

Description

The series of devices uses **Super Trench II** 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

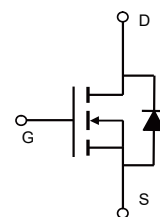
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS}=120V, I_D=120A$
 $R_{DS(ON)}=4.7m\Omega$, typical @ $V_{GS}=10V$
 $R_{DS(ON)}=6.0m\Omega$, 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
VST12N040	VST12N040-D56	DFN5x6	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	120	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	120	A
Drain Current-Continuous($T_C=100^{\circ}C$)	$I_D(100^{\circ}C)$	85	A
Pulsed Drain Current	I_{DM}	480	A
Maximum Power Dissipation	P_D	160	W
Derating factor		1.28	W/ $^{\circ}C$
Single pulse avalanche energy ^(Note 5)	E_{AS}	540	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^{\circ}C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	0.78	$^{\circ}\text{C/W}$
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Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	120		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =120V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.2	1.7	2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =60A	-	4.7	5.0	mΩ
		V _{GS} =4.5V, I _D =60A	-	6.0	7.0	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =60A		120	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =60V, V _{GS} =0V, F=1.0MHz	-	5786	-	PF
Output Capacitance	C _{oss}		-	391	-	PF
Reverse Transfer Capacitance	C _{rss}		-	6.1	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =60V, I _D =60A, V _{GS} =10V, R _G =3Ω	-	21	-	nS
Turn-on Rise Time	t _r		-	13	-	nS
Turn-Off Delay Time	t _{d(off)}		-	40	-	nS
Turn-Off Fall Time	t _f		-	12	-	nS
Total Gate Charge	Q _g	V _{DS} =60V, I _D =60A, V _{GS} =10V	-	96	-	nC
Gate-Source Charge	Q _{gs}		-	19.8		nC
Gate-Drain Charge	Q _{gd}		-	22.3		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =60A	-		1.2	V
Diode Forward Current (Note 2)	I _S		-	-	120	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =60A di/dt = 100A/μs(Note3)	-	72	-	nS
Reverse Recovery Charge	Q _{rr}		-	140	-	nC

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
5. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=50V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega$

Typical Electrical and Thermal Characteristics

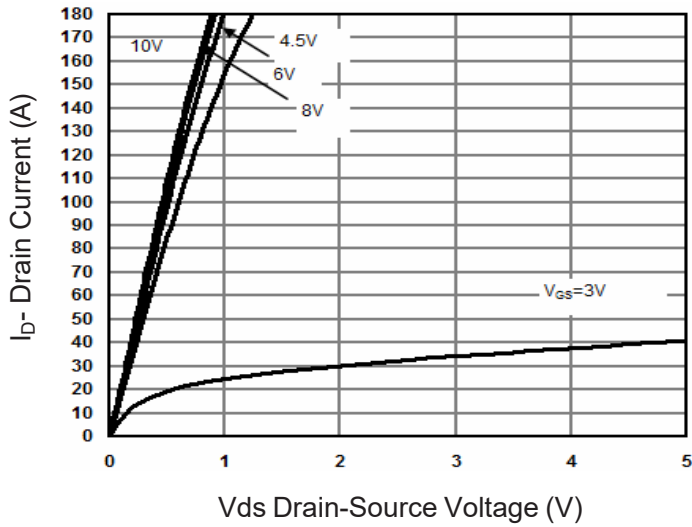


Figure 1 Output Characteristics

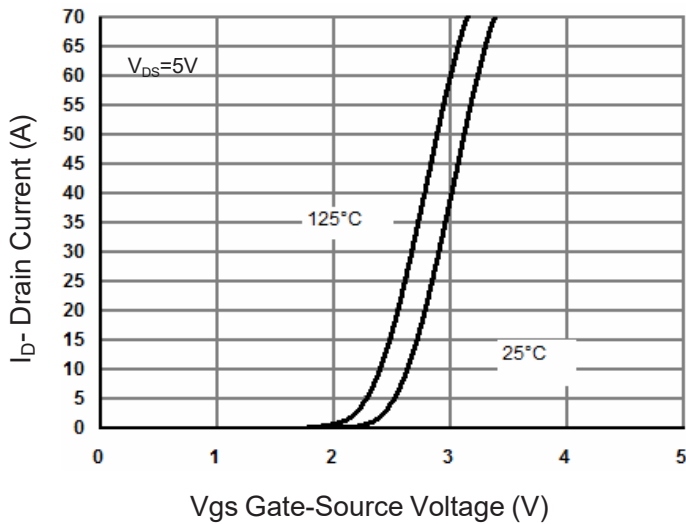


Figure 2 Transfer Characteristics

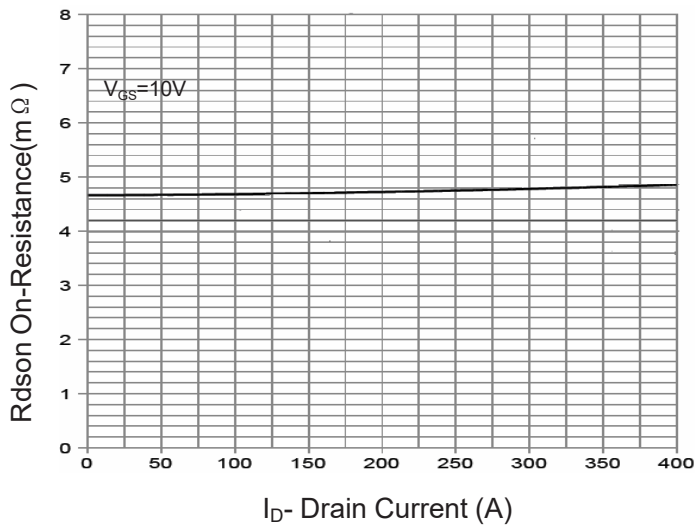


Figure 3 Rdson- Drain Current

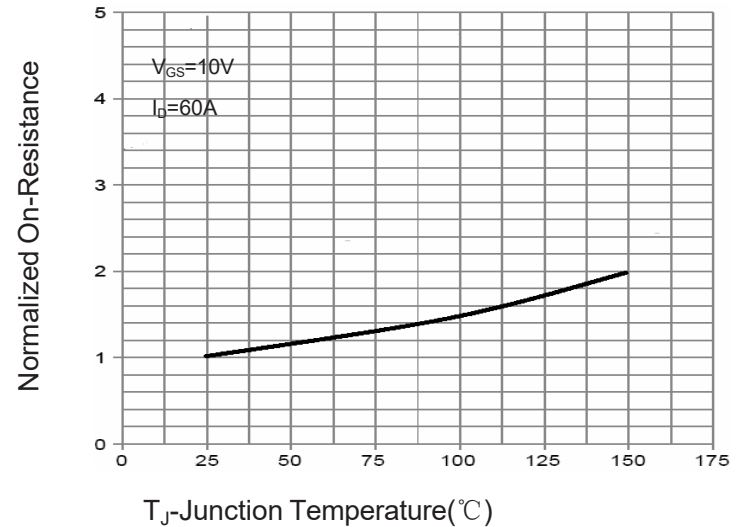


Figure 4 Rdson-Junction Temperature

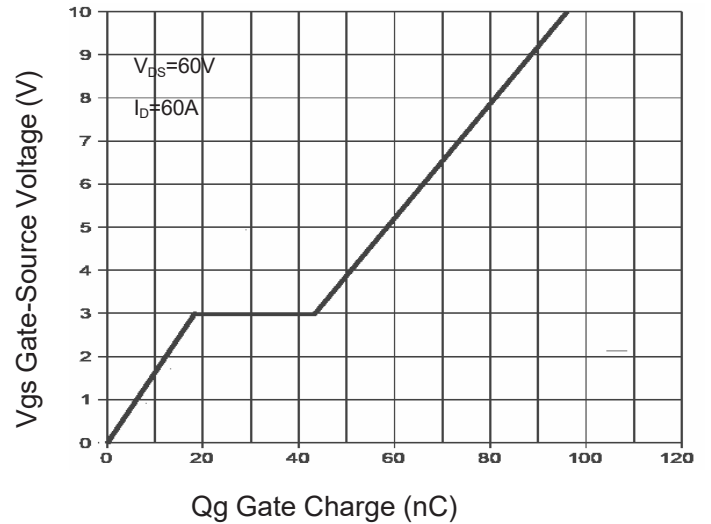


Figure 5 Gate Charge

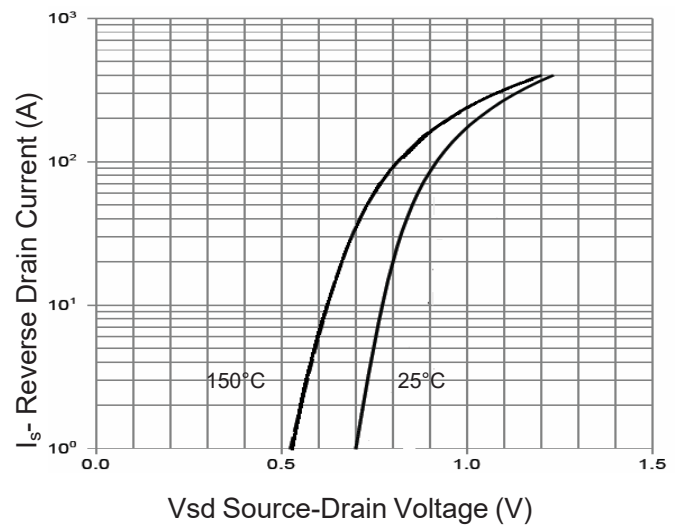
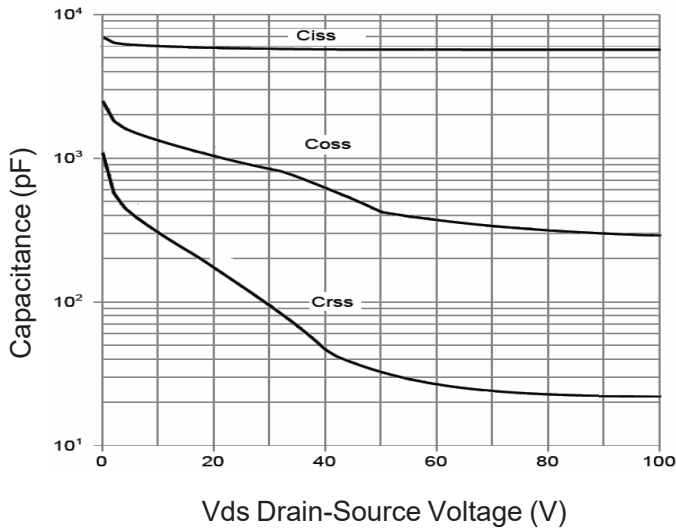
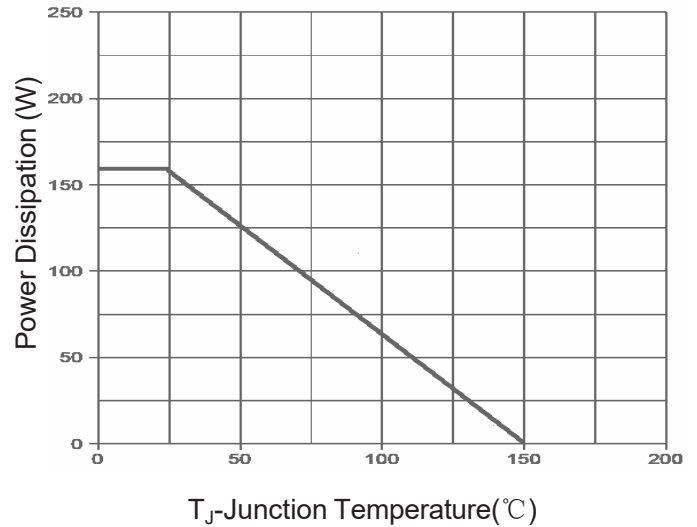


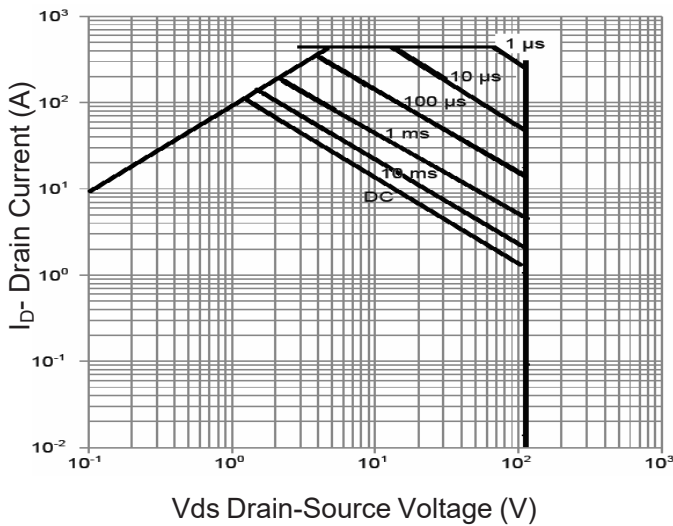
Figure 6 Source- Drain Diode Forward



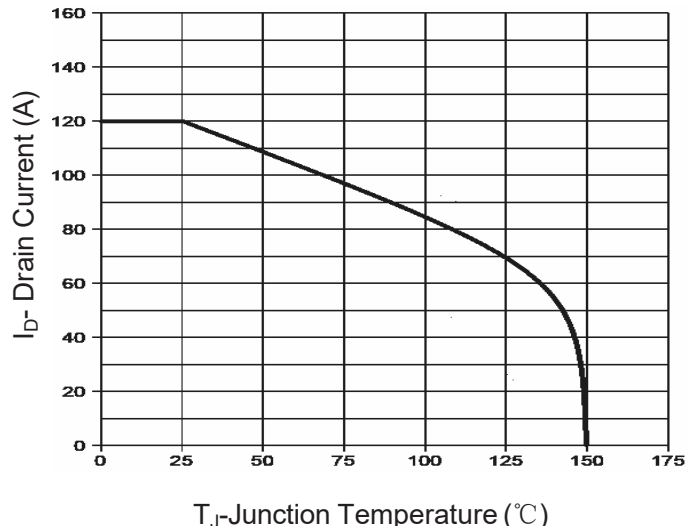
Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



TJ-Junction Temperature(°C)
Figure 9 Power De-rating



Vds Drain-Source Voltage (V)
Figure 8 Safe Operation Area



TJ-Junction Temperature (°C)
Figure 10 Current De-rating

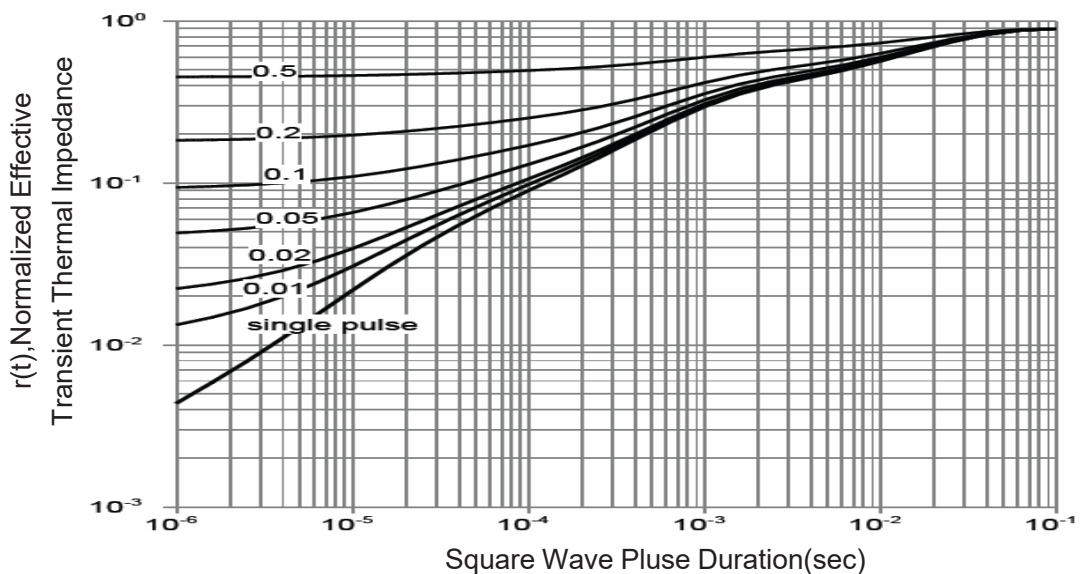


Figure 11 Normalized Maximum Transient Thermal Impedance