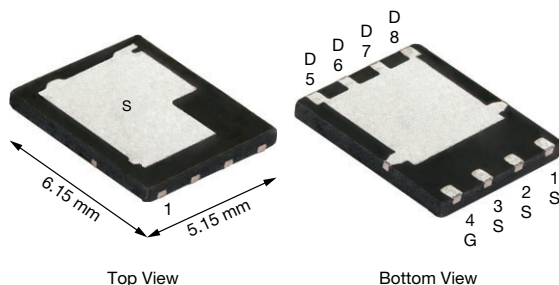


N-Channel 40 V (D-S) 175 °C MOSFET

PowerPAK® SO-8DC



Top View

Bottom View

PRODUCT SUMMARY

V_{DS} (V)	40
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V	0.00088
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.00116
Q_g typ. (nC)	53
I_D (A) ^{a, 9}	291
Configuration	Single

FEATURES

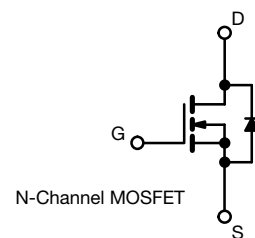
- TrenchFET® Gen IV power MOSFET
- Very low R_{DS} - Q_g figure-of-merit (FOM)
- Tuned for the lowest R_{DS} - Q_{oss} FOM
- Top side cooling feature provides additional venue for thermal transfer
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Synchronous rectification
- OR-ing
- High power density DC/DC
- Motor drive control
- Battery management
- Load switch



N-Channel MOSFET

ORDERING INFORMATION

Package	PowerPAK SO-8DC
Lead (Pb)-free and halogen-free	SiDR402EP-T1-RE3

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V_{DS}	40	V
Gate-source voltage	V_{GS}	+20, -16	V
Continuous drain current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	291
		$T_C = 70$ °C	244
		$T_A = 25$ °C	65.2 ^{b, c}
		$T_A = 70$ °C	54.6 ^{b, c}
Pulsed drain current ($t = 100$ μ s)	I_{DM}	400	A
Continuous source-drain diode current	I_S	$T_C = 25$ °C	136
		$T_A = 25$ °C	6.8 ^{b, c}
Single pulse avalanche current	I_{AS}	50	A
Single pulse avalanche Energy	E_{AS}	125	mJ
Maximum power dissipation	P_D	$T_C = 25$ °C	150
		$T_C = 70$ °C	105
		$T_A = 25$ °C	7.5 ^{b, c}
		$T_A = 70$ °C	5.25 ^{b, c}
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) ^{d, e}		260	°C

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient ^{b, f}	R_{thJA}	15	20	°C/W
Maximum junction-to-case (drain)	R_{thJC}	0.8	1	°C/W
Maximum junction-to-case (source)	R_{thJC}	1.1	1.4	°C/W

Notes

- Based on $T_C = 25$ °C
- Surface mounted on 1" x 1" FR4 board
- $t = 10$ s
- See solder profile (www.vishay.com/doc?73257). The PowerPAK SO-8DC is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components
- Maximum under steady state conditions is 54 °C/W



SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static							
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	40	-	-	V	
V _{DS} temperature coefficient	ΔV _{DS} /T _J	I _D = 250 μA	-	24	-	mV/°C	
V _{GS(th)} temperature coefficient	ΔV _{GS(th)} /T _J		-	-5.4	-		
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1.1	-	2.3	V	
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = +20, -16 V	-	-	± 100	nA	
Zero gate voltage drain current	I _{DSS}	V _{DS} = 40 V, V _{GS} = 0 V	-	-	1	μA	
		V _{DS} = 40 V, V _{GS} = 0 V, T _J = 55 °C	-	-	10		
On-state drain current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	50	-	-	A	
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 20 A	-	0.00073	0.00088	Ω	
		V _{GS} = 4.5 V, I _D = 15 A	-	0.00096	0.00116		
Forward transconductance ^a	g _{fs}	V _{DS} = 10 V, I _D = 20 A	-	147	-	S	
Dynamic ^b							
Input capacitance	C _{iss}	V _{DS} = 20 V, V _{GS} = 0 V, f = 1 MHz	-	9100	-	pF	
Output capacitance	C _{oss}		-	1650	-		
Reverse transfer capacitance	C _{rss}		-	210	-		
C _{rss} /C _{iss} ratio			-	0.024	0.048		
Total gate charge	Q _g	V _{DS} = 20 V, V _{GS} = 10 V, I _D = 20 A	-	110	165	nC	
		V _{DS} = 20 V, V _{GS} = 4.5 V, I _D = 20 A	-	53	80		
Gate-source charge	Q _{gs}		-	22.5	-		
Gate-drain charge	Q _{gd}		-	9.5	-		
Output charge	Q _{oss}	V _{DS} = 20 V, V _{GS} = 0 V	-	75	-		
Gate resistance	R _g	f = 1 MHz	0.3	0.88	1.5	Ω	
Turn-on delay time	t _{d(on)}	V _{DD} = 20 V, R _L = 1 Ω I _D ≅ 20 A, V _{GEN} = 10 V, R _g = 1 Ω	-	15	30	ns	
Rise time	t _r		-	42	84		
Turn-off delay time	t _{d(off)}		-	42	84		
Fall time	t _f		-	10	20		
Turn-on delay time	t _{d(on)}	V _{DD} = 20 V, R _L = 1 Ω I _D ≅ 20 A, V _{GEN} = 4.5 V, R _g = 1 Ω	-	45	90		
Rise time	t _r		-	100	200		
Turn-off delay time	t _{d(off)}		-	56	112		
Fall time	t _f		-	40	80		
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I _S	T _C = 25 °C	-	-	100	A	
Pulse diode forward current (t _p = 100 μs)	I _{SM}		-	-	400		
Body diode voltage	V _{SD}	I _S = 10 A	-	0.73	1.1	V	
Body diode reverse recovery time	t _{rr}	I _F = 20 A, di/dt = 100 A/μs, T _J = 25 °C	-	65	130	ns	
Body diode reverse recovery charge	Q _{rr}		-	90	180	nC	
Reverse recovery fall time	t _a		-	37	-	ns	
Reverse recovery rise time	t _b		-	30	-		

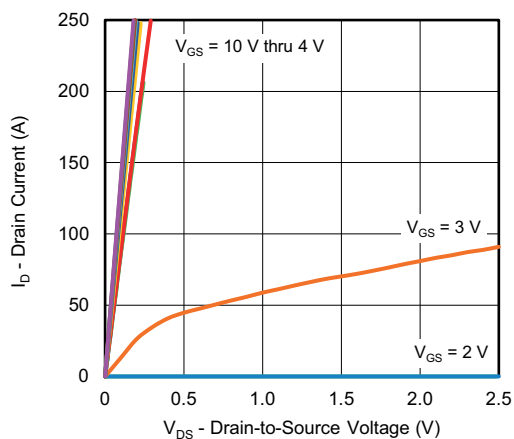
Notes

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

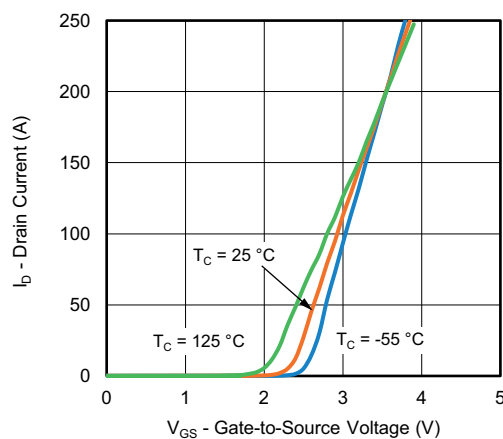
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



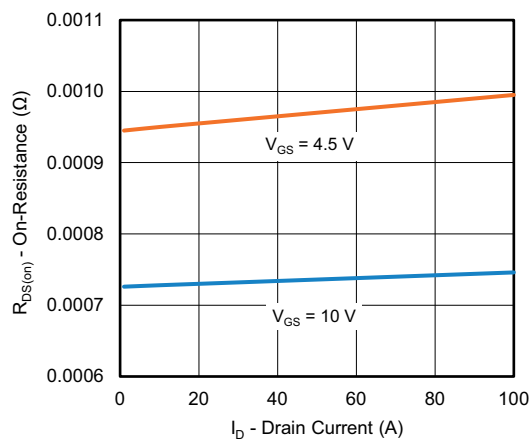
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



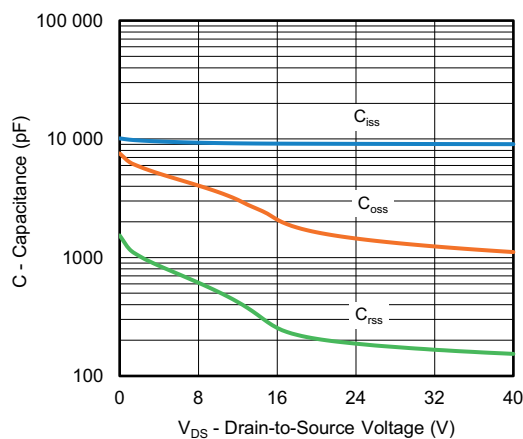
Output Characteristics



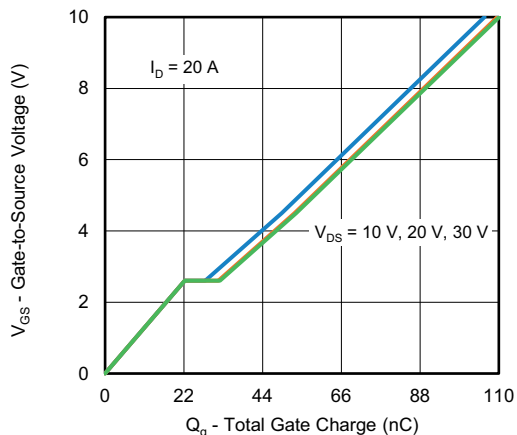
Transfer Characteristics



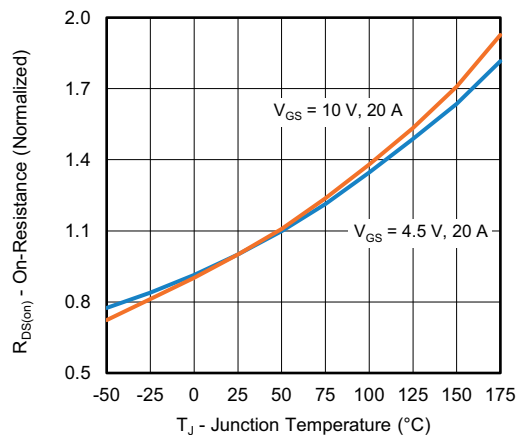
On-Resistance vs. Drain Current



Capacitance



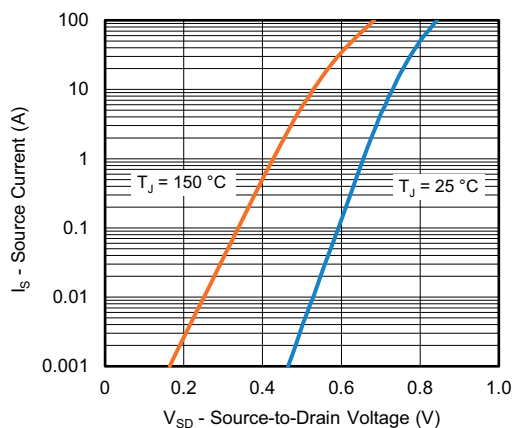
Gate Charge



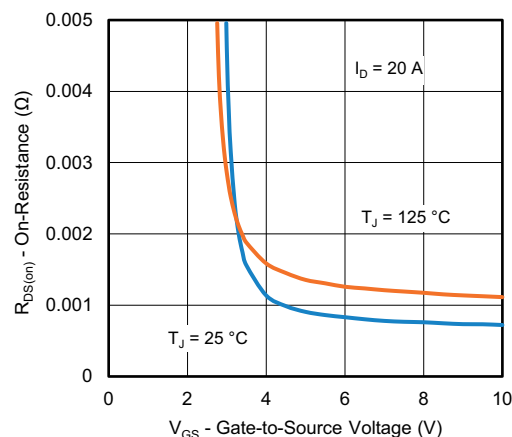
On-Resistance vs. Junction Temperature



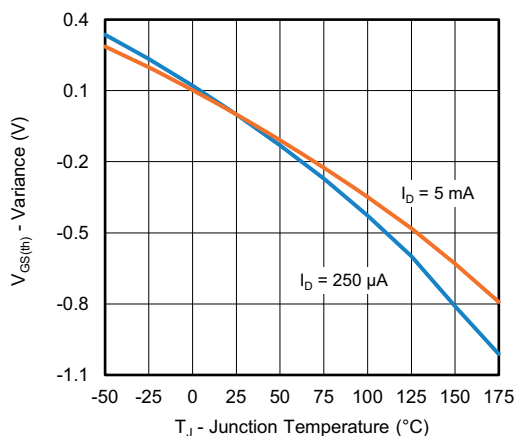
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



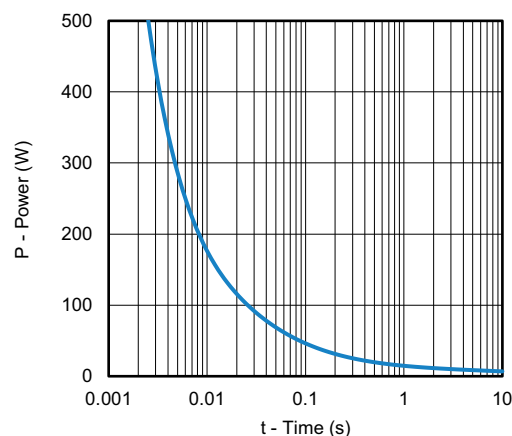
Source-Drain Diode Forward Voltage



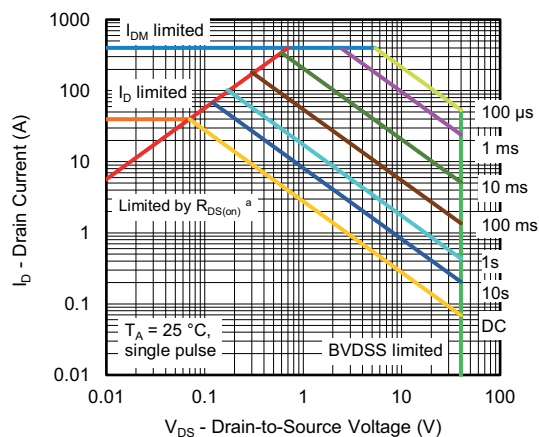
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



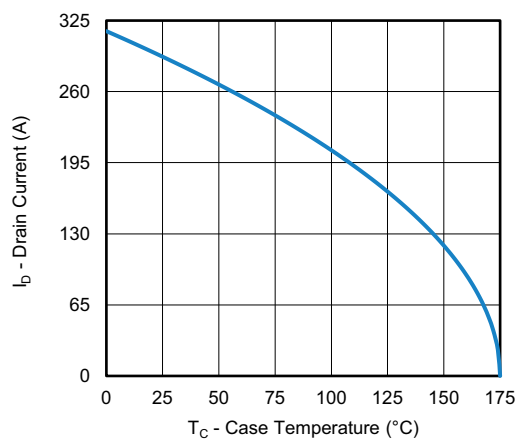
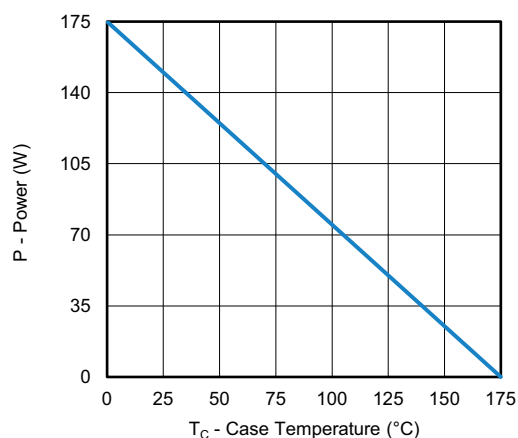
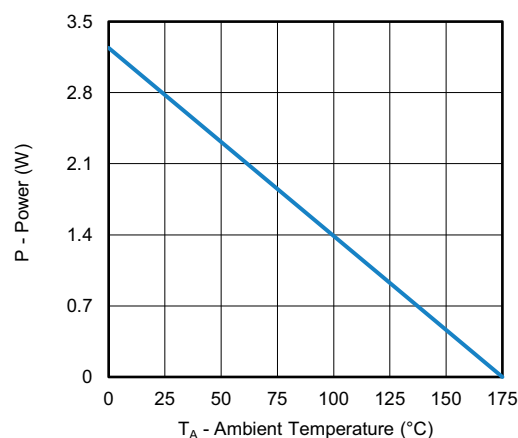
Single Pulse Power, Junction-to-Ambient



Safe Operating Area

Note

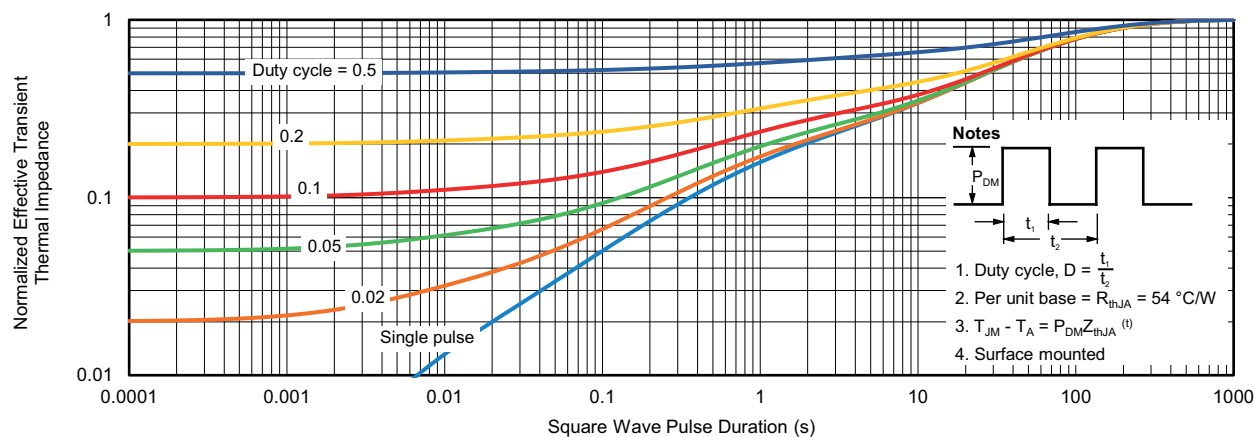
a. $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Current Derating ^a

Power, Junction-to-Case

Power, Junction-to-Ambient
Note

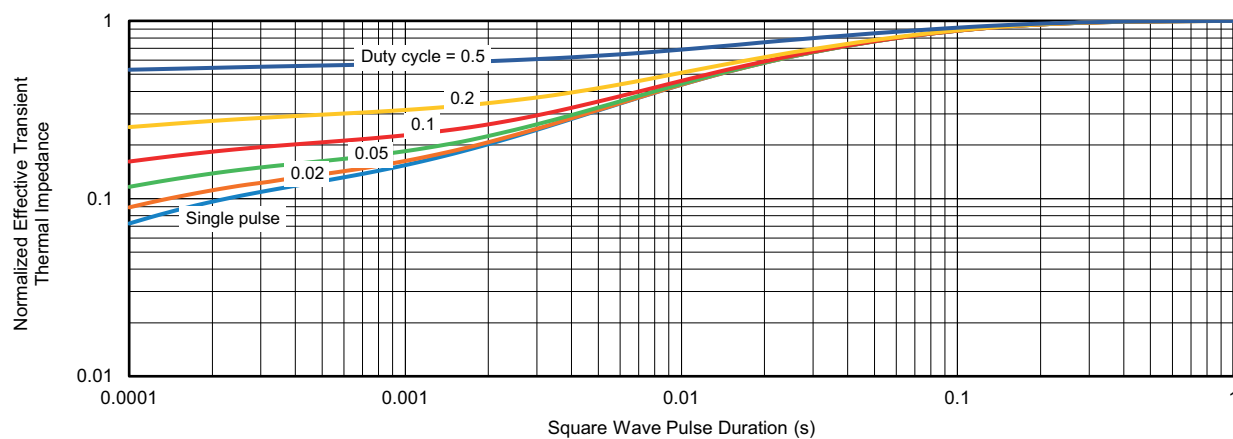
- b. The power dissipation P_D is based on T_J max. = 175 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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