

# WPV65N400-HAF

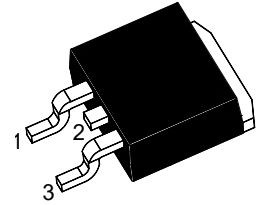
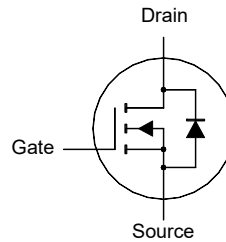
## N-Channel Enhancement Mode MOSFET

### Features

- Low  $R_{DS(on)}$
- Low Gate Charge
- Halogen and Antimony Free(HAF), RoHS compliant

### Application

- DC-DC converters
- Lighting



1.Gate 2.Drain 3.Source  
TO-263 Plastic Package

### Key Parameters

Parameter	Value	Unit
$BV_{DSS}$	650	V
$R_{DS(ON)}$ Max	0.4 @ $V_{GS} = 10$ V	$\Omega$
$V_{GS(th)}$ typ	3	V
$Q_g$ typ	20 @ $V_{GS} = 10$ V	nC

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	650	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Drain Current	$I_D$	9 5.6	A
		$T_c = 25^\circ\text{C}$ $T_c = 100^\circ\text{C}$	
Peak Drain Current, Pulsed <sup>1)</sup>	$I_{DM}$	25	A
Avalanche Current	$I_{AS}$	3	A
Single Pulse Avalanche Energy <sup>2)</sup>	$E_{AS}$	355.5	mJ
Power Dissipation	$P_D$	87	W
		$T_c = 25^\circ\text{C}$	
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	$R_{\theta JC}$	1.44	$^\circ\text{C/W}$
Thermal Resistance from Junction to Ambient <sup>3)</sup>	$R_{\theta JA}$	35	$^\circ\text{C/W}$

<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  $T_J = 25^\circ\text{C}$ ,  $L = 79$  mH,  $R_g = 25$   $\Omega$ ,  $I_D = 3$  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.

# WPV65N400-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 $I_D = 250 \mu\text{A}$	$BV_{DSS}$	650	-	-	V
Drain-Source Leakage Current at $V_{DS} = 650 \text{ V}$	$I_{DSS}$	-	-	1	$\mu\text{A}$
Gate Leakage Current at $V_{GS} = \pm 30 \text{ V}$	$I_{GSS}$	-	-	$\pm 100$	nA
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	$V_{GS(th)}$	2	-	4	V
Drain-Source On-State Resistance at $V_{GS} = 10 \text{ V}$ , $I_D = 5.5 \text{ A}$	$R_{DS(on)}$	-	0.33	0.4	$\Omega$
<b>DYNAMIC PARAMETERS</b>					
Forward Transconductance at $V_{DS} = 5 \text{ V}$ , $I_D = 5.5 \text{ A}$	$g_{fs}$	-	5.8	-	S
Gate Resistance at $V_{GS} = 0 \text{ V}$ , $V_{DS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	$R_g$	-	3.7	-	$\Omega$
Input Capacitance at $V_{GS} = 0 \text{ V}$ , $V_{DS} = 100 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{iss}$	-	636	-	pF
Output Capacitance at $V_{GS} = 0 \text{ V}$ , $V_{DS} = 100 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{oss}$	-	41	-	pF
Reverse Transfer Capacitance at $V_{GS} = 0 \text{ V}$ , $V_{DS} = 100 \text{ V}$ , $f = 1 \text{ MHz}$	$C_{rss}$	-	7	-	pF
Gate charge total at $V_{DS} = 325 \text{ V}$ , $I_D = 5.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$	$Q_g$	-	20	-	nC
Gate to Source Charge at $V_{DS} = 325 \text{ V}$ , $I_D = 5.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$	$Q_{gs}$	-	4	-	nC
Gate to Drain Charge at $V_{DS} = 325 \text{ V}$ , $I_D = 5.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$	$Q_{gd}$	-	9	-	nC
Turn-On Delay Time at $V_{DS} = 325 \text{ V}$ , $I_D = 5.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_g = 24 \Omega$	$t_{d(on)}$	-	30	-	ns
Turn-On Rise Time at $V_{DS} = 325 \text{ V}$ , $I_D = 5.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_g = 24 \Omega$	$t_r$	-	17	-	ns
Turn-Off Delay Time at $V_{DS} = 325 \text{ V}$ , $I_D = 5.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_g = 24 \Omega$	$t_{d(off)}$	-	31	-	ns
Turn-Off Fall Time at $V_{DS} = 325 \text{ V}$ , $I_D = 5.5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_g = 24 \Omega$	$t_f$	-	35	-	ns
<b>Body-Diode PARAMETERS</b>					
Drain-Source Diode Forward Voltage at $I_S = 1 \text{ A}$ , $V_{GS} = 0 \text{ V}$	$V_{SD}$	-	-	1.4	V
Body-Diode Continuous Current	$I_S$	-	-	9	A
Body-Diode Continuous Current, Pulsed	$I_{SM}$	-	-	25	A
Body Diode Reverse Recovery Time at $I_S = 5.5 \text{ A}$ , $di/dt = 100 \text{ A} / \mu\text{s}$	$t_{rr}$	-	300	-	ns
Body Diode Reverse Recovery Charge at $I_S = 5.5 \text{ A}$ , $di/dt = 100 \text{ A} / \mu\text{s}$	$Q_{rr}$	-	2.5	-	$\mu\text{C}$

# WPV65N400-HAF

## Electrical Characteristics Curves

Fig. 1 Typical Output Characteristic

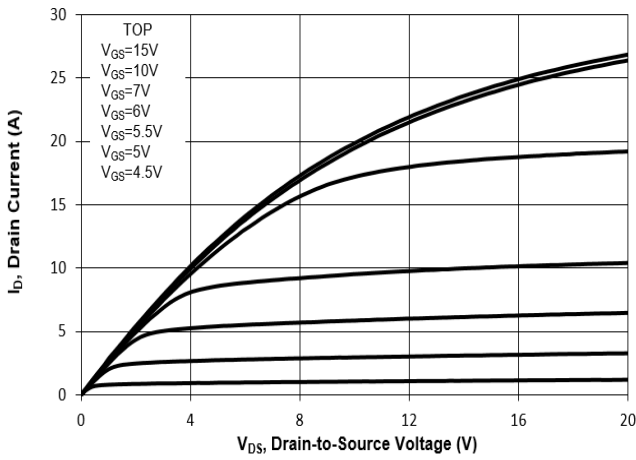


Fig. 2 Typical Transfer Characteristic

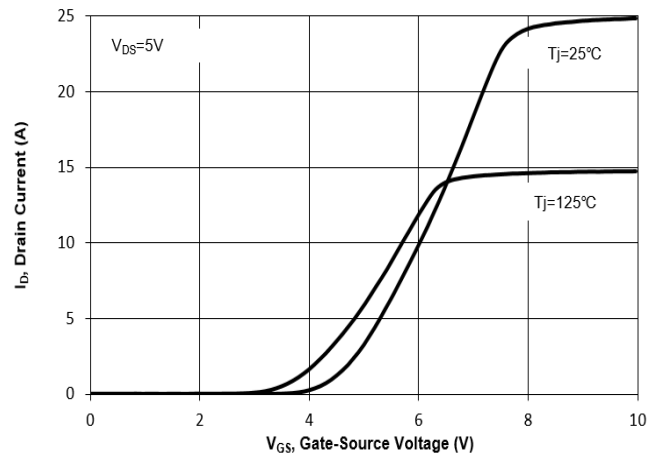


Fig. 3 on-Resistance vs. Drain Current

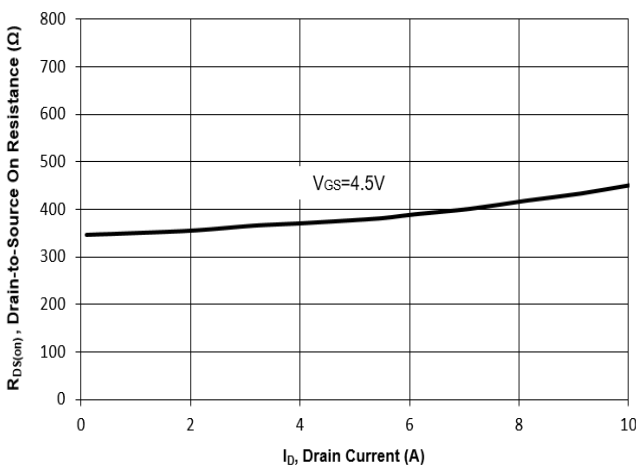


Fig. 4 on-Resistance vs. Gate Voltage

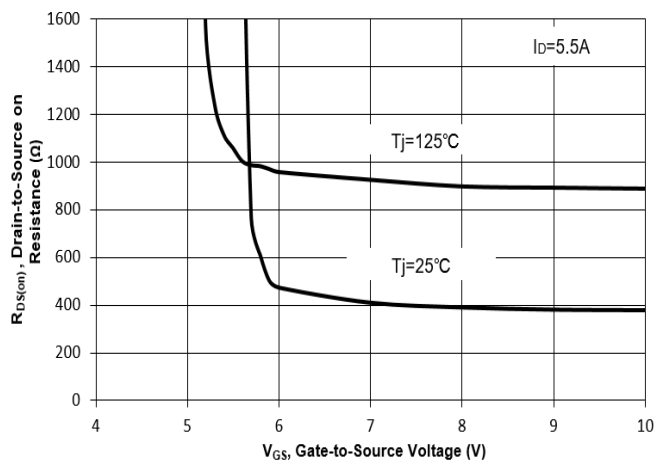


Fig. 5 on-Resistance vs.  $T_J$

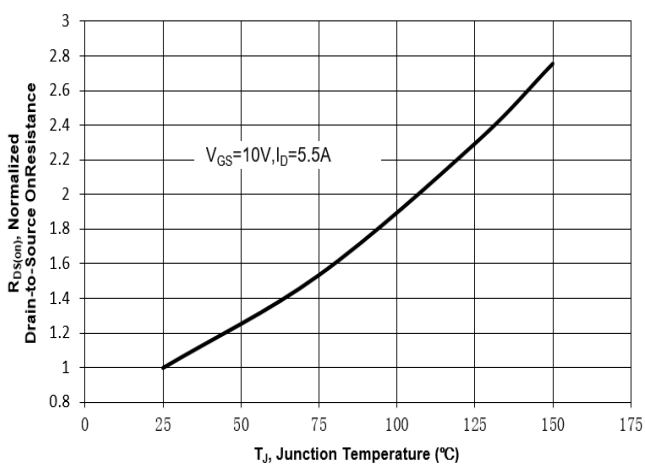
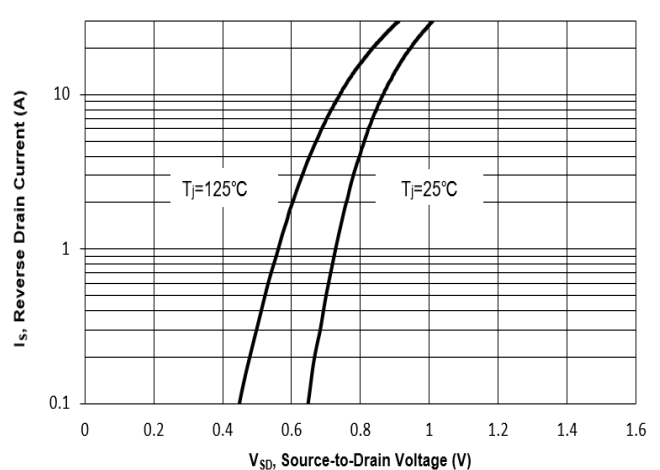


Fig. 6 Typical Body-Diode Forward Characteristic



# WPV65N400-HAF

## Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

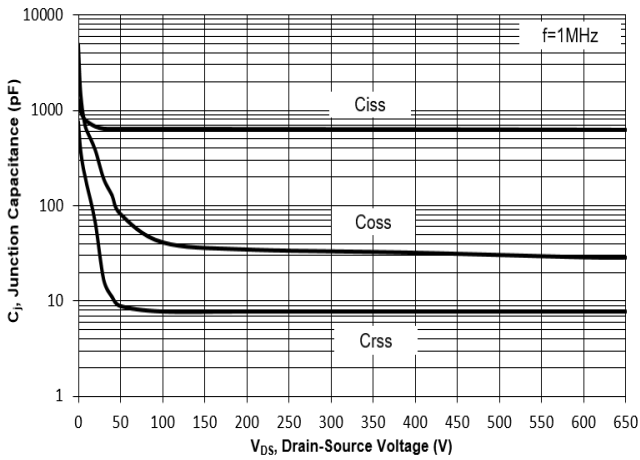


Fig. 8 Drain-Source Leakage Current vs.  $T_J$

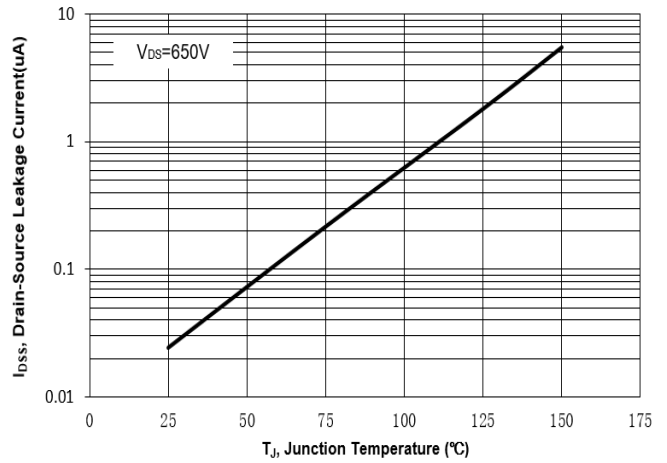


Fig. 9  $V_{(BR)DSS}$  vs. Junction Temperature

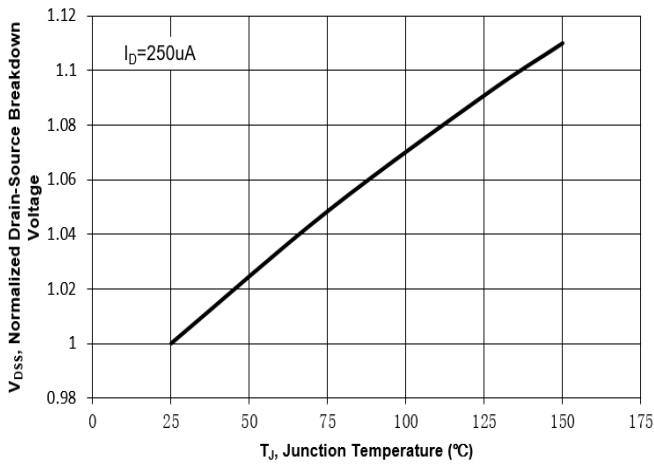


Fig. 10 Gate Threshold Variation vs.  $T_J$

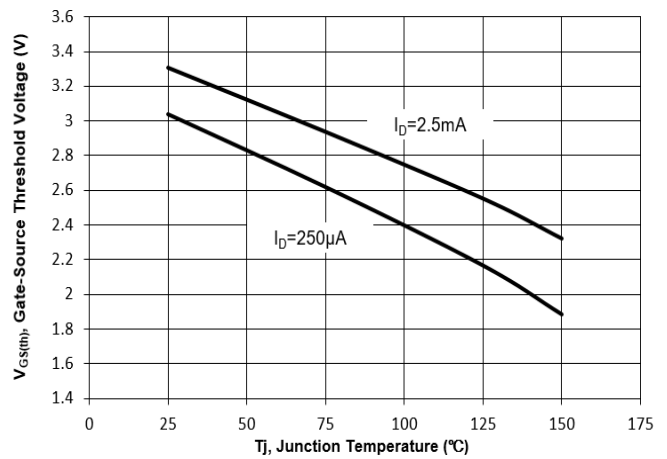


Fig. 11 Gate Charge

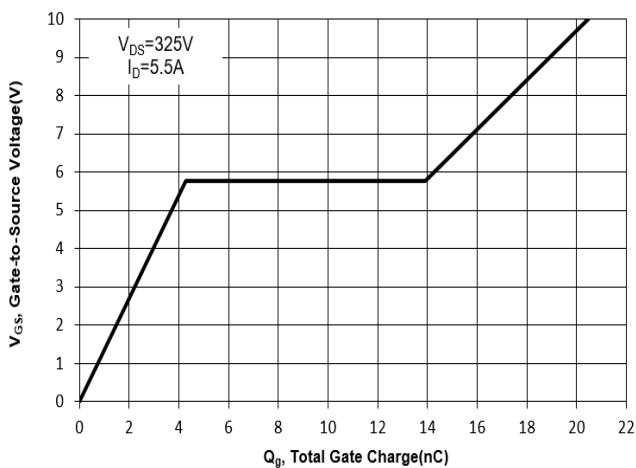
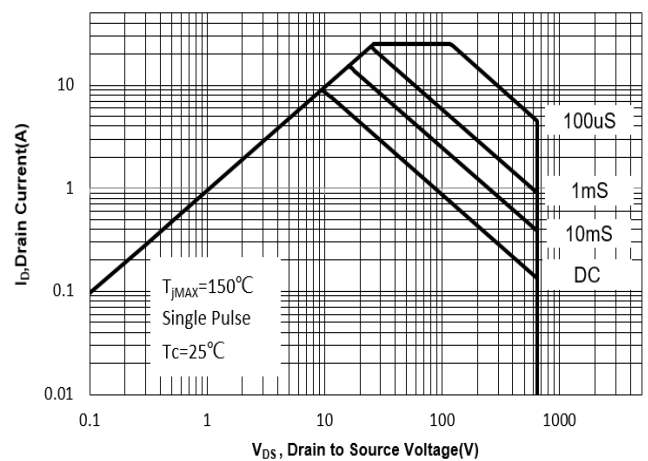


Fig. 12 Safe Operation Area



# WPV65N400-HAF

## Electrical Characteristics Curves

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

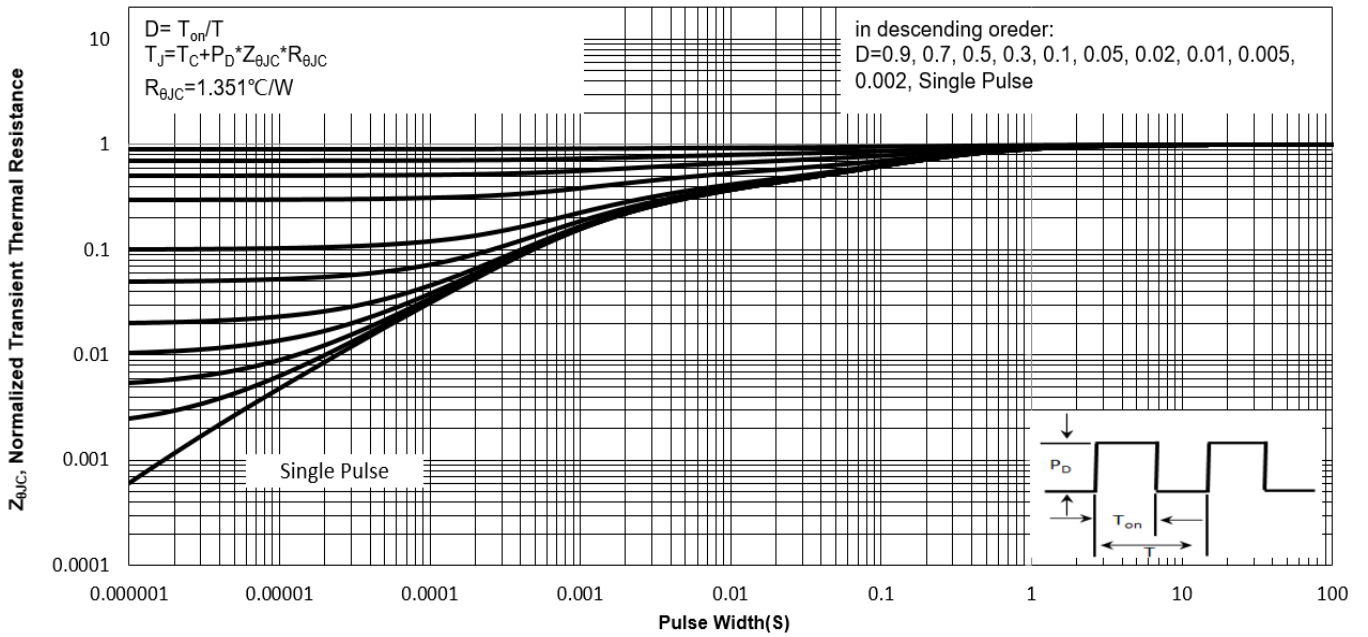
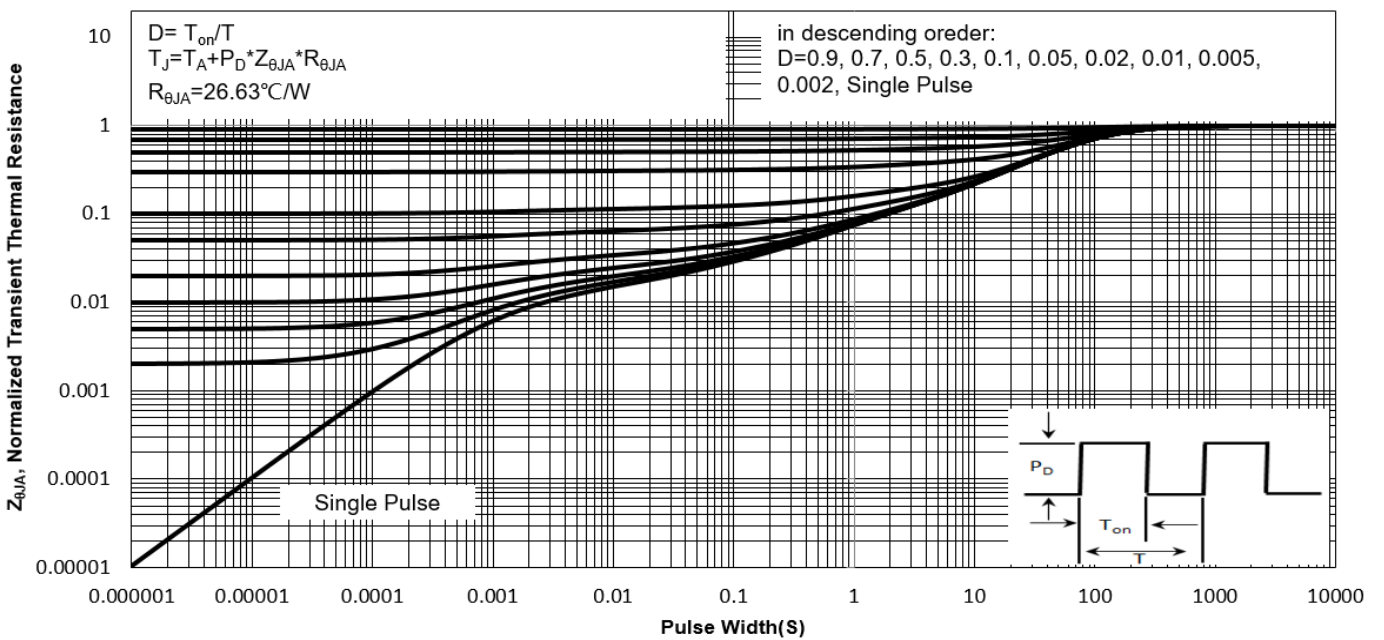


Fig. 14 Normalized Maximum Transient Thermal Impedance( $Z_{\theta JA}$ )



## Test Circuits

Fig.1-1 Switching times test circuit

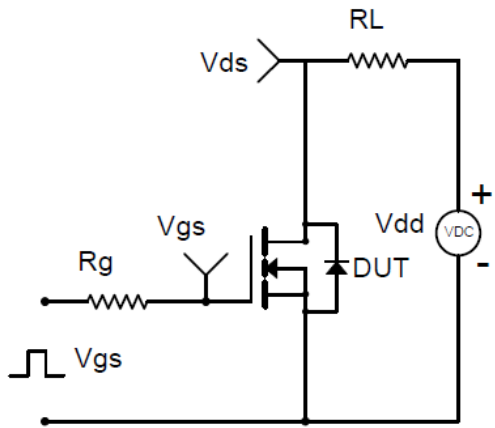


Fig.1-2 Switching Waveform

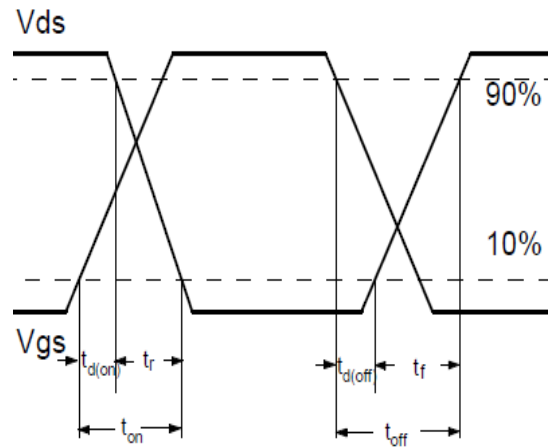


Fig.2-1 Gate charge test circuit

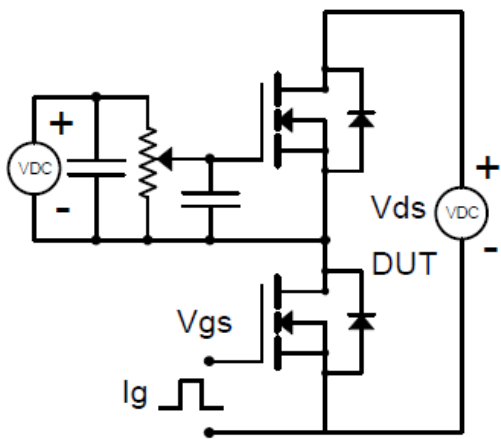


Fig.2-2 Gate charge waveform

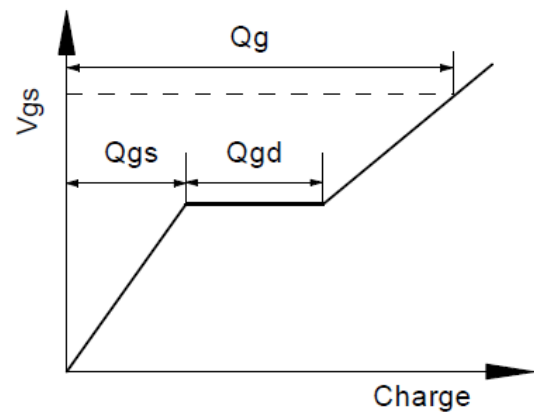


Fig.3-1 Avalanche test circuit

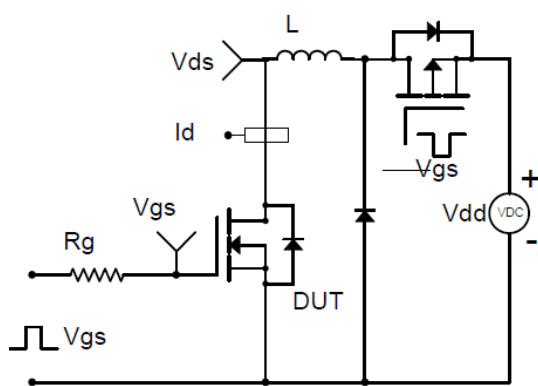
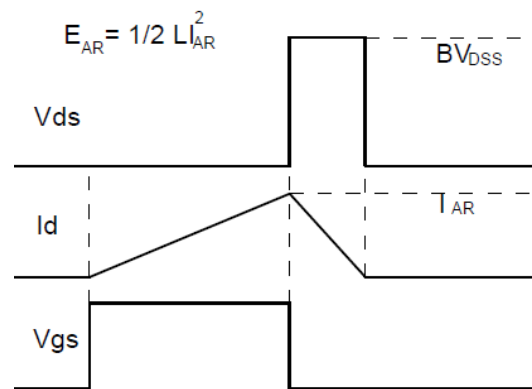


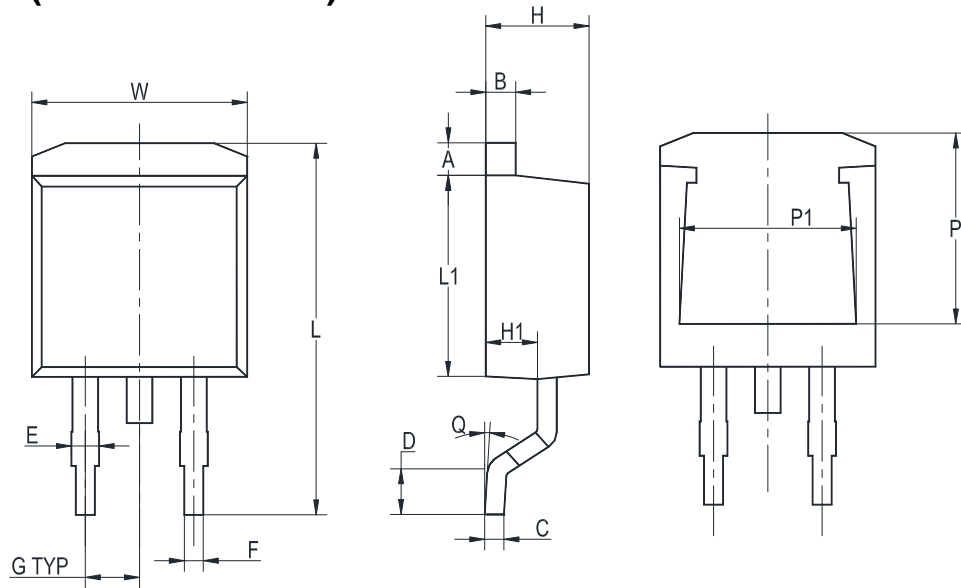
Fig.3-2 Avalanche waveform



# WPV65N400-HAF

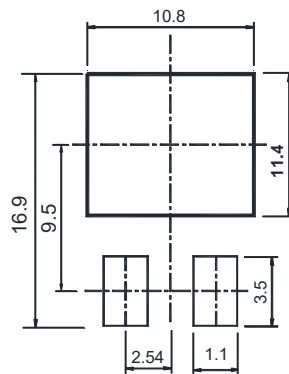
## Package Outline (Dimensions in mm)

TO-263



UNIT	A	B	C	D	E	F	G	W	H	H1	L	L1	Q	P	P1
mm	1.5	1.5	0.5	2.60	1.6	0.94	2.54	10.5	4.8	2.9	16.5	8.7	8°	7.6	8.2
	1.1	1.1	0.3	2.15	1.1	0.68	TYP	9.6	4.4	2.5	14.5	8.2	MAX	7.1	7.4

## Recommended Soldering Footprint



## Packing information

Package	Carton Quantity	Box Quantity	Base Quantity	Delivery Mode
TO-263	5 K / Carton	1 K / Box	50 pcs / Tube	Tube

## Marking information

" PV65N400 " = Part No.

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

Font type: Arial



**Winning Team**  
互創國際

**IMPORTANT NOTICE**

Our company and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes to improve product design, functions and reliability without further notice to this document and any product described herein.

Statements described herein regarding the reliability and suitability of products is for illustrative purposes only. Products specifically described herein are not authorized for use as critical components in life support devices, automobile, military, aviation or aerospace only with the written approval of our company.

The information contained herein is presented only as guidance for product use. No license to any intellectual property rights is granted under this document. No responsibility is assumed by our company for any infringement of patents or any other intellectual property rights of third party that may result from the use of the product.