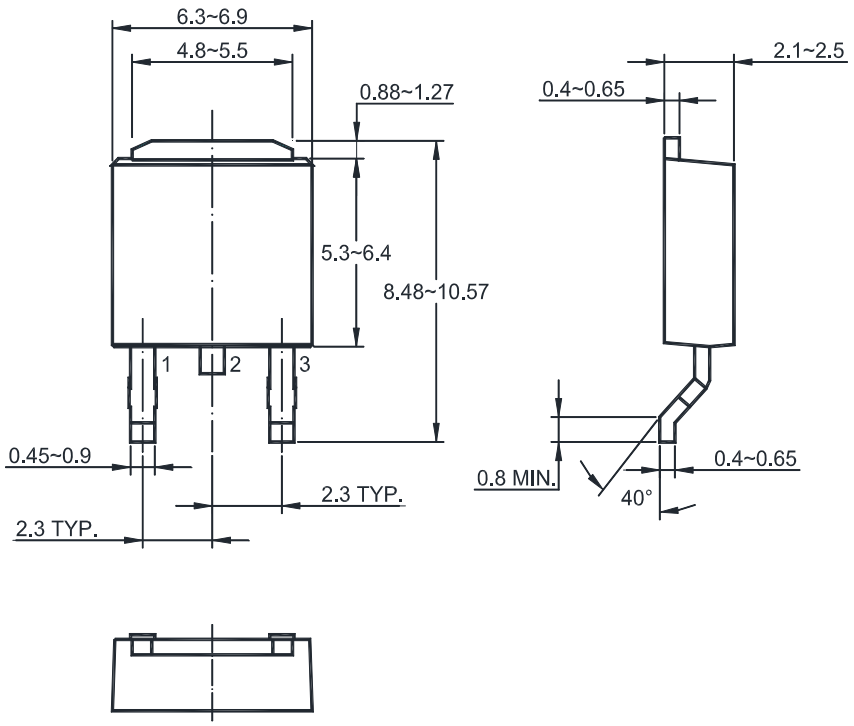


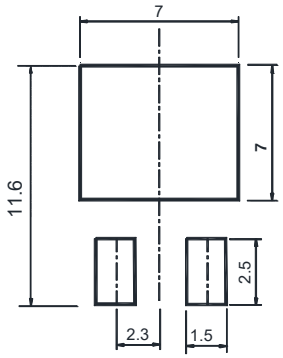
Fig.3-2 Avalanche waveform



Package Outline (Dimensions in mm) TO-252



Recommended Soldering Footprint



Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
TO-252	12	8 ± 0.1	0.315 ± 0.004	330	13	2,500

Marking information

" TR03N039L " = Part No.

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

Font type: Arial

IMPORTANT NOTICE

Our company and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes to improve product design, functions and reliability without further notice to this document and any product described herein.

Statements described herein regarding the reliability and suitability of products is for illustrative purposes only. Products specifically described herein are not authorized for use as critical components in life support devices, automobile, military, aviation or aerospace only with the written approval of our company.

The information contained herein is presented only as guidance for product use. No license to any intellectual property rights is granted under this document. No responsibility is assumed by our company for any infringement of patents or any other intellectual property rights of third party that may result from the use of the product.