

## Description

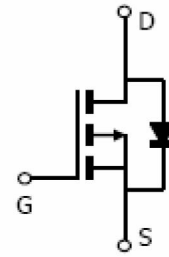
The **VS6P04-S8** uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

## General Features

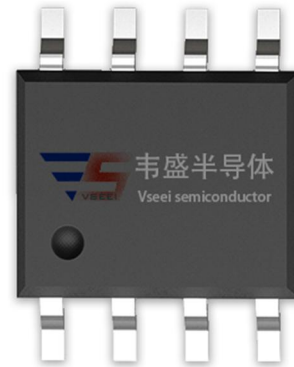
- $V_{DS} = -40V, I_D = -6A$   
 $R_{DS(ON)} < 40m\Omega @ V_{GS} = -10V$
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

## Application

- Power switching application
- Hard switched and high frequency circuits
- DC-DC converter



**Schematic diagram**



## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
<b>VS6P04-S8</b>	<b>VS6P04-S8</b>	SOP-8	Ø330mm	12mm	

## Absolute Maximum Ratings ( $T_A = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	-6	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	-4.2	A
Pulsed Drain Current	$I_{DM}$	30	A
Maximum Power Dissipation	$P_D$	2.2	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

## Thermal Characteristic

Thermal Resistance ,Junction-to-Ambient <sup>(Note 2)</sup>	$R_{\theta JA}$	57	$^\circ C/W$
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**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

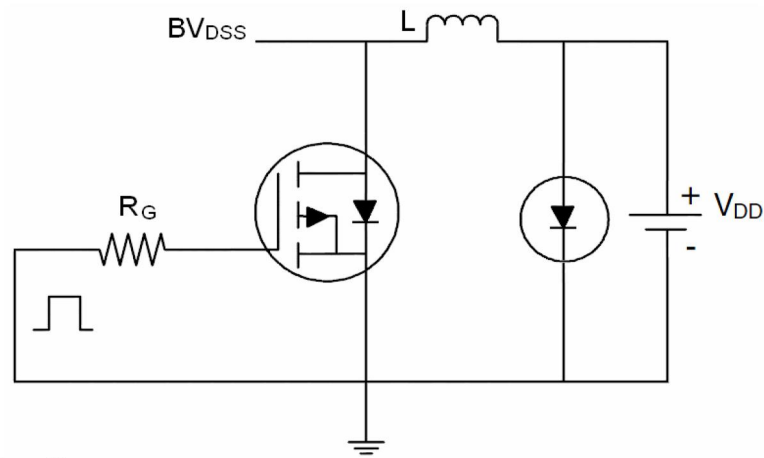
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-40	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-40V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.1	-1.9	-2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-5A$	-	35	40	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=-5V, I_D=-5A$	13	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	$C_{ISS}$	$V_{DS}=-20V, V_{GS}=0V,$ $F=1.0MHz$	-	1150	-	PF
Output Capacitance	$C_{OSS}$		-	97	-	PF
Reverse Transfer Capacitance	$C_{RSS}$		-	72	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-20V, ,R_L=2\Omega$ $V_{GS}=-10V, R_{GEN}=3\Omega$	-	6.2	-	nS
Turn-on Rise Time	$t_r$		-	8.4	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	28	-	nS
Turn-Off Fall Time	$t_f$		-	10	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=-20V, I_D=-5A,$ $V_{GS}=-10V$	-	19	-	nC
Gate-Source Charge	$Q_{gs}$		-	4.4	-	nC
Gate-Drain Charge	$Q_{gd}$		-	4.2	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=-6A$	-	-	1.2	V
Diode Forward Current (Note 2)	$I_S$		-	-	-6	A

**Notes:**

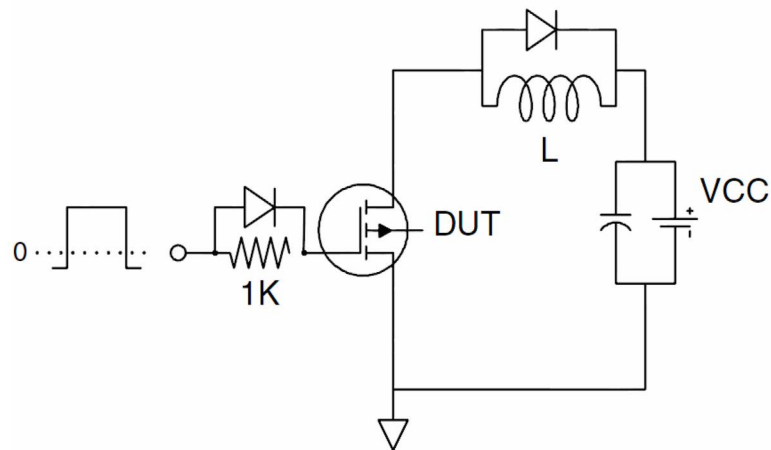
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

## Test Circuit

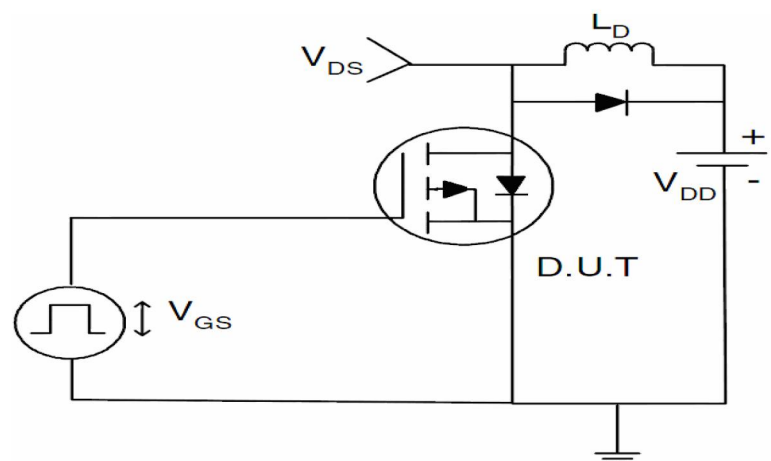
### 1) $E_{AS}$ Test Circuit



### 2) Gate Charge Test Circuit



### 3) Switch Time Test Circuit



## Typical Electrical and Thermal Characteristics (Curves)

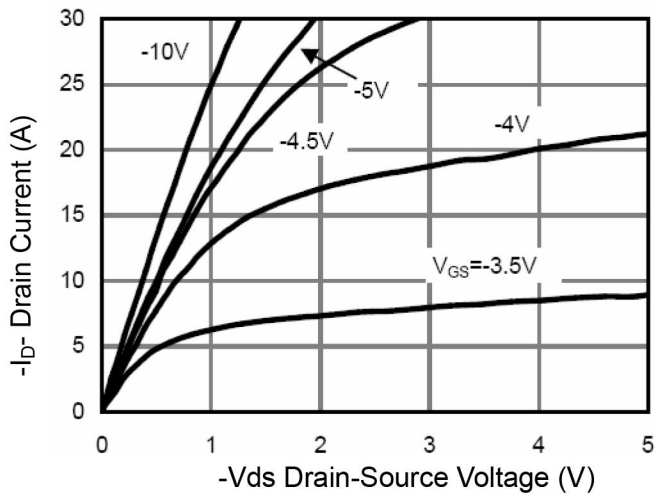


Figure 1 Output Characteristics

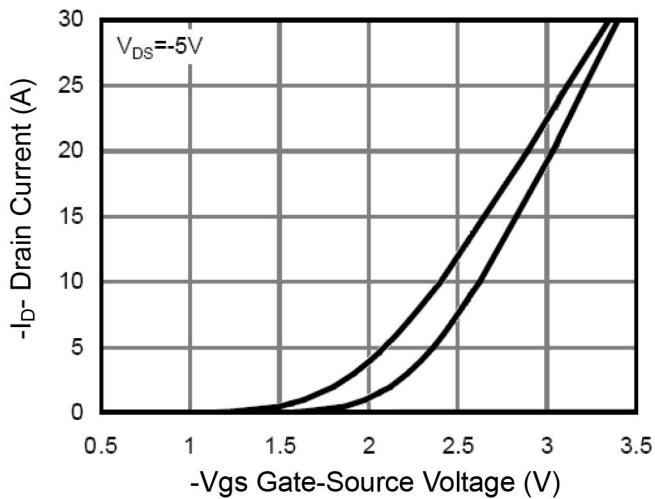


Figure 2 Transfer Characteristics

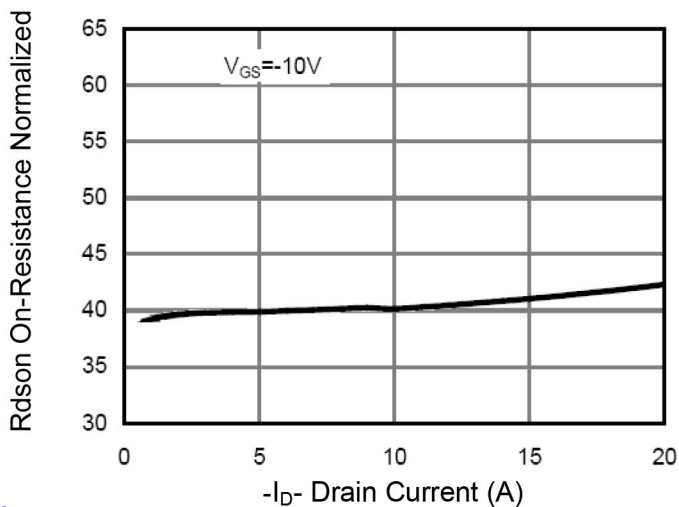


Figure 3 Rdson- Drain Current

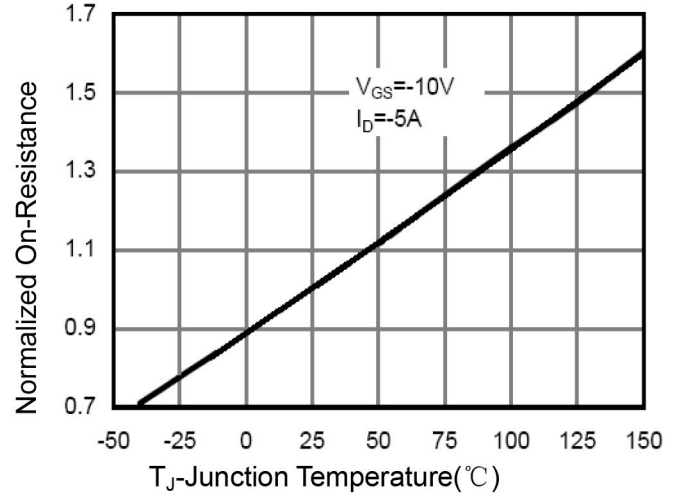


Figure 4 Rdson-Junction Temperature

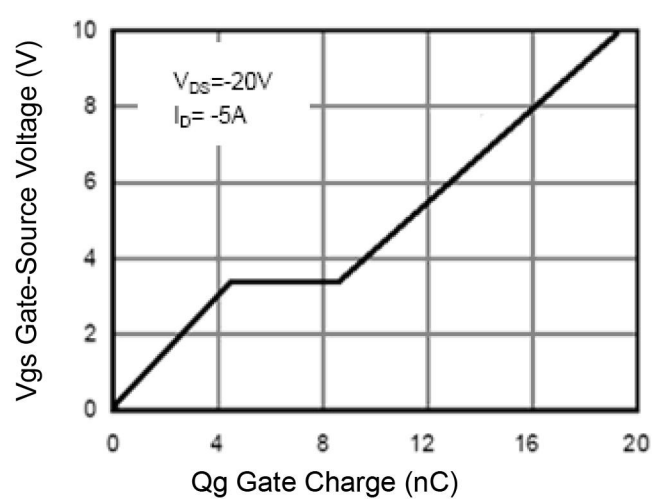


Figure 5 Gate Charge

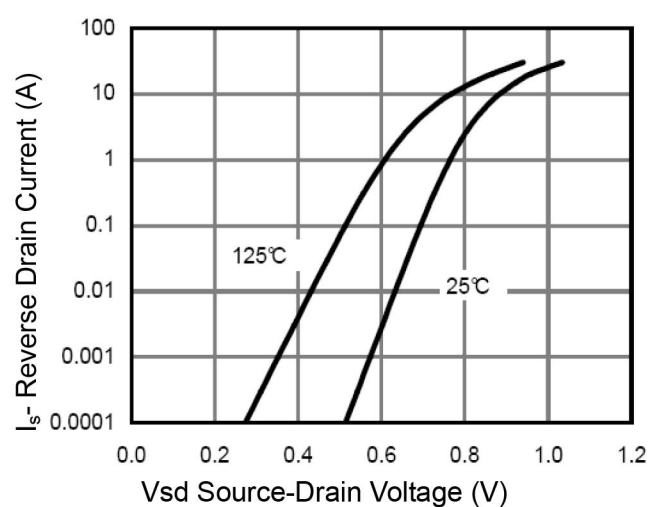


Figure 6 Source- Drain Diode Forward

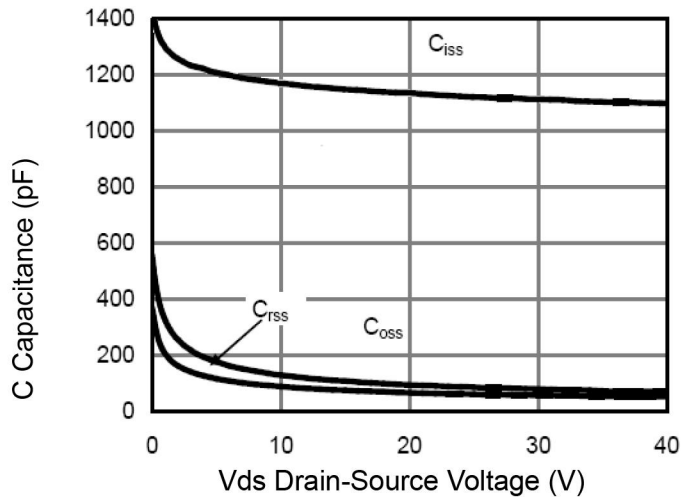


Figure 7 Capacitance vs Vds

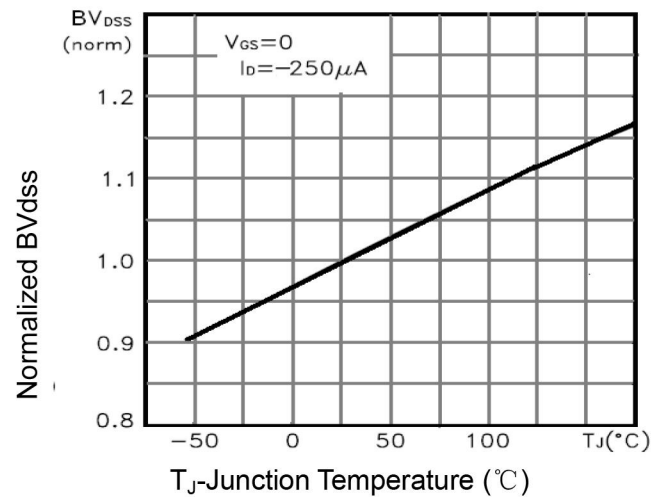
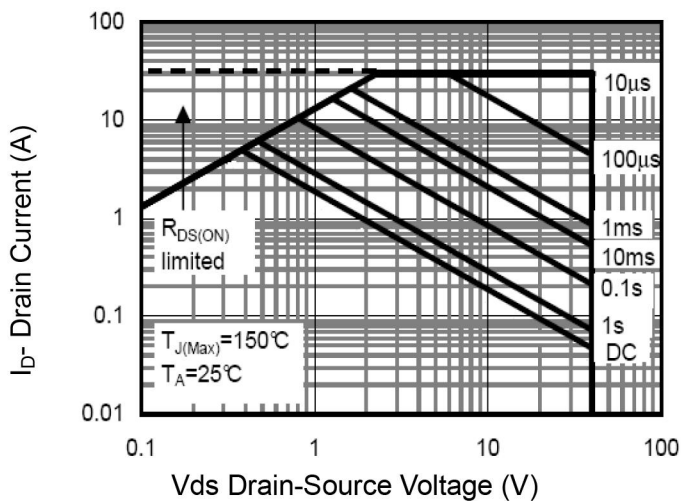

Figure 9  $BV_{DSS}$  vs Junction Temperature


Figure 8 Safe Operation Area

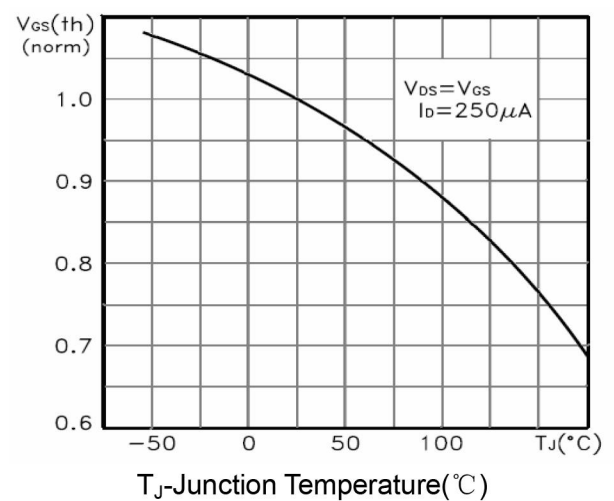
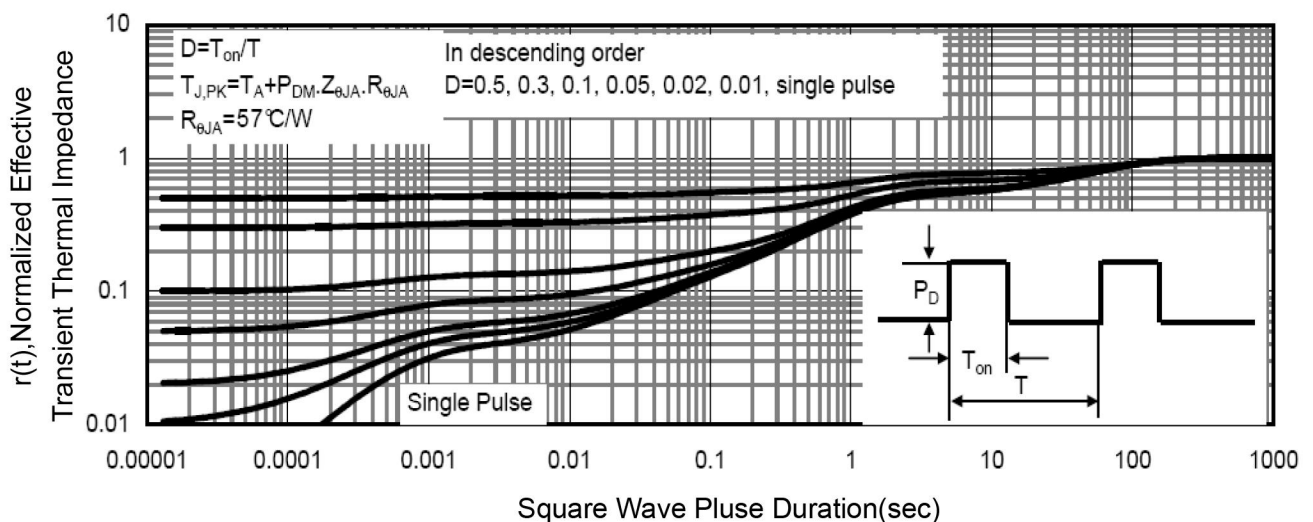

Figure 10  $V_{GS(th)}$  vs Junction Temperature


Figure 11 Normalized Maximum Transient Thermal Impedance