

Description

The VST04P060 uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification

Application

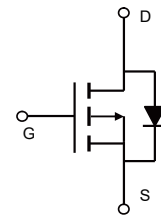
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS} = -40V, I_D = -80A$
 $R_{DS(ON)} = 6.3m\Omega$ (typical) @ $V_{GS} = -10V$
 $R_{DS(ON)} = 9.0m\Omega$ (typical) @ $V_{GS} = -4.5V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating



DFN5x6



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VST04P060	VST04P060-D56	DFN5x6	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	$I_D(T_C = 25^\circ C)$	-80	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(T_C = 100^\circ C)$	-56	A
Drain Current-Continuous ($T_A = 25^\circ C$)	$I_D(T_A = 25^\circ C)$	-12.8	A
Pulsed Drain Current	I_{DM}	-320	A
Maximum Power Dissipation($T_C = 25^\circ C$)	$P_D(T_C = 25^\circ C)$	75	W
Maximum Power Dissipation($T_A = 25^\circ C$)	$P_D(T_A = 25^\circ C)$	2.3	W
Pulsed Drain Current	I_{DM}	-320	A
Derating factor		0.6	W/ $^\circ C$
Single pulse avalanche energy ^(Note 3)	E_{AS}	500	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	1.67	$^{\circ}C/W$
Thermal Resistance,Junction-to-Ambient ^(Note 1)	$R_{\theta JA}$	55	$^{\circ}C/W$

Electrical Characteristics ($T_C=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =-250μA	-40		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-40V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.1	-1.6	-2.2	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-20A	-	6.3	7.5	mΩ
		V _{GS} =-4.5V, I _D =-20A	-	9.0	12.0	mΩ
Gate resistance	R _G		-	2.0	-	Ω
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-20A	-	30	-	S
Dynamic Characteristics (Note2)						
Input Capacitance	C _{ISS}	V _{DS} =-20V, V _{GS} =0V, F=1.0MHz	-	3700	-	PF
Output Capacitance	C _{OSS}		-	880	-	PF
Reverse Transfer Capacitance	C _{RSS}		-	20	-	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-20V, I _D =-20A V _{GS} =-10V, R _G =1.6Ω	-	10.5	-	nS
Turn-on Rise Time	t _r		-	4	-	nS
Turn-Off Delay Time	t _{d(off)}		-	35	-	nS
Turn-Off Fall Time	t _f		-	5	-	nS
Total Gate Charge	Q _g	V _{DS} =-20V, I _D =-20A, V _{GS} =-10V	-	57	-	nC
Gate-Source Charge	Q _{gs}		-	9.8		nC
Gate-Drain Charge	Q _{gd}		-	7.3		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =-20A	-		-1.2	V
Diode Forward Current	I _S		-	-	-80	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =-20A	-		24	nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs	-		68	nC

Notes:

1. The value of $R_{\theta JA}$ is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^{\circ}C$.
2. Guaranteed by design, not subject to production
3. EAS condition : $T_J=25^{\circ}C, V_{DD}=-20V, V_G=-10V, L=0.5mH, R_g=25\Omega$

Typical Electrical and Thermal Characteristics

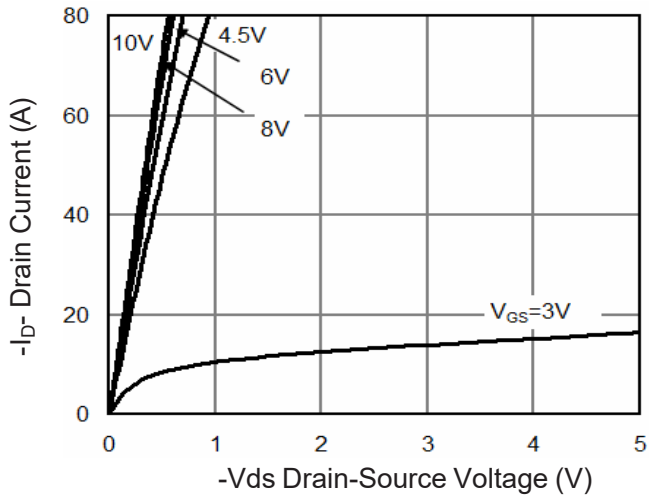


Figure 1 Output Characteristics

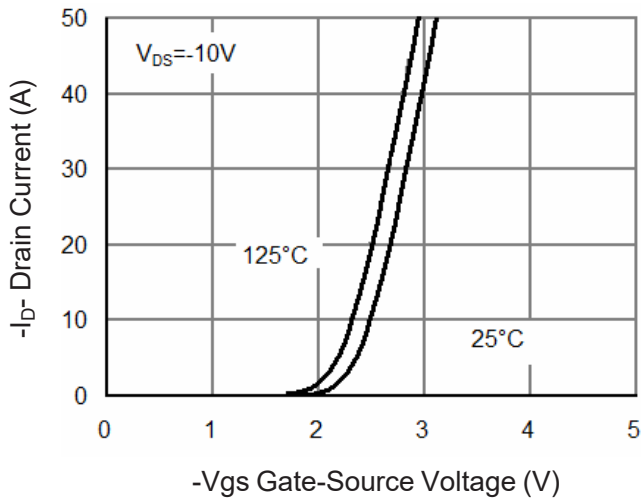


Figure 2 Transfer Characteristics

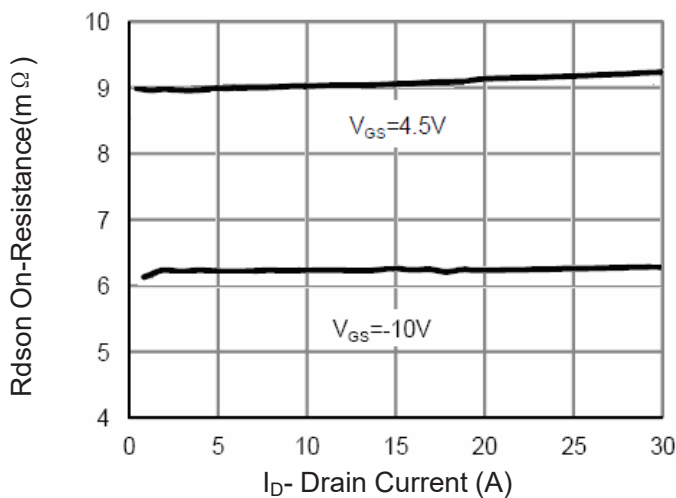


Figure 3 Rdson- Drain Current

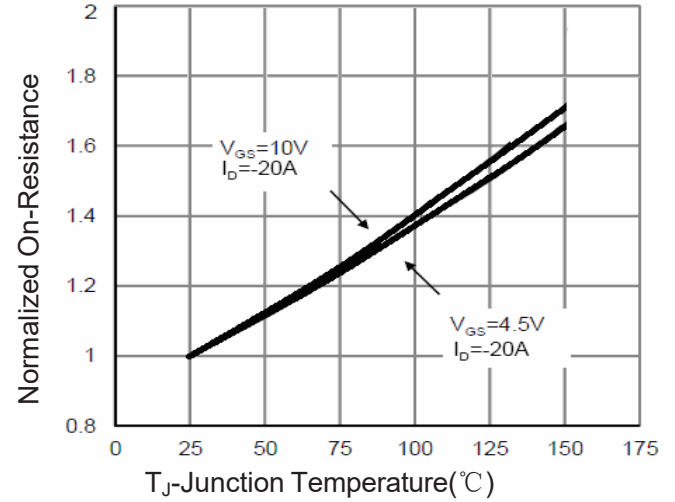


Figure 4 Rdson-Junction Temperature

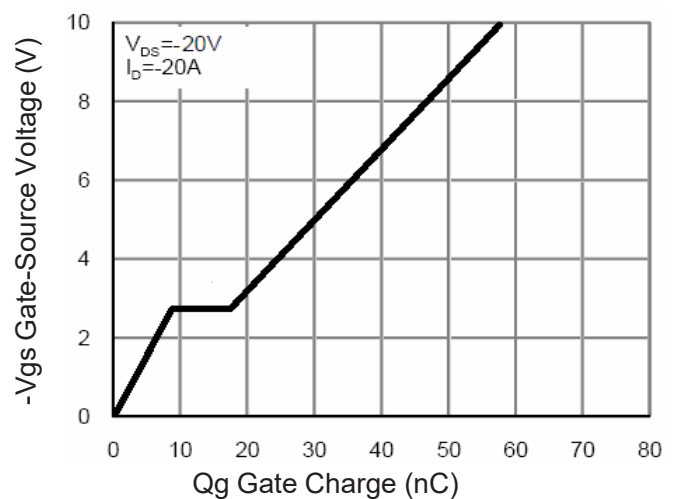


Figure 5 Gate Charge

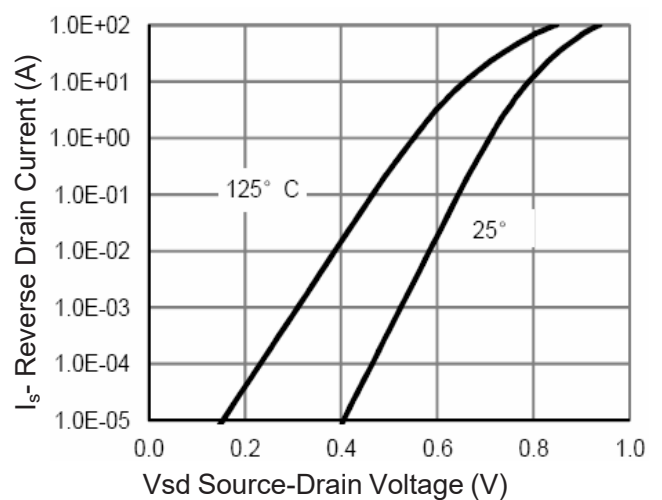
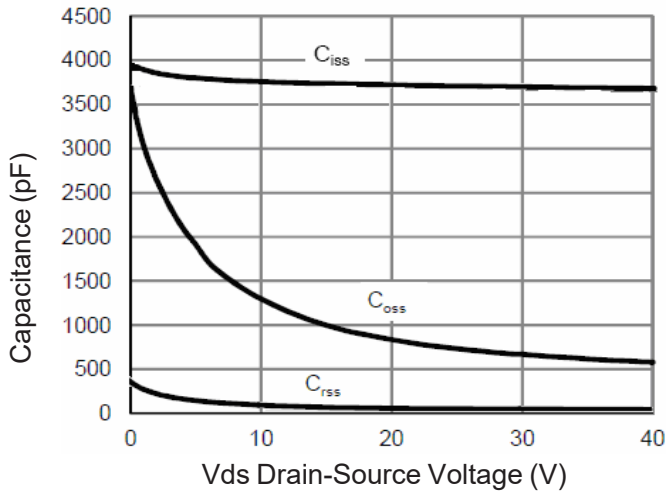
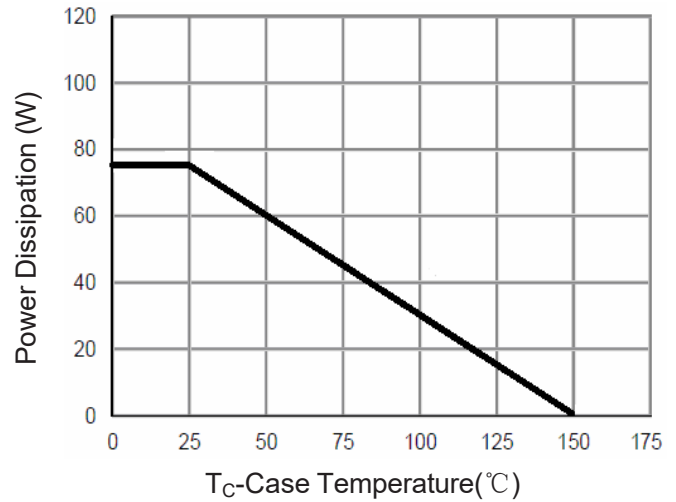
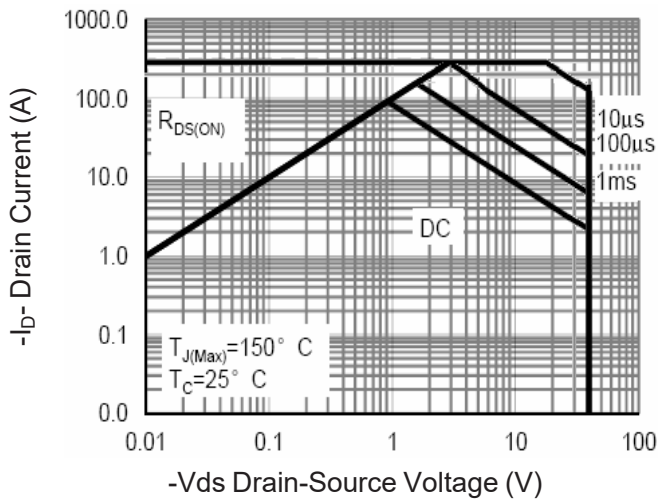
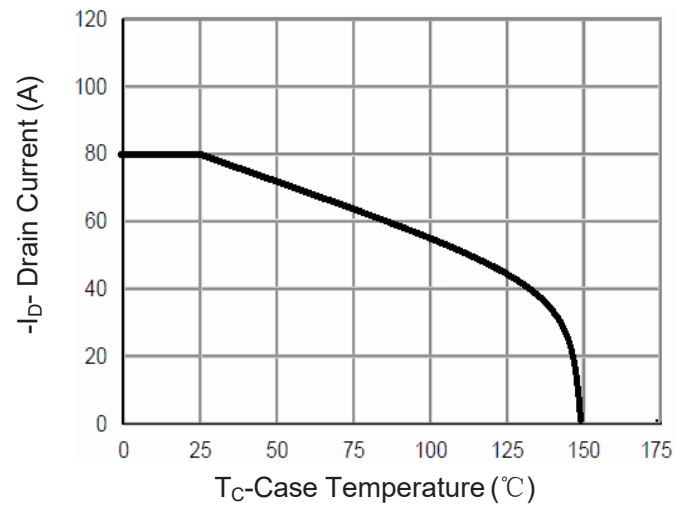
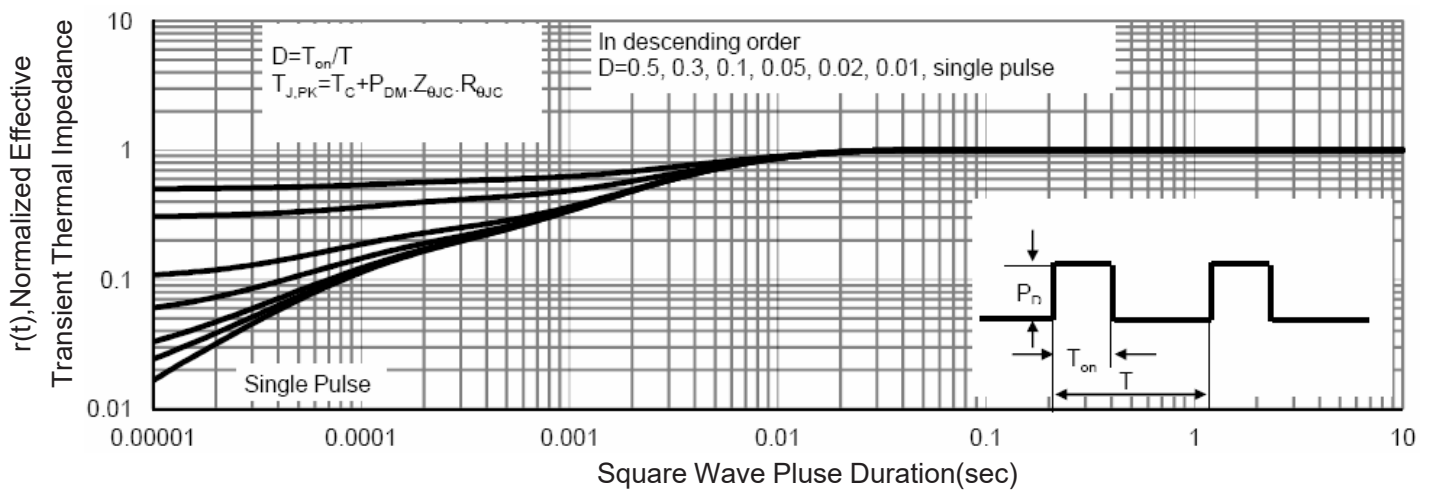


Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 Power De-rating

Figure 8 Safe Operation Area

Figure 10 Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance