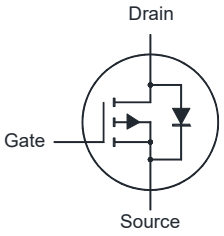
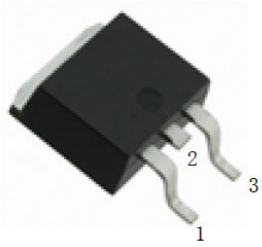
WTR06P1K4L-AH

P-Channel Enhancement Mode MOSFET

Features

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





1.Gate 2.Drain 3.Source

TO-252 Plastic Package

Applications

- Portable appliances
- Battery management

Key Parameters

Parameter	Value	Unit
$-BV_{DSS}$	60	V
$R_{DS(ON)}$ Max	140 @ $-V_{GS}$ = 10 V	mΩ
	188 @ $-V_{GS}$ = 4.5 V	
$-V_{GS(th)}$ typ	1.9	V
Q_g typ	10 @ $-V_{GS}$ = 10 V	nC

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

Parameter		Symbol	Value	Unit
Drain-Source Voltage		$-V_{DS}$	60	V
Gate-Source Voltage		V_{GS}	± 20	V
Drain Current	T_c = 25℃	$-I_D$	10	A
	T_c = 100℃		6.5	
Peak Drain Current, Pulsed [1]		$-I_{DM}$	25	A
Power Dissipation	T_c = 25℃	P_D	20.8	W
	T_c = 100℃		8.3	
Single-Pulse Avalanche Current		$-I_{AS}$	12	A
Single-Pulse Avalanche Energy [2]		E_{AS}	7.2	mJ
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	$R_{\theta JC}$	6	℃/W
Thermal Resistance from Junction to Ambient [3]	$R_{\theta JA}$	50	℃/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, $-I_D$ = 12 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: 09/03/2021 DFI0 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	$-BV_{DSS}$	60	-	-	V
Drain-Source Leakage Current at $-V_{DS}$ = 48 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, $-I_D$ = 5 A at $-V_{GS}$ = 4.5 V, $-I_D$ = 4 A	$R_{DS(on)}$	- -	120 -	140 188	mΩ
DYNAMIC PARAMETERS					
Forward Transconductance at $-V_{DS}$ = 5 V, $-I_D$ = 5 A	g_{FS}	-	7	-	S
Gate Resistance at V_{DS} = 0 V, V_{GS} = 0 V, f = 1 MHz	R_g	-	19	-	Ω
Input Capacitance at $-V_{DS}$ = 30 V, V_{GS} = 0 V, f = 1 MHz	C_{iss}	-	496	-	pF
Output Capacitance at $-V_{DS}$ = 30 V, V_{GS} = 0 V, f = 1 MHz	C_{oss}	-	33	-	pF
Reverse Transfer Capacitance at $-V_{DS}$ = 30 V, V_{GS} = 0 V, f = 1 MHz	C_{rss}	-	12	-	pF
Total Gate Charge at $-V_{DS}$ = 30 V, $-V_{GS}$ = 10 V, $-I_D$ = 5 A	Q_g	-	10	-	nC
Gate-Source Charge at $-V_{DS}$ = 30 V, $-V_{GS}$ = 10 V, $-I_D$ = 5 A	Q_{gs}	-	2.4	-	nC
Gate-Drain Charge at $-V_{DS}$ = 30 V, $-V_{GS}$ = 10 V, $-I_D$ = 5 A	Q_{gd}	-	1.8	-	nC
Turn-On Delay Time at $-V_{DD}$ = 30 V, $-V_{GS}$ = 10 V, $-I_D$ = 5 A, R_g = 3.3 Ω	$t_{d(on)}$	-	6.5	-	ns
Turn-On Rise Time at $-V_{DD}$ = 30 V, $-V_{GS}$ = 10 V, $-I_D$ = 5 A, R_g = 3.3 Ω	t_r	-	12	-	ns
Turn-Off Delay Time at $-V_{DD}$ = 30 V, $-V_{GS}$ = 10 V, $-I_D$ = 5 A, R_g = 3.3 Ω	$t_{d(off)}$	-	12	-	ns
Turn-Off Fall Time at $-V_{DD}$ = 30 V, $-V_{GS}$ = 10 V, $-I_D$ = 5 A, R_g = 3.3 Ω	t_f	-	2.5	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $-I_S$ = 1 A, V_{GS} = 0 V	$-V_{SD}$	-	0.8	1.2	V
Body-Diode Continuous Current	$-I_S$	-	-	10	A
Body-Diode Continuous Current, Pulsed	$-I_{SM}$	-	-	25	A
Body Diode Reverse Recovery Time at $-I_S$ = 5 A, di/dt = 100 A / µs	t_{rr}	-	9	-	ns
Body Diode Reverse Recovery Charge at $-I_S$ = 5 A, di/dt = 100 A / µs	Q_{rr}	-	5.3	-	nC

Electrical Characteristics Curves

Fig. 1 Typical Output Characteristic

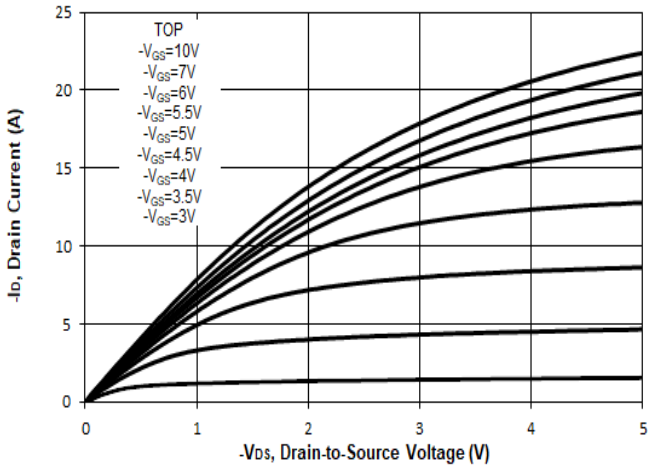


Fig. 2 Typical Transfer Characteristic

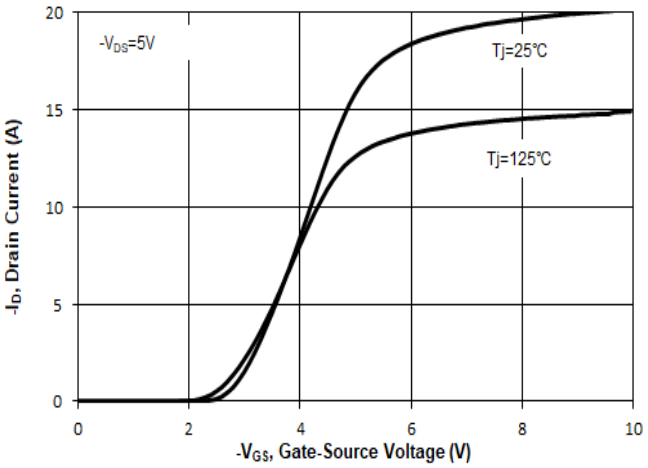


Fig. 3 on-Resistance vs. Gate Voltage

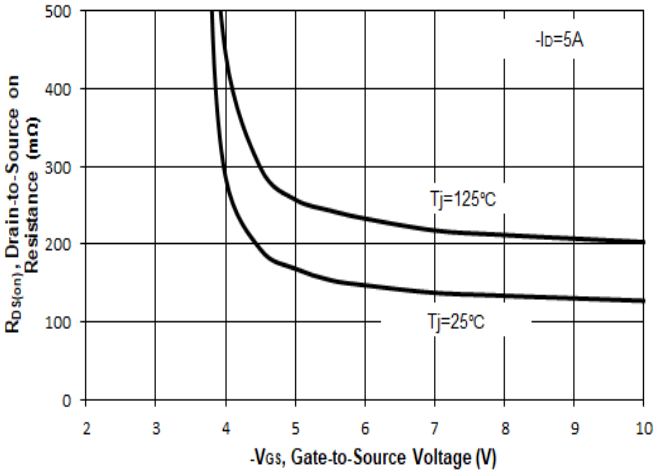


Fig. 4 on-Resistance vs.T_j

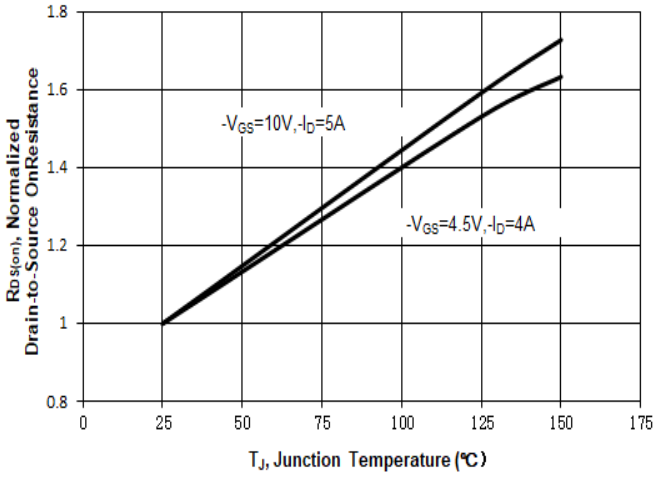


Fig. 5 On-Resistance vs. Drain Current

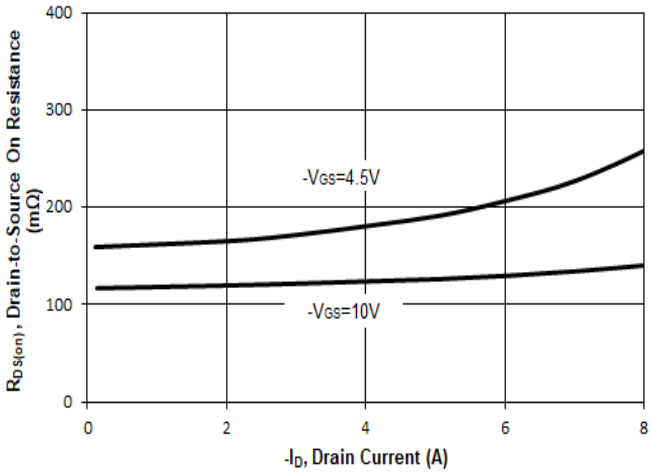
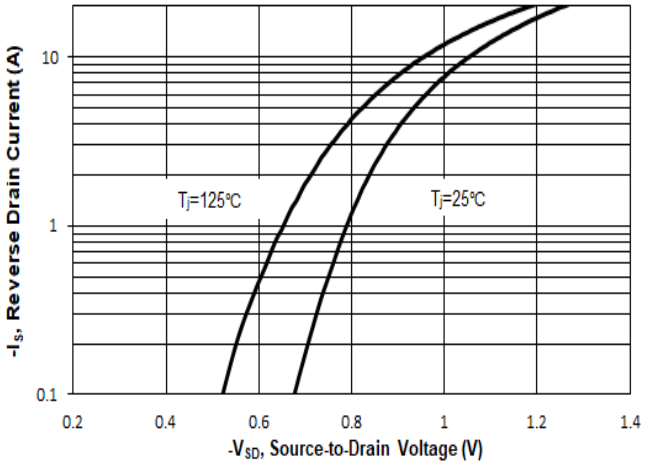


Fig. 6 Typical Body Diode Forward Characteristic



Electrical Characteristics Curves

Fig. 7 $V_{(BR)DSS}$ vs. Junction Temperature

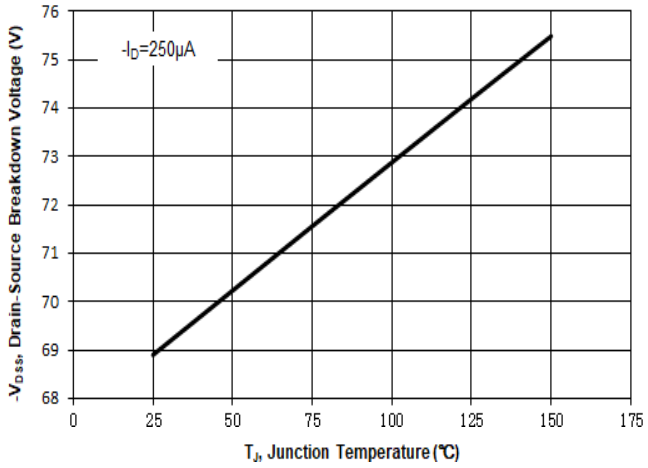


Fig. 8 Gate Threshold Variation vs. T_j

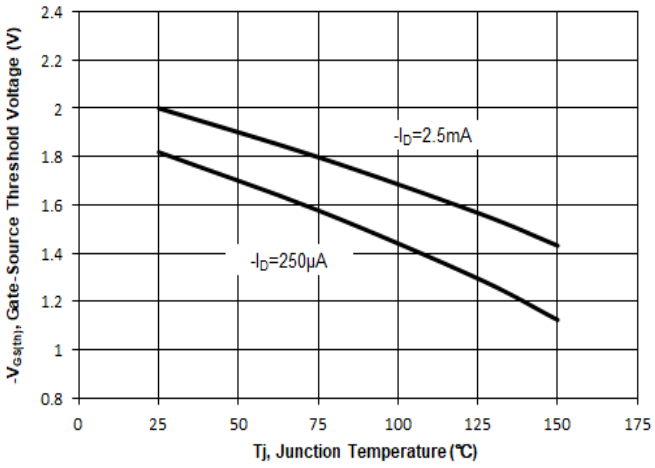


Fig. 9 Typical Junction Capacitance

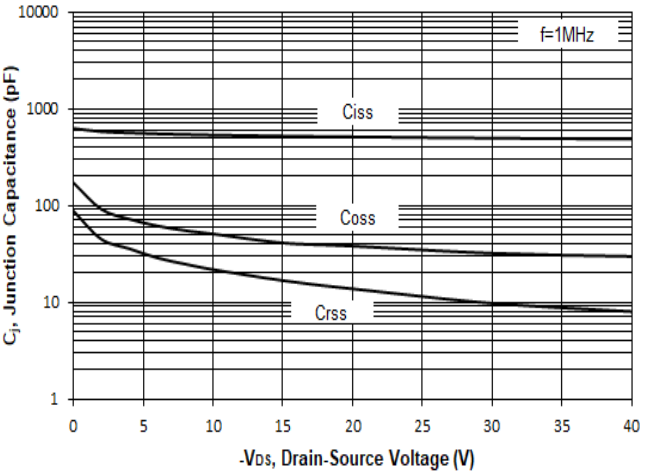


Fig. 10 Gate Charge

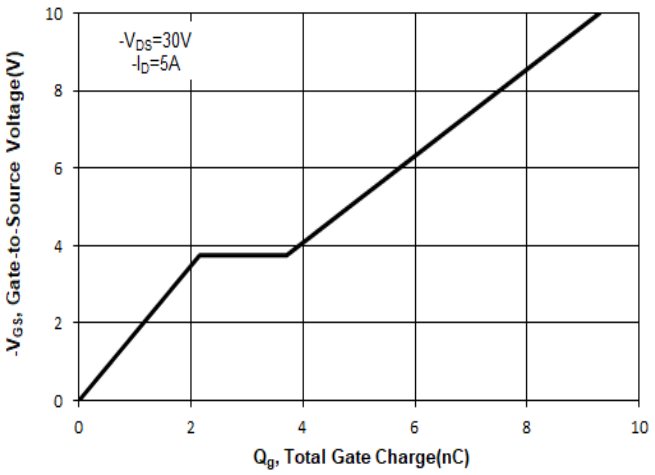


Fig. 11 Drain-Source Leakage Current vs. T_j

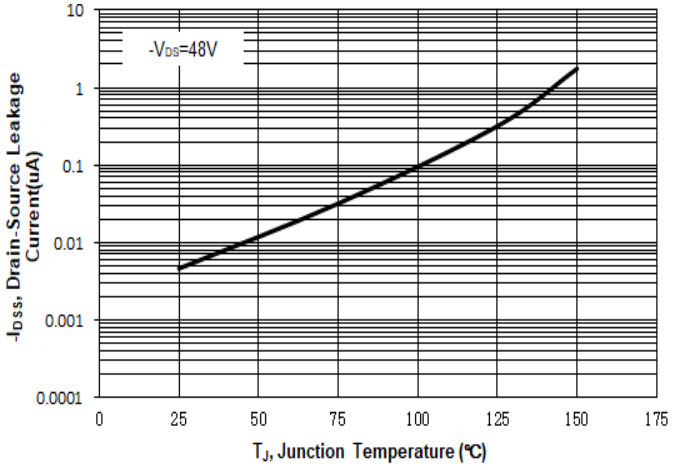
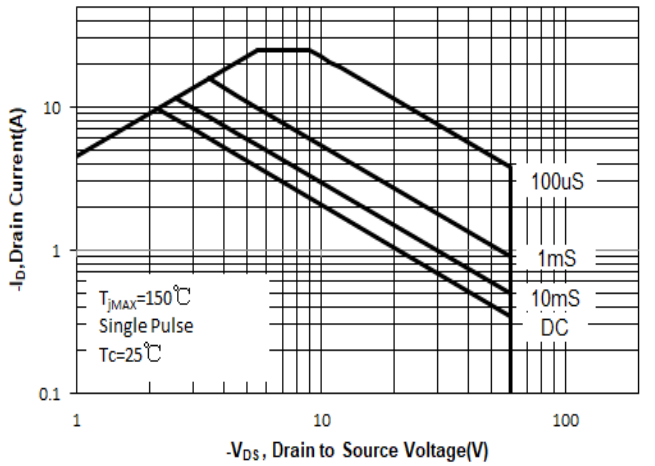


Fig. 12 Safe Operation Area



Electrical Characteristics Curves

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

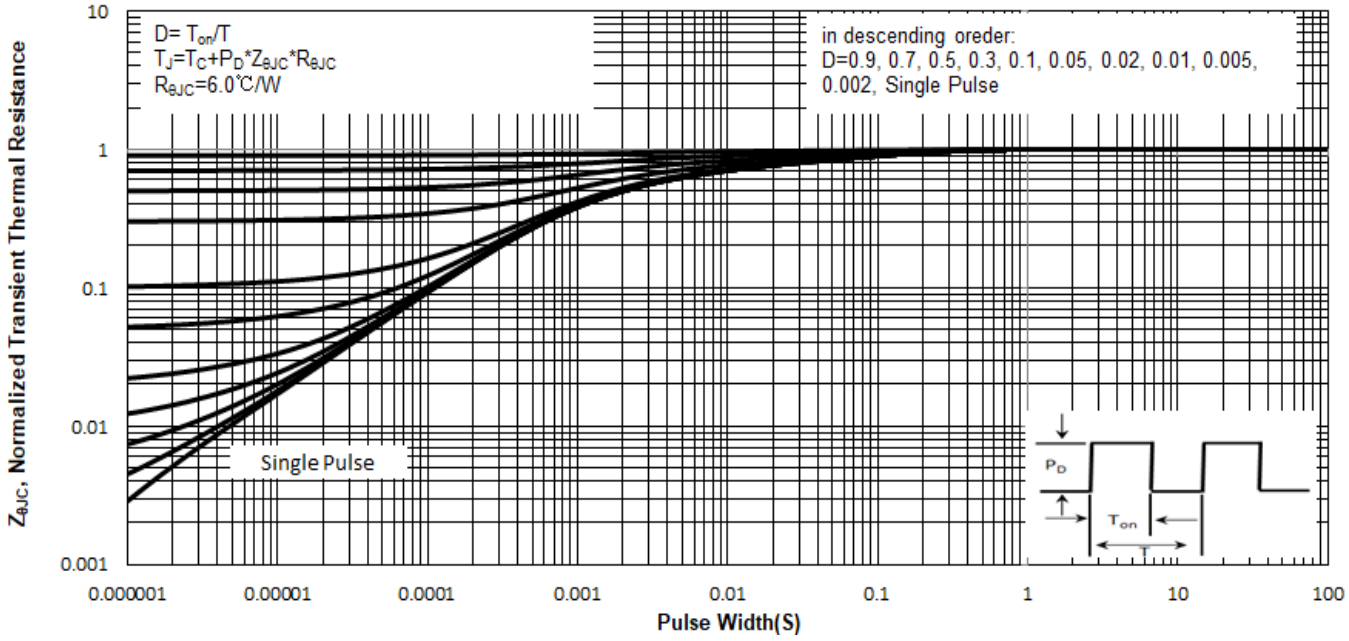
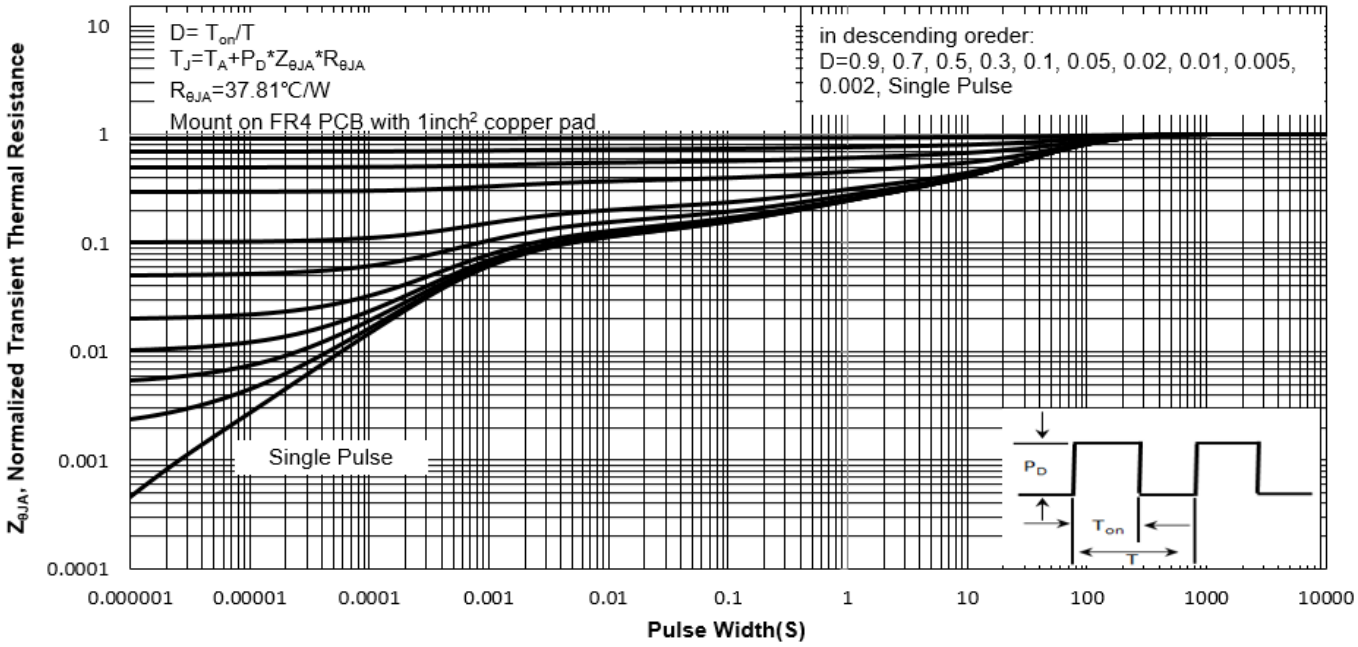


Fig. 14 Normalized Maximum Transient Thermal Impedance($z_{\Theta JA}$)



Test Circuits

Fig.1-1 Switching times test circuit

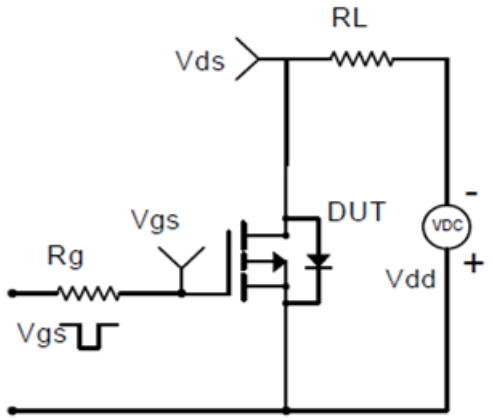


Fig.1-2 Switching Waveform

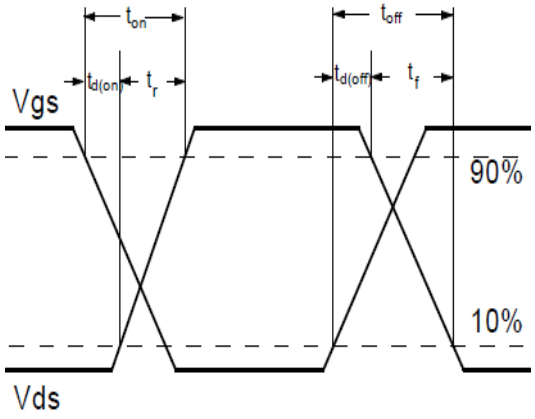


Fig.2-1 Gate charge test circuit

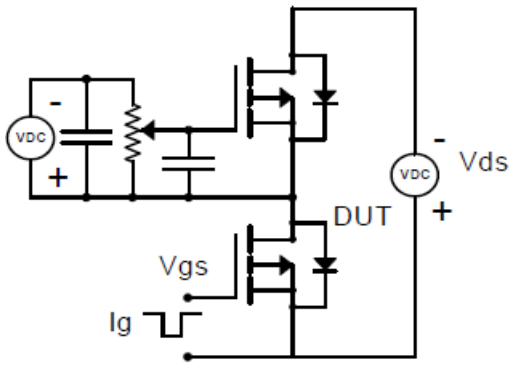


Fig.2-2 Gate charge waveform

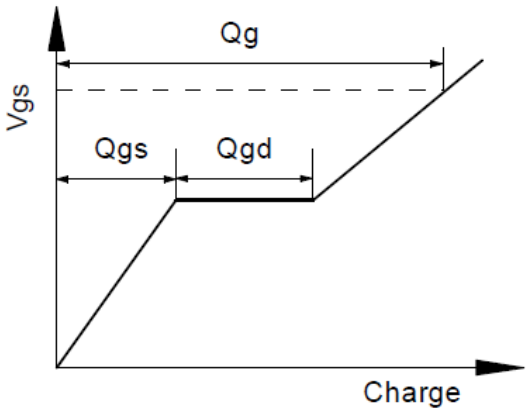


Fig.3-1 Avalanche test circuit

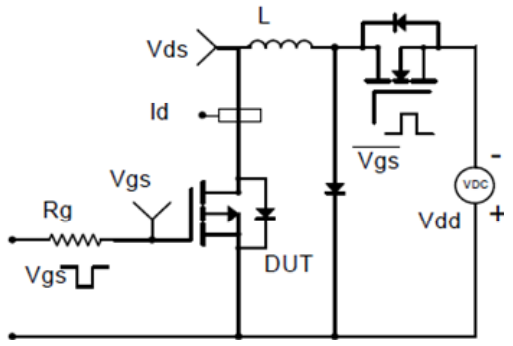
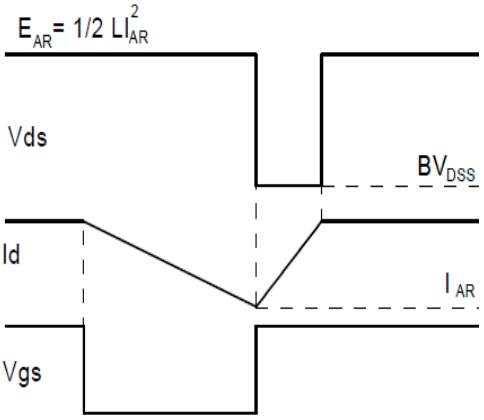
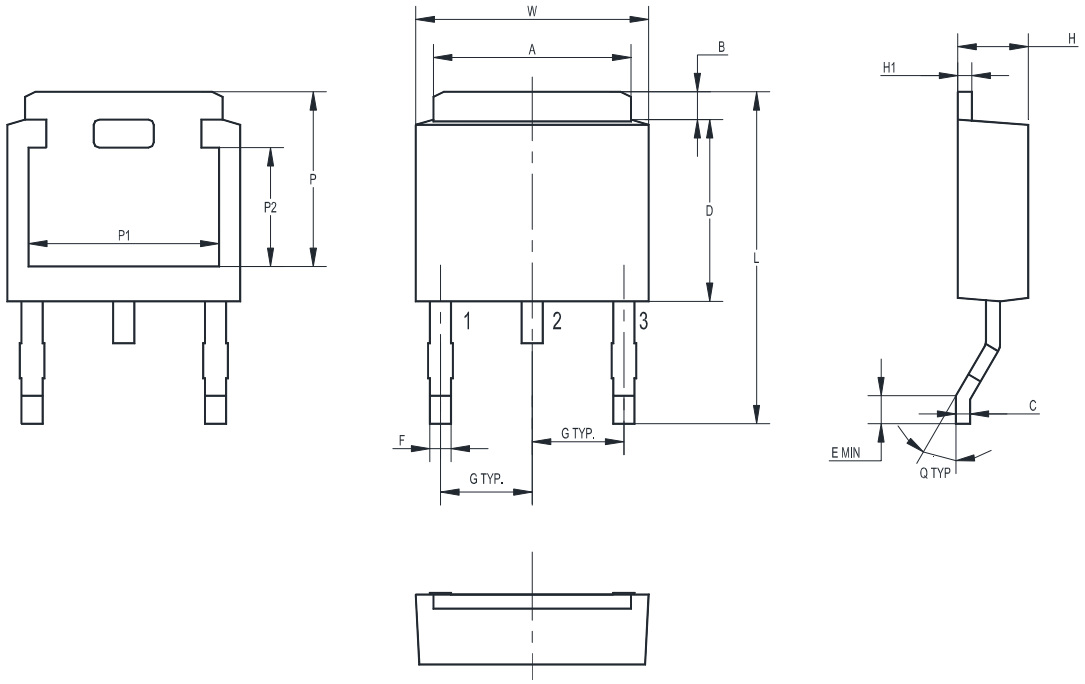


Fig.3-2 Avalanche waveform

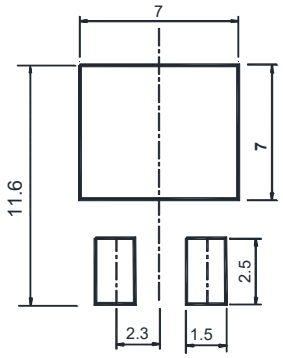


Package Outline (Dimensions in mm) TO-252



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

" TR06P1K4L " = Part No.

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

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