

VCRR P-Channel Super Trench Power MOSFET

Description

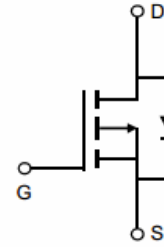
The VCRRP50P80A uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

General Features

- $V_{DS} = -50V, I_D = -80A$
 $R_{DS(ON)} = 7.6m\Omega$ (typical) @ $V_{GS} = -10V$
 $R_{DS(ON)} = 9.4m\Omega$ (typical) @ $V_{GS} = -4.5V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

Application

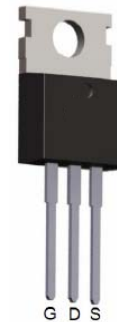
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification



Schematic Diagram



Marking and pin assignment



TO-220-3L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package
VCRRP50P80A		TO-220-3L

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-50	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	-80	A
Drain Current-Continuous($T_C = 100^\circ\text{C}$)	$I_D(100^\circ\text{C})$	-56	A
Pulsed Drain Current	I_{DM}	-300	A
Maximum Power Dissipation	P_D	180	W
Derating factor		1.2	W/ $^\circ\text{C}$
Single pulse avalanche energy ^(Note 5)	E_{AS}	1024	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	0.83	$^{\circ}C/W$
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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}	$V_{GS}=0V, I_D=-250\mu A$	-50		-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-50V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.7	-1.1	-1.8	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-20A$	-	7.6	9	m Ω
		$V_{GS}=-4.5V, I_D=-20A$	-	9.4	11.8	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-20A$	-	35	-	S
Dynamic Characteristics ^(Note 4)						
Input Capacitance	C_{iss}	$V_{DS}=-25V, V_{GS}=0V,$ $F=1.0MHz$	-	4414	-	PF
Output Capacitance	C_{oss}		-	1352	-	PF
Reverse Transfer Capacitance	C_{rss}		-	22	-	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-25V, I_D=-20A$ $V_{GS}=-10V, R_G=1.6\Omega$	-	12.5	-	nS
Turn-on Rise Time	t_r		-	5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	45	-	nS
Turn-Off Fall Time	t_f		-	8	-	nS
Total Gate Charge	Q_g	$V_{DS}=-25V, I_D=-20A,$ $V_{GS}=-10V$	-	65.5	-	nC
Gate-Source Charge	Q_{gs}		-	12.7	-	nC
Gate-Drain Charge	Q_{gd}		-	8	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V_{SD}	$V_{GS}=0V, I_S=-20A$	-		-1.2	V
Diode Forward Current ^(Note 2)	I_S		-	-	-80	A
Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}C, I_F = -20A$ $di/dt = 100A/\mu s$ ^(Note 3)	-		30	nS
Reverse Recovery Charge	Q_{rr}		-		75	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 : $T_J=25^{\circ}C, V_{DD}=-25V, V_G=-10V, L=0.5mH, R_g=25\Omega$

Typical Electrical and Thermal Characteristics

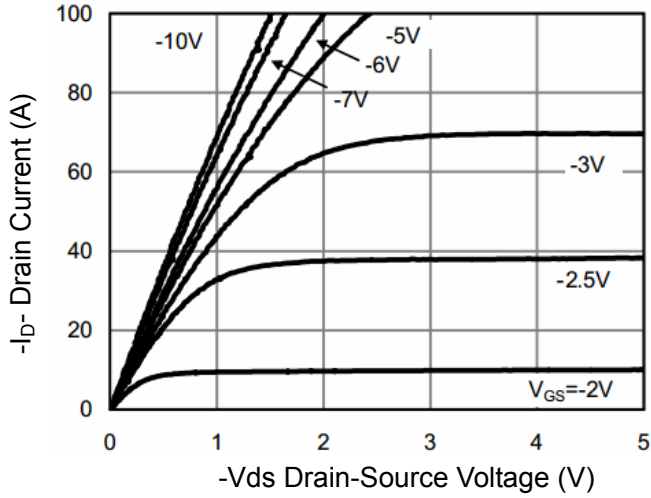


Figure 1 Output Characteristics

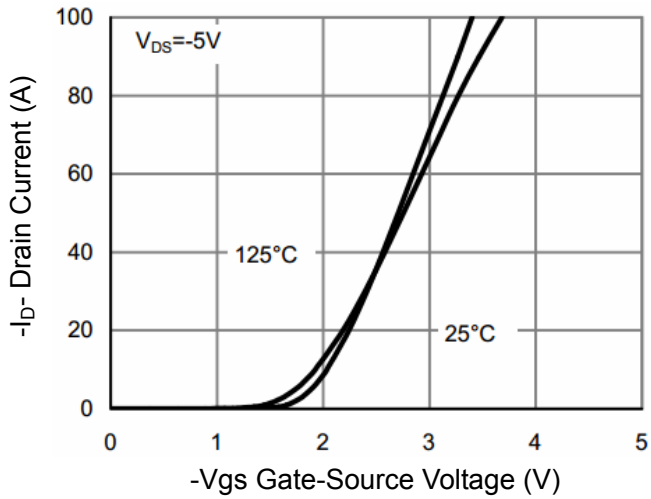


Figure 2 Transfer Characteristics

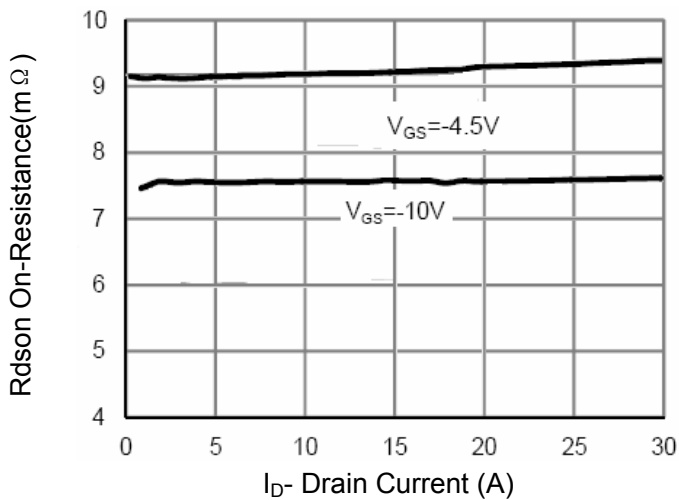


Figure 3 Rdson- Drain Current

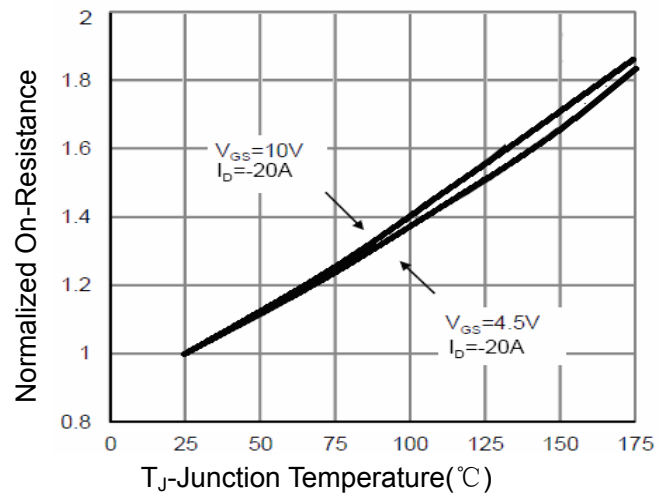


Figure 4 Rdson-Junction Temperature

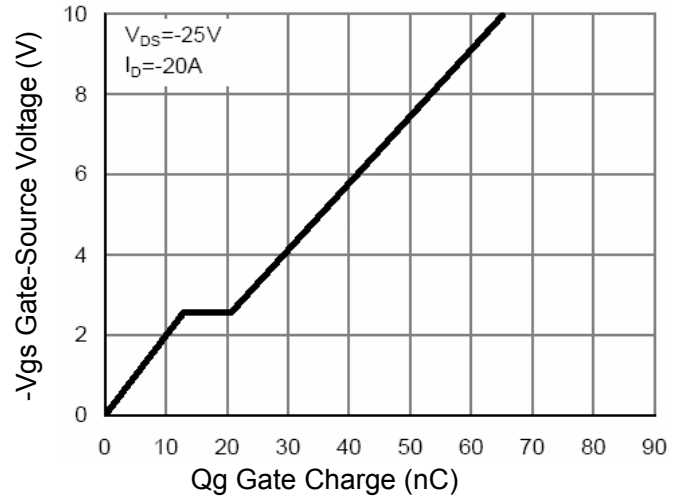


Figure 5 Gate Charge

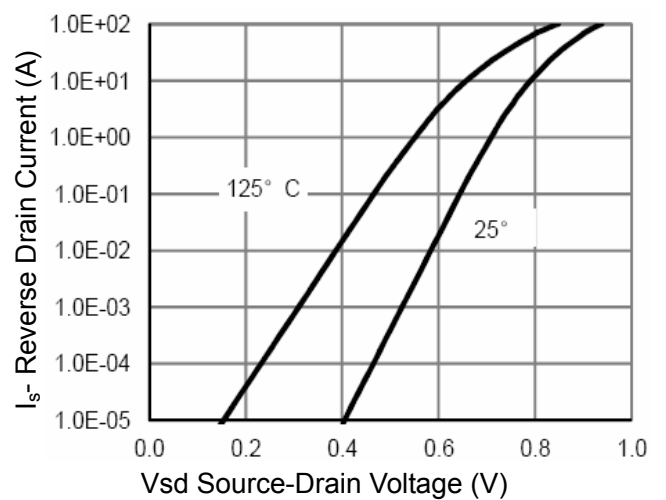


Figure 6 Source- Drain Diode Forward

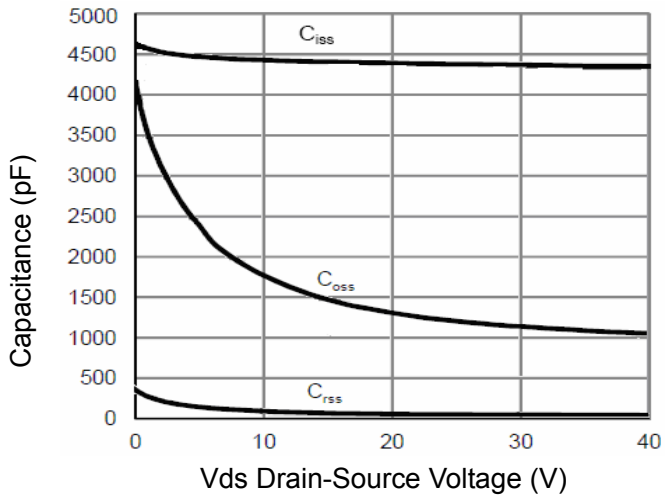


Figure 7 Capacitance vs Vds

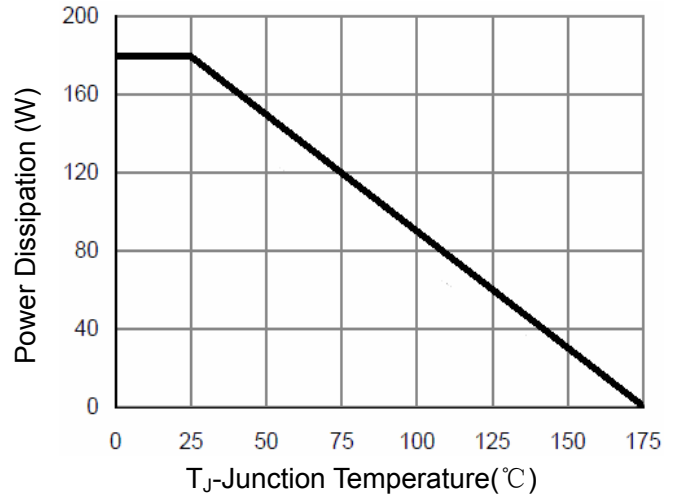


Figure 9 Power De-rating

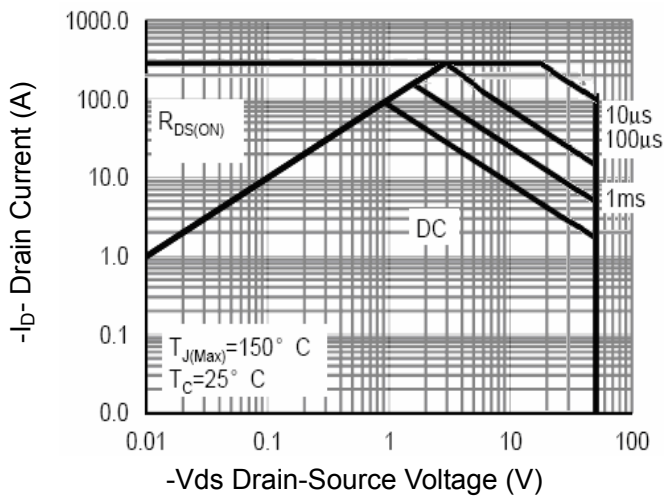


Figure 8 Safe Operation Area

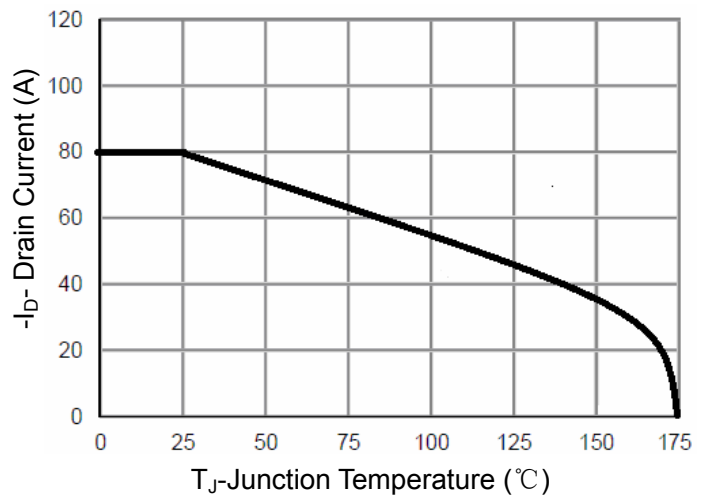


Figure 10 Current De-rating

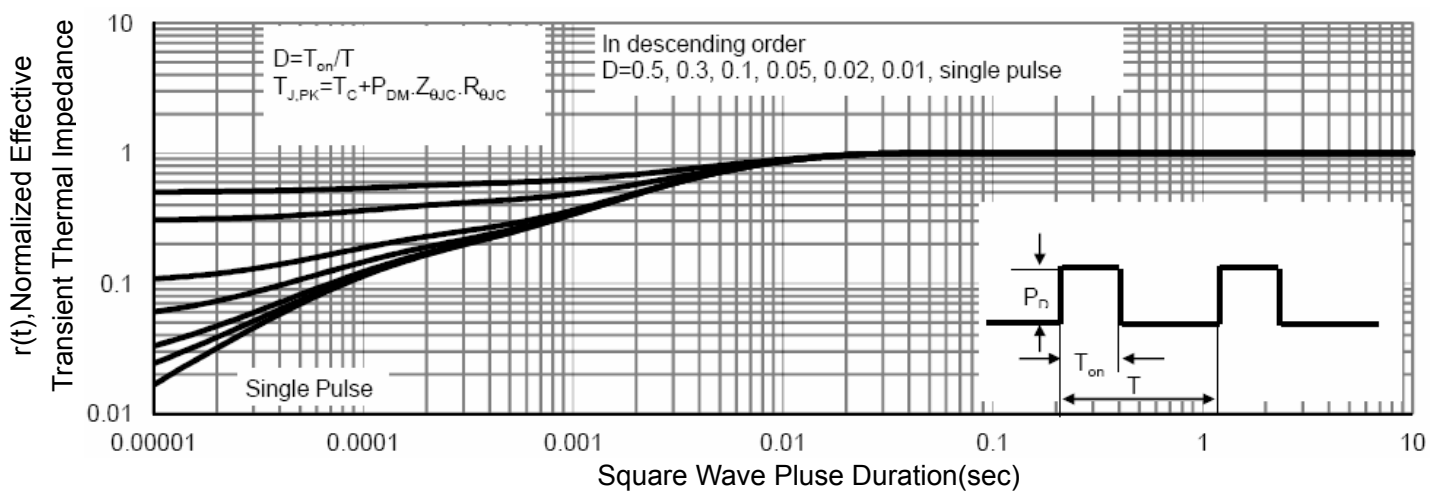
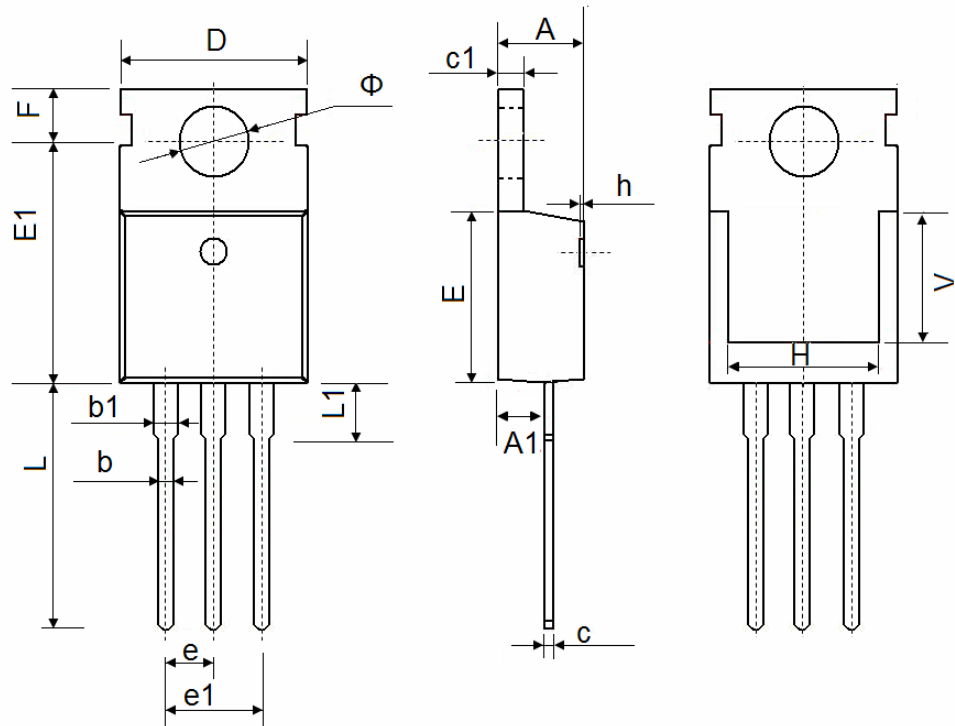


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-220-3L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150

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