优尚

YOUSHANG SEMICONDUCTOR

设计研发新型功率器件

各类小信号开关

中低压及高压大电流等场效应管

0755-83047638
ysbdt@szyoushang.cn
www.szyoushang.cn

企业微信二维码　企业QQ二维码

Product Summary

Device	BV_{DSS}	$R_{DS(ON)}$	I_D T_A = +25°C
Q1	12V	17mΩ @ V_{GS} = 4.5V	9.5A
		25mΩ @ V_{GS} = 2.5V	7.8A
Q2	-20V	35mΩ @ V_{GS} = -4.5V	-6.8A
		55mΩ @ V_{GS} = -2.5V	-5.3A

Features and Benefits

- Thermally Efficient Package – Cooler Running Applications
- High Conversion Efficiency
- Low $R_{DS(ON)}$ – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed

Description and Applications

This new generation complementary pair enhancement mode MOSFET has been designed to minimize $R_{DS(ON)}$ yet maintain superior switching performance. This device is ideal for use in notebook battery power management and load switch.

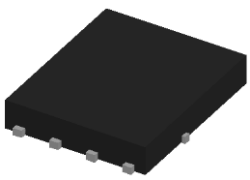
- Notebook battery power management
- DC-DC converters
- Load switches

Mechanical Data

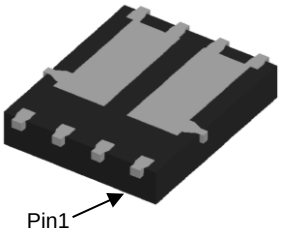
- Package: PowerDI®5060-8
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – 100% Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Terminal Connections: See Diagram Below
- Weight: 0.097 grams (Approximate)

Site 1:

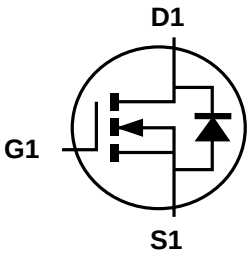
PowerDI5060-8 (Type C)



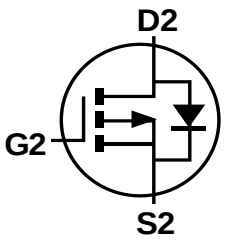
Top View



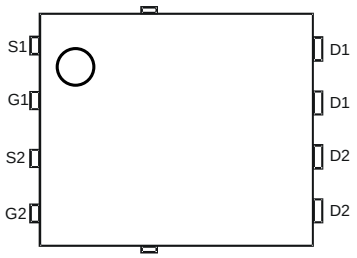
Bottom View



Q1 N-Channel MOSFET



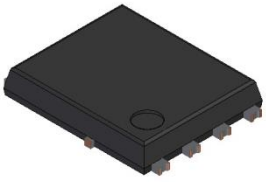
Q2 P-Channel MOSFET



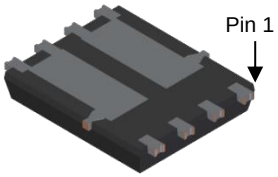
Top View
Pin Configuration

Site 2:

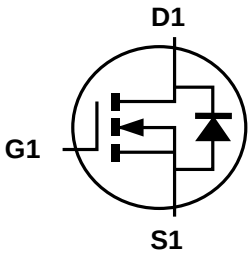
PowerDI5060-8 (SWP) (Type R)



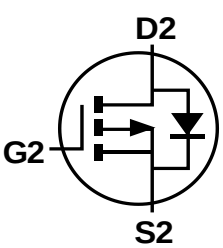
Top View



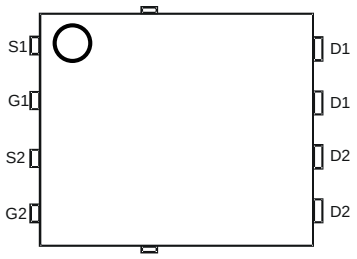
Bottom View



Q1 N-Channel MOSFET



Q2 P-Channel MOSFET



Top View
Pin Configuration

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Q1 Value	Q2 Value	Unit
Drain-Source Voltage			V_{DSS}	12	-20	V
Gate-Source Voltage			V_{GSS}	±8	±8	V
Continuous Drain Current (Note 5) V_{GS} = 4.5V	Steady State	T_A = +25°C	I_D	9.5	-6.8	A
		T_A = +70°C		7.6	-5.4	
	t < 10s	T_A = +25°C	I_D	13.0	-9.4	A
		T_A = +70°C		10.4	-7.5	
Maximum Body Diode Forward Current (Note 5)			I_S	2.4	-2.2	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	65	-35	A
Avalanche Current (Note 6) L = 0.1mH			I_{AS}	22	-20	A
Avalanche Energy (Note 6) L = 0.1mH			E_{AS}	25	20	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	2.3	W
	T_A = +70°C		1.5	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	56	°C/W
	t < 10s		29	
Thermal Resistance, Junction to Case		$R_{\theta JC}$	5.4	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
6. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.

Electrical Characteristics Q1 N-Channel (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	12	—	—	V	V_{GS} = 0V, I_D = 250μA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	V_{DS} = 12V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.6	0.8	1.5	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	9.6	17	mΩ	V_{GS} = 4.5V, I_D = 11.8A
		—	11	25		V_{GS} = 2.5V, I_D = 9.8A
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	V_{GS} = 0V, I_S = 2.9A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	1495	—	pF	V_{DS} = 6V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	310	—		
Reverse Transfer Capacitance	C_{rss}	—	285	—		
Gate Resistance	R_g	—	1.6	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = 3.3V)	Q_g	—	11.5	—	nC	V_{DS} = 6V, I_D = 11.8A
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	15.6	—		
Gate-Source Charge	Q_{gs}	—	2.3	—		
Gate-Drain Charge	Q_{gd}	—	4.6	—		
Turn-On Delay Time	$t_{D(ON)}$	—	5.7	—	ns	V_{DD} = 6V, R_L = 6Ω, V_{GS} = 4.5V, R_g = 6Ω, I_D = 1A
Turn-On Rise Time	t_R	—	10.1	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	40.4	—		
Turn-Off Fall Time	t_F	—	22.5	—		
Body Diode Reverse-Recovery Time	t_{RR}	—	16.4	—	ns	I_F = 2.9A, di/dt = 100A/μs
Body Diode Reverse-Recovery Charge	Q_{RR}	—	3.2	—	nC	I_F = 2.9A, di/dt = 100A/μs

Electrical Characteristics Q2 P-Channel (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note7)						
Drain-Source Breakdown Voltage	BV_{DSS}	-20	—	—	V	V_{GS} = 0V, I_D = -250μA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	-1	μA	V_{DS} = -20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.6	-0.8	-1.5	V	V_{DS} = V_{GS}, I_D = -250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	25	35	mΩ	V_{GS} = -4.5V, I_D = -8.9A
			34	55		V_{GS} = -2.5V, I_D = -6.9A
Diode Forward Voltage	V_{SD}	—	-0.8	-1.2	V	V_{GS} = 0V, I_S = -2.9A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	1745	—	pF	V_{DS} = -10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	146	—		
Reverse Transfer Capacitance	C_{rss}	—	119	—		
Gate Resistance	R_g	—	7.5	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = -3.3V)	Q_g	—	11.2	—	nC	V_{DS} = -6V, I_D = -8.9A
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	15.4	—		
Gate-Source Charge	Q_{gs}	—	1.9	—		
Gate-Drain Charge	Q_{gd}	—	2.9	—		
Turn-On Delay Time	$t_{D(ON)}$	—	7.4	—	ns	V_{DD} = -6V, R_g = 6Ω, V_{GS} = -4.5V, I_D = -1A
Turn-On Rise Time	t_R	—	6.2	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	60.1	—		
Turn-Off Fall Time	t_F	—	16.3	—		
Body Diode Reverse-Recovery Time	t_{RR}	—	9.2	—	ns	I_F= -2.9A, di/dt = -100A/μs
Body Diode Reverse-Recovery Charge	Q_{RR}	—	2.8	—	nC	I_F = -2.9A, di/dt = -100A/μs

Notes: 7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

Typical Characteristics – N-CHANNEL

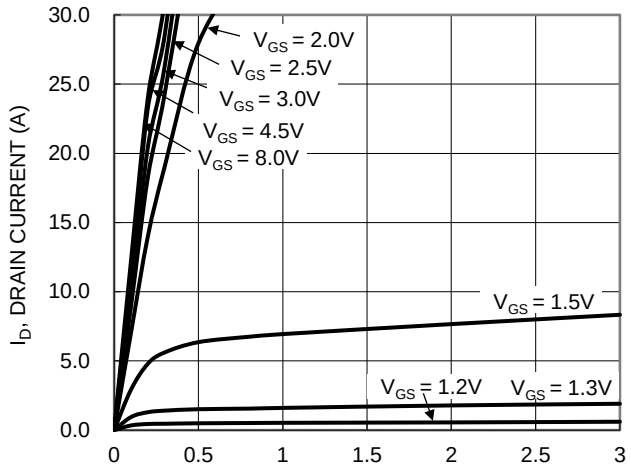


Figure 1. Typical Output Characteristic

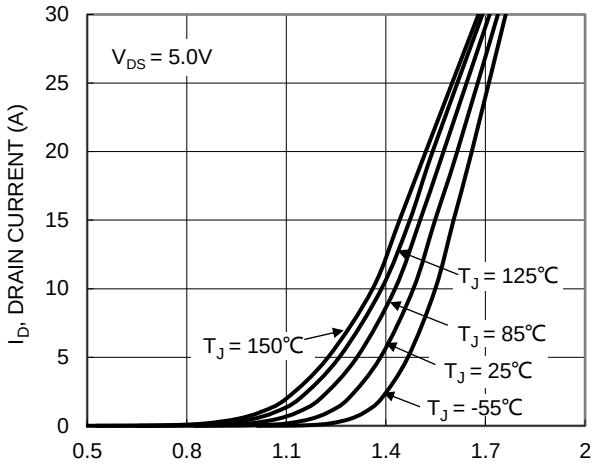


Figure 2. Typical Transfer Characteristic

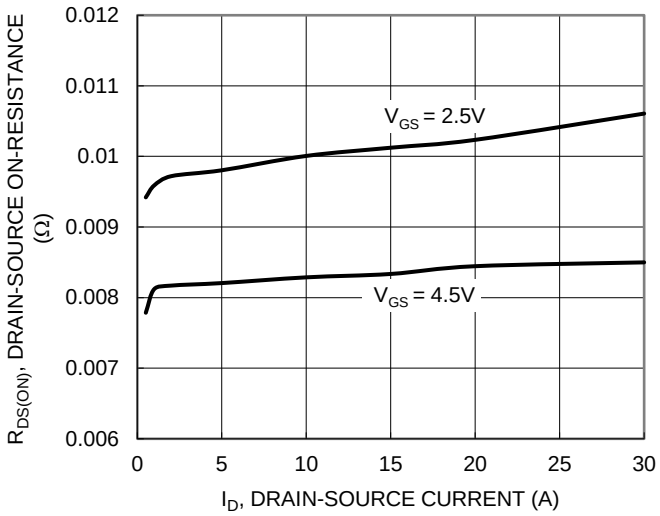


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

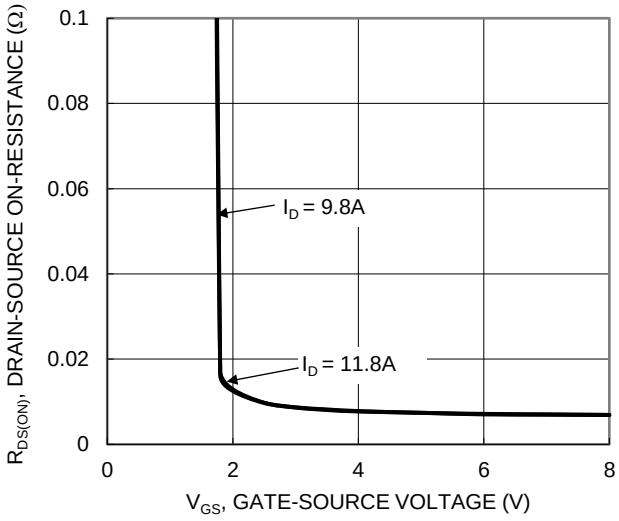


Figure 4. Typical Transfer Characteristic

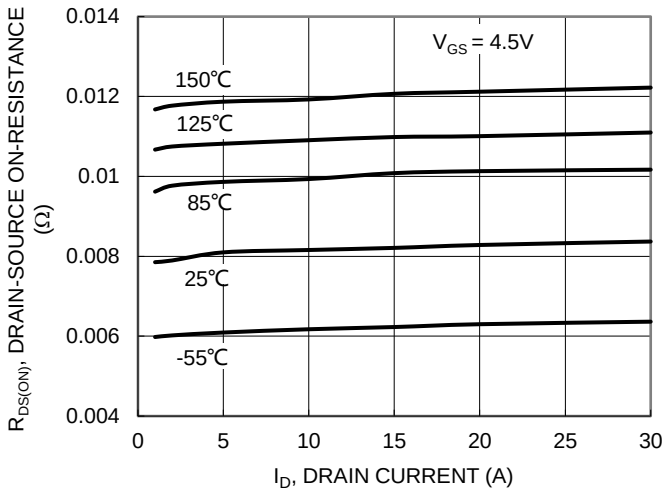


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

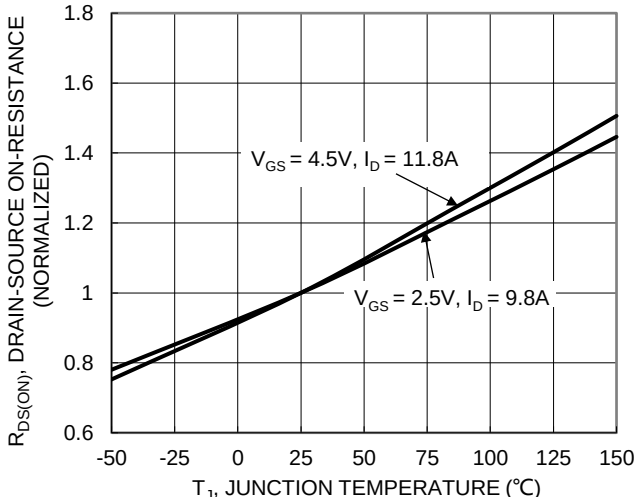


Figure 6. On-Resistance Variation with Junction Temperature

Typical Characteristics – N-CHANNEL (continued)

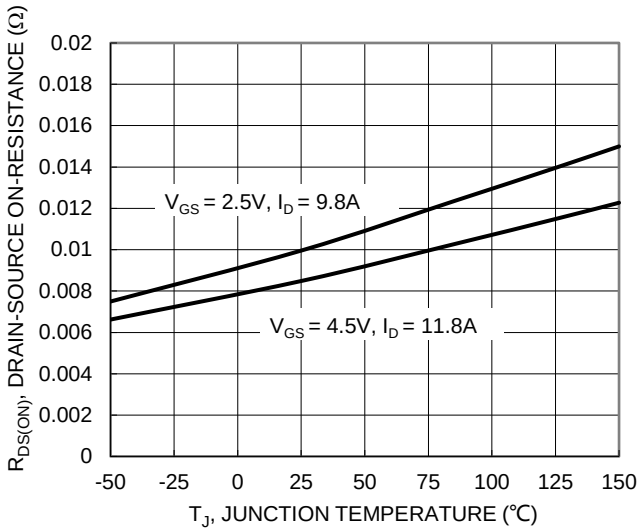


Figure 7. On-Resistance Variation with Junction Temperature

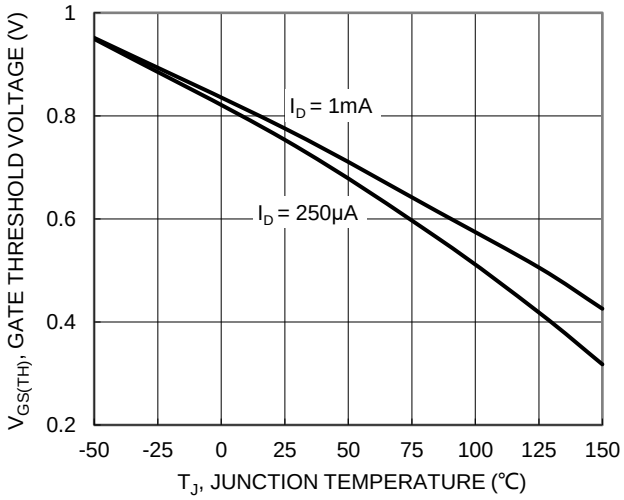


Figure 8. Gate Threshold Variation vs. Junction Temperature

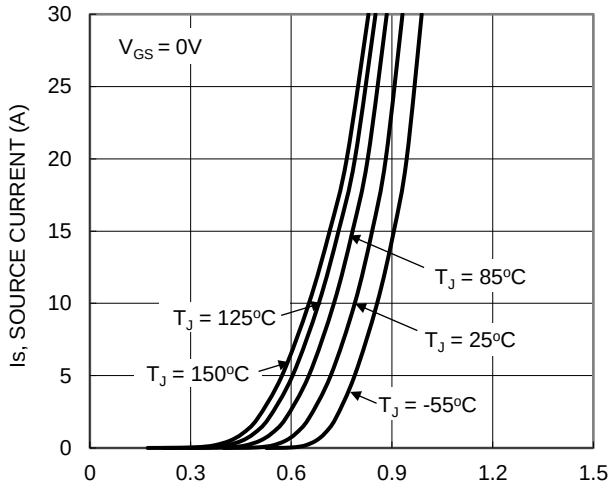


Figure 9. Diode Forward Voltage vs. Current

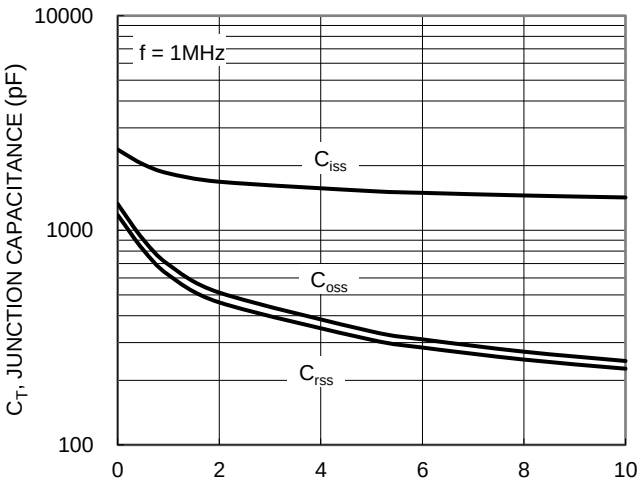


Figure 10. Typical Junction Capacitance

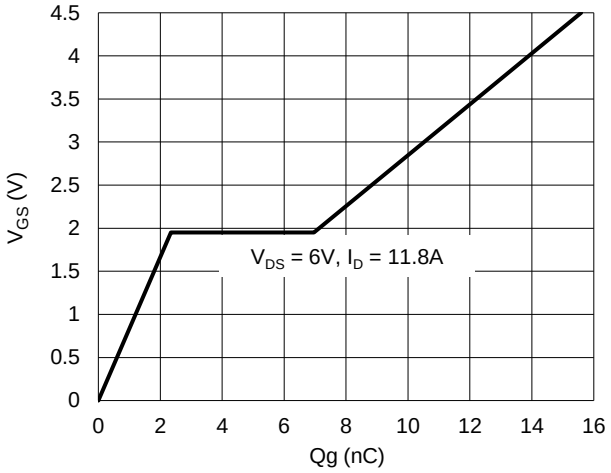


Figure 11. Gate Charge

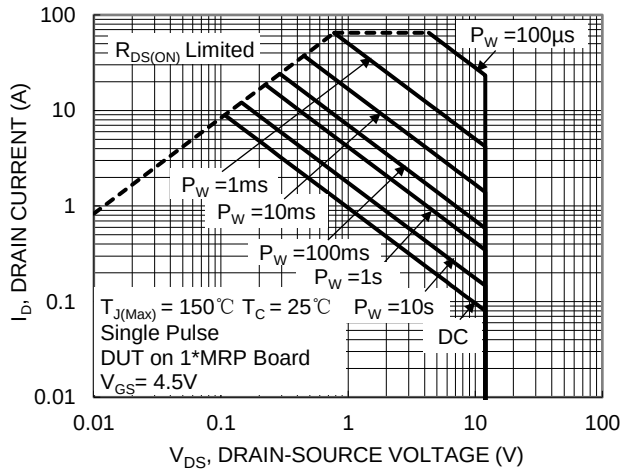


Figure 12. SOA, Safe Operation Area

Typical Characteristics – P-CHANNEL

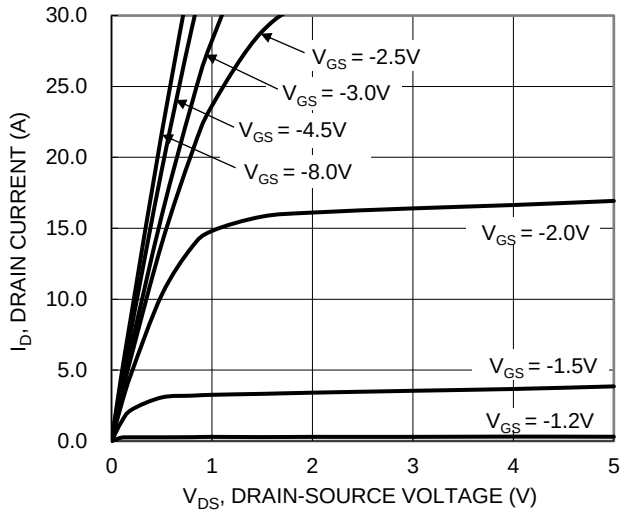


Figure 13. Typical Output Characteristic

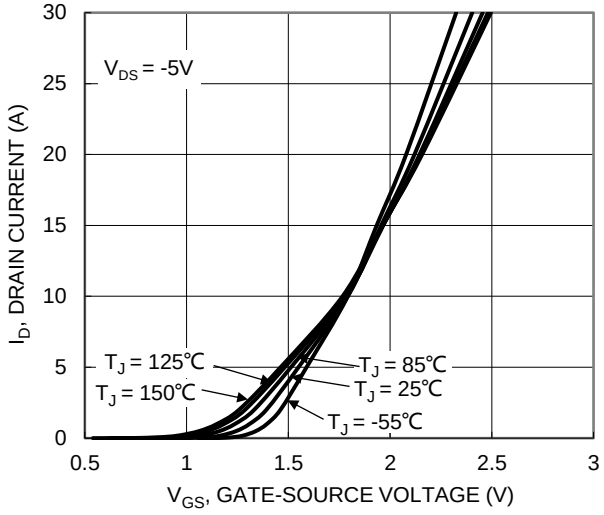


Figure 14. Typical Transfer Characteristic

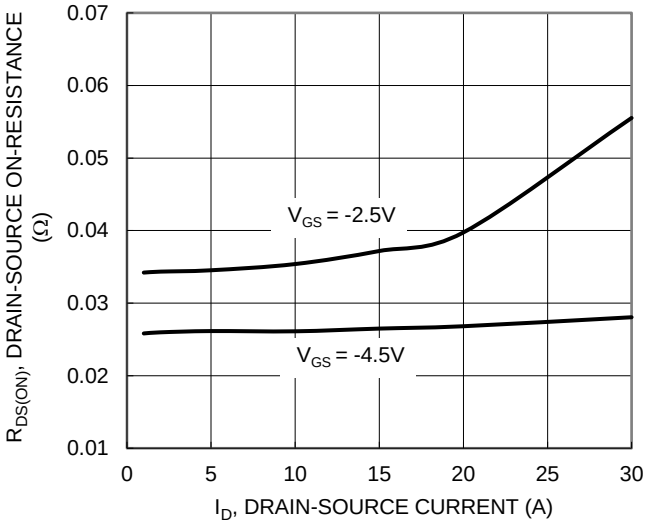


Figure 15. Typical On-Resistance vs. Drain Current and Gate Voltage

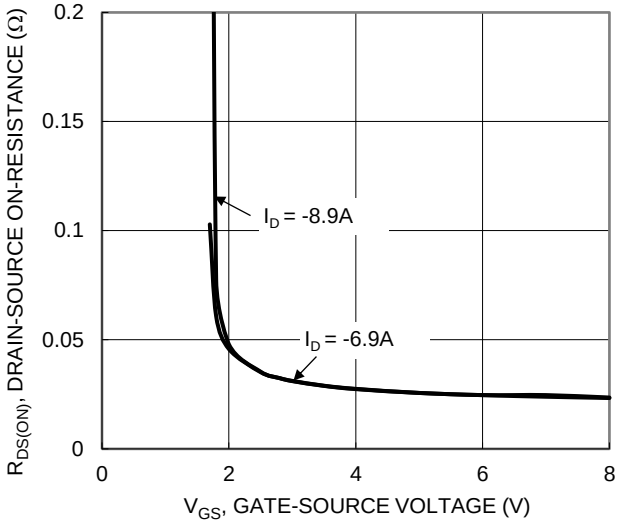


Figure 16. Typical Transfer Characteristic

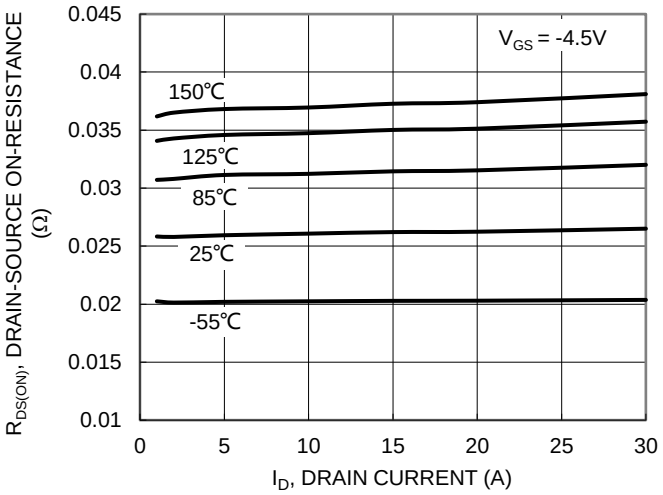


Figure 17. Typical On-Resistance vs. Drain Current and Junction Temperature

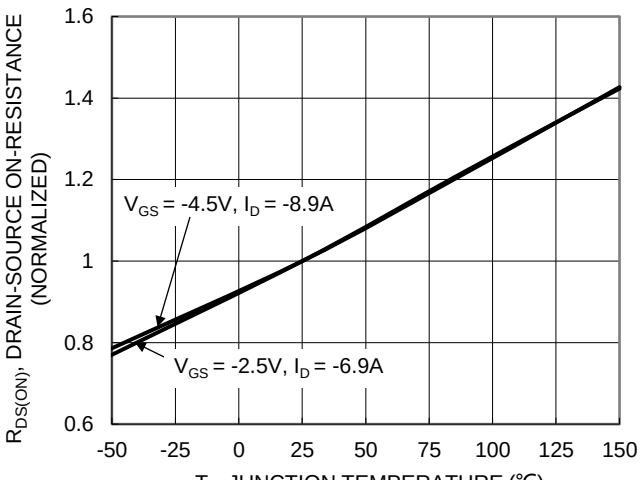


Figure 18. On-Resistance Variation with Junction Temperature

Typical Characteristics – P-CHANNEL (continued)

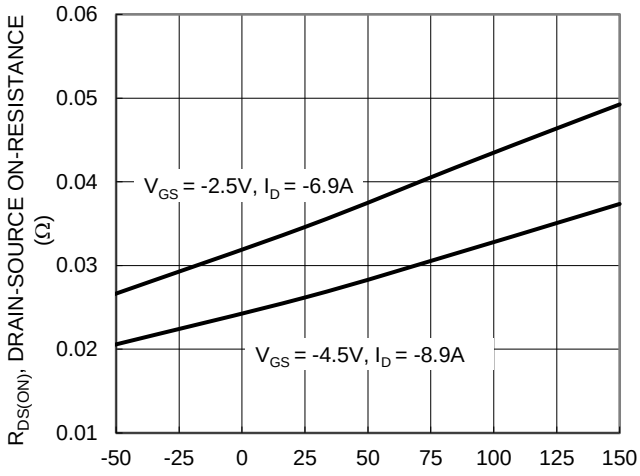


Figure 19. On-Resistance Variation with Junction Temperature

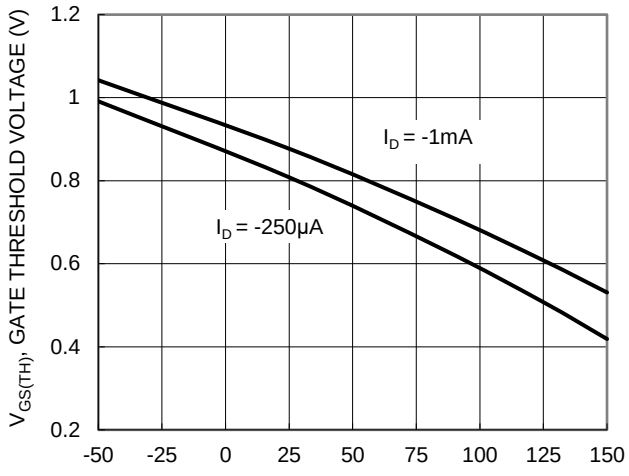


Figure 20. Gate Threshold Variation vs. Junction Temperature

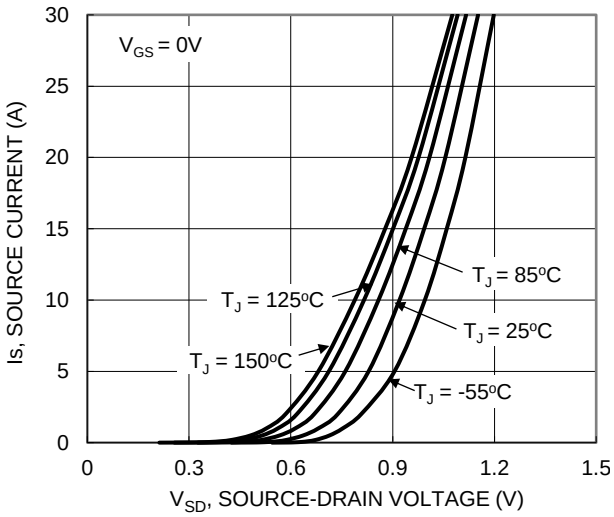


Figure 21. Diode Forward Voltage vs. Current

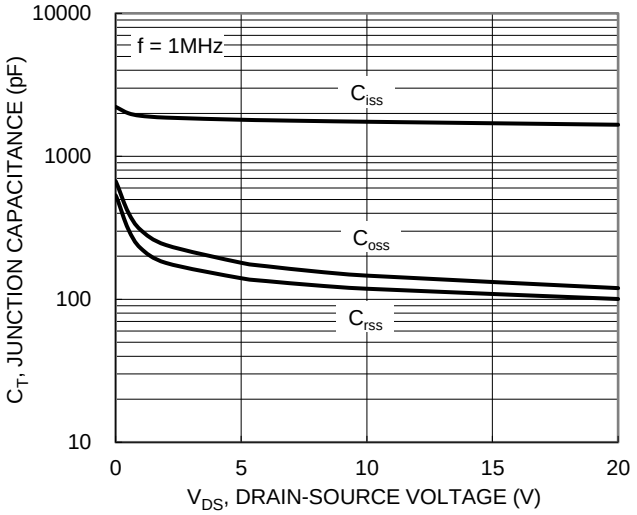


Figure 22. Typical Junction Capacitance

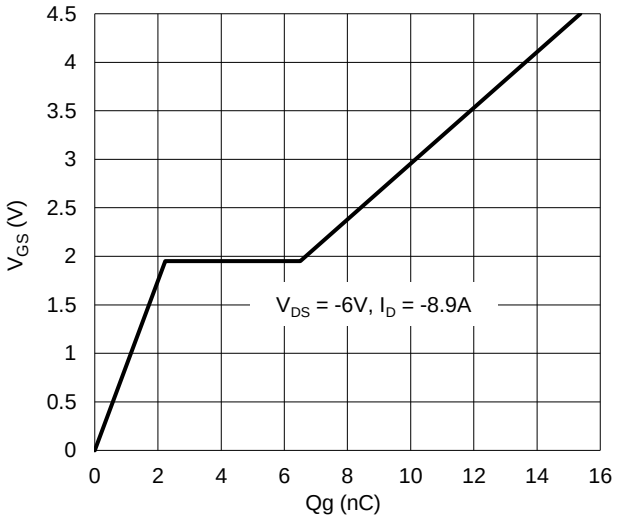


Figure 23. Gate Charge

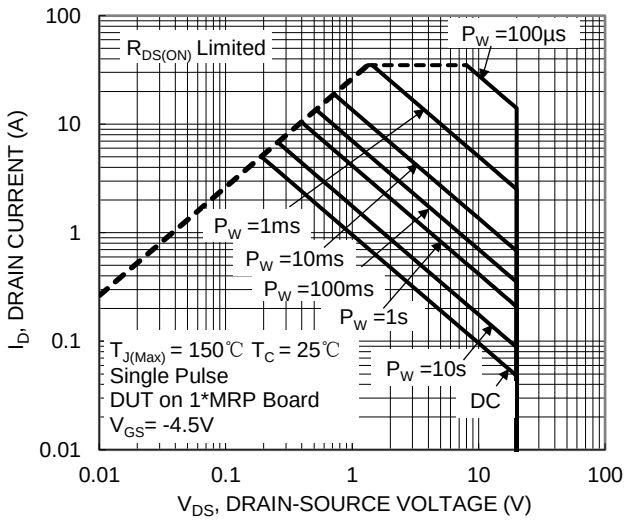


Figure 24. SOA, Safe Operation Area

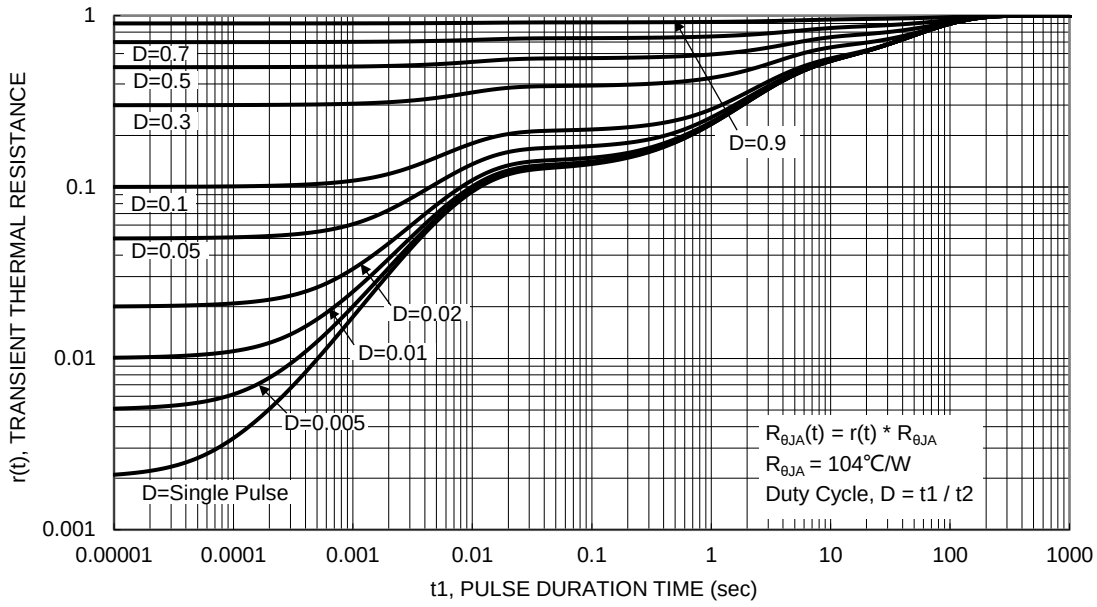
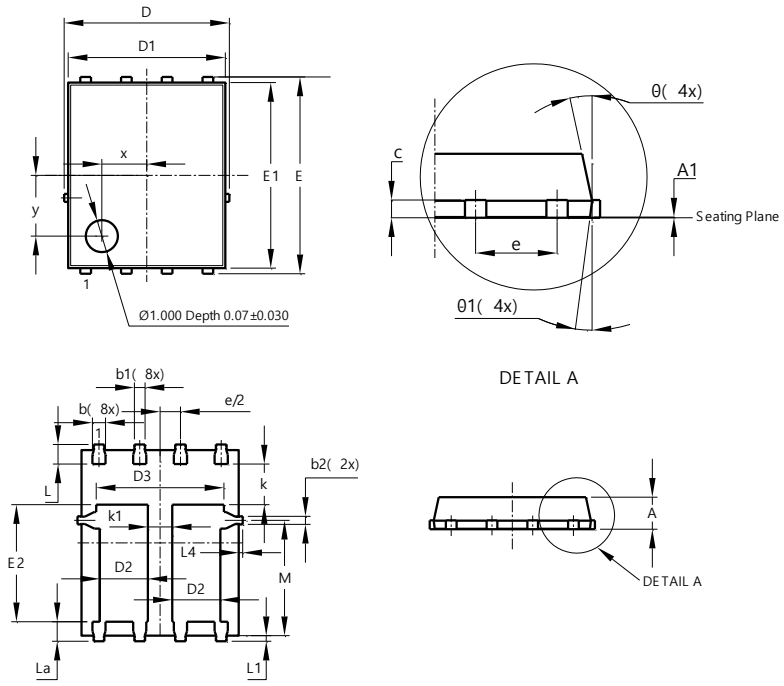


Figure 25. Transient Thermal Resistance

Package Outline Dimensions

Site 1:

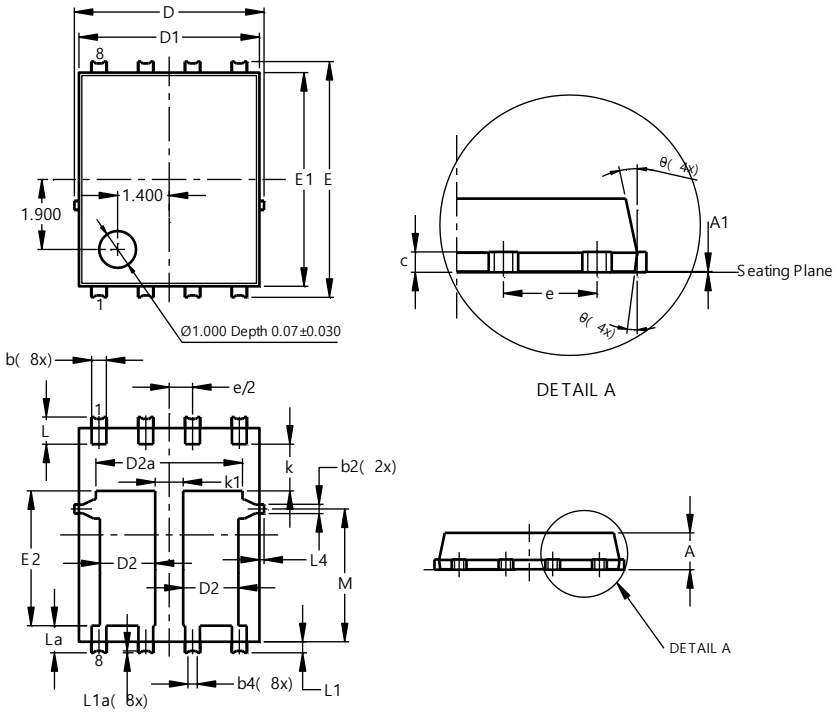
PowerDI5060-8 (Type C)



PowerDI5060-8 (Type C)			
Dim	**Min**	**Max**	**Typ**
A	0.90	1.10	1.00
A1	0	0.05	0.02
b	0.33	0.51	0.41
b1	0.300	0.366	0.333
b2	0.20	0.35	0.25
c	0.23	0.33	0.277
D	5.15 BSC		
D1	4.85	4.95	4.90
D2	1.40	1.60	1.50
D3	-	-	3.98
E	6.15 BSC		
E1	5.75	5.85	5.80
E2	3.56	3.76	3.66
e	1.27BSC		
k	-	-	1.27
k1	0.56	-	-
L	0.51	0.71	0.61
La	0.51	0.71	0.61
L1	0.05	0.20	0.175
L4	-	-	0.125
M	3.50	3.71	3.605
x	-	-	1.400
y	-	-	1.900
θ	10°	12°	11°
θ1	6°	8°	7°
All Dimensions in mm			

Site 2:

PowerDI5060-8 (SWP) (Type R)

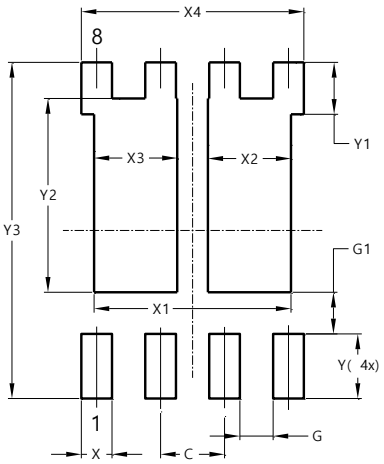


PowerDI5060-8 (SWP) (Type R)			
Dim	**Min**	**Max**	**Typ**
A	0.90	1.10	1.00
A1	0	0.05	--
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	1.40	1.60	1.50
D2a	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
e	1.27BSC		
k	1.05	--	--
k1	0.56	--	--
L	0.635	0.835	0.735
La	0.635	0.835	0.735
L1	0.200	0.400	0.300
L1a	0.050REF		
L4	0.025	0.225	0.125
M	3.205	4.005	3.605
θ	10°	12°	11°
θ1	6°	8°	7°
All Dimensions in mm			

Suggested Pad Layout

Site 1:

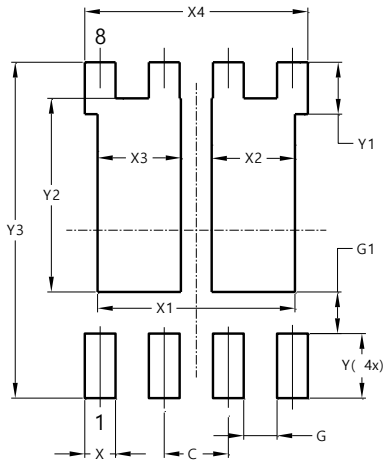
PowerDI5060-8 (Type C)



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	3.910
X2	1.650
X3	1.650
X4	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610

Site 2:

PowerDI5060-8 (SWP) (Type R)



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	3.910
X2	1.650
X3	1.650
X4	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610