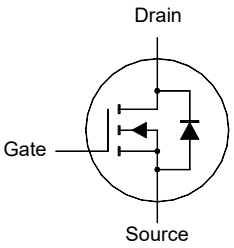
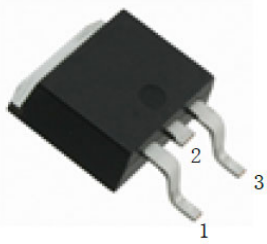
WTR04N065L-AH

N-Channel Enhancement Mode MOSFET





1.Gate 2.Drain 3.Source

TO-252 Plastic Package

Features

- AEC-Q101 Qualified
- Low Gate Charge
- Halogen and Antimony Free(HAF), RoHS compliant

Applications

- synchronous buck converter

Key Parameters

Parameter	Value	Unit
BV_{DSS}	40	V
$R_{DS(ON)}$ Max	6.5 @ V_{GS} = 10 V	mΩ
	8 @ V_{GS} = 4.5 V	
$V_{GS(th)}$ typ	1.4	V
Q_g typ	58 @ V_{GS} = 10 V	nC

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

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	± 20	V
Drain Current - Continuous	T_c = 25℃ T_c = 100℃	I_D	64 40	A
Peak Drain Current, Pulsed [1]		I_{DM}	240	A
Single-Pulse Avalanche Current		I_{AS}	34.3	A
Single-Pulse Avalanche Energy [2]		E_{AS}	58.8	mJ
Power Dissipation	T_c = 25℃	P_D	43.5	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	$R_{\theta JC}$	2.8	℃/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 = 34.3 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: 08/04/2021 DF2B 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}	40	-	-	V
Drain-Source Leakage Current at V_{DS} = 32 V	I_{DSS}	-	-	1	µA
Gate-Source 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	-	2.5	V
Drain-Source On-State Resistance at V_{GS} = 10 V, I_D = 10 A at V_{GS} = 4.5 V, I_D = 5 A	$R_{DS(on)}$	- -	4.7 -	6.5 8	mΩ
DYNAMIC PARAMETERS					
Forward Transconductance at V_{DS} = 5 V, I_D = 5 A	g_{FS}	-	21.8	-	S
Gate Resistance at V_{DS} = 0 V, V_{GS} = 0 V, f = 1 MHz	R_g	-	0.5	-	Ω
Input Capacitance at V_{GS} = 0 V, V_{DS} = 20 V, f = 1 MHz	C_{iss}	-	3197	-	pF
Output Capacitance at V_{GS} = 0 V, V_{DS} = 20 V, f = 1 MHz	C_{oss}	-	243	-	pF
Reverse Transfer Capacitance at V_{GS} = 0 V, V_{DS} = 20 V, f = 1 MHz	C_{rss}	-	146	-	pF
Gate Charge Total at V_{DS} = 20 V, V_{GS} = 10 V, I_D = 10 A at V_{DS} = 20 V, V_{GS} = 4.5 V, I_D = 10 A	Q_g	- -	58 27	- -	nC
Gate to Source Charge at V_{DS} = 20 V, V_{GS} = 10 V, I_D = 10 A	Q_{gs}	-	9	-	nC
Gate to Drain Charge at V_{DS} = 20 V, V_{GS} = 10 V, I_D = 10 A	Q_{gd}	-	9	-	nC
Turn-On Delay Time at V_{GS} = 10 V, V_{DS} = 20 V, I_D = 10 A, R_G = 3.3 Ω	$t_{d(on)}$	-	21	-	ns
Turn-On Rise Time at V_{GS} = 10 V, V_{DS} = 20 V, I_D = 10 A, R_G = 3.3 Ω	t_r	-	21	-	ns
Turn-Off Delay Time at V_{GS} = 10 V, V_{DS} = 20 V, I_D = 10 A, R_G = 3.3 Ω	$t_{d(off)}$	-	19	-	ns
Turn-Off Fall Time at V_{GS} = 10 V, V_{DS} = 20 V, I_D = 10 A, R_G = 3.3 Ω	t_f	-	2.7	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at I_S = 1 A, V_{GS} = 0 V	V_{SD}	-	-	1	V
Body-Diode Continuous Current	I_S	-	-	64	A
Body-Diode Continuous Current, Pulsed	I_{SM}	-	-	240	A
Body Diode Reverse Recovery Time at I_S = 10 A, di/dt = 100 A / µs	t_{rr}	-	13.8	-	ns
Body Diode Reverse Recovery Charge at I_S = 10 A, di/dt = 100 A / µs	Q_{rr}	-	5.6	-	nC

Electrical Characteristics Curves

Fig. 1 Typical Output Characteristic

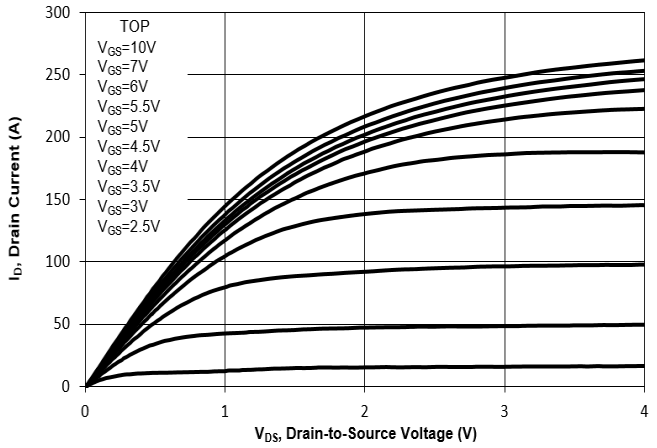


Fig. 2 Typical Transfer Characteristic

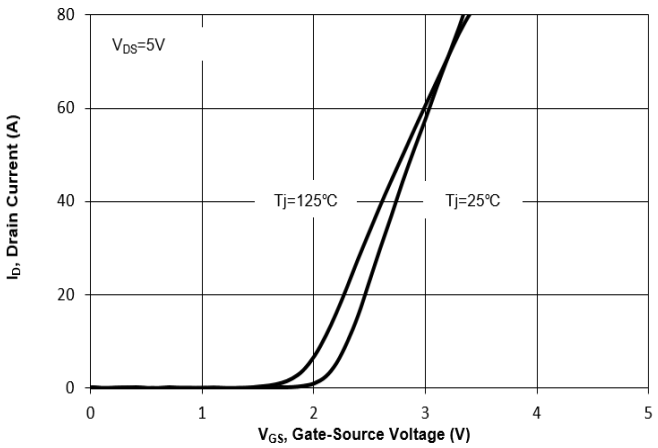


Fig. 3 On-Resistance vs. Drain Current

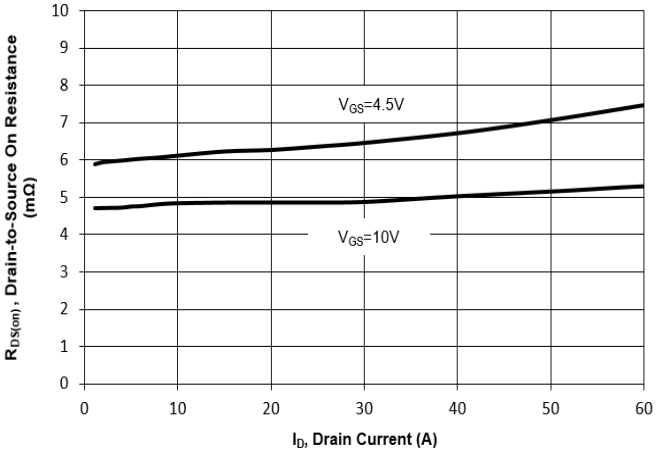


Fig. 4 On-Resistance vs. Gate Voltage

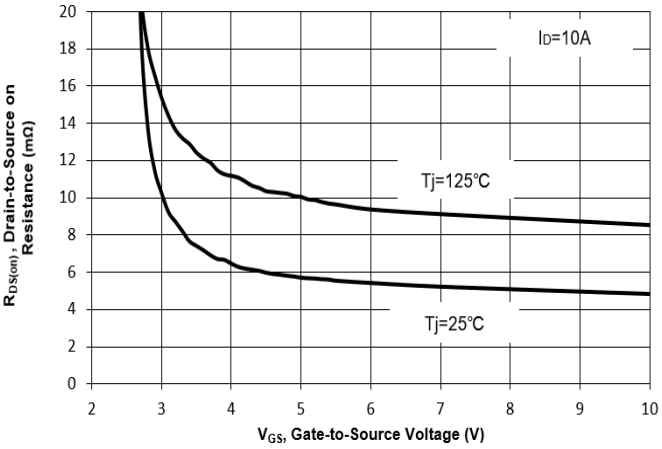


Fig. 5 On-Resistance vs.T_j

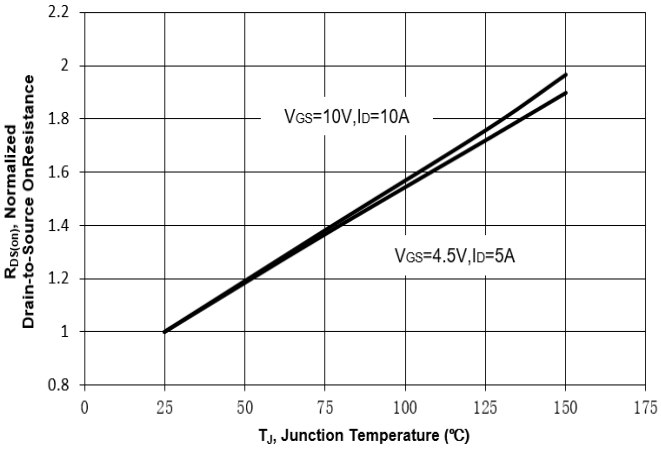
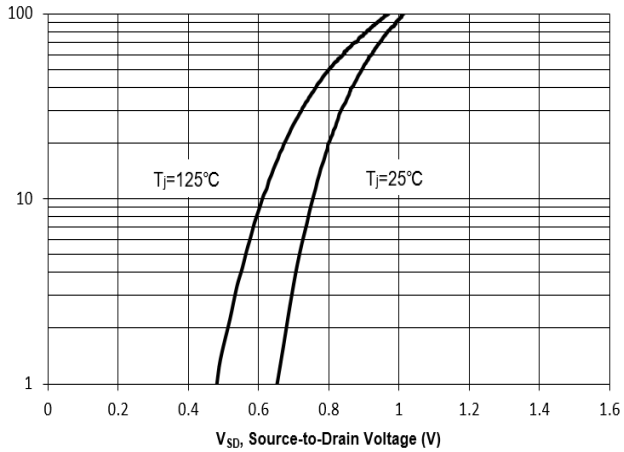


Fig. 6 Typical Body-Diode Forward Characteristic



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

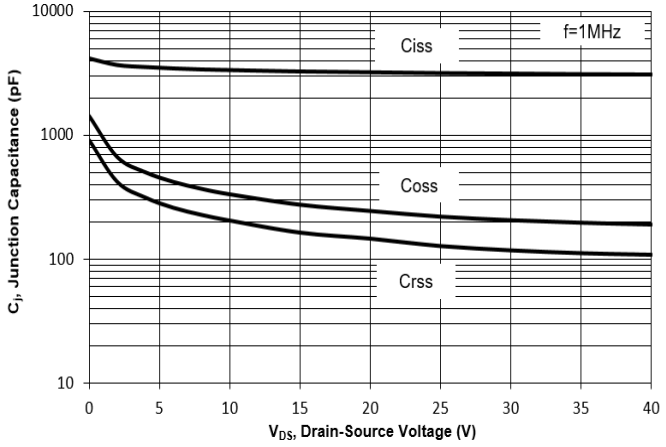


Fig. 8 Drain-Source Leakage Current vs. T_j

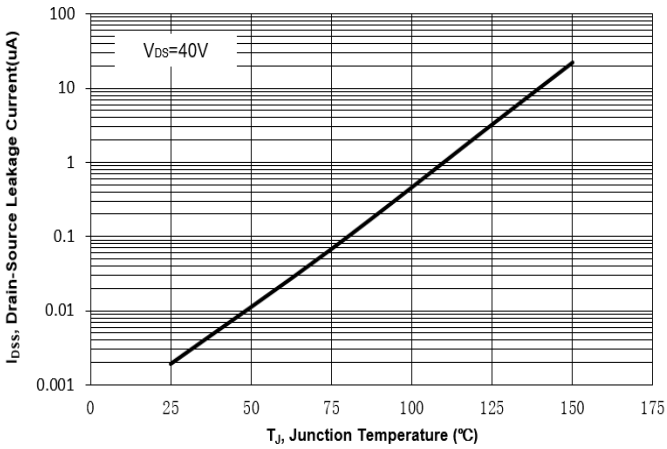


Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

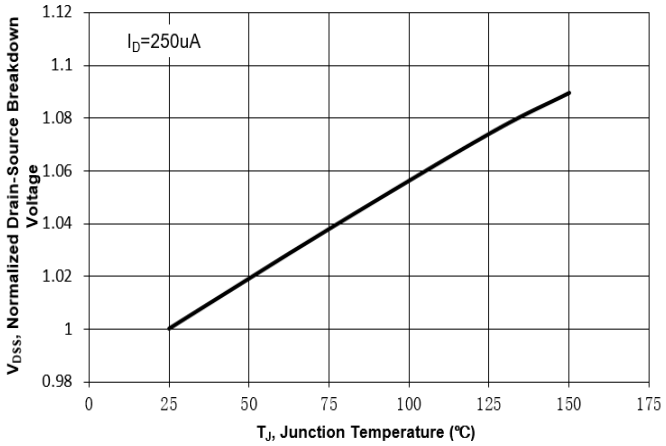


Fig. 10 Gate Threshold Variation vs. T_j

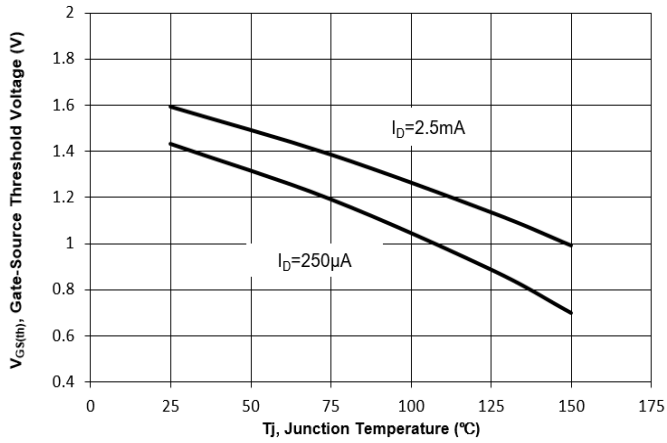


Fig. 11 Gate Charge

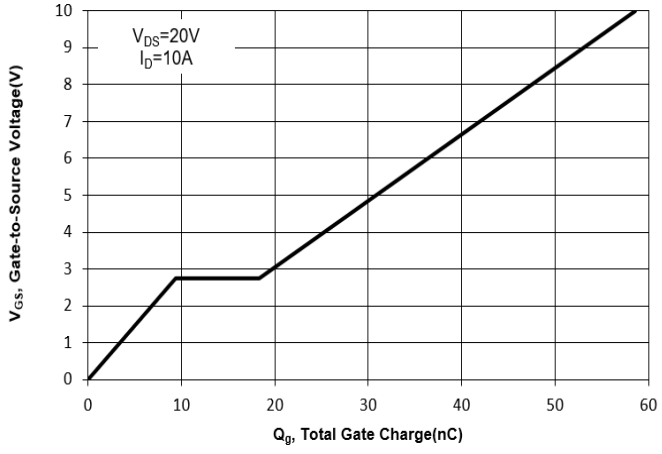
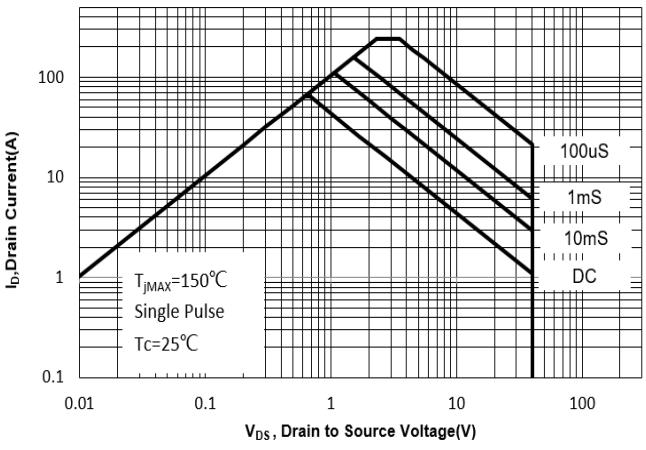


Fig. 12 Safe Operation Area



Electrical Characteristics Curves

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

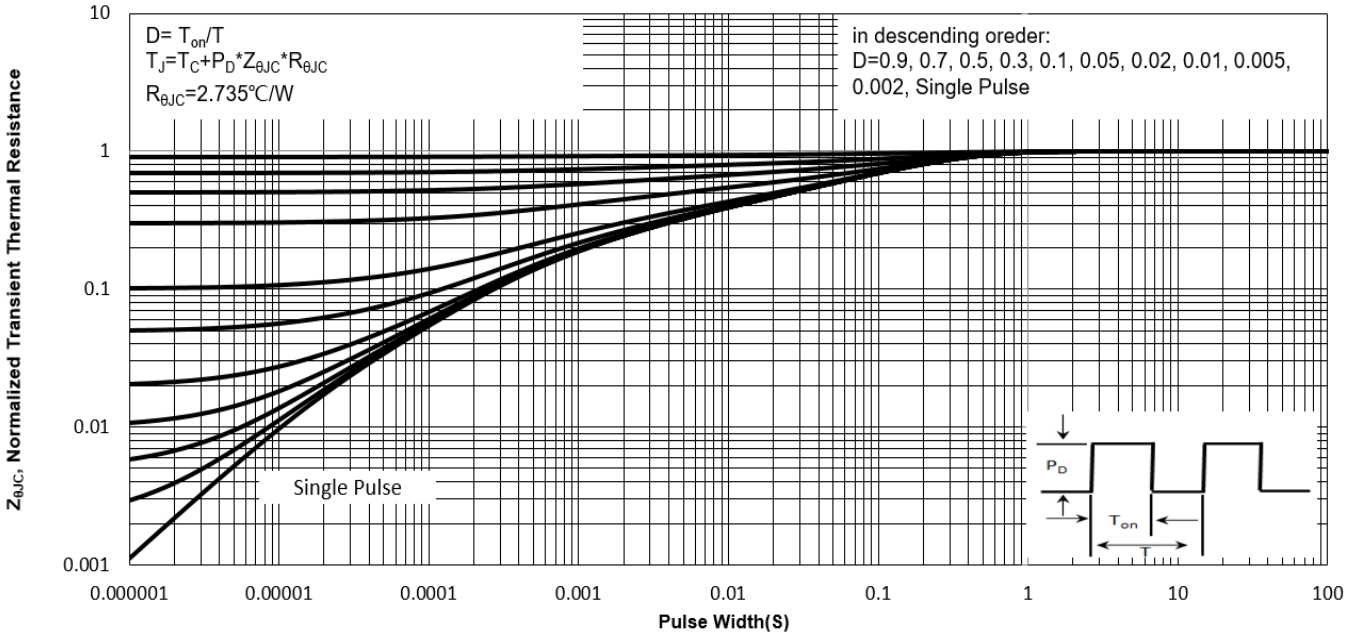
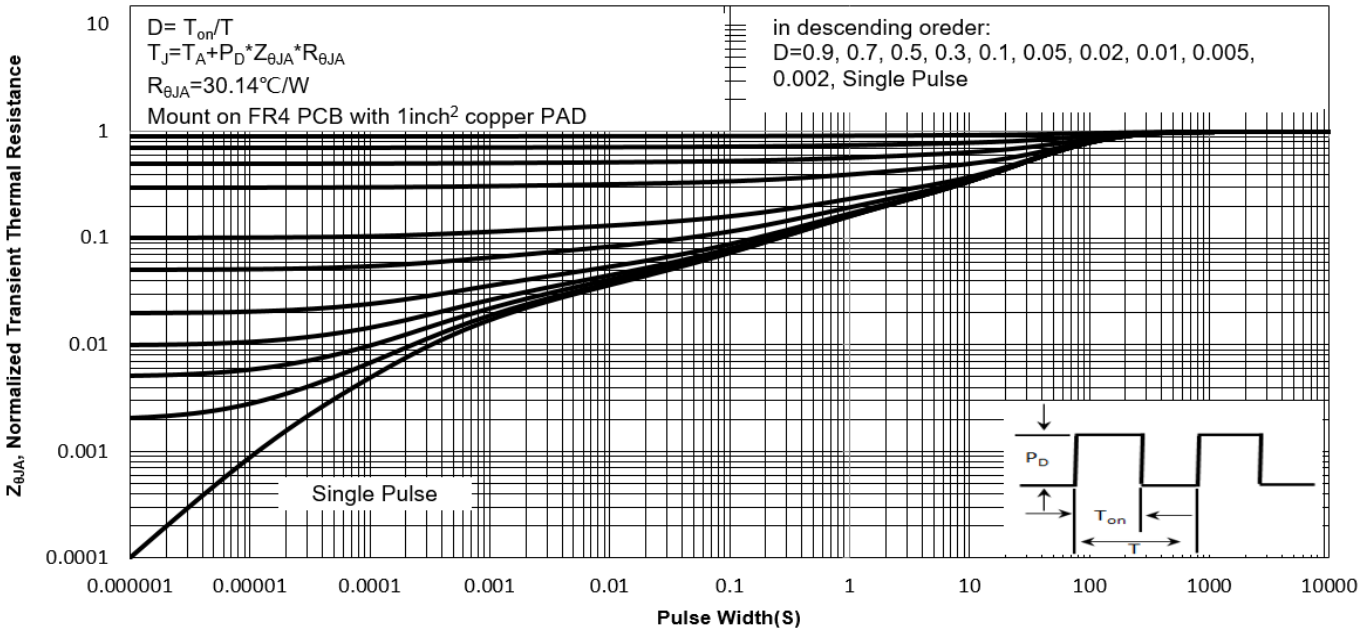


Fig.14 Normalized Maximum Transient Thermal Impedance($z_{\Theta JA}$)



Test Circuits

Fig.1-1 Switching times test circuit

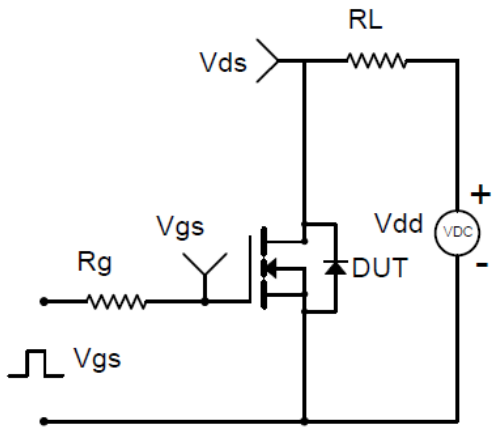


Fig.1-2 Switching Waveform

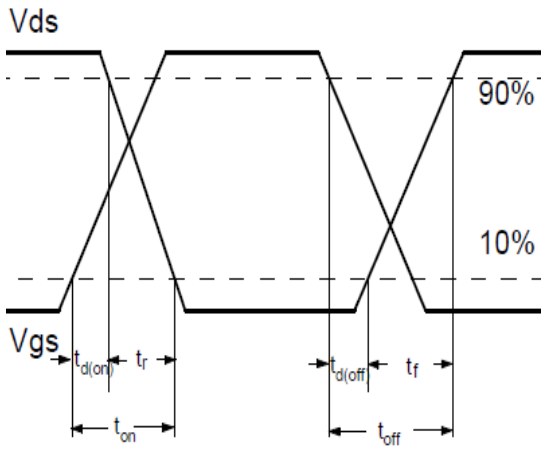


Fig.2-1 Gate charge test circuit

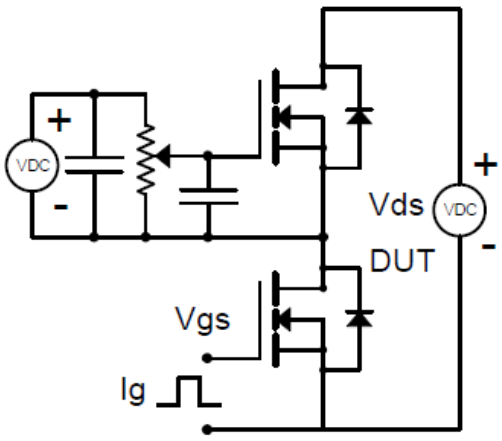


Fig.2-2 Gate charge waveform

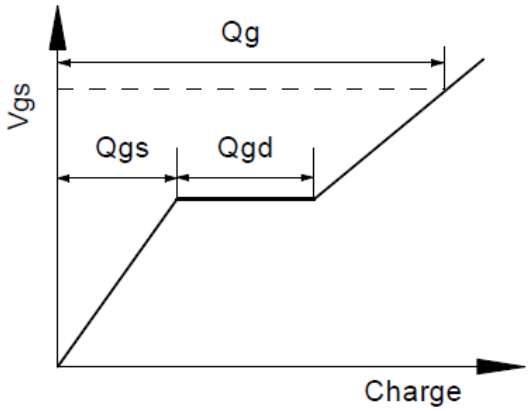


Fig.3-1 Avalanche test circuit

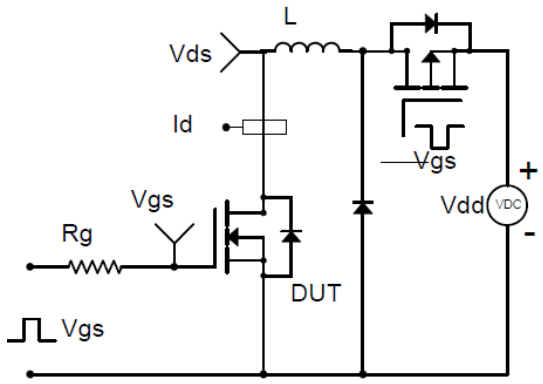
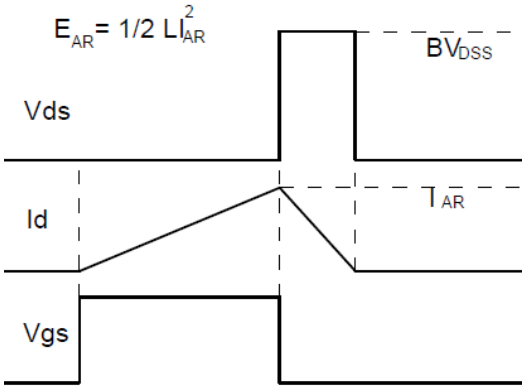
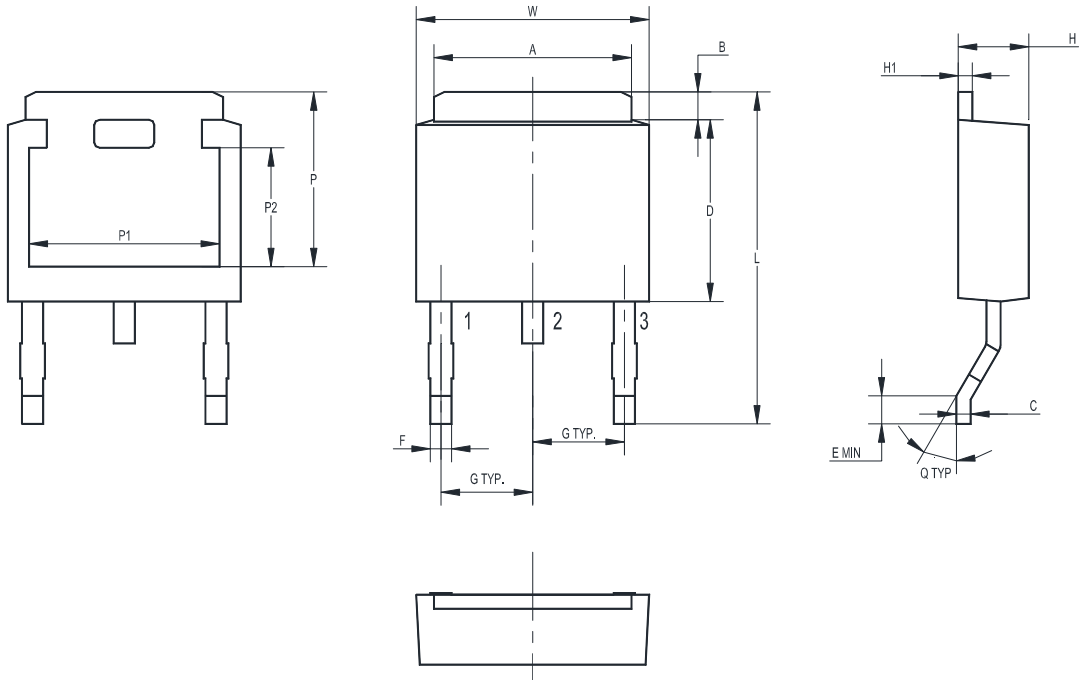


Fig.3-2 Avalanche waveform

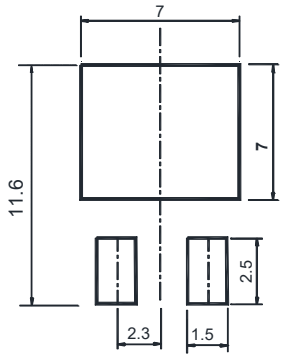


Package Outline (Dimensions in mm) TO-252



UNIT	A	B	C	D	E	F	G	W	H	H1	Q	L	P	P1	P2
mm	5.5	1.20	0.65	6.2	0.8 MIN	1.0	2.3 TYP	6.7	2.5	0.65	60° TYP	10.7	5.4	5.0	3.4
	4.9	0.85	0.4	5.6		0.5		6.1	2.1	0.4		9	5.0	4.6	2.9

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

" TR04N065L " = Part No.

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

Font type: Arial

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