

N-Channel 40 V (D-S) MOSFET



PRODUCT SUMMARY

V_{DS} (V)	40
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V	0.0022
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.0032
Q_g typ. (nC)	21.5
I_D (A) ^a	128
Configuration	Single

FEATURES

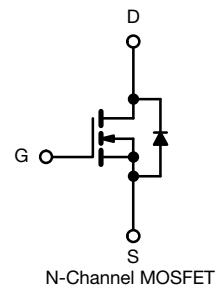
- TrenchFET® Gen IV power MOSFET
- 40 V drain-source break-down voltage
- Tuned for low Q_g and Q_{oss}
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Synchronous rectification
- High power density DC/DC
- Motor drive control



ORDERING INFORMATION

Package	PowerPAK SO-8
Lead (Pb)-free and halogen-free	SIRA54ADP-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	
Continuous drain current ($T_J = 150$ °C)	$T_C = 25$ °C	128	A
	$T_C = 70$ °C		
	$T_A = 25$ °C		
	$T_A = 70$ °C		
Pulsed drain current ($t = 100$ µs)	I_{DM}	300	
Continuous source-drain diode current	$T_C = 25$ °C	59.7	
	$T_A = 25$ °C	4.7 b, c	
Single pulse avalanche current	I_{AS}	25	mJ
Single pulse avalanche Energy	E_{AS}	31.25	
Maximum power dissipation	$T_C = 25$ °C	65.7	W
	$T_C = 70$ °C	425	
	$T_A = 25$ °C	5.2 b, c	
	$T_A = 70$ °C	3.3 b, c	
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature) ^{d, e}		260	

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient ^{b, f}	R_{thJA}	20	24	°C/W
Maximum junction-to-case (drain)	R_{thJC}	1.5	1.9	

Notes

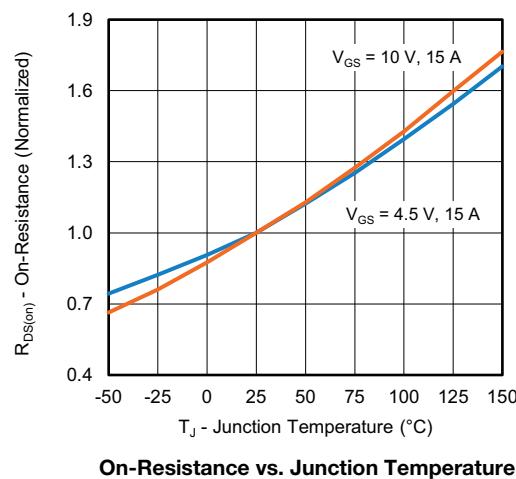
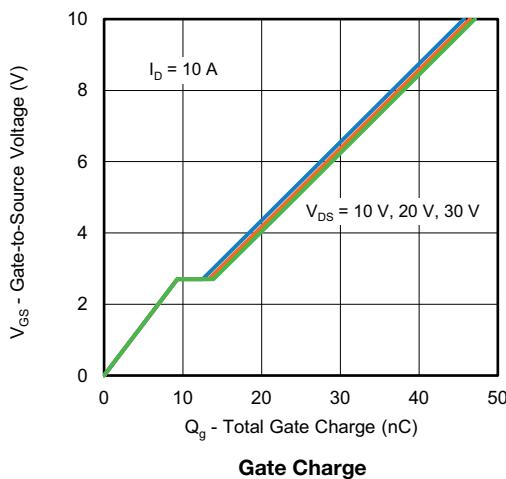
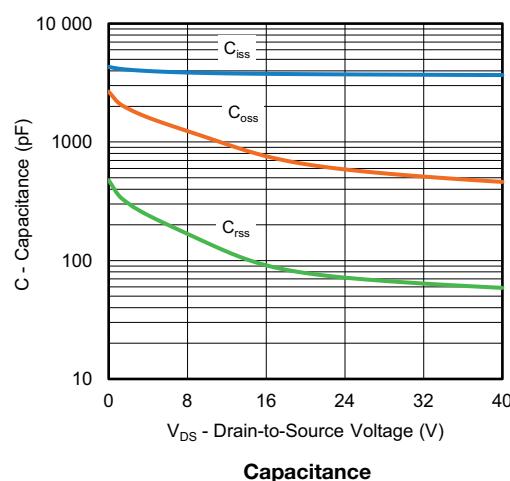
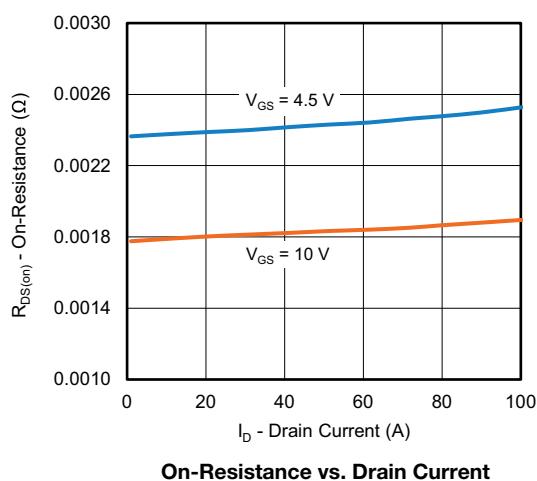
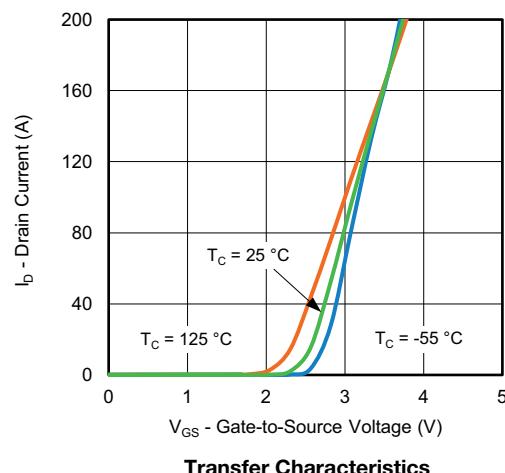
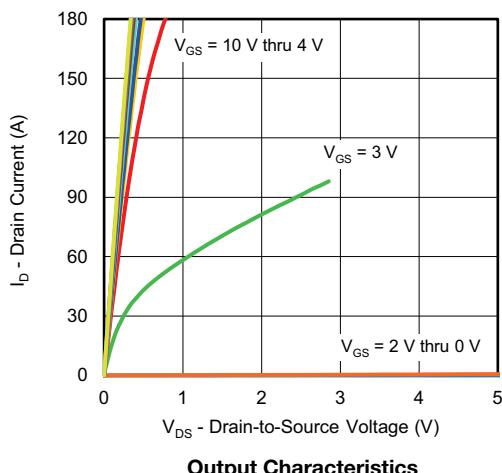
- Based on $T_C = 25$ °C
- Surface mounted on 1" x 1" FR4 board
- $t = 10$ s
- See solder profile (www.vishay.com/doc?73257). The PowerPAK SO-8 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at 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 62.5 °C/W

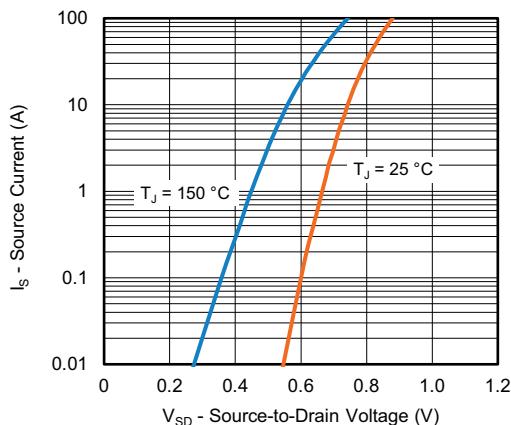
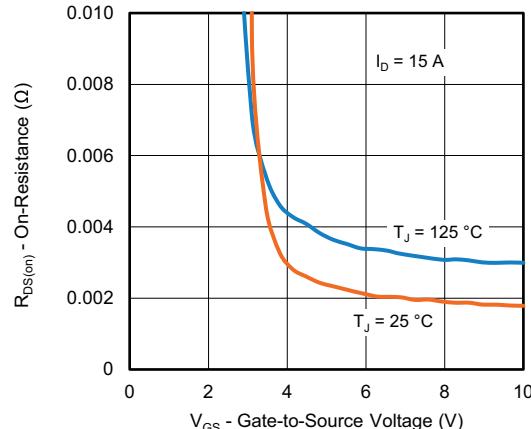
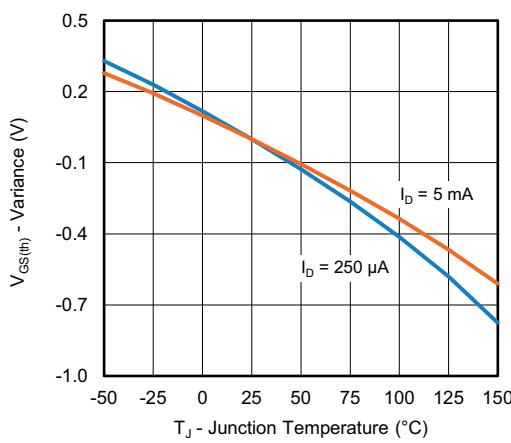
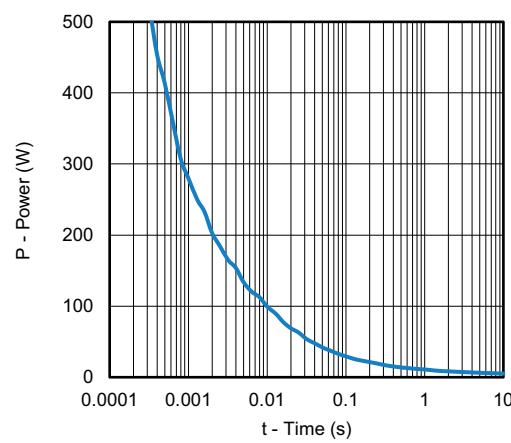
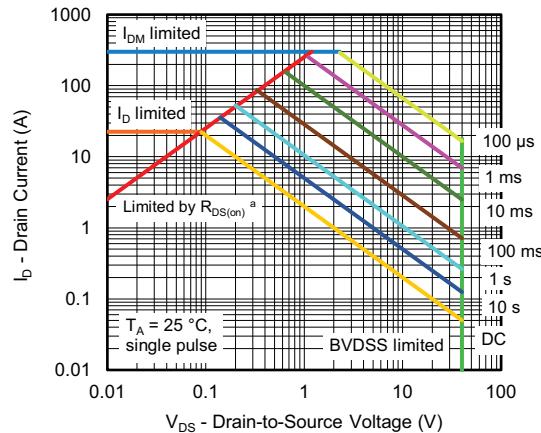
SPECIFICATIONS ($T_J = 25^\circ\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0 \text{ V}$, $I_D = 1 \text{ mA}$	40	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 1 \text{ mA}$	-	25	-	mV/°C
$V_{GS(\text{th})}$ temperature coefficient	$\Delta V_{GS(\text{th})}/T_J$	$I_D = 250 \mu\text{A}$	-	-5.2	-	
Gate-source threshold voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$	1	-	2.5	V
Gate-source leakage	I_{GSS}	$V_{DS} = 0 \text{ V}$, $V_{GS} = +20, -16 \text{ V}$	-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 40 \text{ V}$, $V_{GS} = 0 \text{ V}$	-	-	1	μA
		$V_{DS} = 40 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 75^\circ\text{C}$	-	-	20	
Drain-source on-state resistance ^a	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$, $I_D = 15 \text{ A}$	-	0.0018	0.0022	Ω
		$V_{GS} = 4.5 \text{ V}$, $I_D = 15 \text{ A}$	-	0.0024	0.0032	
Forward transconductance ^a	g_{fs}	$V_{DS} = 10 \text{ V}$, $I_D = 15 \text{ A}$	-	98	-	S
Dynamic ^b						
Input capacitance	C_{iss}	$V_{DS} = 20 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	-	3850	-	pF
Output capacitance	C_{oss}		-	655	-	
Reverse transfer capacitance	C_{rss}		-	75	-	
Total gate charge	Q_g	$V_{DS} = 20 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 10 \text{ A}$	-	46.7	70	nC
		$V_{DS} = 20 \text{ V}$, $V_{GS} = 4.5 \text{ V}$, $I_D = 10 \text{ A}$	-	21.5	32	
Gate-source charge	Q_{gs}		-	9.3	-	
Gate-drain charge	Q_{gd}		-	4	-	
Output charge	Q_{oss}	$V_{DS} = 20 \text{ V}$, $V_{GS} = 0 \text{ V}$	-	24.5	-	ns
Gate resistance	R_g	$f = 1 \text{ MHz}$	0.5	1.1	1.8	
Turn-on delay time	$t_{d(\text{on})}$	$V_{DD} = 20 \text{ V}$, $R_L = 2 \Omega$ $I_D \geq 10 \text{ A}$, $V_{GEN} = 10 \text{ V}$, $R_g = 1 \Omega$	-	15	30	
Rise time	t_r		-	6	12	
Turn-off delay time	$t_{d(\text{off})}$		-	30	60	
Fall time	t_f		-	6	12	
Turn-on delay time	$t_{d(\text{on})}$		-	26	52	
Rise time	t_r		-	63	126	
Turn-off delay time	$t_{d(\text{off})}$		-	33	66	
Fall time	t_f		-	10	20	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	$T_C = 25^\circ\text{C}$	-	-	59.7	A
Pulse diode forward current ($t_p = 100 \mu\text{s}$)	I_{SM}		-	-	300	
Body diode voltage	V_{SD}	$I_S = 5 \text{ A}$	-	0.72	1.1	V
Body diode reverse recovery time	t_{rr}	$I_F = 10 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $T_J = 25^\circ\text{C}$	-	29	58	ns
Body diode reverse recovery charge	Q_{rr}		-	23	46	nC
Reverse recovery fall time	t_a		-	15	-	ns
Reverse recovery rise time	t_b		-	14	-	

Notes

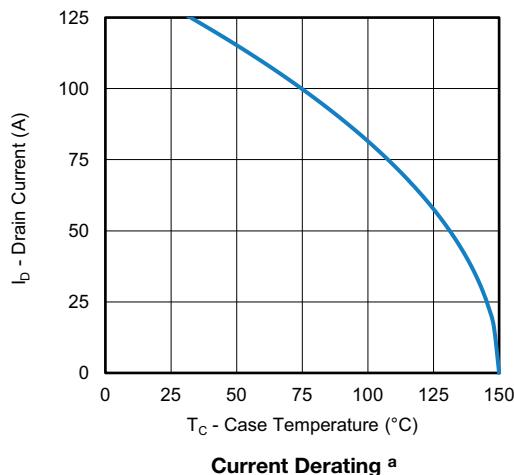
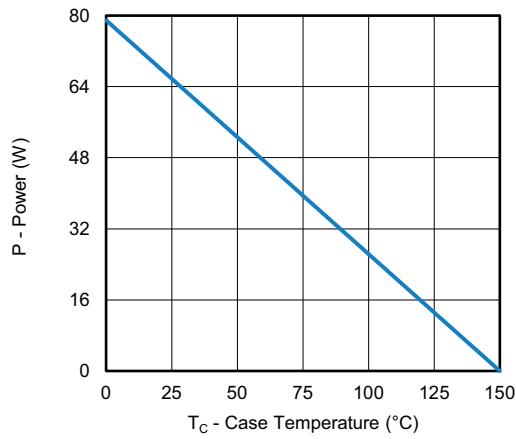
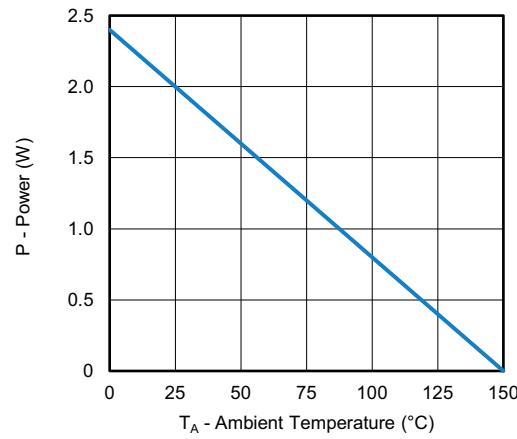
g. Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2 \%$
h. Guaranteed by design, not subject to production testing

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.

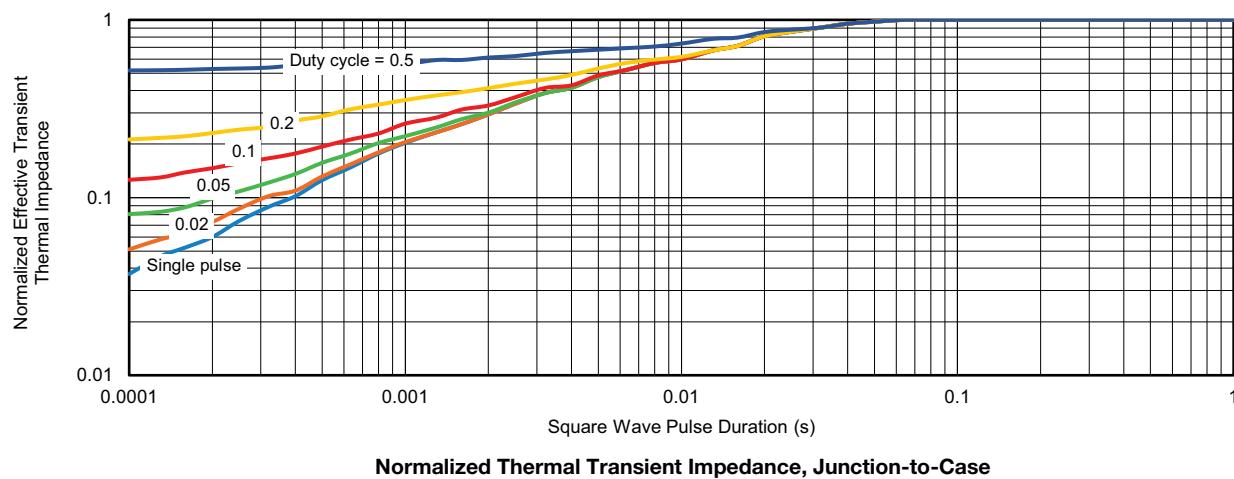
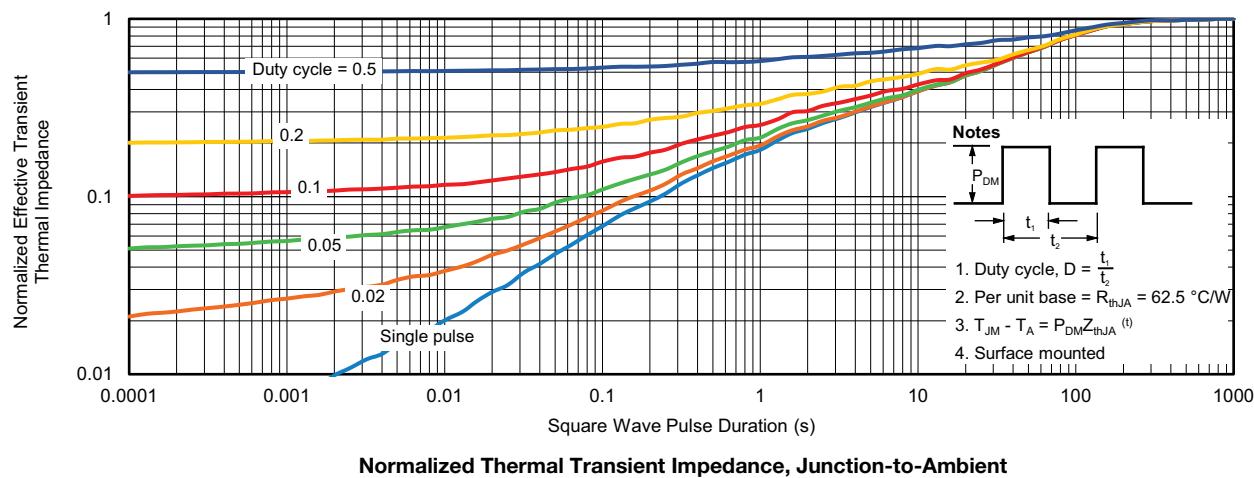
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)


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. = 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

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)


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