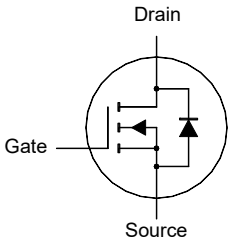
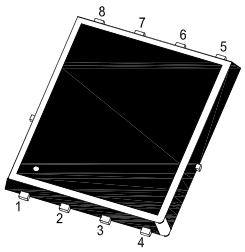
WTM510N039S-HAF

N-Channel Enhancement Mode MOSFET

Features

- Low Miller Capacitance
- Fully Characterized Capacitance and Avalanche
- Halogen and Antimony Free(HAF), RoHS compliant





1.Source 2.Source 3.Source 4.Gate
5.Drain 6.Drain 7.Drain 8.Drain
DFN5060 Plastic Package

Application

- 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	4.3 @ V_{GS} = 10 V	mΩ
	6.1 @ V_{GS} = 7 V	mΩ
$V_{GS(th)}$ typ	3	V
Q_g typ	112@ 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	80 50	A
Peak Drain Current, Pulsed [1]		I_{DM}	400	A
Single Pulse Avalanche Current		I_{AS}	34	A
Single Pulse Avalanche Energy [2]		E_{AS}	290	mJ
Power Dissipation	T_c = 25℃	P_{tot}	50	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	$R_{\theta JC}$	2.5	℃/W
Thermal Resistance from Junction to Ambient [3]	$R_{\theta JA}$	50	℃/W

[1] Pulse Test: Pulse Width ≤ 100 μs, Duty Cycle ≤ 2%.

[2] Limited by $T_{J(MAX)}$, starting T_J = 25 °C, L = 0.5 mH, R_g = 50 Ω, I_D = 34 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.

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Dated: 17/08/2020 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 = 10 mA	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	$V_{GS(th)}$	2	-	4	V
Drain-Source On-State Resistance at V_{GS} = 10 V, I_D = 50 A at V_{GS} = 7 V, I_D = 20 A	$R_{DS(on)}$	- -	3.3 -	4.3 6.1	mΩ
DYNAMIC PARAMETERS					
Forward Transconductance at V_{DS} = 5 V, I_D = 30 A	g_{fs}	-	40	-	S
Gate Resistance at V_{GS} = 0 V, V_{DS} = 0 V, f = 1MHz	R_g	-	1.1	-	Ω
Input Capacitance at V_{GS} = 0 V, V_{DS} = 50 V, f = 1 MHz	C_{iss}	-	6330	-	pF
Output Capacitance at V_{GS} = 0 V, V_{DS} = 50 V, f = 1 MHz	C_{oss}	-	782	-	pF
Reverse Transfer Capacitance at V_{GS} = 0 V, V_{DS} = 50 V, f = 1 MHz	C_{rss}	-	35	-	pF
Gate charge total at V_{DS} = 50 V, I_D = 50 A, V_{GS} = 10 V	Q_g	-	112	-	nC
Gate to Source Charge at V_{DS} = 50 V, I_D = 50 A, V_{GS} = 10 V	Q_{gs}	-	32	-	nC
Gate to Drain Charge at V_{DS} = 50 V, I_D = 50 A, V_{GS} = 10 V	Q_{gd}	-	40	-	nC
Turn-On Delay Time at V_{DS} = 50 V, V_{GS} = 10 V, I_D = 20 A, R_g = 3.3 Ω	$t_{d(on)}$	-	41	-	nS
Turn-On Rise Time at V_{DS} = 50 V, V_{GS} = 10 V, I_D = 20 A, R_g = 3.3 Ω	t_r	-	47	-	nS
Turn-Off Delay Time at V_{DS} = 50 V, V_{GS} = 10 V, I_D = 20 A, R_g = 3.3 Ω	$t_{d(off)}$	-	33	-	nS
Turn-Off Fall Time at V_{DS} = 50 V, V_{GS} = 10 V, I_D = 20 A, R_g = 3.3 Ω	t_f	-	10	-	nS
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at I_S = 50 A, V_{GS} = 0 V	V_{SD}	-	-	1.3	V
Body Diode Reverse Recovery Time at I_S = 20 A, di/dt = 200 A / μs, V_{DD} = 60 V	t_{rr}	-	47	-	nS
Body Diode Reverse Recovery Charge at I_S = 20 A, di/dt = 200 A / μs, V_{DD} = 60 V	Q_{rr}	-	118	-	nC

Electrical Characteristics Curves

Fig. 1 Typical Output Characteristic

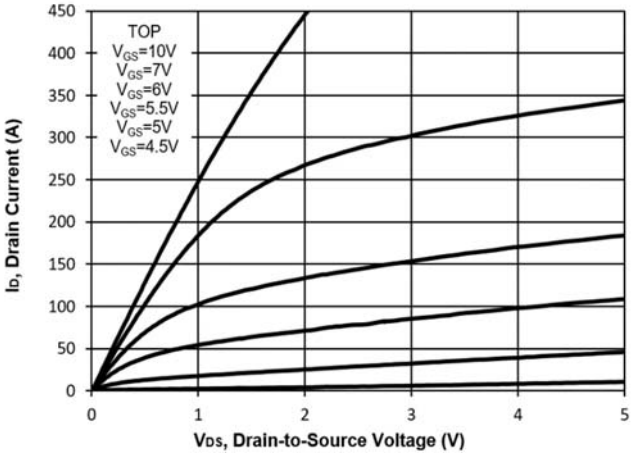


Fig. 2 Typical Transfer Characteristic

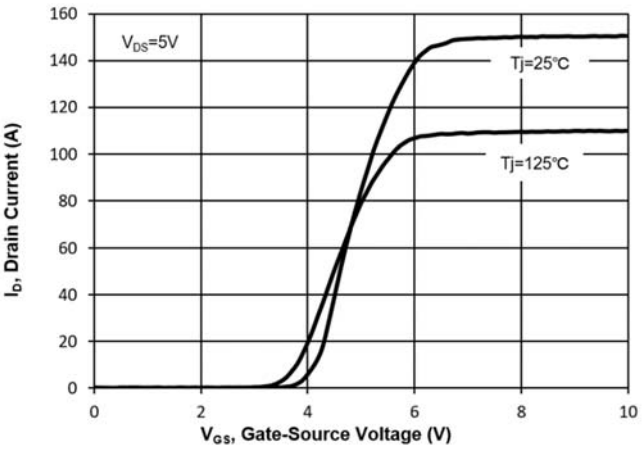


Fig. 3 on-Resistance vs. Drain Current

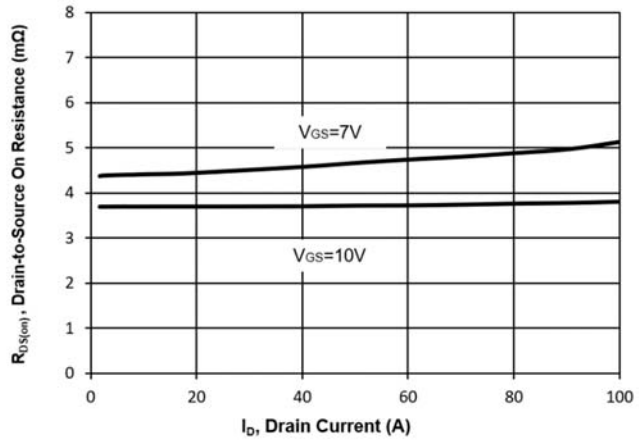


Fig. 4 on-Resistance vs. Gate Voltage

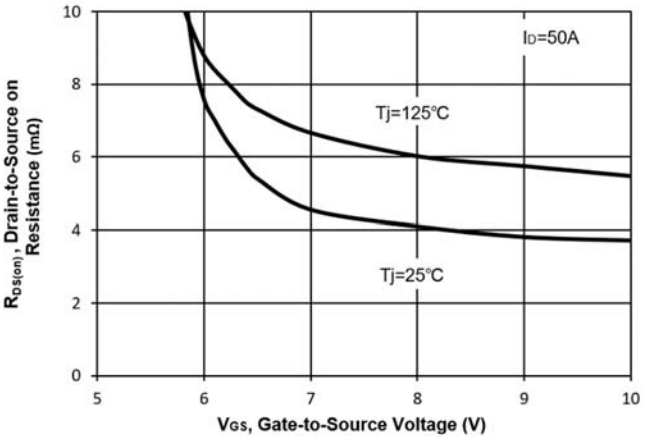


Fig. 5 on-Resistance vs.T_j

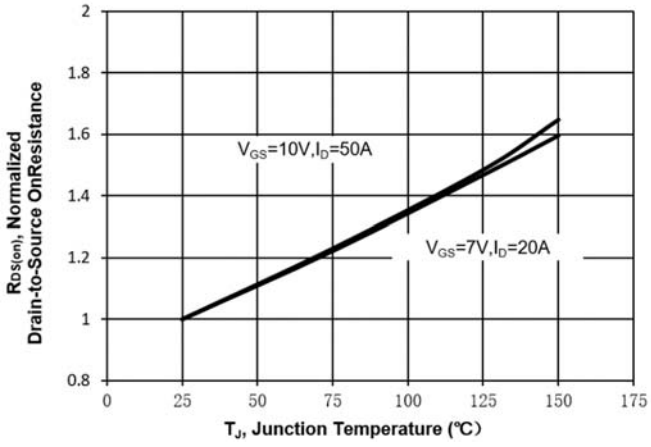
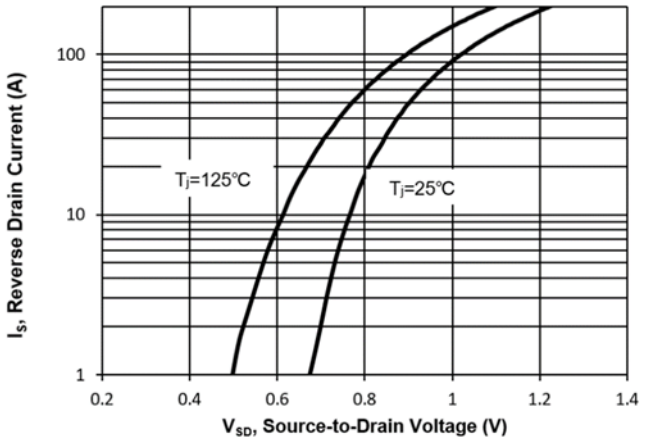


Fig. 6 Typical Forward Characteristic



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

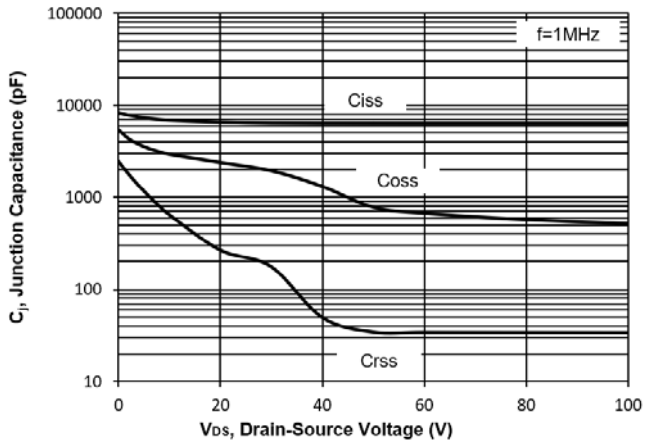


Fig. 8 Drain-Source Leakage Current vs. T_j

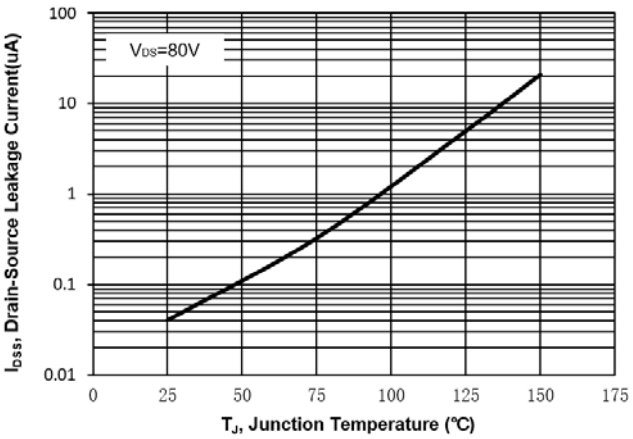


Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

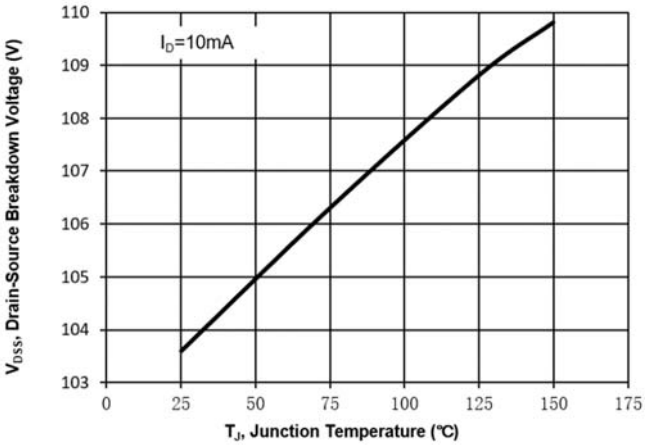


Fig. 10 Gate Threshold Variation vs. T_j

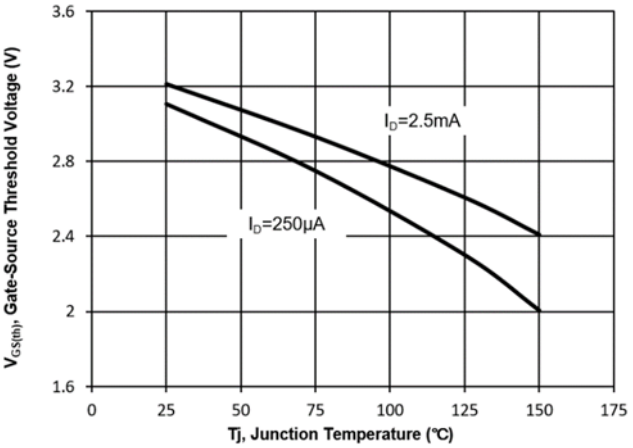


Fig. 11 Gate Charge

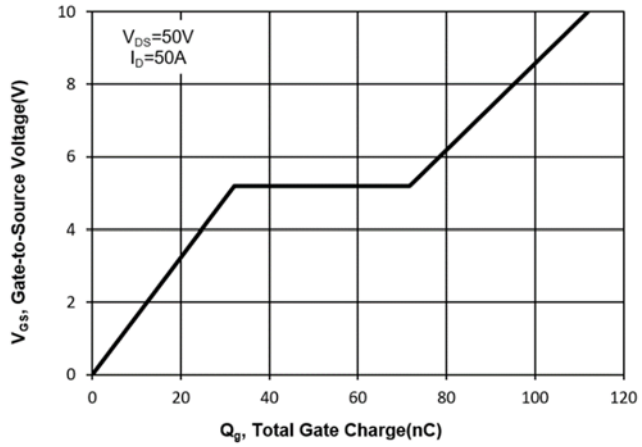
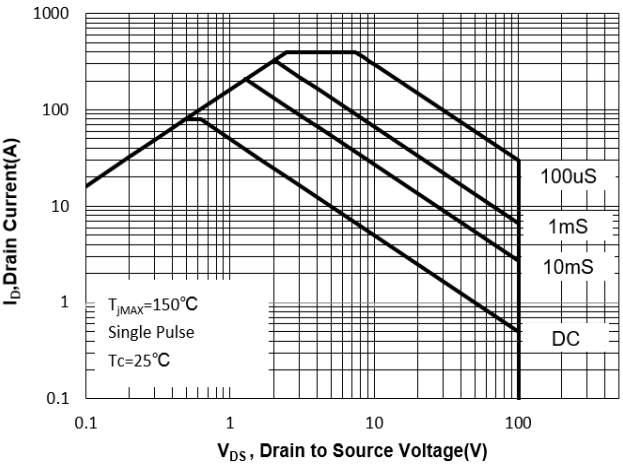


Fig. 12 Safe Operation Area



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Electrical Characteristics Curves

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

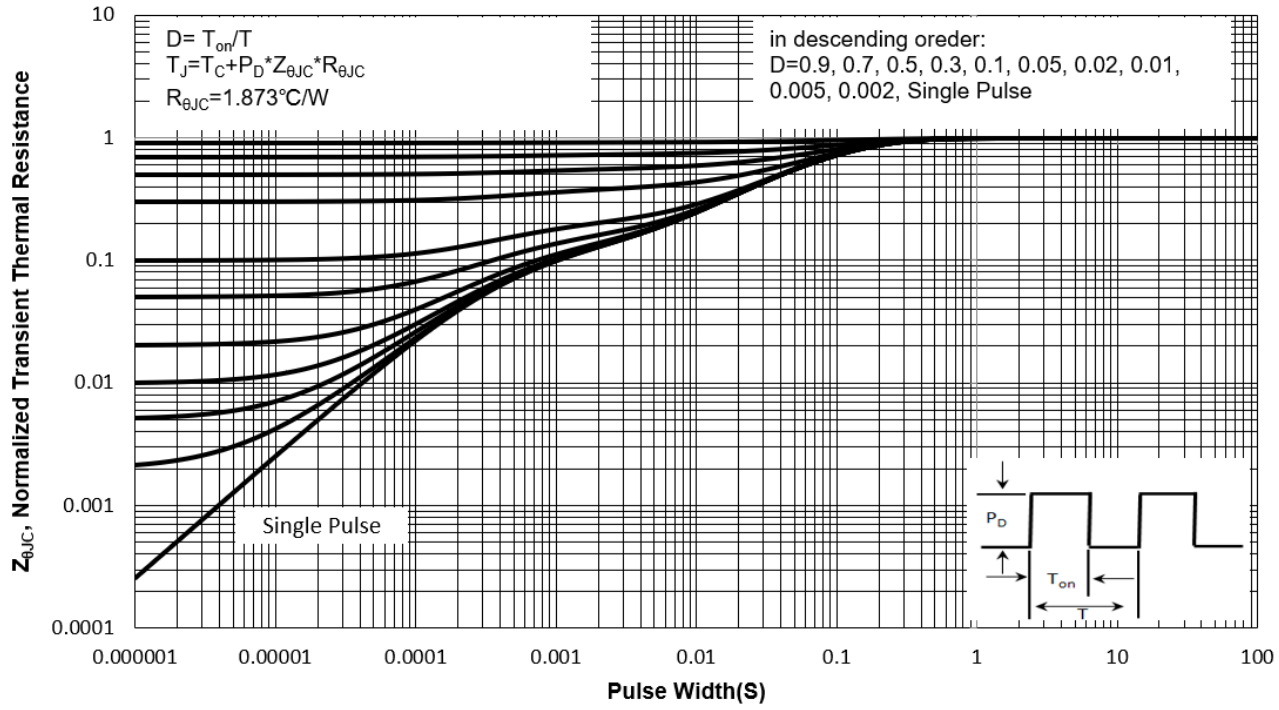
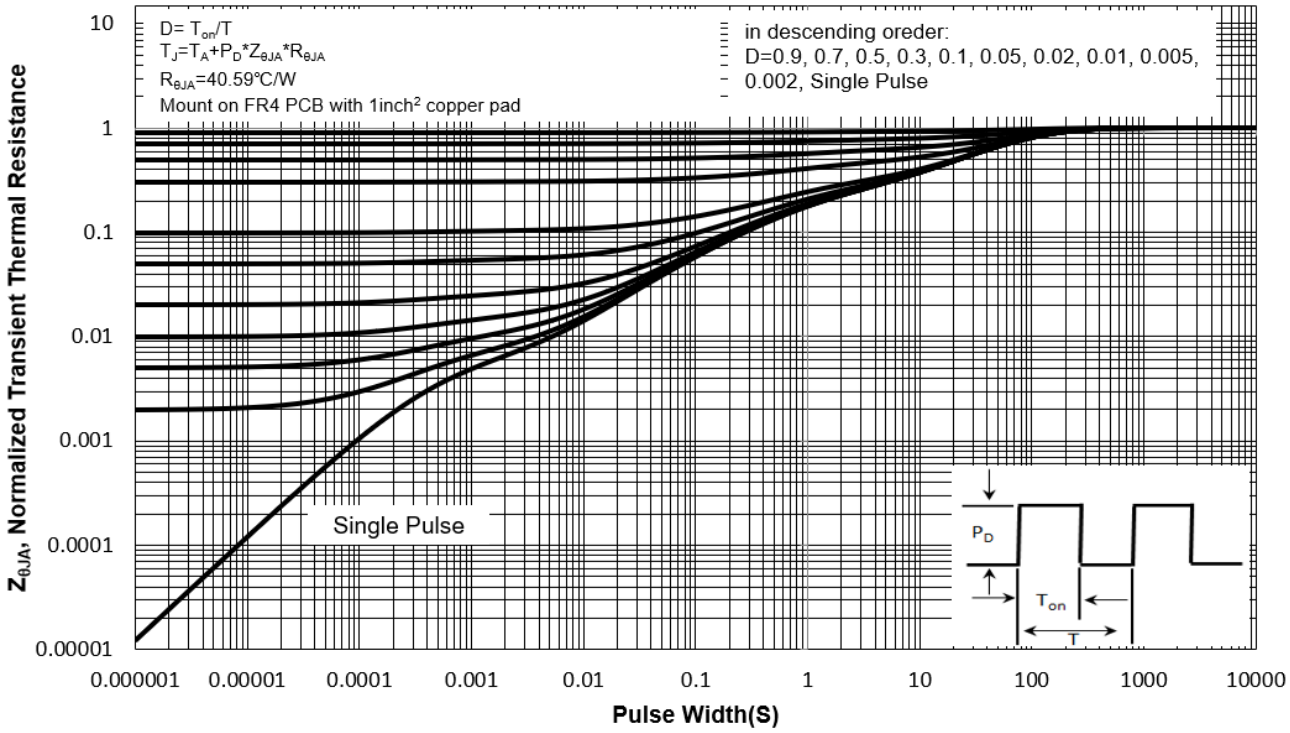


Fig.14 Normalized Maximum Transient Thermal Impedance($z_{\Theta JA}$)



Test Circuits

Fig.1-1 Switching times test circuit

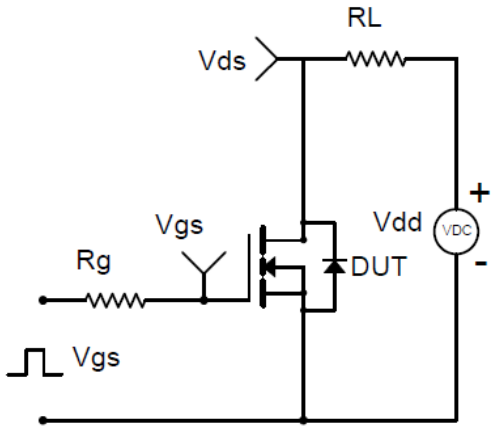


Fig.1-2 Switching Waveform

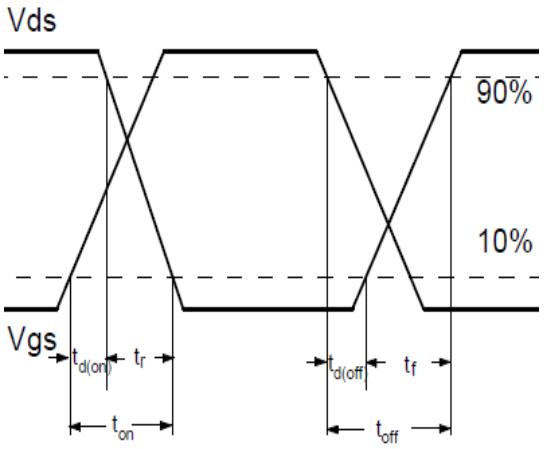


Fig.2-1 Gate charge test circuit

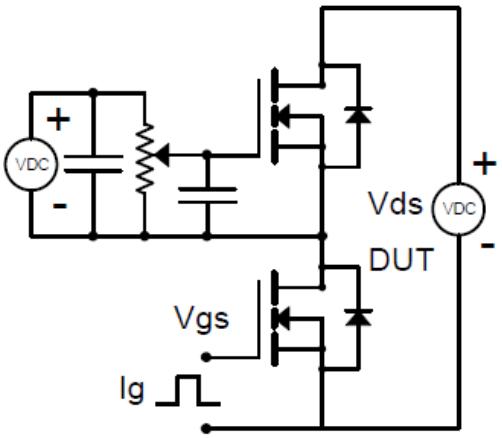


Fig.2-2 Gate charge waveform

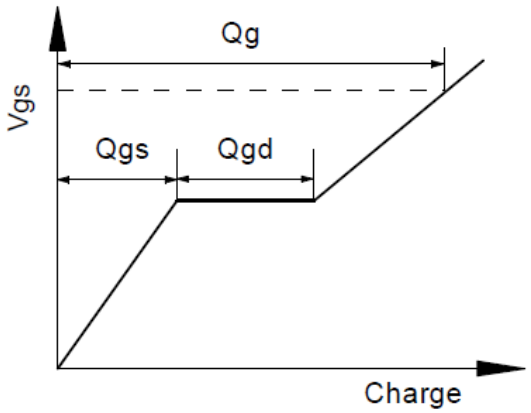


Fig.3-1 Avalanche test circuit

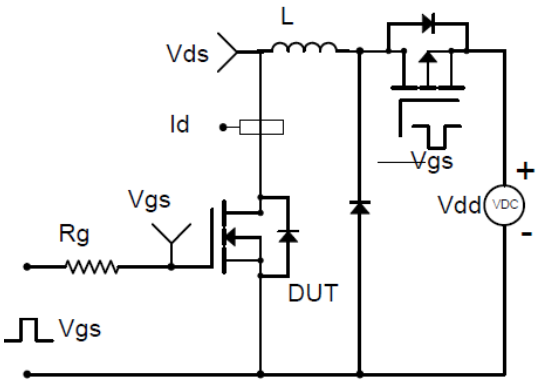
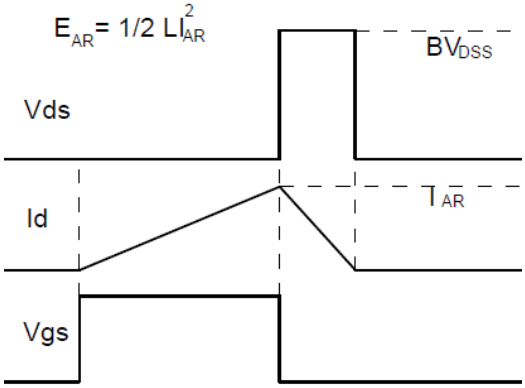
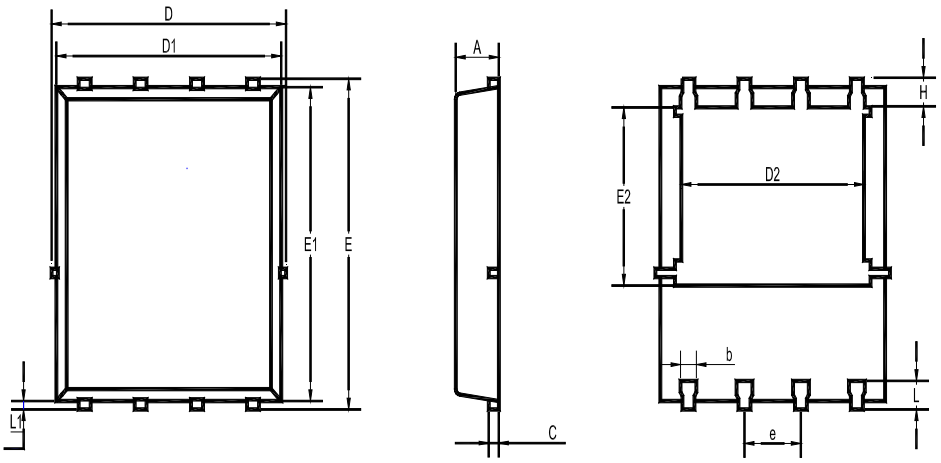


Fig.3-2 Avalanche waveform

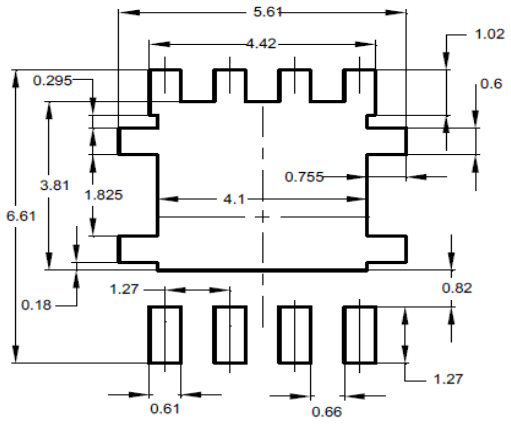


Package Outline Dimensions (Units: mm) DFN5060



UNIT	A	b	C	D	D1	D2	E	E1	E2	e	L	L1	H
mm	1.12 0.9	0.51 0.33	0.34 0.11	5.26 4.7	5.1 4.7	4. 5 3.56	6.25 5.75	6 5.6	3.66 3.18	1.37 1.17	0.71 0.35	0.2 0.06	0.71 0.35

Recommended Soldering Footprint

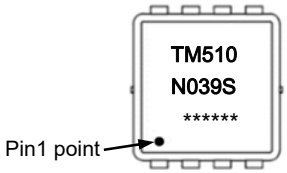


Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
DFN5060	12	8 ± 0.1	0.315 ± 0.004	330	13	3,000

Marking information

" TM510N039S " = Part No.
" ****** " = Date Code Marking
Font type: Arial



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