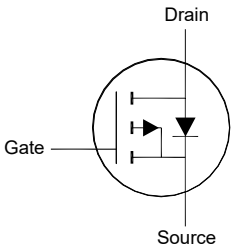
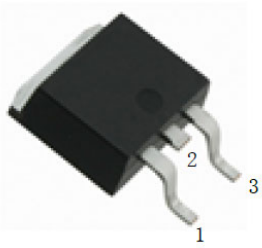
WTR04P065LS-HAF

P-Channel Enhancement Mode MOSFET

Features

- Low On-Resistance
- Surface-mounted package
- Low Gate-Source Threshold Voltage
- Halogen and Antimony Free(HAF), RoHS compliant





1.Gate 2.Drain 3.Source

TO-252 Plastic Package

Key Parameters

Parameter	Value	Unit
$-BV_{DSS}$	40	V
$R_{DS(ON)}$ Max	7.3 @ $-V_{GS}$ = 10 V	mΩ
	10.5 @ $-V_{GS}$ = 4.5 V	
$-V_{GS(th)}$ typ	1.5	V
Q_g typ	125 @ $-V_{GS}$ = 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	T_c = 25°C T_c = 100°C	$-I_D$	71 44	A
Peak Drain Current, Pulsed [1]		$-I_{DM}$	300	A
Single-Pulse Avalanche Current		$-I_{AS}$	45	A
Single-Pulse Avalanche Energy [2]		E_{AS}	101	mJ
Power Dissipation	T_c = 25°C	P_D	65.2	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	$R_{\theta JC}$	2.3	℃/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 $T_{J(MAX)}$ = 175°C.

[2] Limited by $T_{J(MAX)}$, starting T_J = 25°C, L = 0.1 mH, R_g = 25 Ω, $-I_{AS}$ = 45 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: 28/08/2023 Rev: 04

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 $-V_{DS}$ = 40 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	$-V_{GS(th)}$	1.0	-	2.5	V
Drain-Source On-State Resistance at $-V_{GS}$ = 10 V, $-I_D$ = 20 A at $-V_{GS}$ = 4.5 V, $-I_D$ = 10 A	$R_{DS(on)}$	- -	6 -	7.3 10.5	mΩ
DYNAMIC PARAMETERS					
Forward Transconductance at $-V_{DS}$ = 5 V, $-I_D$ = 10 A	g_{FS}	-	40.6	-	S
Gate Resistance at V_{GS} = 0 V, V_{DS} = 0 V, f = 1 MHz	R_g	-	1.6	-	Ω
Input Capacitance at $-V_{DS}$ = 20 V, V_{GS} = 0 V, f = 1 MHz	C_{iss}	-	7560	-	pF
Output Capacitance at $-V_{DS}$ = 20 V, V_{GS} = 0 V, f = 1 MHz	C_{oss}	-	521	-	pF
Reverse Transfer Capacitance at $-V_{DS}$ = 20 V, V_{GS} = 0 V, f = 1 MHz	C_{rss}	-	344	-	pF
Total Gate Charge at $-V_{DS}$ = 20 V, $-V_{GS}$ = 10 V, $-I_D$ = 20 A at $-V_{DS}$ = 20 V, $-V_{GS}$ = 4.5 V, $-I_D$ = 20 A	Q_g	- -	125 59	- -	nC
Gate-Source Charge at $-V_{DS}$ = 20 V, $-V_{GS}$ = 10 V, $-I_D$ = 20 A	Q_{gs}	-	24	-	nC
Gate-Drain Charge at $-V_{DS}$ = 20 V, $-V_{GS}$ = 10 V, $-I_D$ = 20 A	Q_{gd}	-	19	-	nC
Turn-On Delay Time at $-V_{DD}$ = 20 V, $-V_{GS}$ = 10 V, $-I_D$ = 20 A, R_G = 3.3 Ω	$t_{d(on)}$	-	37	-	ns
Turn-On Rise Time at $-V_{DD}$ = 20 V, $-V_{GS}$ = 10 V, $-I_D$ = 20 A, R_G = 3.3 Ω	t_r	-	48	-	ns
Turn-Off Delay Time at $-V_{DD}$ = 20 V, $-V_{GS}$ = 10 V, $-I_D$ = 20 A, R_G = 3.3 Ω	$t_{d(off)}$	-	43	-	ns
Turn-Off Fall Time at $-V_{DD}$ = 20 V, $-V_{GS}$ = 10 V, $-I_D$ = 20 A, R_G = 3.3 Ω	t_f	-	9	-	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	$-I_S$	-	-	71	A
Body-Diode Continuous Current, Pulsed	$-I_{SM}$	-	-	300	A
Body Diode Reverse Recovery Time at $-I_S$ = 20 A, di/dt = 100 A / µs	t_{rr}	-	21	-	ns
Body Diode Reverse Recovery Charge at $-I_S$ = 20 A, di/dt = 100 A / µs	Q_{rr}	-	16	-	nC

Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

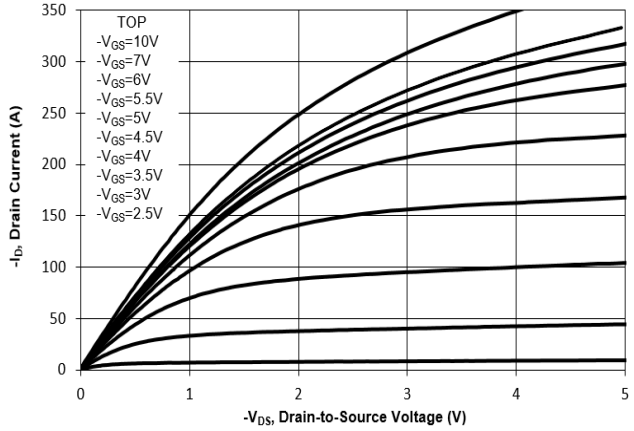


Fig. 2 Typical Transfer Characteristics

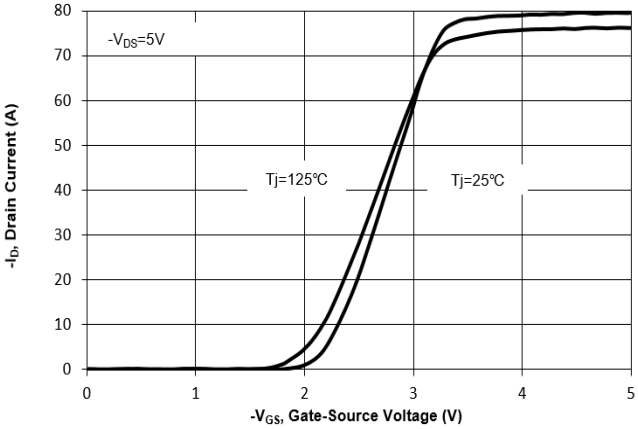


Fig. 3 on-Resistance vs. Drain Current

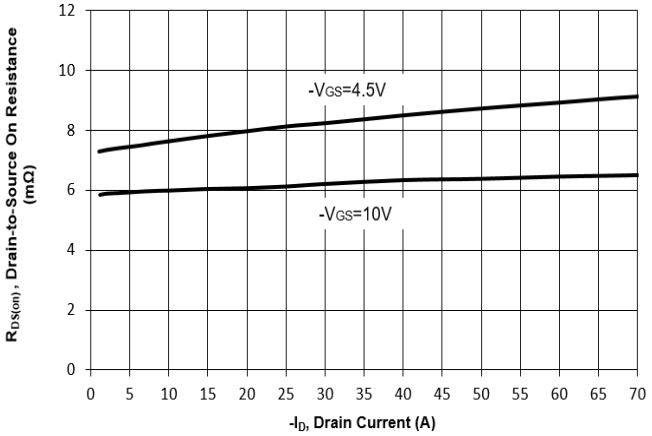


Fig. 4 on-Resistance vs. Gate to Source Voltage

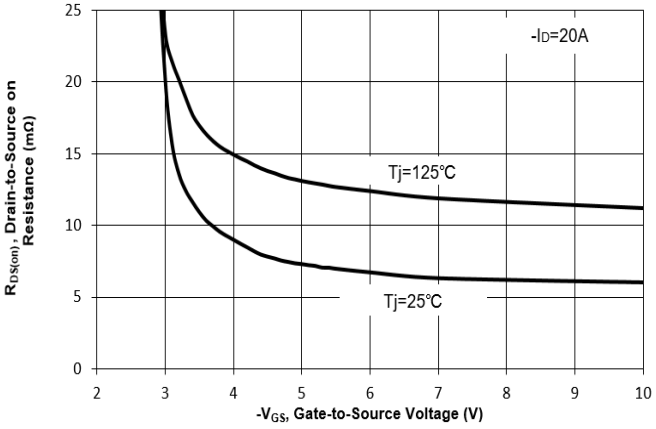


Fig. 5 on-Resistance vs.T_j

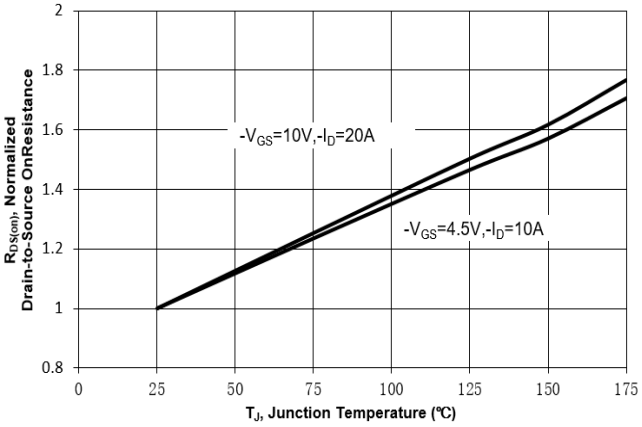
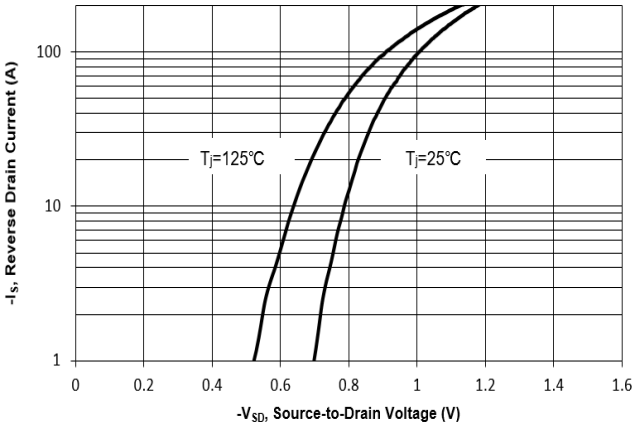


Fig. 6 Typical Body-Diode Forward Characteristics



Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

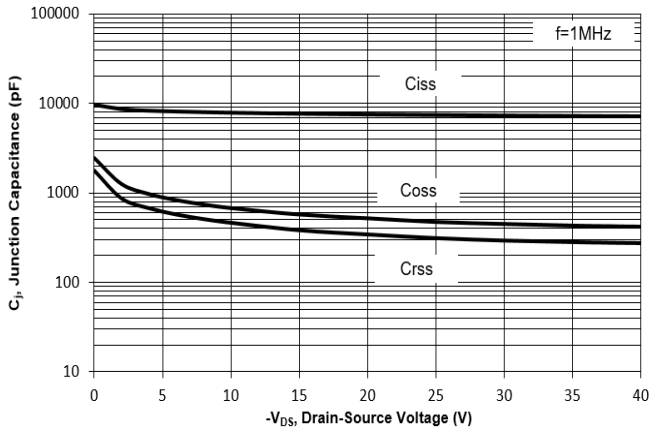


Fig. 8 Drain-Source Leakage Current vs. T_j

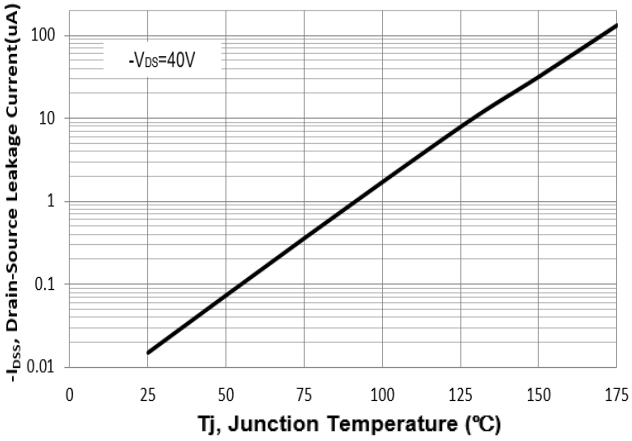


Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

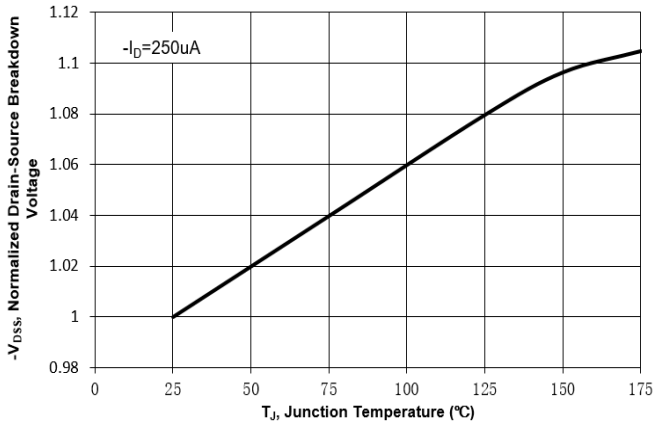


Fig. 10 Gate Threshold Variation vs. T_j

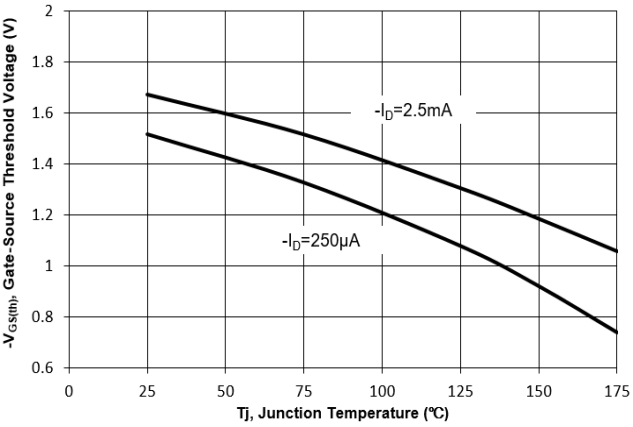


Fig. 11 Gate Charge

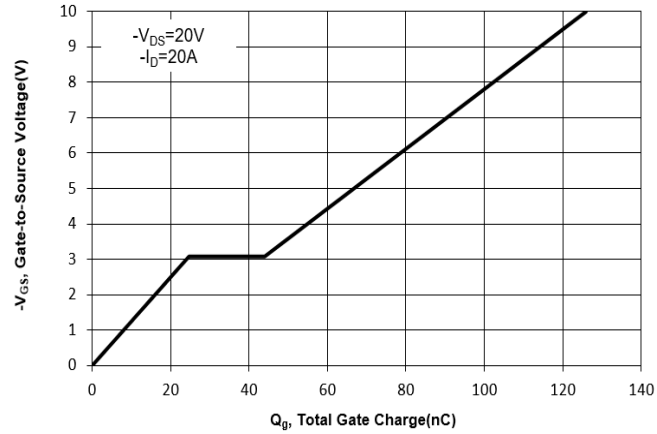
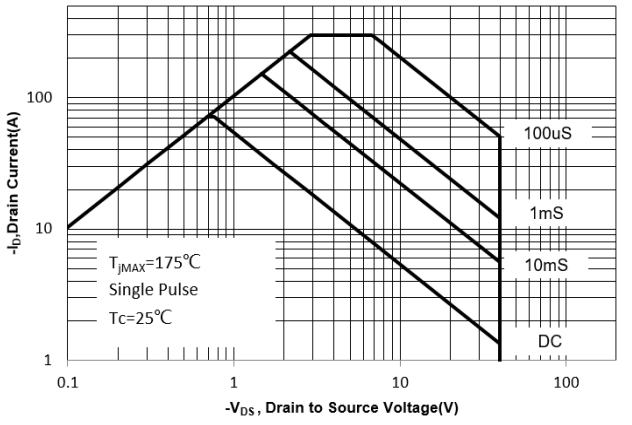


Fig. 12 Safe Operation Area



Electrical Characteristics Curves

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

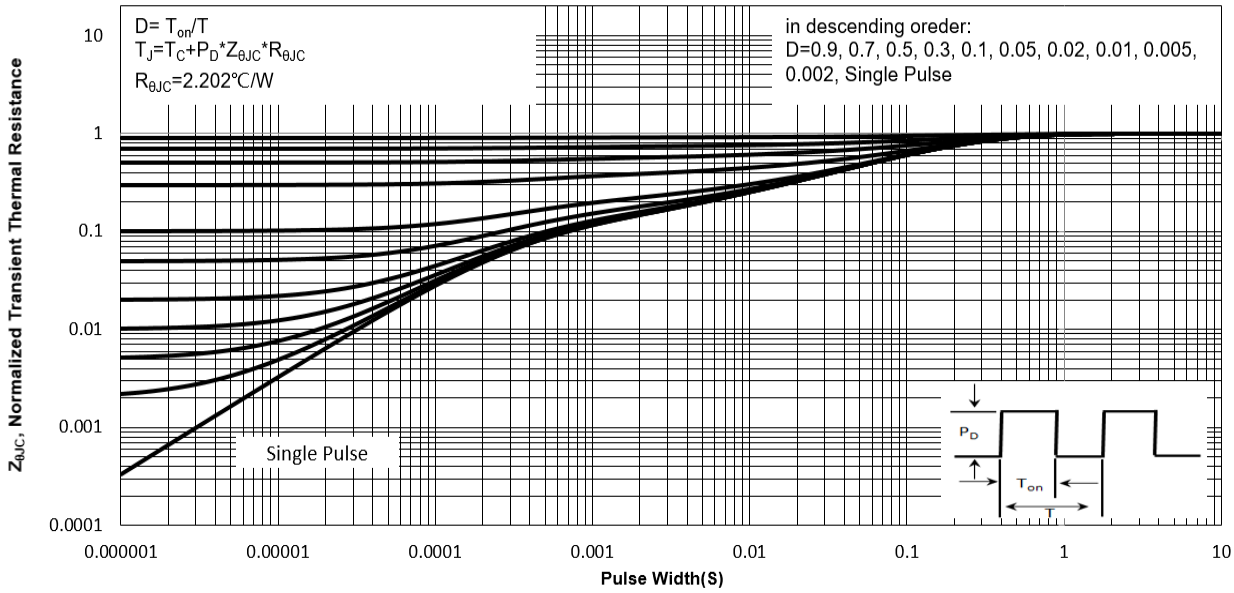
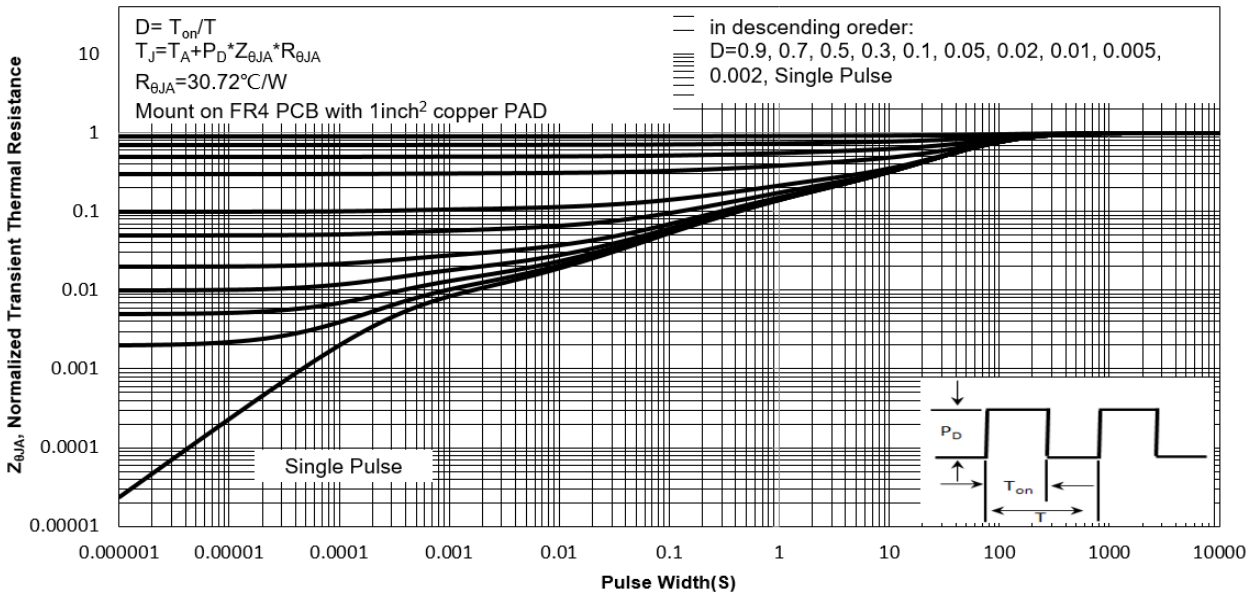


Fig. 14 Normalized Maximum Transient Thermal Impedance($z_{\Theta JA}$)



Test Circuits

Fig.1-1 Switching times test circuit

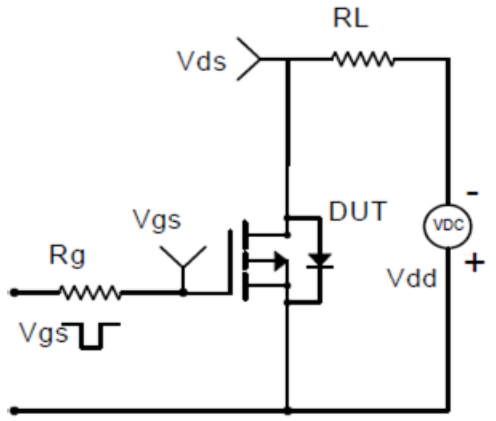


Fig.1-2 Switching Waveform

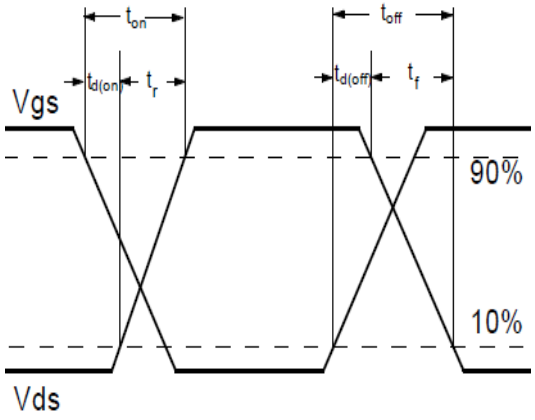


Fig.2-1 Gate charge test circuit

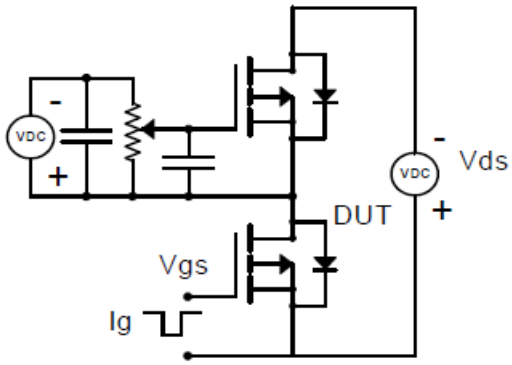


Fig.2-2 Gate charge waveform

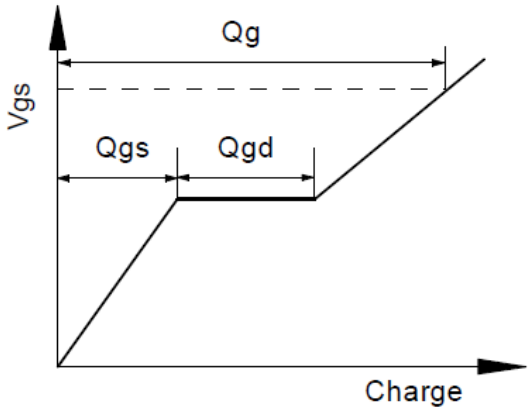


Fig.3-1 Avalanche test circuit

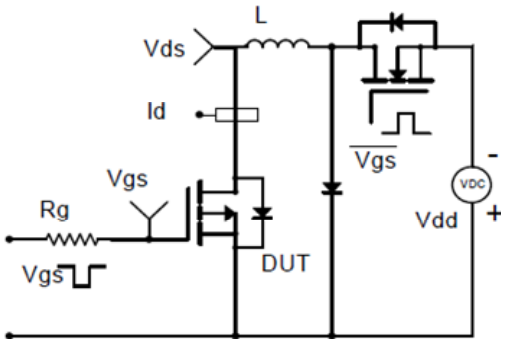
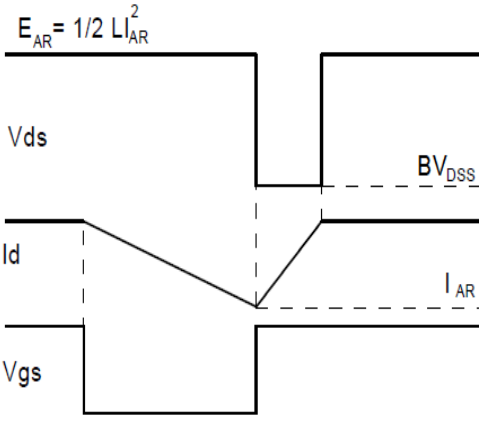
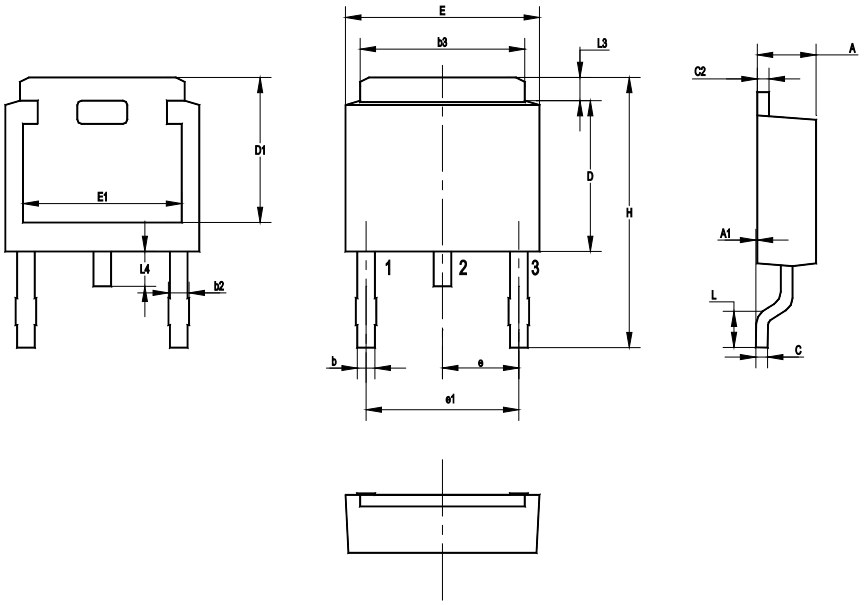


Fig.3-2 Avalanche waveform

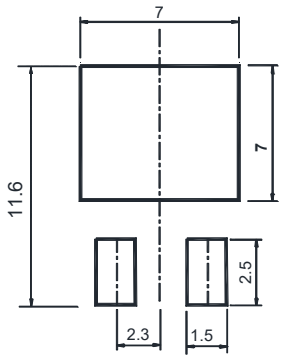


Package Outline (Dimensions in mm) TO-252



UNIT	A	A1	b	b2	b3	C	C2	D	D1	E	E1	e	e1	H	L	L3	L4
mm	2.5	0.15	1.0	1.15	5.5	0.65	0.65	6.2	5.4	6.7	5.0	2.30	4.60	10.7	1.78	1.20	1.10
	2.1	0	0.5	0.65	4.9	0.4	0.4	5.6	5.0	6.1	4.6	TYP.	TYP.	9	1.40	0.85	0.51

Recommended Soldering Footprint



Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
TO-252	16	8 ± 0.1	0.315 ± 0.004	330	13	2,500

Marking information

" TR04P065LS " = Part No.

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

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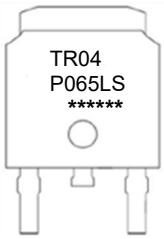

Dated: 28/08/2023 Rev: 04