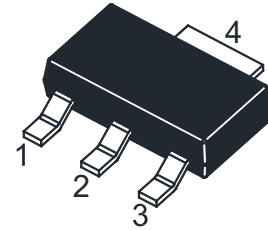
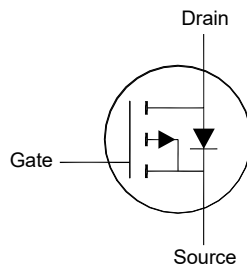


# WTQ06P450LS-HAF

## P-Channel Enhancement Mode MOSFET

### Features

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



1.Gate 2.Drain 3.Source 4.Drain  
SOT-223 Plastic Package

### Key Parameters

Parameter	Value	Unit
$-V_{(BR)DSS}$	60	V
$R_{DS(ON)}$ Max	46 @ $-V_{GS} = 10$ V	m $\Omega$
	52 @ $-V_{GS} = 4.5$ V	
$-V_{GS(th)}$ typ	1.5	V
$Q_g$ typ	34 @ $-V_{GS} = 10$ V	nC

### Absolute Maximum Ratings (at $T_a = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit	
Drain-Source Voltage	$-V_{DS}$	60	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V	
Drain Current	$-I_D$	$T_c = 25^\circ\text{C}$	14	A
		$T_c = 100^\circ\text{C}$	8	A
Peak Drain Current <sup>1)</sup>	$-I_{DM}$	70	A	
Avalanche Current	$-I_{AS}$	23	A	
Avalanche Energy <sup>2)</sup>	$E_{AS}$	26.4	mJ	
Power Dissipation	$P_D$	14.3	W	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 150	$^\circ\text{C}$	

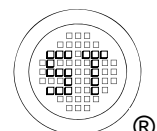
### Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	8.7	$^\circ\text{C/W}$
Thermal Resistance from Junction to Ambient <sup>3)</sup>	$R_{\theta JA}$	45	$^\circ\text{C/W}$

<sup>1)</sup> Pulse Test: Pulse Width  $\leq 100$   $\mu\text{s}$ , Duty Cycle  $\leq 2\%$ , Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)} = 150^\circ\text{C}$ .

<sup>2)</sup> Limited by  $T_{J(MAX)}$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.1$  mH,  $R_g = 25$   $\Omega$ ,  $-I_{AS} = 23$  A,  $V_{GS} = 10$  V.

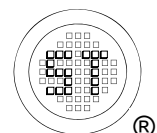
<sup>3)</sup> Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air.



# WTQ06P450LS-HAF

Characteristics at  $T_a = 25^\circ\text{C}$  unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>					
Drain-Source Breakdown Voltage at $-I_D = 250 \mu\text{A}$	$-V_{(BR)DSS}$	60	-	-	V
Drain-Source On-State Current at $-V_{DS} = 48 \text{ V}$	$-I_{DSS}$	-	-	1	$\mu\text{A}$
Gate-Source Leakage Current at $V_{GS} = \pm 16 \text{ V}$	$I_{GSS}$	-	-	$\pm 100$	nA
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$ , $-I_D = 250 \mu\text{A}$	$-V_{GS(th)}$	1	-	2.5	V
Drain-Source On-State Resistance at $-V_{GS} = 10 \text{ V}$ , $-I_D = 10 \text{ A}$ at $-V_{GS} = 4.5 \text{ V}$ , $-I_D = 8 \text{ A}$	$R_{DS(ON)}$	-	36	46	m $\Omega$
		-	-	52	
<b>DYNAMIC PARAMETERS</b>					
Forward Transconductance at $-V_{DS} = 5 \text{ V}$ , $-I_D = 8 \text{ A}$	$g_{fs}$	-	18.7	-	S
Gate resistance at $V_{GS} = 0 \text{ V}$ , $V_{DS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	$R_g$	-	6.4	-	$\Omega$
Input Capacitance at $V_{GS} = 0 \text{ V}$ , $-V_{DS} = 30 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{iss}$	-	2089	-	pF
Output Capacitance at $V_{GS} = 0 \text{ V}$ , $-V_{DS} = 30 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{oss}$	-	99	-	pF
Reverse Transfer Capacitance at $V_{GS} = 0 \text{ V}$ , $-V_{DS} = 30 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{rss}$	-	50	-	pF
Total Gate Charge at $-V_{GS} = 10 \text{ V}$ , $-V_{DS} = 30 \text{ V}$ , $-I_D = 10 \text{ A}$ at $-V_{GS} = 4.5 \text{ V}$ , $-V_{DS} = 30 \text{ V}$ , $-I_D = 10 \text{ A}$	$Q_g$	-	34	-	nC
		-	16	-	
Gate-Source Charge at $-V_{GS} = 10 \text{ V}$ , $-V_{DS} = 30 \text{ V}$ , $-I_D = 10 \text{ A}$	$Q_{gs}$	-	6	-	nC
Gate-Drain Charge at $-V_{GS} = 10 \text{ V}$ , $-V_{DS} = 30 \text{ V}$ , $-I_D = 10 \text{ A}$	$Q_{gd}$	-	5	-	nC
Turn-On Delay Time at $-V_{GS} = 10 \text{ V}$ , $-V_{DD} = 30 \text{ V}$ , $-I_D = 10 \text{ A}$ , $R_g = 3.3 \Omega$	$t_{d(on)}$	-	11	-	ns
Turn-On Rise Time at $-V_{GS} = 10 \text{ V}$ , $-V_{DD} = 30 \text{ V}$ , $-I_D = 10 \text{ A}$ , $R_g = 3.3 \Omega$	$t_r$	-	18	-	ns
Turn-Off Delay Time at $-V_{GS} = 10 \text{ V}$ , $-V_{DD} = 30 \text{ V}$ , $-I_D = 10 \text{ A}$ , $R_g = 3.3 \Omega$	$t_{d(off)}$	-	25	-	ns
Turn-Off Fall Time at $-V_{GS} = 10 \text{ V}$ , $-V_{DD} = 30 \text{ V}$ , $-I_D = 10 \text{ A}$ , $R_g = 3.3 \Omega$	$t_f$	-	4	-	ns
<b>Body-Diode PARAMETERS</b>					
Drain-Source Diode Forward Voltage at $-I_s = 1 \text{ A}$ , $V_{GS} = 0 \text{ V}$	$-V_{SD}$	-	-	1.3	V
Body-Diode Continuous Current	$-I_s$	-	-	14	A
Pulsed Body-Diode Continuous Current	$-I_{SM}$	-	-	70	A
Body Diode Reverse Recovery Time at $-I_s = 10 \text{ A}$ , $di/dt = 100 \text{ A} / \mu\text{s}$	$t_{rr}$	-	14	-	ns
Body Diode Reverse Recovery Charge at $-I_s = 10 \text{ A}$ , $di/dt = 100 \text{ A} / \mu\text{s}$	$Q_{rr}$	-	10	-	nC



## Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

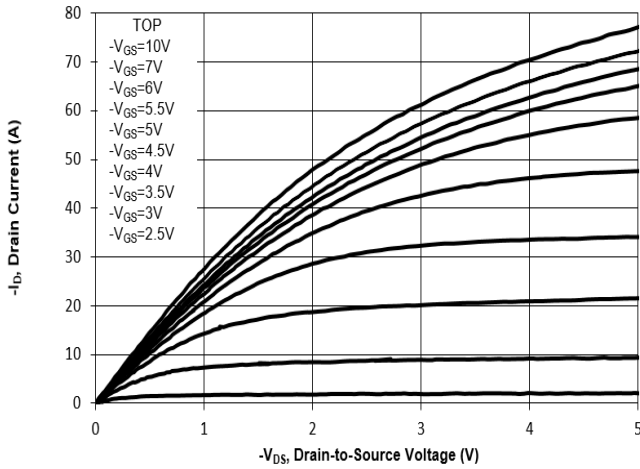


Fig. 2 Typical Transfer Characteristics

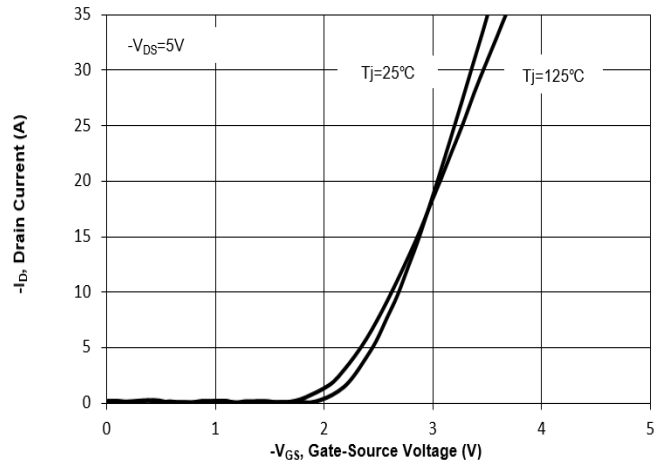


Fig. 3 on-Resistance vs. Drain Current

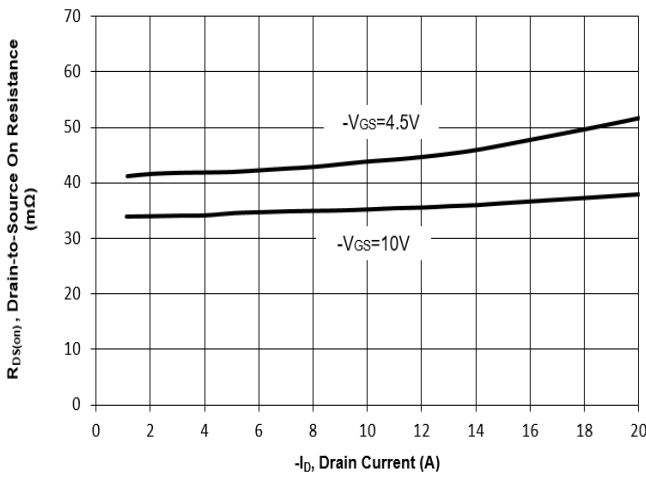


Fig. 4 on-Resistance vs. Gate to Source Voltage

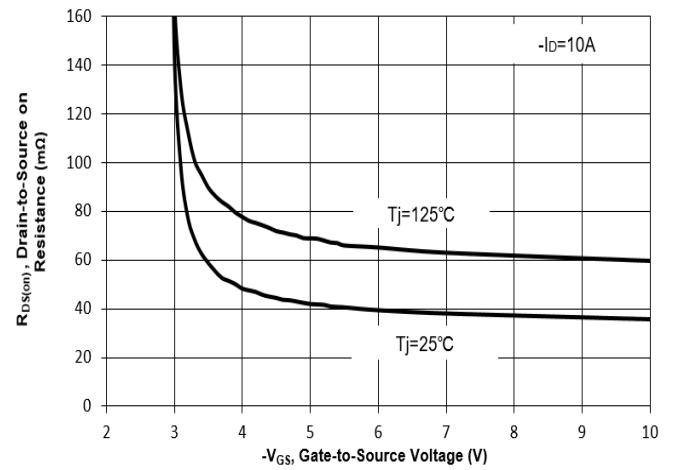


Fig. 5 on-Resistance vs.  $T_J$

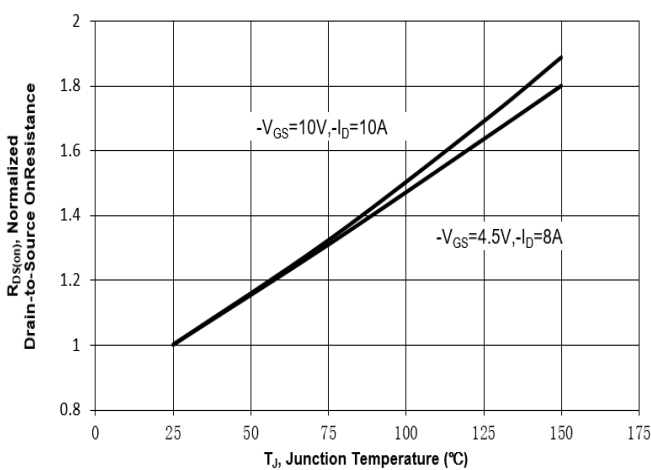
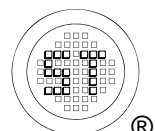
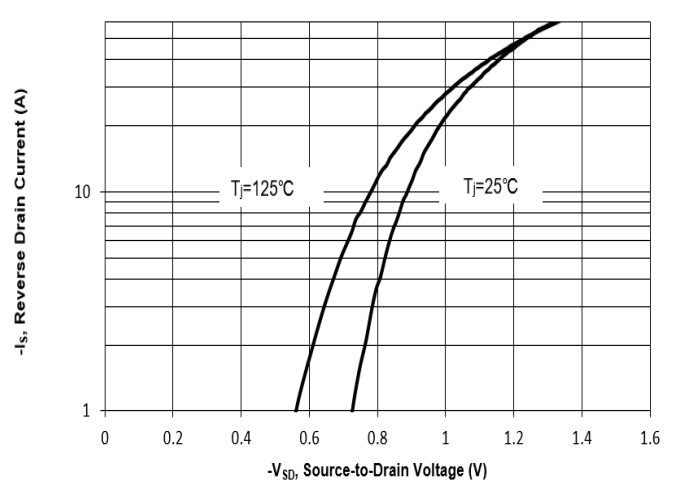


Fig. 6 Typical Body-Diode Forward Characteristics



## Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

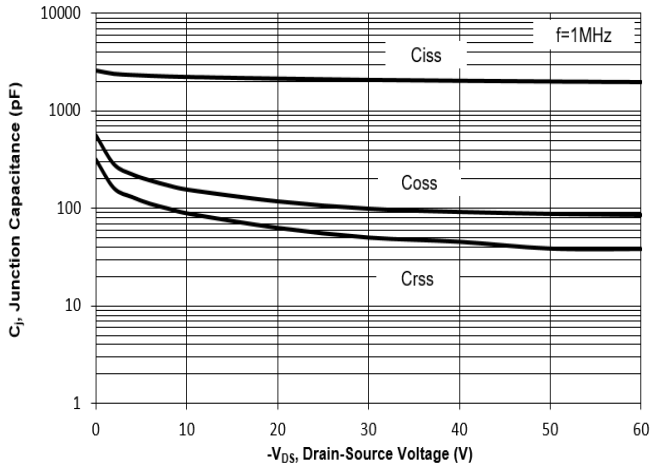


Fig. 8 Drain-Source Leakage Current vs. T<sub>J</sub>

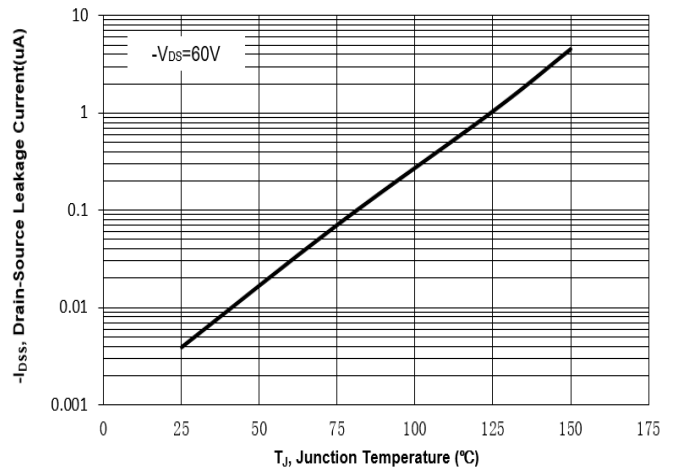


Fig. 9 V<sub>(BR)DSS</sub> vs. Junction Temperature

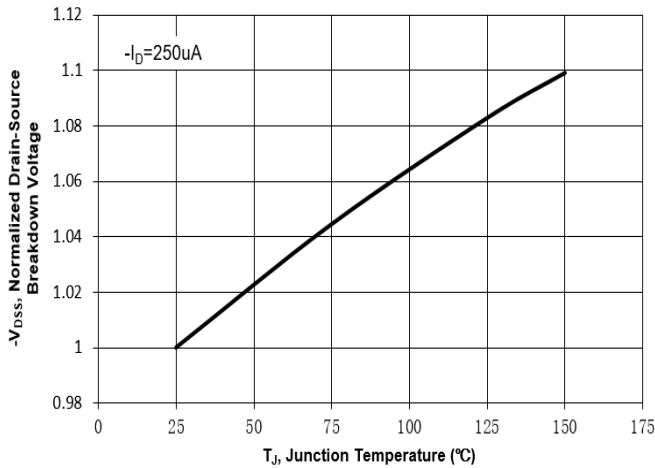


Fig. 10 Gate Threshold Variation vs. T<sub>J</sub>

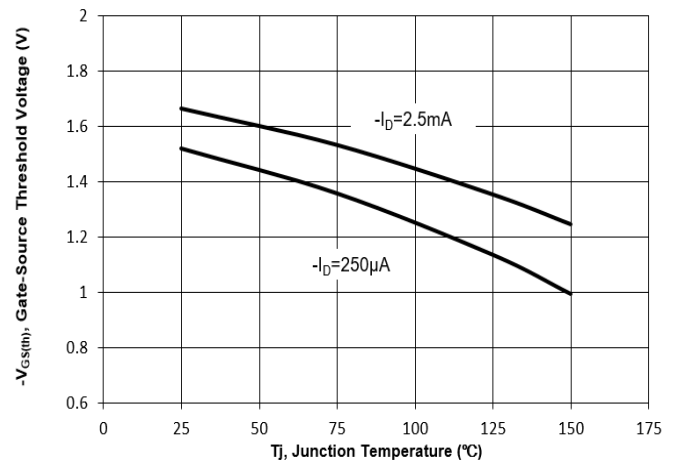


Fig. 11 Gate Charge

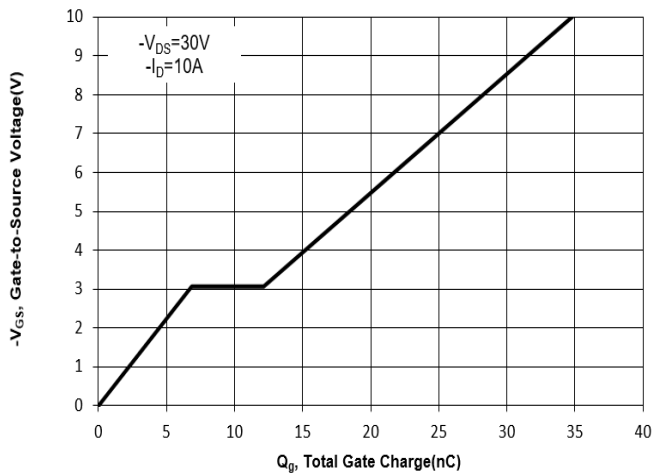
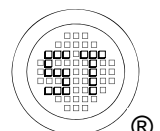
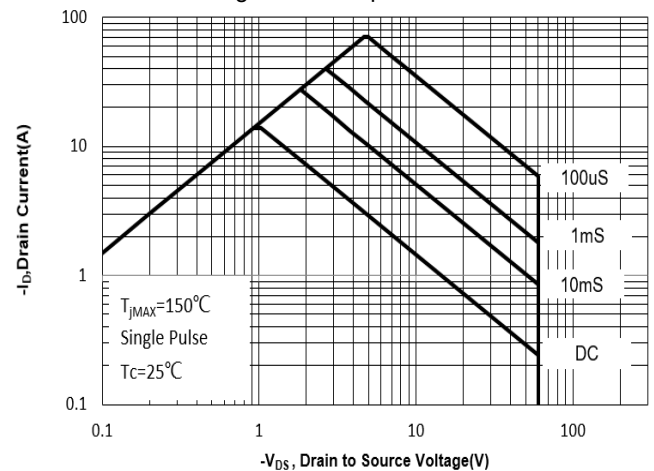


Fig. 12 Safe Operation Area



## Electrical Characteristics Curves

Fig. 13 Normalized Maximum Transient Thermal Impedance( $Z_{\theta JC}$ )

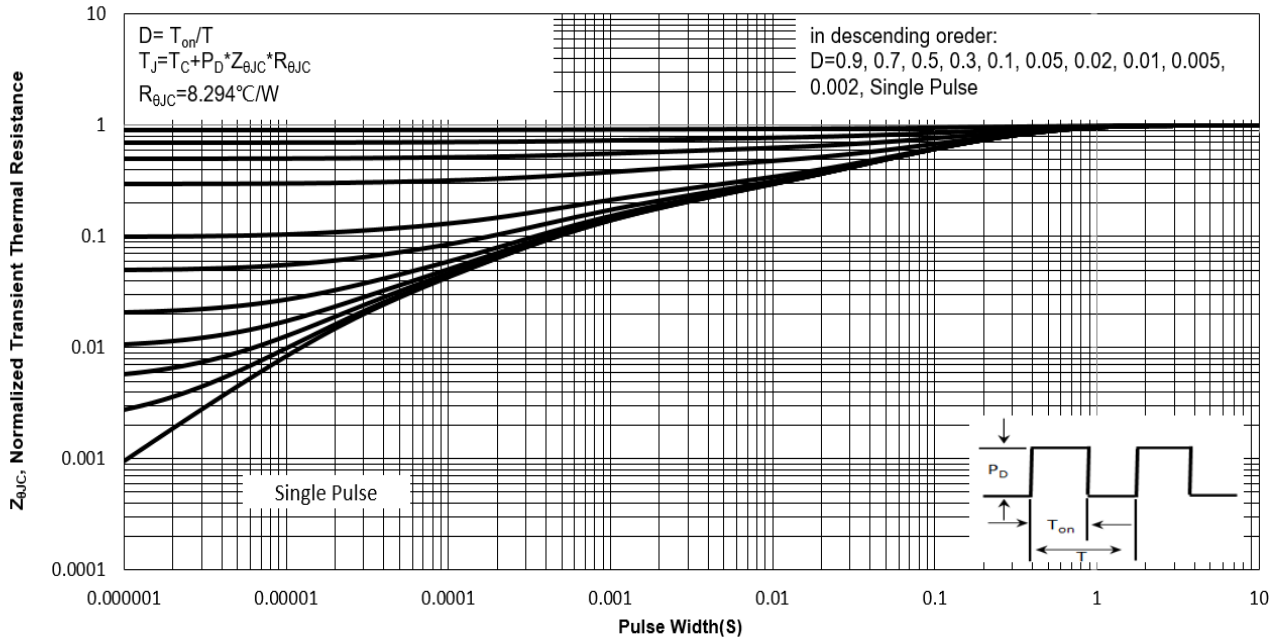
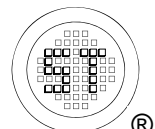
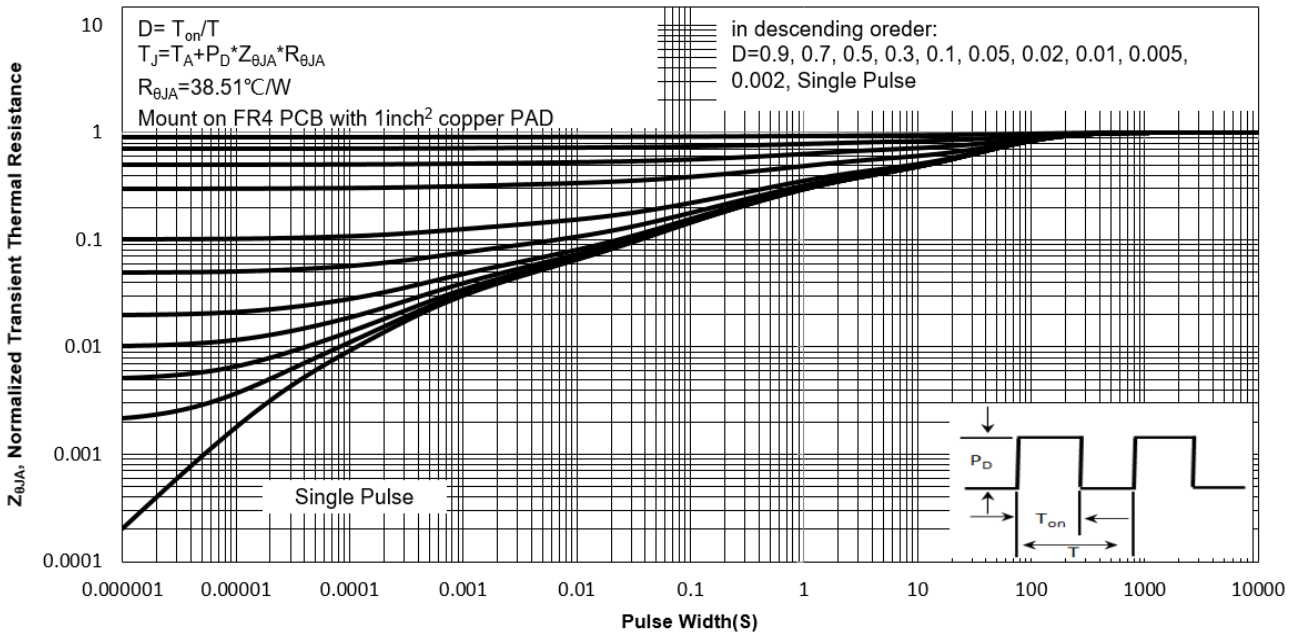


Fig. 14 Normalized Maximum Transient Thermal Impedance( $Z_{\theta JA}$ )



## Test Circuits

Fig.1-1 Switching times test circuit

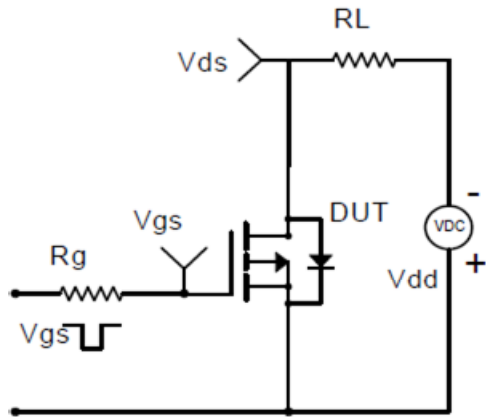


Fig.1-2 Switching Waveform

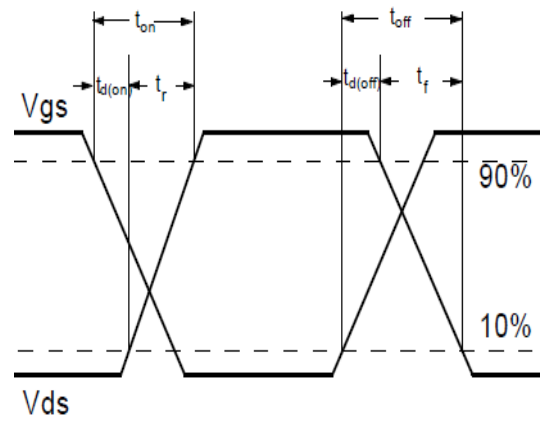


Fig.2-1 Gate charge test circuit

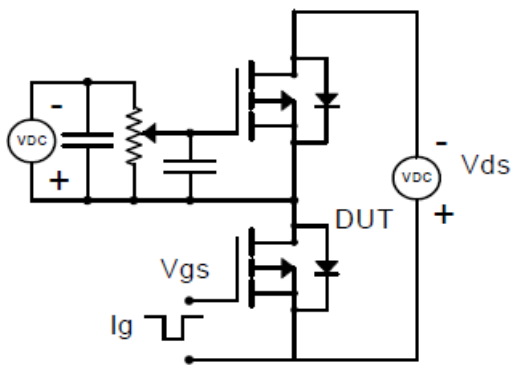


Fig.2-2 Gate charge waveform

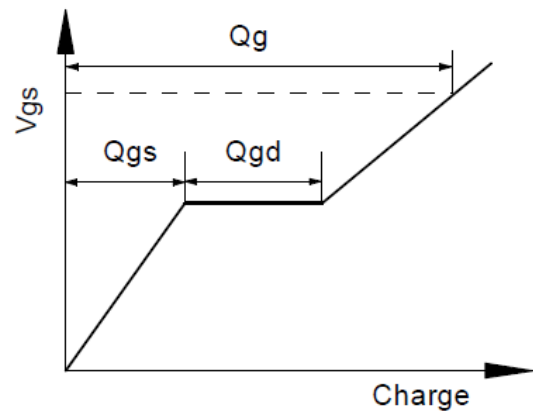


Fig.3-1 Avalanche test circuit

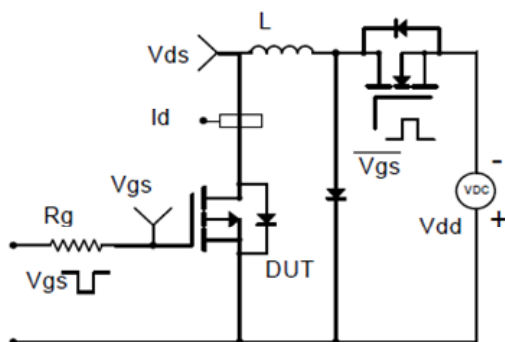
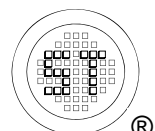
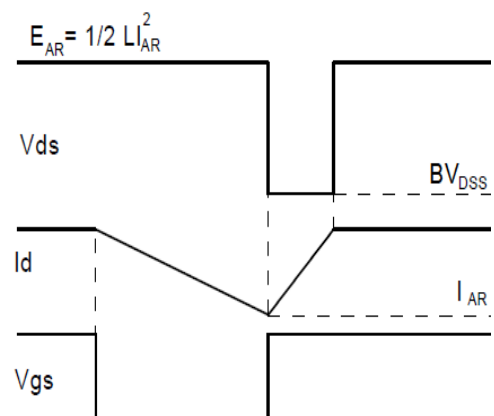


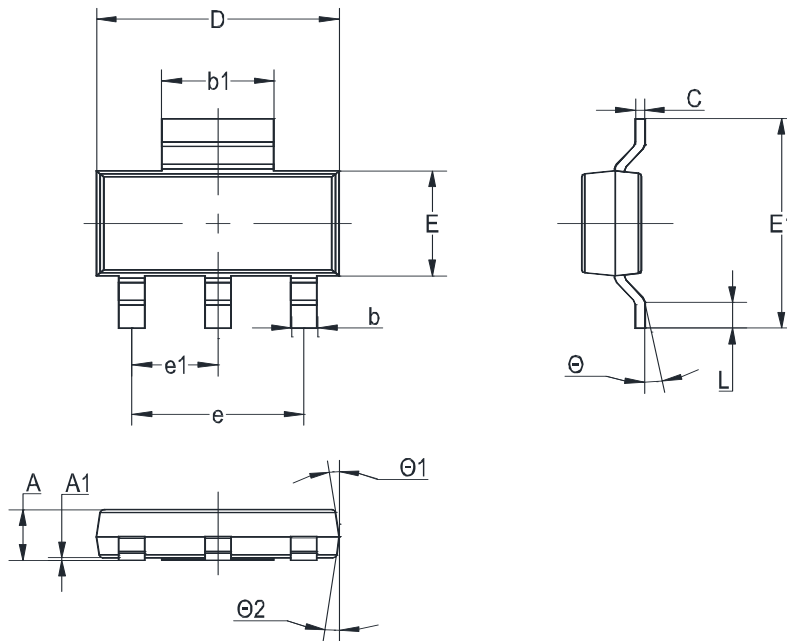
Fig.3-2 Avalanche waveform



# WTQ06P450LS-HAF

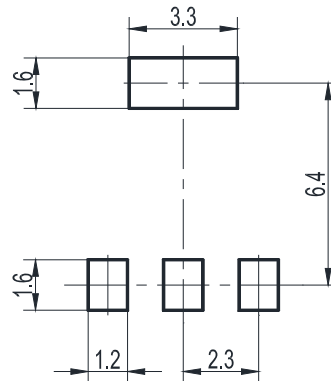
## Package Outline (Dimensions in mm)

SOT-223



Unit	A	A1	b	b1	C	D	E	E1	e	e1	L	Θ	Θ1	Θ2
mm	1.8	0.1	0.8	3.1	0.32	6.7	3.7	7.3	4.6	2.3	1.1	10°	7°	7°
	1.5	MAX	0.6	2.9	0.22	6.3	3.3	6.7	TYP	TYP	0.7	0°	0°	0°

## Recommended Soldering Footprint



## Packing information

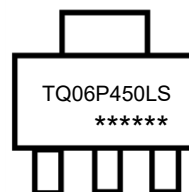
Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
SOT-223	12	8 ± 0.1	0.315 ± 0.004	330	13	3,000

## Marking information

" TQ06P450LS " = Part No.

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

Font type: Arial



Disclaimer: Our company reserve the right to make modifications, enhancements, improvements, corrections or other changes to improve product design, functions and reliability, anytime without notice.

