

Product Summary

Device	BV _{DSS}	R _{DS(ON)} Max	I _D T _A = +25°C
Q1 N-Channel	60V	29mΩ @ V _{GS} = 10V	6.0A
		34mΩ @ V _{GS} = 6V	5.5A
Q2 P-Channel	-60V	50mΩ @ V _{GS} = -10V	-5.0A
		70mΩ @ V _{GS} = -4.5V	-4.6A

Description and Applications

This new generation MOSFET is designed to minimize the on-state resistance (R_{DS(ON)}) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

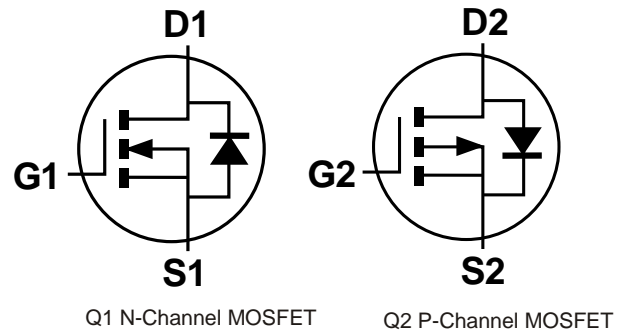
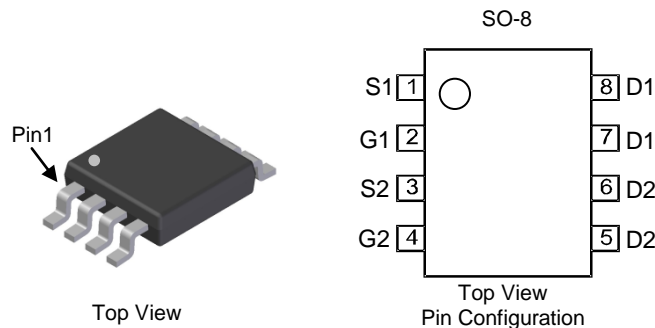
- DC-DC Converters
- Power Management Functions
- Backlighting

Features and Benefits

- Low Input Capacitance
- Low On-Resistance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Tin Finish Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 **e3**
- Weight: 0.074 grams (Approximate)

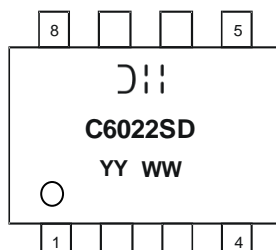


Ordering Information (Note 4)

Part Number	Case	Packaging
DMC6022SSD-13	SO-8	2,500/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



☺||| = Manufacturer's Marking
 C6022SD = Product Type Marking Code
 YYWW = Date Code Marking
 YY or YY = Year (ex: 16= 2016)
 WW = Week (01 to 53)

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic			Symbol	Q1	Q2	Unit
Drain-Source Voltage			V_{DSS}	60	-60	V
Gate-Source Voltage			V_{GSS}	± 20	± 20	V
Continuous Drain Current (Note 6) N-Channel: $V_{GS} = 10\text{V}$ P-Channel: $V_{GS} = -10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	6.0 5.0	-5.0 -4.0	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	8.4 6.7	-6.5 -5.2	A
Maximum Body Diode Forward Current (Note 6)			I_S	2.0	-2.0	A
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)			I_{DM}	45	-35	A
Avalanche Current (Note 7) $L = 0.1\text{mH}$			I_{AS}	22	-25	A
Avalanche Energy (Note 7) $L = 0.1\text{mH}$			E_{AS}	24	24	mJ

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	P_D	1.5	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	102	$^\circ\text{C/W}$
	$t < 10\text{s}$		64	
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	P_D	2.0	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	74	$^\circ\text{C/W}$
	$t < 10\text{s}$		47	
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	10	$^\circ\text{C}$
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

Electrical Characteristics N-Channel Q1 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	I_{DSS}	—	—	1	μA	$V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	1.0	—	3.0	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	21	29	m Ω	$V_{GS} = 10\text{V}, I_D = 5\text{A}$
		—	22	34		$V_{GS} = 6\text{V}, I_D = 5\text{A}$
Diode Forward Voltage	V_{SD}	—	0.8	1.2	V	$V_{GS} = 0\text{V}, I_S = 1.7\text{A}$
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	2110	—	pF	$V_{DS} = 30\text{V}, V_{GS} = 0\text{V},$ $f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	78	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	51	—	pF	
Gate Resistance	R_g	—	2.0	—	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge at ($V_{GS} = 4.5\text{V}$)	Q_g	—	14	—	nC	$V_{DS} = 30\text{V}, I_D = 6\text{A}$
Total Gate Charge at ($V_{GS} = 10\text{V}$)	Q_g	—	32	—	nC	
Gate-Source Charge	Q_{GS}	—	7.0	—	nC	
Gate-Drain Charge	Q_{GD}	—	4.0	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	5.4	—	ns	$V_{GS} = 10\text{V}, V_{DS} = 30\text{V},$ $R_G = 6\Omega, I_D = 1\text{A}$
Turn-On Rise Time	t_R	—	4.4	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	30.4	—	ns	
Turn-Off Fall Time	t_F	—	8.4	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	18.1	—	ns	$I_F = 1.7\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	Q_{RR}	—	12.5	—	nC	$I_F = 1.7\text{A}, di/dt = 100\text{A}/\mu\text{s}$

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 - UIS in production with $L = 0.1\text{mH}$, starting $T_A = +25^\circ\text{C}$.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV _{DSS}	-60	—	—	V	V _{GS} = 0V, I _D = -250μA
Zero Gate Voltage Drain Current T _J = +25°C	I _{DSS}	—	—	-1	μA	V _{DS} = -60V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	V _{GS(TH)}	-1.0	—	-3.0	V	V _{DS} = V _{GS} , I _D = -250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	35	50	mΩ	V _{GS} = -10V, I _D = -5A
			45	70		V _{GS} = -4.5V, I _D = -4A
Diode Forward Voltage	V _{SD}	—	-0.7	-1.2	V	V _{GS} = 0V, I _S = -1A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C _{iss}	—	1525	—	pF	V _{DS} = -30V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	—	90	—	pF	
Reverse Transfer Capacitance	C _{rss}	—	70	—	pF	
Gate Resistance	R _g	—	16	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = -4.5V)	Q _g	—	14.5	—	nC	V _{DS} = -30V, I _D = -5A
Total Gate Charge (V _{GS} = -10V)	Q _g	—	30.6	—	nC	
Gate-Source Charge	Q _{gs}	—	4.9	—	nC	
Gate-Drain Charge	Q _{gd}	—	5.2	—	nC	
Turn-On Delay Time	t _{D(ON)}	—	5.3	—	ns	V _{GS} = -10V, V _{DS} = -30V, R _G = 3Ω, I _D = -5A
Turn-On Rise Time	t _R	—	15.4	—	ns	
Turn-Off Delay Time	t _{D(OFF)}	—	79.2	—	ns	
Turn-Off Fall Time	t _F	—	45.3	—	ns	
Body Diode Reverse Recovery Time	t _{RR}	—	15.2	—	ns	I _F = -5A, di/dt = -100A/μs
Body Diode Reverse Recovery Charge	Q _{RR}	—	9.3	—	nC	I _F = -5A, di/dt = -100A/μs

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

N-Channel

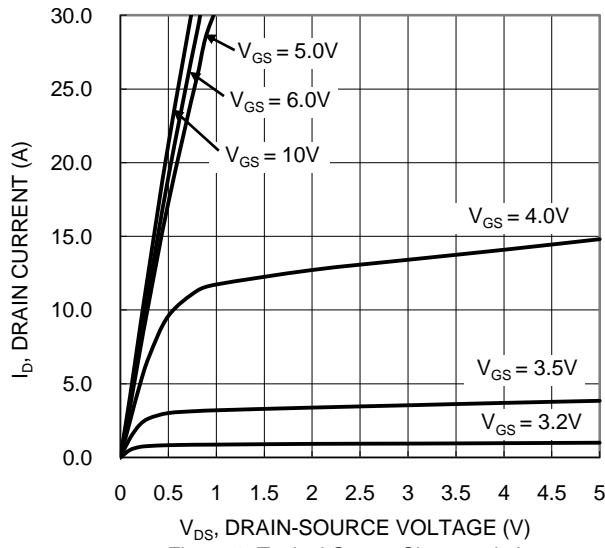


Figure 1. Typical Output Characteristic

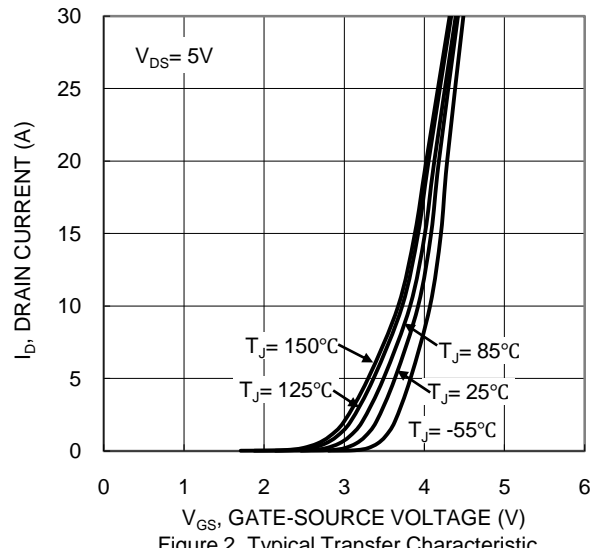


Figure 2. Typical Transfer Characteristic

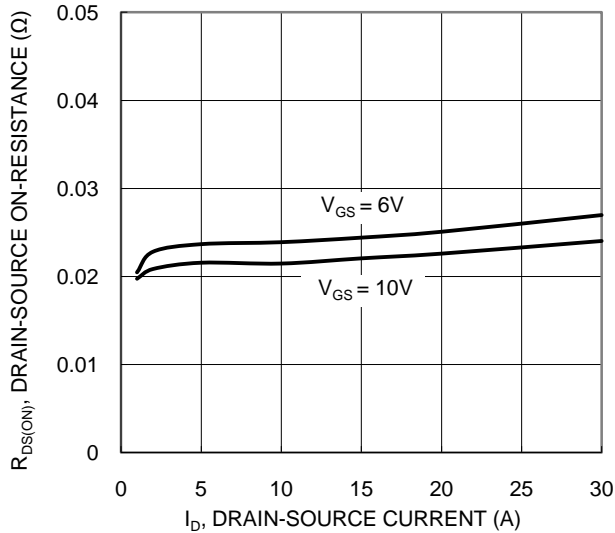


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

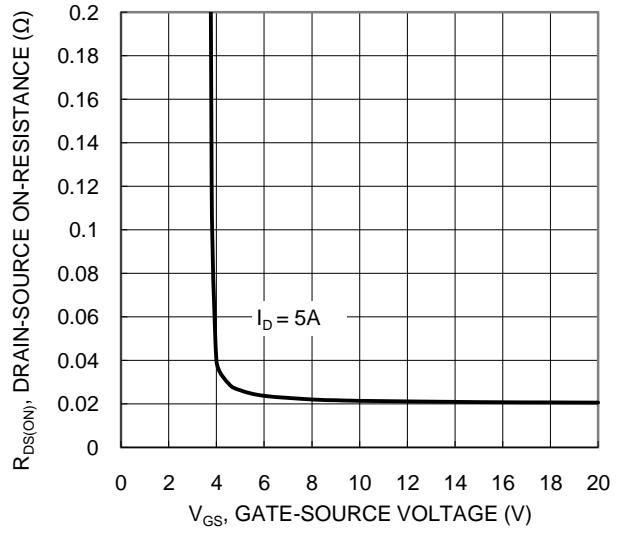


Figure 4. Typical Transfer Characteristic

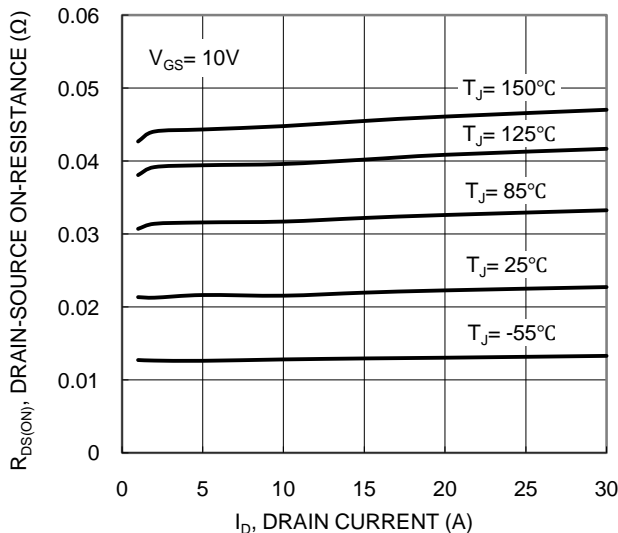


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

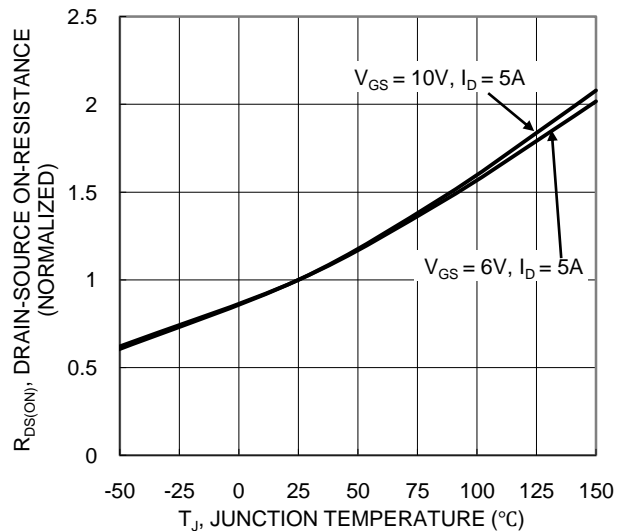


Figure 6. On-Resistance Variation with Junction Temperature

N-Channel (Cont.)

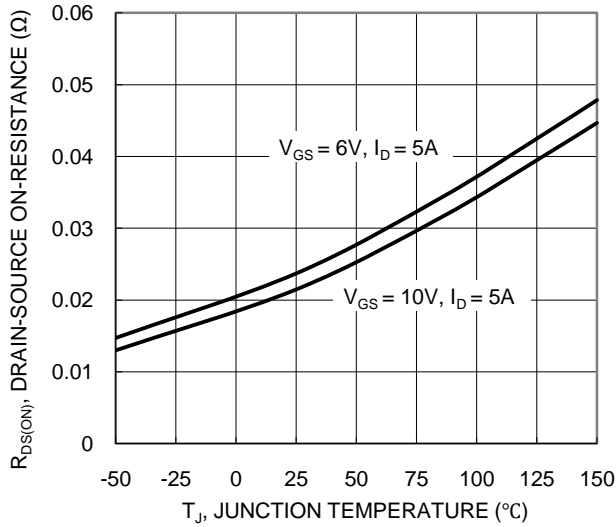


Figure 7. On-Resistance Variation with Junction Temperature

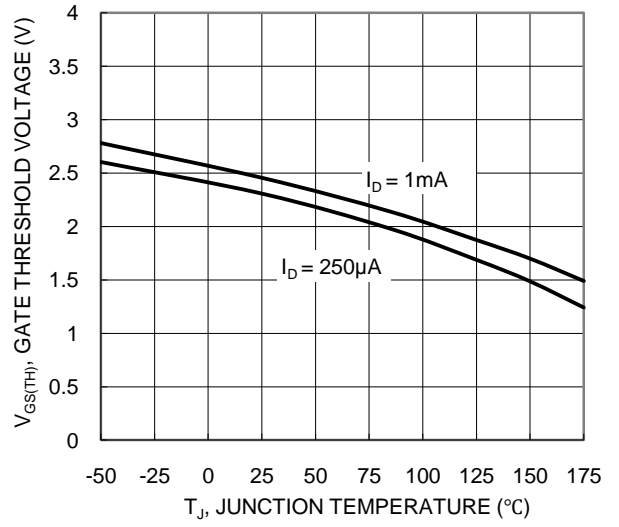


Figure 8. Gate Threshold Variation vs. Junction Temperature

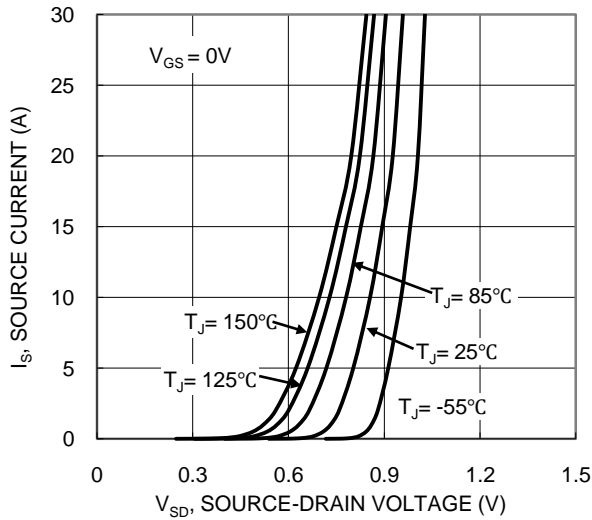


Figure 9. Diode Forward Voltage vs. Current

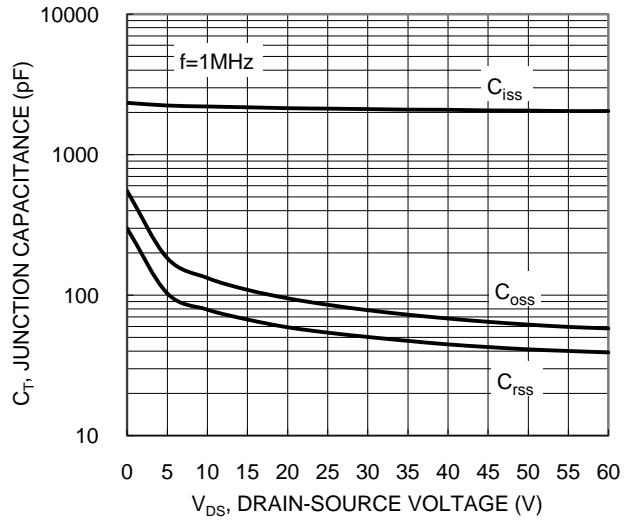


Figure 10. Typical Junction Capacitance

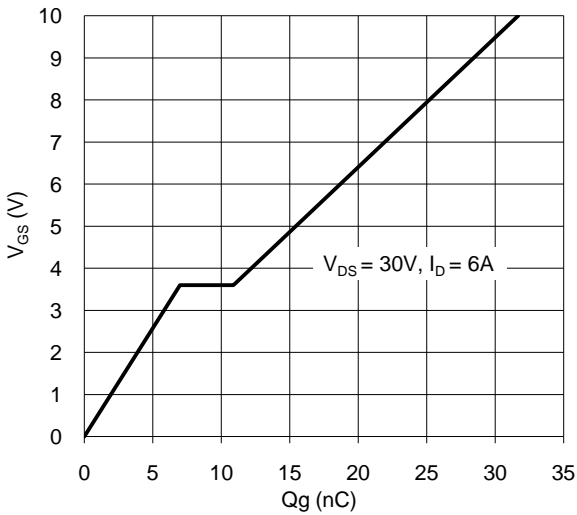


Figure 11. Gate Charge

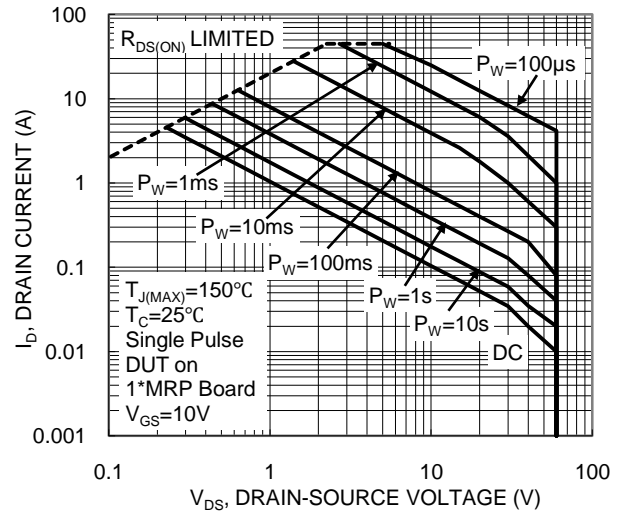


Figure 12. SOA, Safe Operation Area

P-Channel

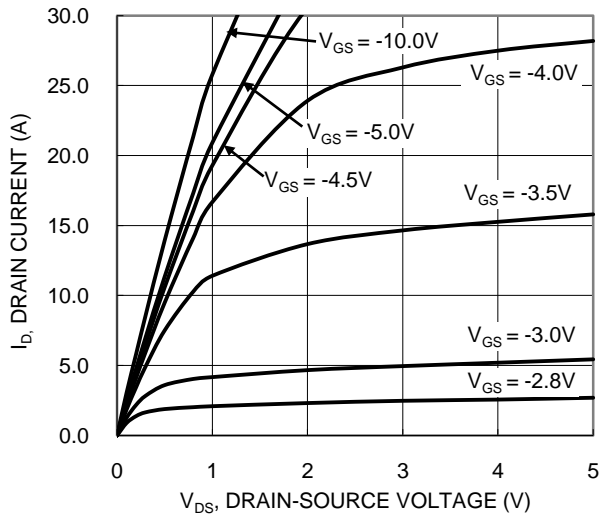


Figure 13. Typical Output Characteristic

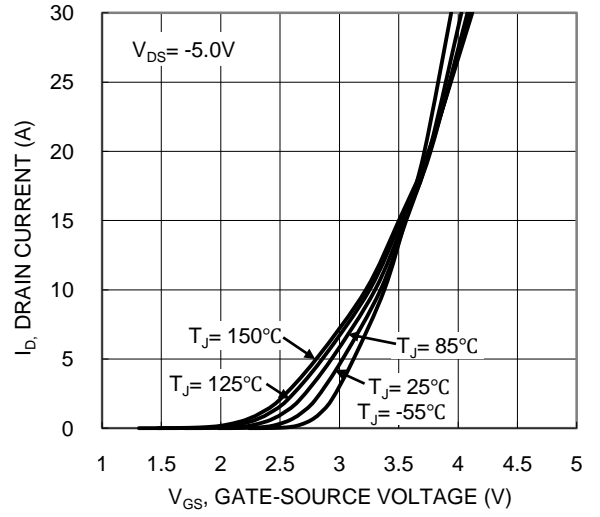


Figure 14. Typical Transfer Characteristic

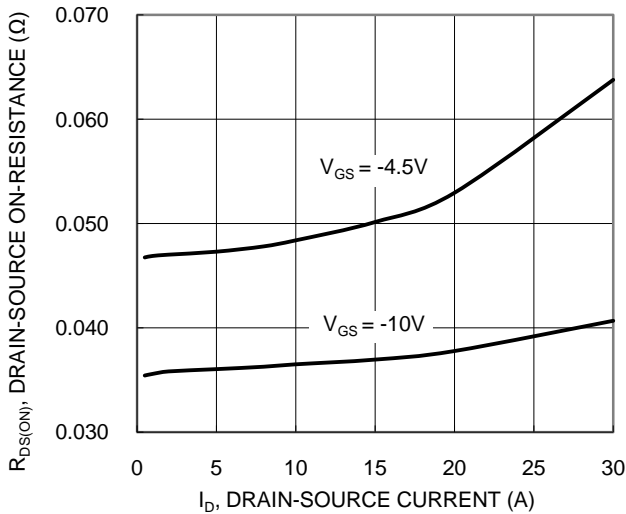


Figure 15. Typical On-Resistance vs. Drain Current and Gate Voltage

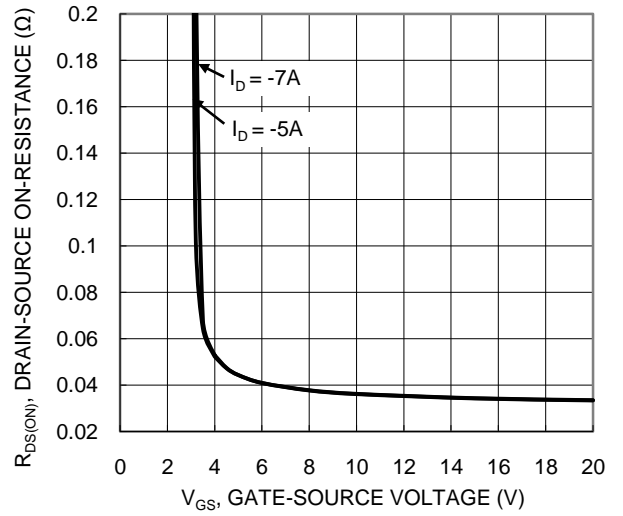


Figure 16. Typical Transfer Characteristic

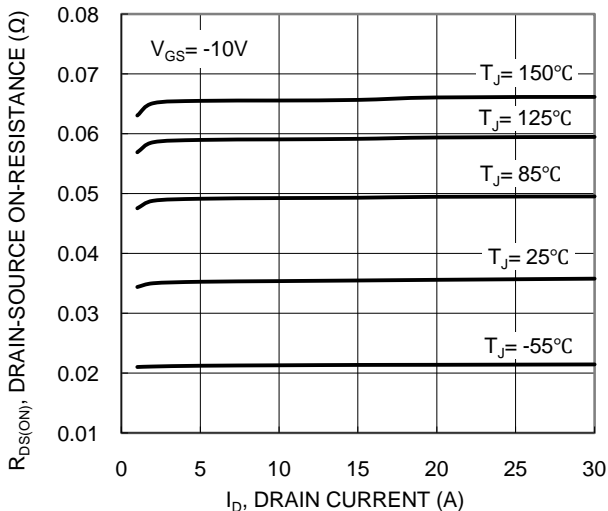


Figure 17. Typical On-Resistance vs. Drain Current and Temperature

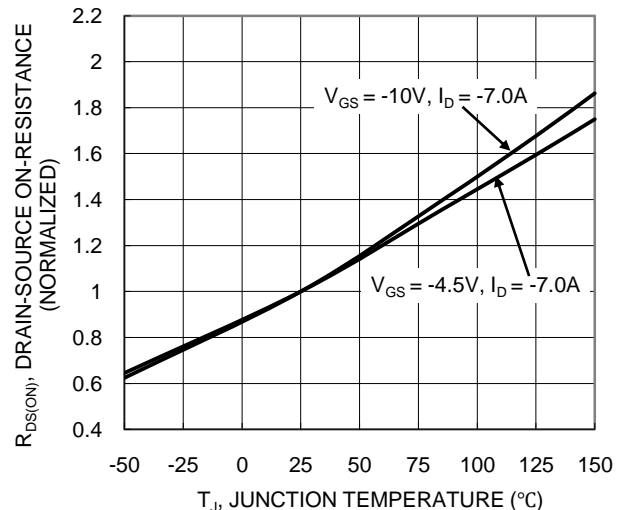


Figure 18. On-Resistance Variation with Temperature

P-Channel (Cont.)

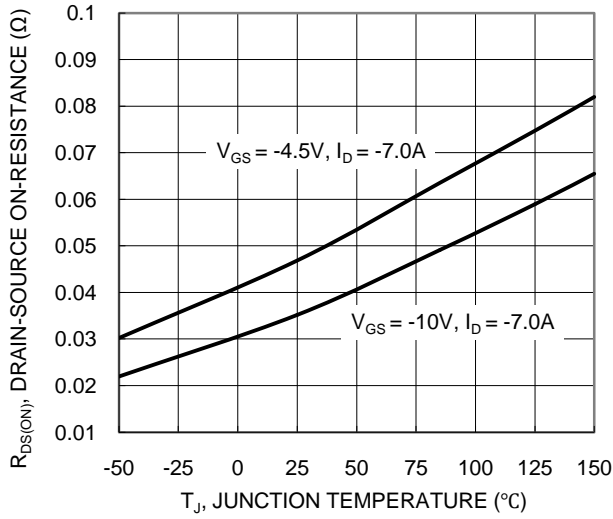


Figure 19. On-Resistance Variation with Temperature

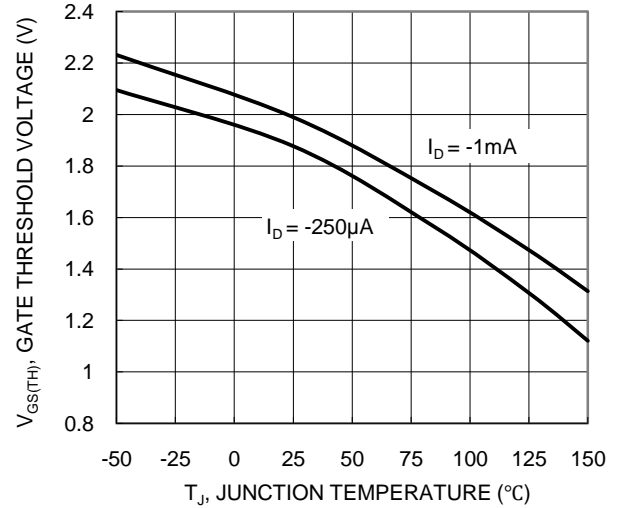


Figure 20. Gate Threshold Variation vs. Temperature

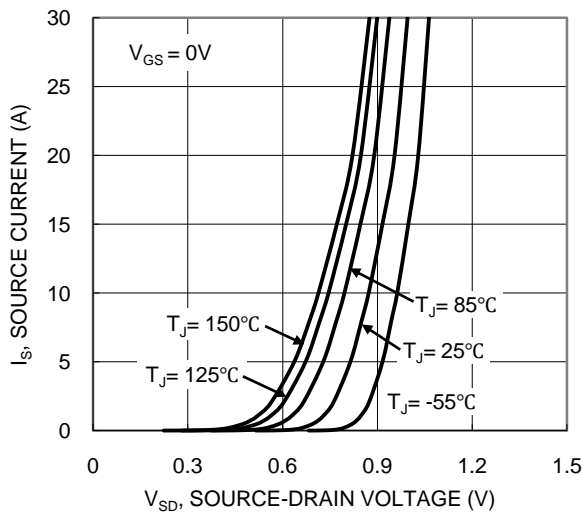


Figure 21. Diode Forward Voltage vs. Current

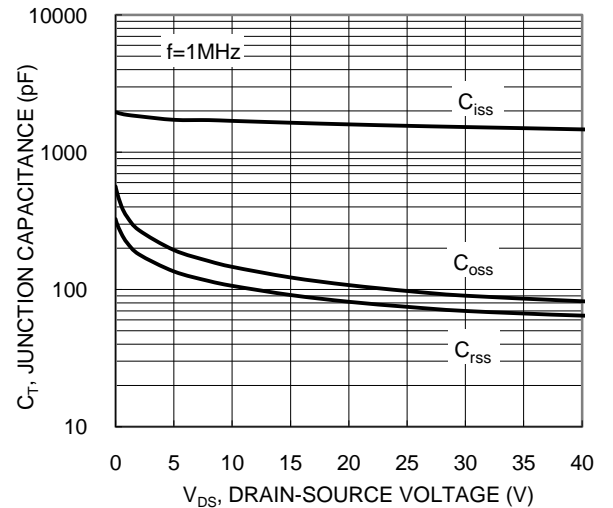


Figure 22. Typical Junction Capacitance

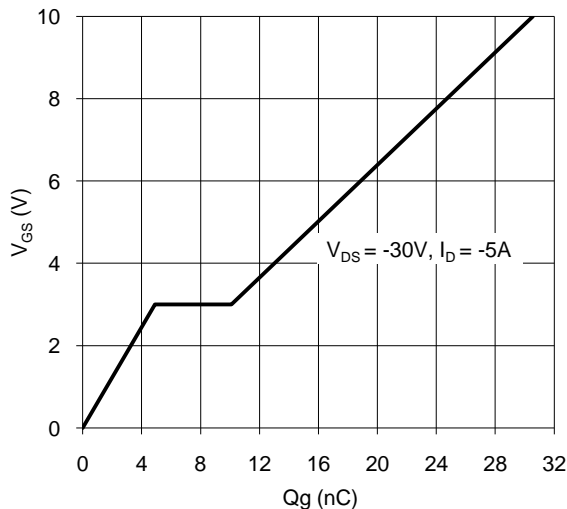


Figure 23. Gate Charge

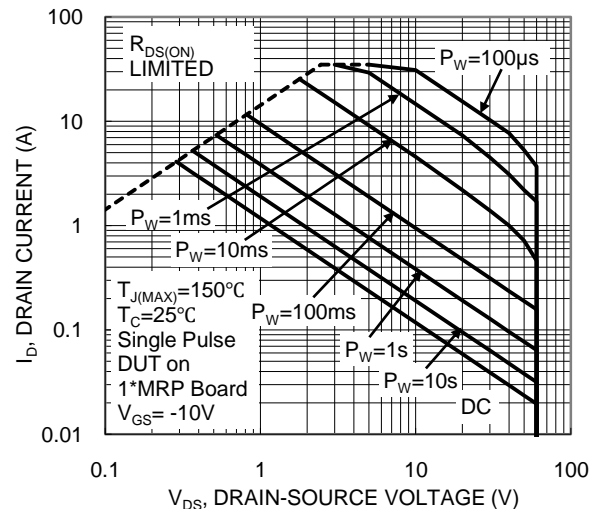


Figure 24. SOA, Safe Operation Area

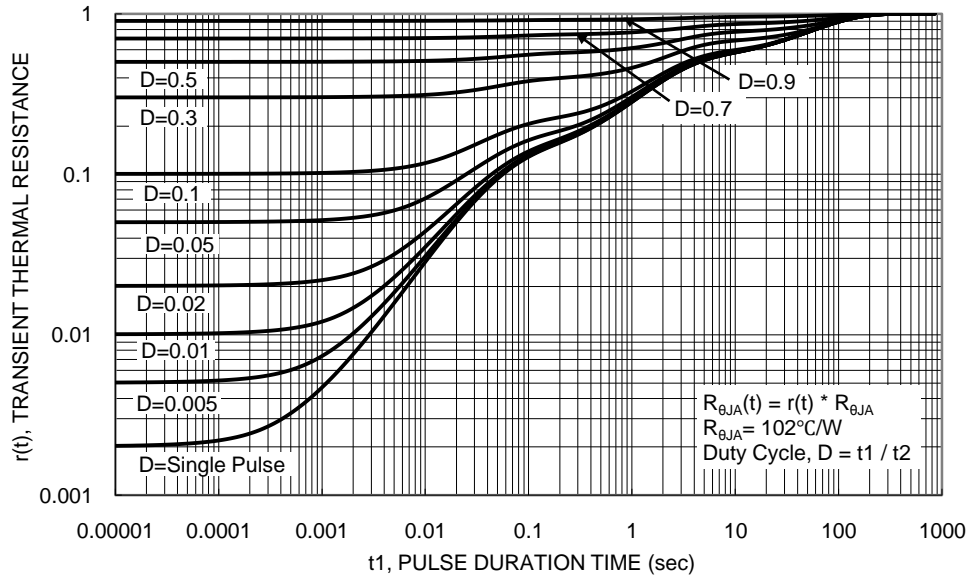
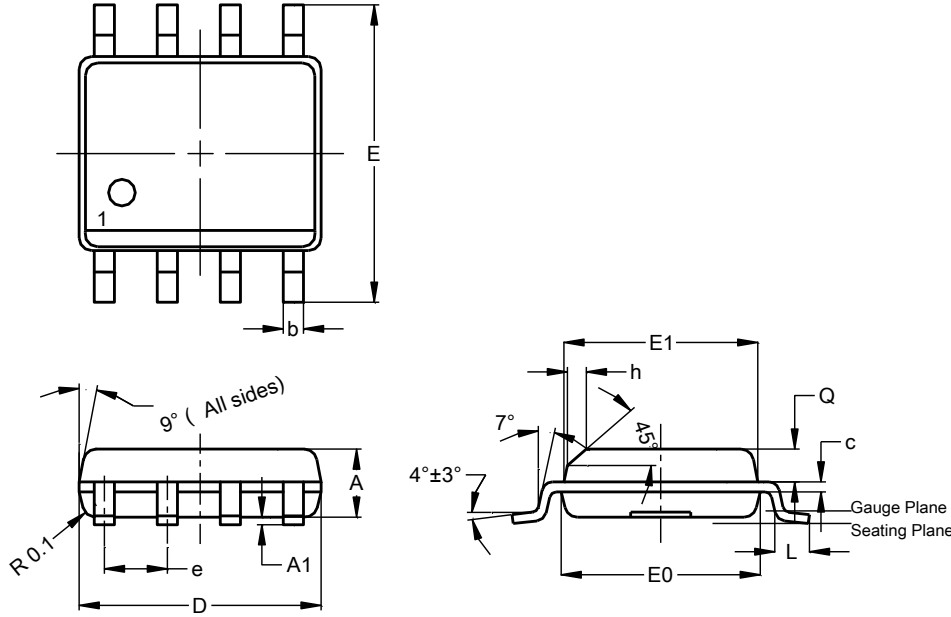


Figure 25. Transient Thermal Resistance

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SO-8



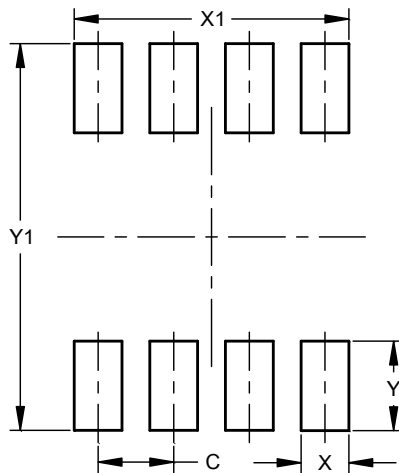
SO-8			
Dim	Min	Max	Typ
A	1.40	1.50	1.45
A1	0.10	0.20	0.15
b	0.30	0.50	0.40
c	0.15	0.25	0.20
D	4.85	4.95	4.90
E	5.90	6.10	6.00
E1	3.80	3.90	3.85
E0	3.85	3.95	3.90
e	--	--	1.27
h	-	--	0.35
L	0.62	0.82	0.72
Q	0.60	0.70	0.65

All Dimensions in mm

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SO-8



Dimensions	Value (in mm)
C	1.27
X	0.802
X1	4.612
Y	1.505
Y1	6.50

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