Vishay Siliconix

P-Channel 20 V (D-S) MOSFET



Marking code: BQ

PRODUCT SUMMARY	
V _{DS} (V)	-20
$R_{DS(on)}$ max. (Ω) at $V_{GS} = -4.5 \text{ V}$	0.0240
$R_{DS(on)}$ max. (Ω) at V_{GS} = -2.5 V	0.0321
$R_{DS(on)}$ max. (Ω) at $V_{GS} = -1.8 \text{ V}$	0.0511
Q _g typ. (nC)	19.8
I _D (A) ^{a, d}	-8
Configuration	Single

FEATURES

- TrenchFET® Gen III p-channel power MOSFET
- $R_{DS(on)}$ rating at $V_{GS} = -1.8 \text{ V}$
- 100 % R_q and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

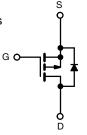


RoHS COMPLIANT

HALOGEN FREE

APPLICATIONS

- Battery management in mobile devices
- · Battery switch
- · Load switch
- PA switch



P-Channel MOSFET

ORDERING INFORMATION	
Package	TSOP-6
Lead (Pb)-free and halogen-free	Si3493DDV-T1-GE3

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V _{DS}	-20	V
Gate-source voltage		V _{GS}	± 8	v
Continuous drain current (T _J = 150 °C)	T _C = 25 °C		-8 ^a	
	T _C = 70 °C	1 . [-8	
	T _A = 25 °C	I _D	-7.5 ^{b, c}	
	T _A = 70 °C	T	-6 ^{b, c}	^
Pulsed drain current (t = 100 μs)		I _{DM}	-32	A
Continuous source-drain diode current	T _C = 25 °C		-3	
	T _A = 25 °C	ls -	-1.67 ^{b, c}	
Single pulse avalanche current	1 0111	I _{AS}	-10	
Single pulse avalanche energy	L = 0.1 mH	E _{AS}	5	mJ
Maximum power dissipation	T _C = 25 °C		3.6	
	T _C = 70 °C	1 , [2.3	14/
	T _A = 25 °C	P _D	2 b, c	W
	T _A = 70 °C	†	1.3 ^{b, c}	
Operating junction and storage temperature range		T _J , T _{stg}	-55 to +150	°C

THERMAL RESISTANCE RATINGS						
PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT	
Maximum junction-to-ambient ^b	t ≤ 5 s	R _{thJA}	50	62.5	°C/W	
Maximum junction-to-case (drain)	Steady state	R _{thJC}	28	35		

- a. Package limited.
- Surface mounted on 1" x 1" FR4 board.
- c. t = 5 s. d. Maximum under steady state conditions is 110 °C/W.

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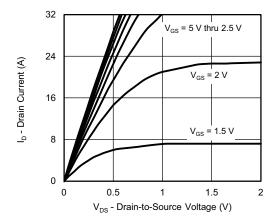
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static	•		I.	•			
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0 \text{ V}, I_D = -250 \mu\text{A}$	-20	-	-	V	
V _{DS} temperature coefficient	$\Delta V_{DS}/T_{J}$	1 050 A	-	-12	-	mV/°C	
V _{GS(th)} temperature coefficient	$\Delta V_{GS(th)}/T_J$	I _D = -250 μA	-	2.5	-		
Gate-source threshold voltage	V _{GS(th)}	$V_{DS} = V_{GS}, I_{D} = -250 \mu A$	-0.4	-	-1	V	
Gate-source leakage	I _{GSS}	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 8 \text{ V}$	-	-	± 100	nA	
Zero gate voltage drain current	_	$V_{DS} = -20 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	-1	μА	
	I _{DSS}	V _{DS} = -20 V, V _{GS} = 0 V, T _J = 70 °C	-	-	-10		
On-state drain current ^a	I _{D(on)}	$V_{DS} \ge -10 \text{ V}, V_{GS} = -4.5 \text{ V}$	-20	-	-	Α	
Drain-source on-state resistance ^a		$V_{GS} = -4.5 \text{ V}, I_D = -7.5 \text{ A}$	-	0.0200	0.0240	1	
	R _{DS(on)}	$V_{GS} = -2.5 \text{ V}, I_D = -6.4 \text{ A}$	-	0.0257	0.0321	Ω	
		V _{GS} = -1.8 V, I _D = -2 A	-	0.0378	0.0511		
Forward transconductance ^a	9 _{fs}	V _{DS} = -10 V, I _D = -7.5 A	-	30	-	S	
Dynamic ^b							
Input capacitance	C _{iss}		-	1825	-	pF	
Output capacitance	Coss	$V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	_	210	-		
Reverse transfer capacitance	C _{rss}		_	200	-		
Total gata abaysa		$V_{DS} = -10 \text{ V}, V_{GS} = -8 \text{ V}, I_{D} = -7.5 \text{ A}$	-	34.8	52.2	nC	
Total gate charge	Q_g		-	19.8	30		
Gate-source charge	Q_{gs}	$V_{DS} = -10 \text{ V}, V_{GS} = -4.5 \text{ V}, I_D = -7.5 \text{ A}$	-	2.6	-		
Gate-drain charge	Q_{gd}		-	3	-		
Gate resistance	R_g	f = 1 MHz	2.12	10.6	21.2	Ω	
Turn-on delay time	t _{d(on)}		-	25	38		
Rise time	t _r	$V_{DD} = -10 \text{ V}, R_L = 1.67 \Omega, I_D \cong -6 \text{ A},$	-	30	45		
Turn-off delay time	t _{d(off)}	V_{GEN} = -4.5 V, R_g = 1 Ω	-	95	145		
Fall time	t _f		-	40	60		
Turn-on delay time	t _{d(on)}		-	8	16	ns	
Rise time	t _r	$V_{DD} = -10 \text{ V}, R_L = 1.67 \Omega, I_D \cong -6 \text{ A},$	_	20	30		
Turn-off delay time	t _{d(off)}	$V_{GEN} = -8 \text{ V}, R_g = 1 \Omega$	-	115	173		
Fall time	t _f		-	40	60		
Drain-Source Body Diode Characteristi	cs						
Continuous source-drain diode current	I _S	T _C = 25 °C -	-	-8	^		
Pulse diode forward current	I _{SM}		-	-	-32	A	
Body diode voltage	V_{SD}	I _S = -6 A, V _{GS} = 0 V	-	-0.8	-1.2	٧	
Body diode reverse recovery time	t _{rr}		-	21	32	ns	
Body diode reverse recovery charge	Q _{rr}	1 6 A d1/d+ 100 A/ T 05 00	-	9	18	nC	
Reverse recovery fall time	ta	I _F = -6 A, dl/dt = 100 A/μs, T _J = 25 °C	-	9	-		
Reverse recovery rise time	t _b		-	12	-	ns	

Notes

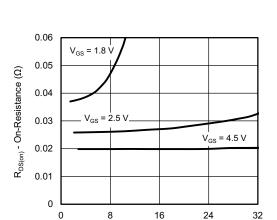
- a. Pulse test; pulse width $\leq 300~\mu s,$ duty cycle $\leq 2~\%.$
- b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



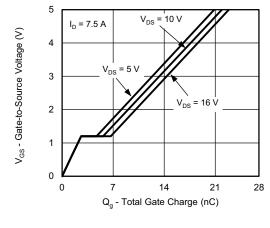


Output Characteristics

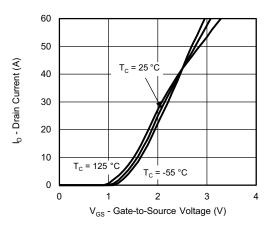


On-Resistance vs. Drain Current and Gate Voltage

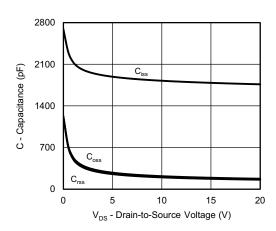
I_D - Drain Current (A)



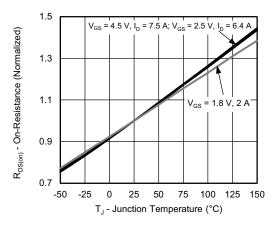
Gate Charge



Transfer Characteristics

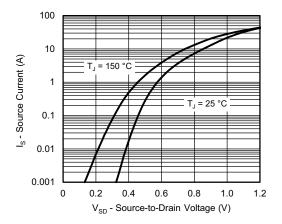


Capacitance

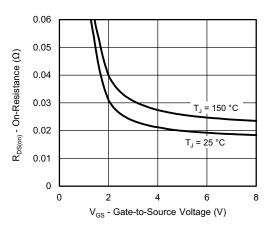


On-Resistance vs. Junction Temperature

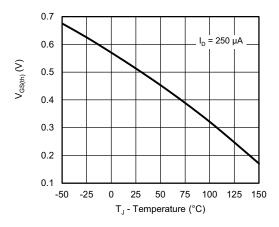




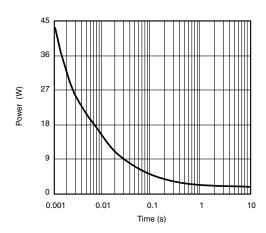
Source-Drain Diode Forward Voltage



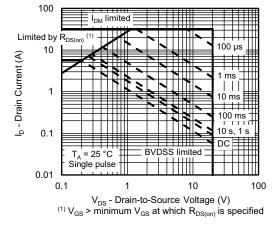
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

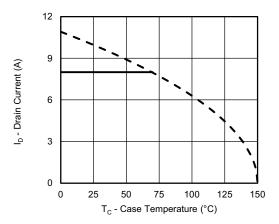


Single Pulse Power, Junction-to-Ambient

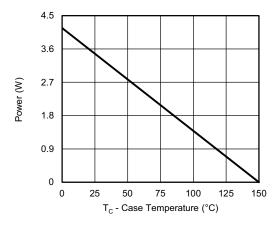


Safe Operating Area, Junction-to-Ambient

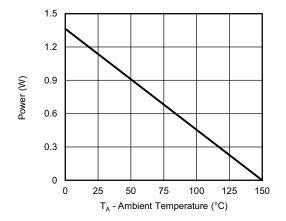




Current Derating a





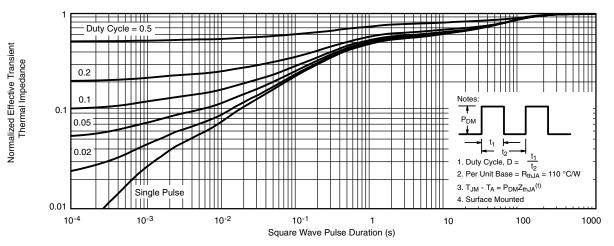


Power, Junction-to-Ambient

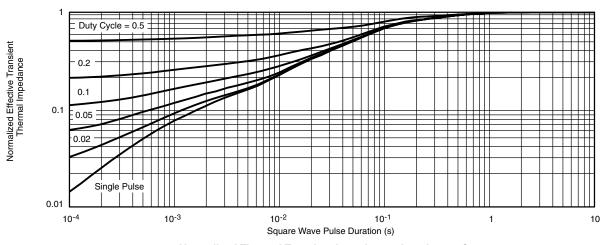
Note

a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.





Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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