

SI7178DP-VB Datasheet

N-Channel 100-V (D-S) MOSFET

PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
100	0.009 at $V_{GS} = 10$ V	65

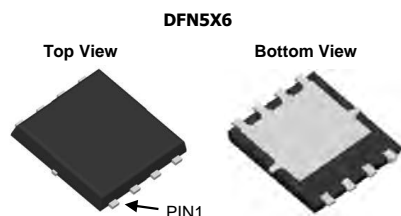
FEATURES

- Trench Power MOSFET
- 175 °C Junction Temperature
- Low Thermal Resistance Package
- 100 % R_g Tested

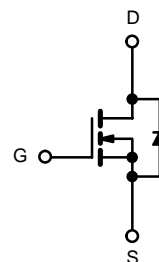
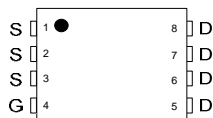

RoHS
 COMPLIANT

APPLICATIONS

- Isolated DC/DC Converters



Top View



N-Channel MOSFET

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V_{DS}	100	V
Gate-source voltage	V_{GS}	± 20	
Continuous drain current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	65
		$T_C = 70$ °C	60
		$T_A = 25$ °C	20 ^{b, c}
		$T_A = 70$ °C	18.5 ^{b, c}
Pulsed drain current ($t = 100$ μ s)	I_{DM}	180	A
Continuous source-drain diode current	I_S	$T_C = 25$ °C	60
		$T_A = 25$ °C	4.8 ^{b, c}
Single pulse avalanche current	I_{AS}	30	
Single pulse avalanche energy	E_{AS}	40	mJ
Maximum power dissipation	P_D	$T_C = 25$ °C	80
		$T_C = 70$ °C	50
		$T_A = 25$ °C	5 ^{b, c}
		$T_A = 70$ °C	3.2 ^{b, c}
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature) ^c		260	

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient ^b	R_{thJA}	20	25	°C/W
Maximum junction-to-case (drain)	R_{thJC}	1.6	2	

Notes

- Package limited
- Surface mounted on 1" x 1" FR4 board
- $t = 10$ s

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	100	-	-	V
V _{DS} temperature coefficient	ΔV _{DS} /T _J	I _D = 10 mA	-	81	-	mV/°C
V _{GS(th)} temperature coefficient	ΔV _{GS(th)} /T _J	I _D = 250 μA	-	-7.5	-	
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	3	-	5	V
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V	-	-	100	nA
Zero gate voltage drain current	I _{DSS}	V _{DS} = 100 V, V _{GS} = 0 V	-	-	1	μA
		V _{DS} = 100 V, V _{GS} = 0 V, T _J = 70 °C	-	-	15	
On-state drain current ^a	I _{D(on)}	V _{DS} ≥ 10 V, V _{GS} =10 V	40	-	-	A
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} =10 V, I _D = 10 A	-	0.009	-	Ω
		V _{GS} = 7.5 V, I _D = 10 A	-	0.012	-	
Forward transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 10 A	-	46	-	S
Dynamic ^b						
Input capacitance	C _{iss}	V _{DS} = 50 V, V _{GS} = 0 V, f = 1 MHz	-	3970	-	pF
Output capacitance	C _{oss}		-	132	-	
Reverse transfer capacitance	C _{rss}		-	11.2	-	
Total gate charge	Q _g	V _{DS} = 50 V, V _{GS} = 10 V, I _D = 10 A	-	20	-	nC
		V _{DS} = 50 V, V _{GS} = 7.5 V, I _D = 10 A	-	15	-	
Gate-source charge	Q _{gs}		-	6.45	-	
Gate-drain charge	Q _{gd}		-	3.5	-	
Output charge	Q _{oss}	V _{DS} = 50 V, V _{GS} = 0 V	-	22	-	
Gate resistance	R _g	f = 1 MHz	0.2	0.76	1.4	Ω
Turn-on delay time	t _{d(on)}	V _{DD} = 50 V, R _L = 5 Ω, I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω	-	12	24	ns
Rise time	t _r		-	5	10	
Turn-off delay time	t _{d(off)}		-	19	38	
Fall time	t _f		-	5	10	
Turn-on delay time	t _{d(on)}	V _{DD} = 50 V, R _L = 5 Ω, I _D ≅ 10 A, V _{GEN} = 7.5 V, R _g = 1 Ω	-	15	30	
Rise time	t _r		-	6	12	
Turn-off delay time	t _{d(off)}		-	19	38	
Fall time	t _f		-	5	10	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I _S	T _C = 25 °C	-	-	60	A
Pulse diode forward current	I _{SM}		-	-	80	
Body diode voltage	V _{SD}	I _S = 5 A, V _{GS} = 0 V	-	0.78	1.1	V
Body diode reverse recovery time	t _{rr}	I _F = 10 A, di/dt = 100 A/μs, T _J = 25 °C	-	43	86	ns
Body diode reverse recovery charge	Q _{rr}		-	72	144	nC
Reverse recovery fall time	t _a		-	33	-	ns
Reverse recovery rise time	t _b		-	10	-	

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.

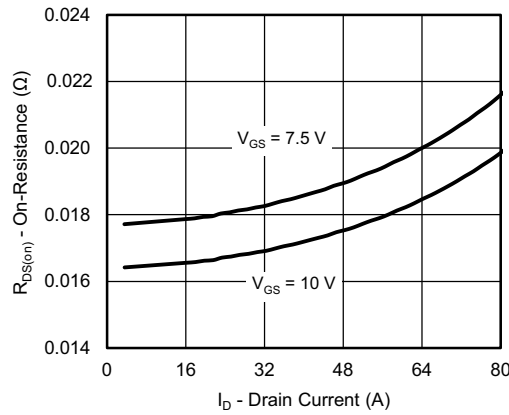
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



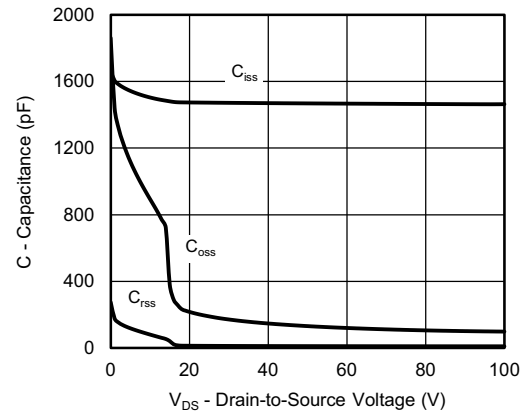
Output Characteristics



Transfer Characteristics



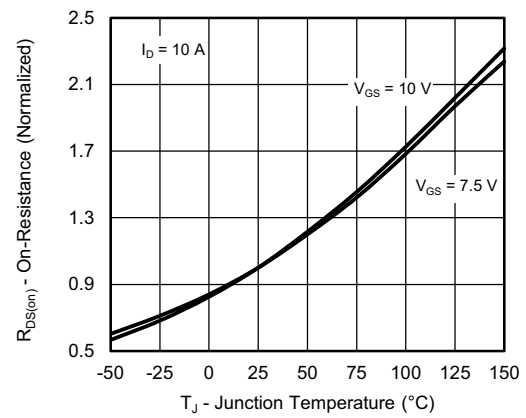
On-Resistance vs. Drain Current and Gate Voltage



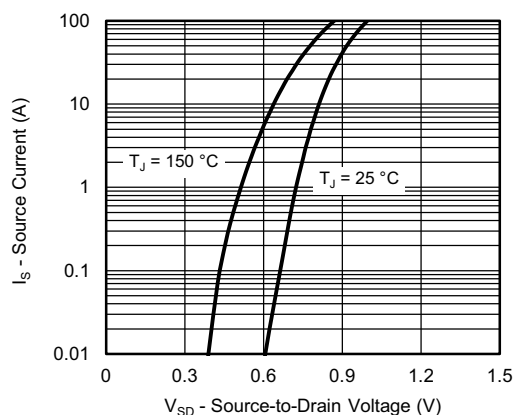
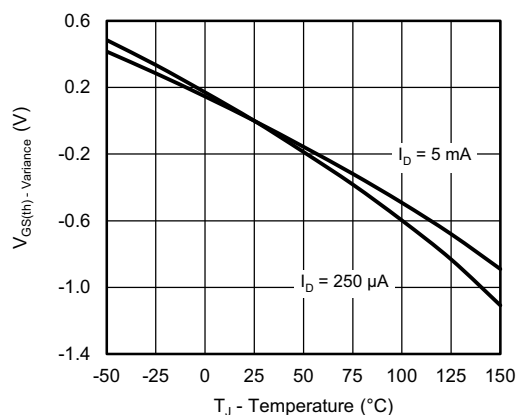
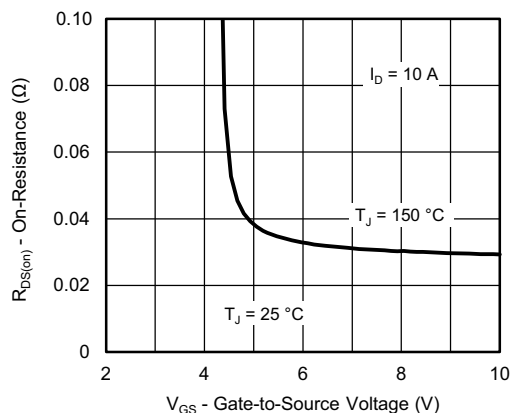
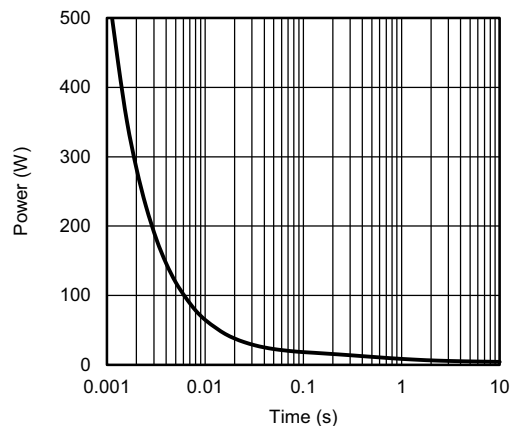
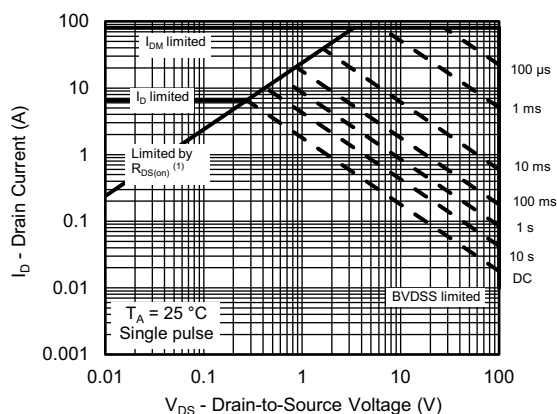
Capacitance



Gate Charge

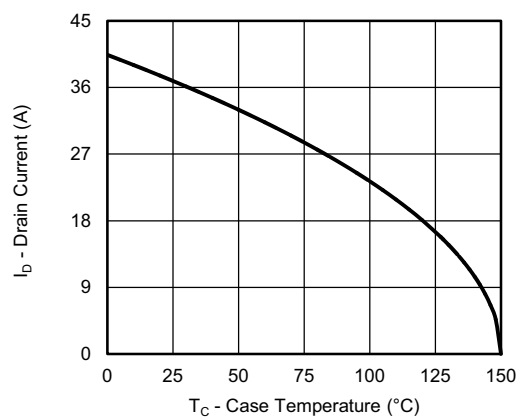
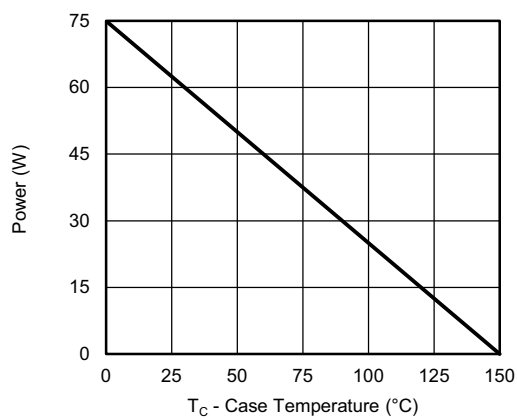
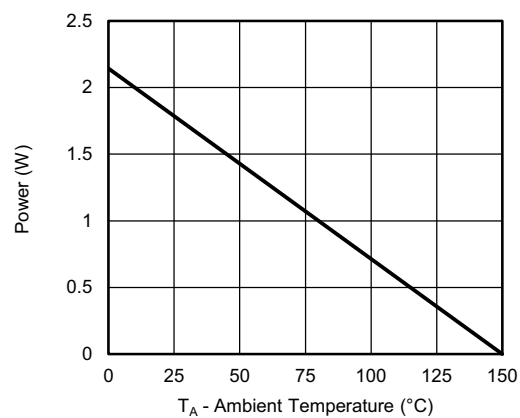


On-Resistance vs. Junction Temperature

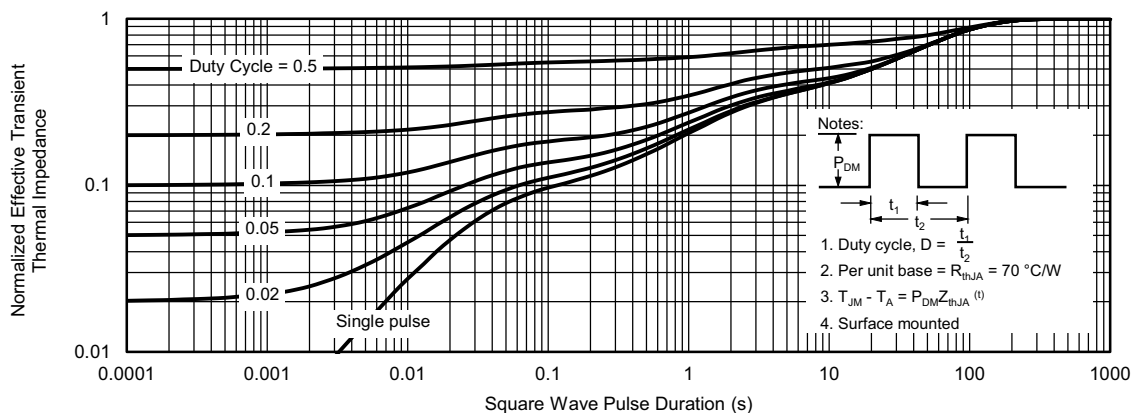
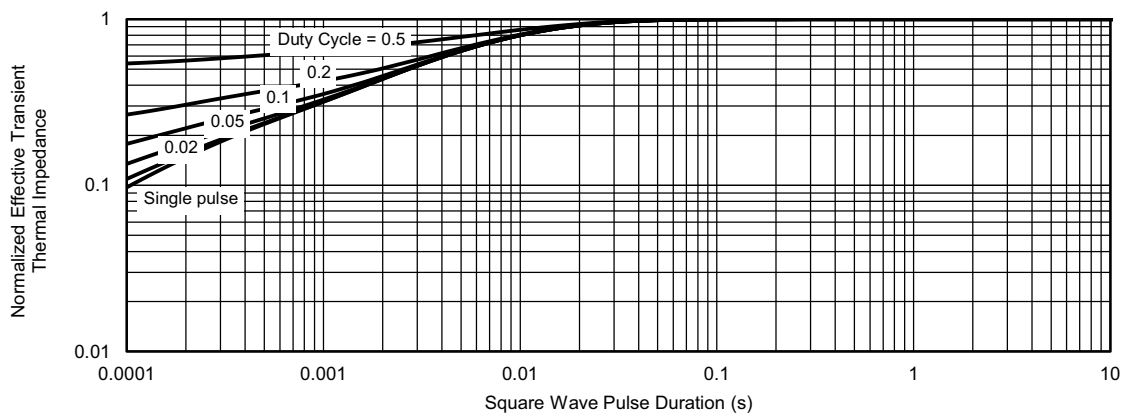
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Source-Drain Diode Forward Voltage

Threshold Voltage

On-Resistance vs. Gate-to-Source Voltage

Single Pulse Power, Junction-to-Ambient


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

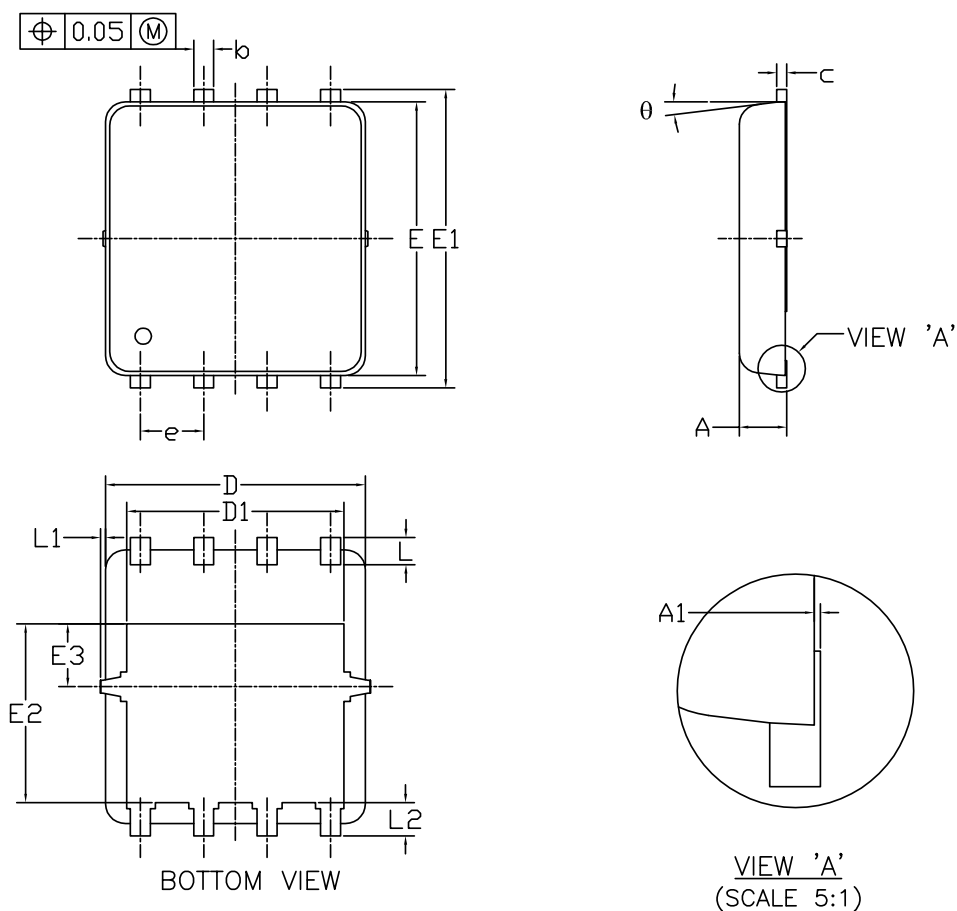
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Current Derating ^a

Power, Junction-to-Case

Power, Junction-to-Ambient
Note

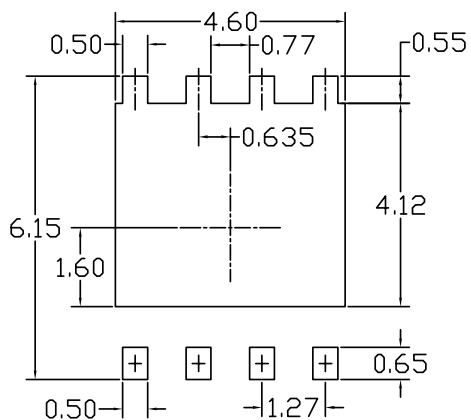
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Case

DFN5x6_8L_EP1_P PACKAGE OUTLIN



RECOMMENDED LAND PATTERN



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.85	0.95	1.00	0.033	0.037	0.039
A1	0.00	---	0.05	0.000	---	0.002
b	0.30	0.40	0.50	0.012	0.016	0.020
c	0.15	0.20	0.25	0.006	0.008	0.010
D	5.10	5.20	5.30	0.201	0.205	0.209
D1	4.25	4.35	4.45	0.167	0.171	0.175
E	5.45	5.55	5.65	0.215	0.219	0.222
E1	5.95	6.05	6.15	0.234	0.238	0.242
E2	3.525	3.625	3.725	0.139	0.143	0.147
E3	1.175	1.275	1.375	0.046	0.050	0.054
e	1.27 BSC			0.050 BSC		
L	0.45	0.55	0.65	0.018	0.022	0.026
L1	0	---	0.15	0	---	0.006
L2	0.68 REF			0.027 REF		
θ	0°	---	10°	0°	---	10°

NOTE

UNIT: mm

- PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MILS EACH.
- CONTROLLING DIMENSION IS MILLIMETER.
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

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