

SI7972DP-T1-GE3-VB Datasheet

Dual N-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY	
V _{DS} (V)	60
R _{DS(on)} (Ω) at V _{GS} = 10 V	0.032
R _{DS(on)} (Ω) at V _{GS} = 4.5 V	0.038
Q _g typ. (nC)	7.1
I _D (A)	17
Configuration	Dual

FEATURES

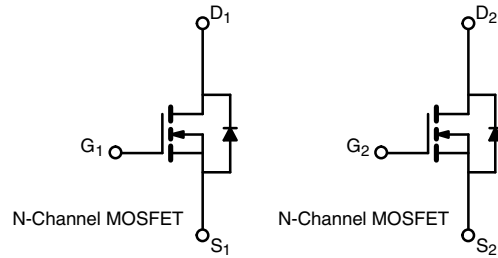
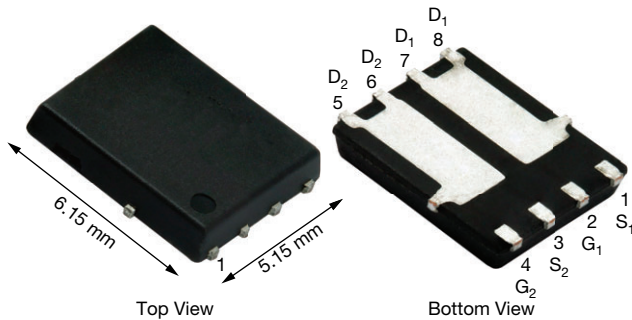
- TrenchFET® power MOSFET
- PWM optimized
- 100 % R_g and UIS tested

APPLICATIONS

- System power DC/DC



RoHS
COMPLIANT
HALOGEN
FREE



ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V _{DS}	60	V
Gate-source voltage	V _{GS}	± 20	
Continuous drain current (T _J = 150 °C)	I _D	T _C = 25 °C	17
		T _C = 70 °C	8 ^a
		T _A = 25 °C	8 ^a
		T _A = 70 °C	8 ^a
Pulsed drain current	I _{DM}	40	A
Source-drain current diode current	I _S	T _C = 25 °C	
		T _A = 25 °C	3 ^{b, c}
Maximum power dissipation	P _D	T _C = 25 °C	22
		T _C = 70 °C	14
		T _A = 25 °C	3.6 ^{b, c}
		T _A = 70 °C	2.3 ^{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	TYP.	MAX.	UNIT
Maximum junction-to-ambient ^{b, f}	R _{thJA}	26	35	°C/W
Maximum junction-to-case (drain)	R _{thJC}	4	5.5	

Notes

- Package limited
- Surface mounted on 1" x 1" FR4 board
- t = 10 s
- The DFN 5x6 package 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 80 °C/W

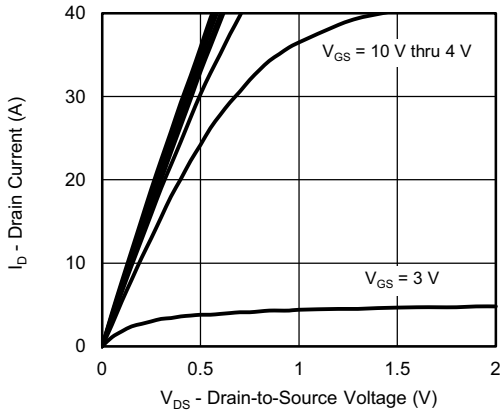
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	38	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	-4.9	-	
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.2	-	2.7	V
Gate-body leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	-	-	100	nA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$	-	-	10	
On-state drain current ^b	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	60	-	-	A
Drain-source on-state resistance ^b	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 11\text{ A}$	-	0.032	-	Ω
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$	-	0.038	-	
Forward transconductance ^b	g_{fs}	$V_{DS} = 30\text{ V}, I_D = 11\text{ A}$	-	38	-	S
Dynamic ^a						
Input capacitance	C_{iss}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	1050	-	pF
Output capacitance	C_{oss}		-	435	-	
Reverse transfer capacitance	C_{rss}		-	20	-	
Total gate charge	Q_g	$V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 11\text{ A}$	-	15.2	23	nC
		$V_{DS} = 30\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 11\text{ A}$	-	7.1	11	
Gate-source charge	Q_{gs}		-	4.4	-	
Gate-drain charge	Q_{gd}		-	1.3	-	
Gate resistance	R_g	$f = 1\text{ MHz}$	0.12	0.6	1.2	Ω
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 3.45\text{ }\Omega$ $I_D \cong 8.7\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$	-	15	120	ns
Rise time	t_r		-	80	30	
Turn-off delay time	$t_{d(off)}$		-	15	30	
Fall time	t_f		-	15	30	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 3.45\text{ }\Omega$ $I_D \cong 8.7\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$	-	10	15	
Rise time	t_r		-	25	40	
Turn-off delay time	$t_{d(off)}$		-	20	30	
Fall time	t_f		-	10	15	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$	-	-	8	A
Pulse diode forward current ^a	I_{SM}		-	-	40	
Body diode voltage	V_{SD}	$I_S = 8.7\text{ A}$	-	0.8	1.2	V
Body diode reverse recovery time	t_{rr}	$I_F = 8.7\text{ A}, di/dt = 100\text{ A}/\mu\text{s},$ $T_J = 25\text{ }^\circ\text{C}$	-	34	51	ns
Body diode reverse recovery charge	Q_{rr}		-	30	45	nC
Reverse recovery fall time	t_a		-	16	-	ns
Reverse recovery rise time	t_b		-	18	-	

Notes

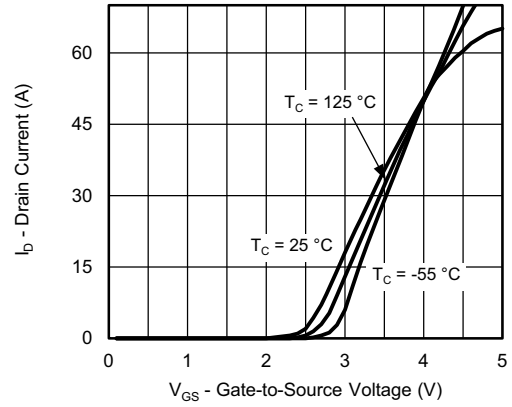
- a. Guaranteed by design, not subject to production testing
 b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$

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.

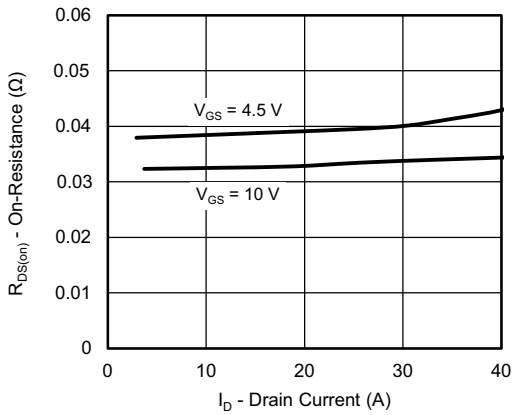
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



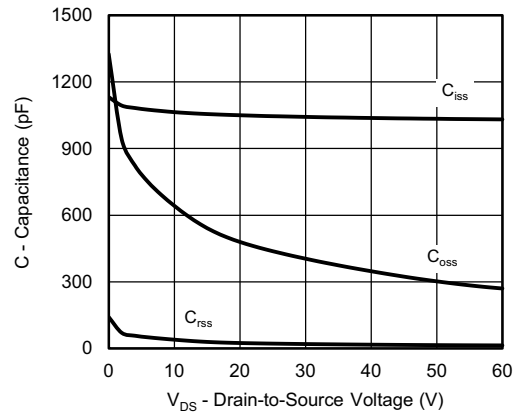
Output Characteristics



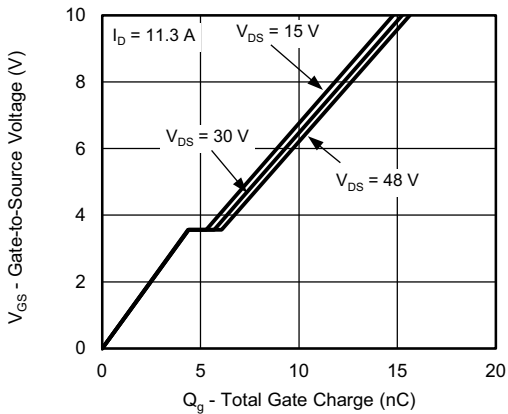
Transfer Characteristics



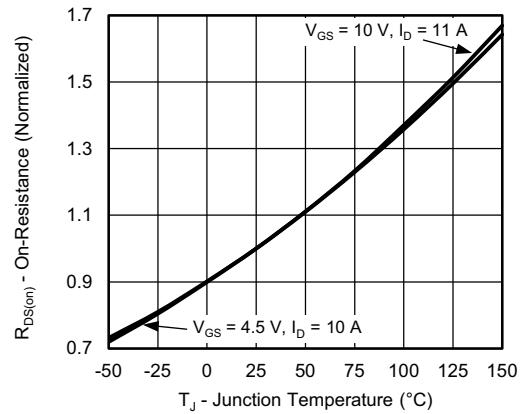
On-Resistance vs. Drain Current



Capacitance

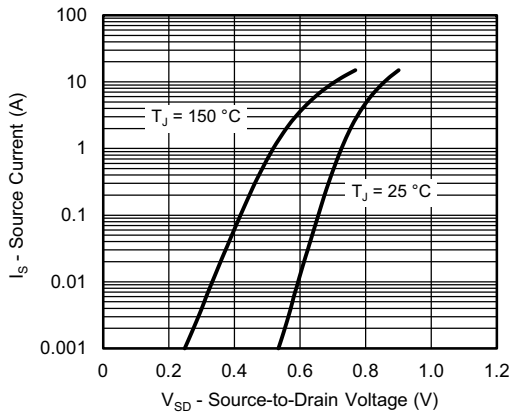


Gate Charge

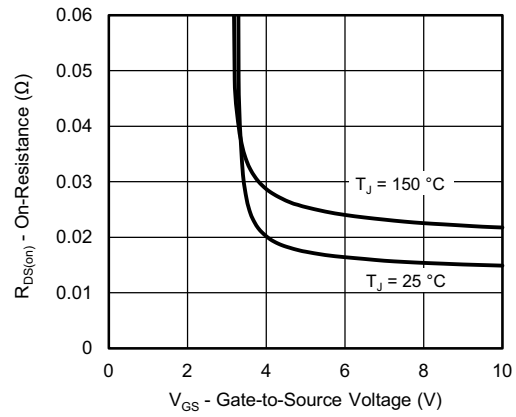


On-Resistance vs. Junction Temperature

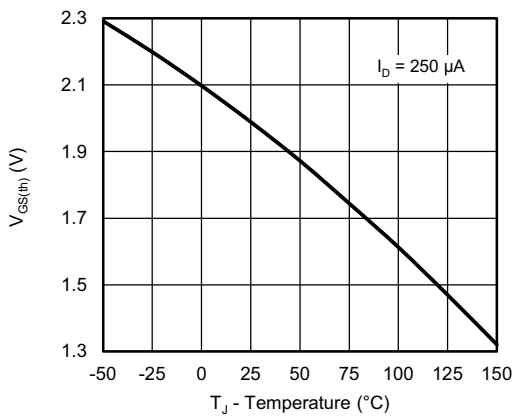
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



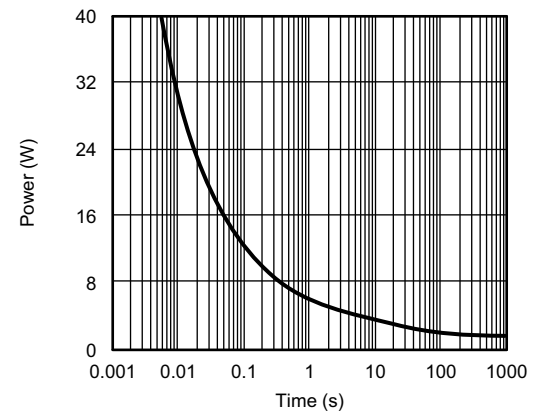
Source-Drain Diode Forward Voltage



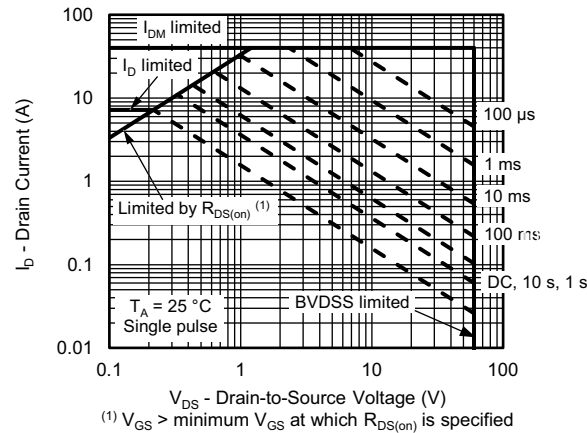
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



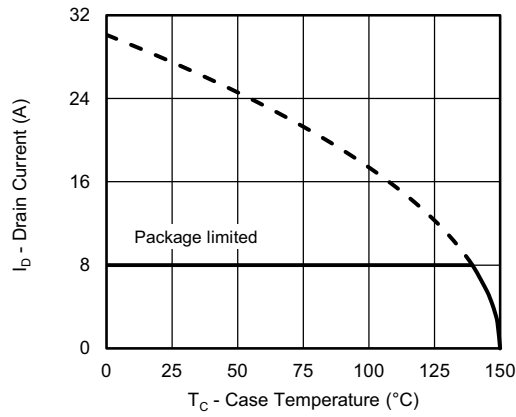
Single Pulse Power



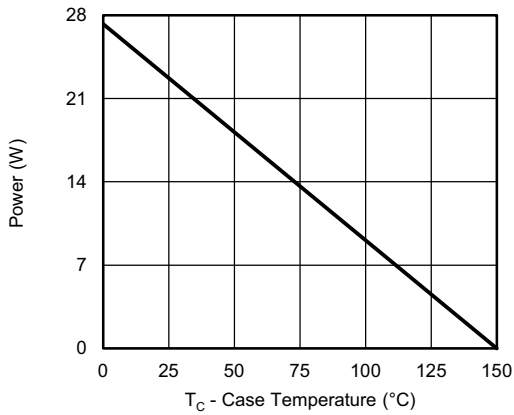
Safe Operating Area, Junction-to-Ambient

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

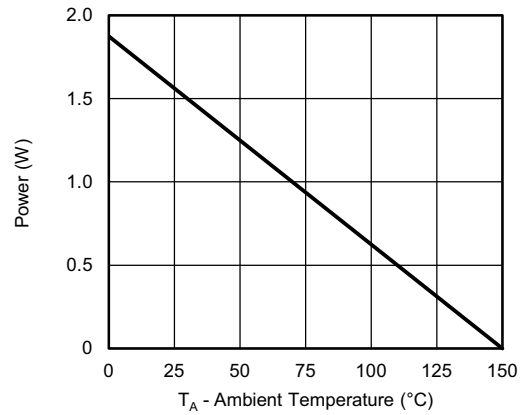
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Power, Junction-to-Case

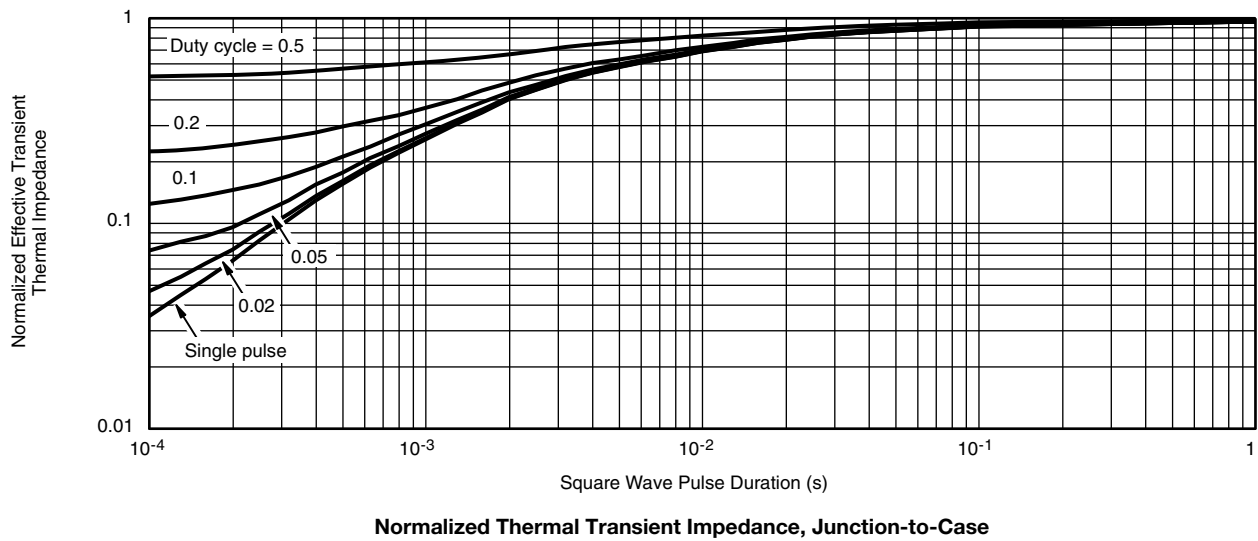
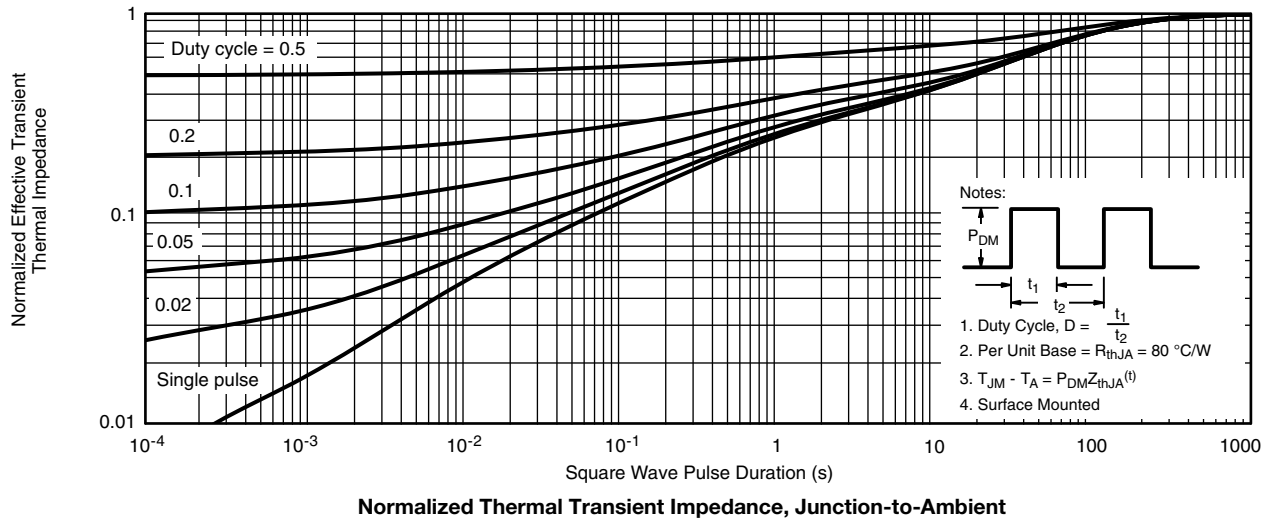


Power, Junction-to-Ambient

Note

- a. The power dissipation P_D is based on $T_J \text{ max.} = 150 \text{ °C}$, 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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