

ASYMMETRIC DUAL N-CHANNEL ENHANCEMENT MODE MOSFET

Features

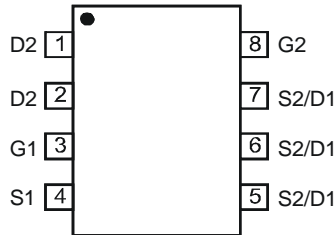
- DIOFET utilize a unique patented process to monolithically integrate a MOSFET and a Schottky in a single die to deliver:
 - Low $R_{DS(on)}$ – minimizes conduction loss
 - Low V_{SD} – reducing the losses due to body diode construction
 - Low Q_{rr} – lower Q_{rr} of the integrated Schottky reduces body diode switching losses
 - Low gate capacitance (Q_g/Q_{gs}) ratio – reduces risk of shoot-through or cross conduction currents at high frequencies
 - Avalanche rugged – I_{AR} and E_{AR} rated
- **Lead Free By Design/RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

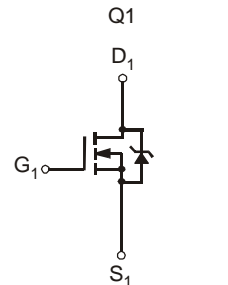
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Weight: 0.072 grams (approximate)



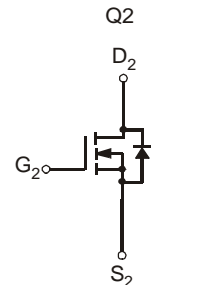
Top View



Top View
Internal Schematic



N-Channel MOSFET +
Integrated Schottky Diode



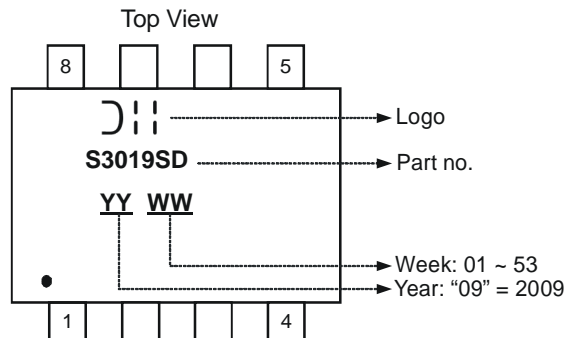
N-Channel MOSFET

Ordering Information (Note 3)

Part Number	Case	Packaging
DMS3019SSD-13	SO-8	2500 / Tape & Reel

- Notes:
1. No purposefully added lead.
 2. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com/products/lead_free/index.php.
 3. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

Marking Information



Maximum Ratings – Q1 @TA = 25°C unless otherwise specified

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V _{DSS}	30	V
Gate-Source Voltage			V _{GSS}	±12	V
Continuous Drain Current (Note 4) V _{GS} = 10V	Steady State	T _A = 25°C	I _D	7.0	A
		T _A = 70°C		5.6	
Continuous Drain Current (Note 5) V _{GS} = 10V	Steady State	T _A = 25°C	I _D	9.0	A
		T _A = 70°C		7.0	
Continuous Drain Current (Note 5) V _{GS} = 4.5V	Steady State	T _A = 25°C	I _D	8.0	A
		T _A = 70°C		6.5	
Pulsed Drain Current (Note 6)			I _{DM}	40	A
Avalanche Current (Notes 6 & 7)			I _{AR}	13	A
Repetitive Avalanche Energy (Notes 6 & 7) L = 0.3mH			E _{AR}	25.4	mJ

Maximum Ratings – Q2 @TA = 25°C unless otherwise specified

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V _{DSS}	30	V
Gate-Source Voltage			V _{GSS}	±20	V
Continuous Drain Current (Note 4) V _{GS} = 10V	Steady State	T _A = 25°C	I _D	5.7	A
		T _A = 70°C		4.6	
Continuous Drain Current (Note 5) V _{GS} = 10V	Steady State	T _A = 25°C	I _D	7.0	A
		T _A = 70°C		5.6	
Continuous Drain Current (Note 5) V _{GS} = 4.5V	Steady State	T _A = 25°C	I _D	6.0	A
		T _A = 70°C		4.7	
Pulsed Drain Current (Note 6)			I _D	40	A
Avalanche Current (Notes 6 & 7)			I _{AR}	16	A
Repetitive Avalanche Energy (Notes 6 & 7) L = 0.1mH			E _{AR}	12.8	mJ

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 4)	P _D	1.19	W
Thermal Resistance, Junction to Ambient @T _A = 25°C (Note 4)	R _{θJA}	107	°C/W
Power Dissipation (Note 5)	P _D	1.79	W
Thermal Resistance, Junction to Ambient @T _A = 25°C (Note 5)	R _{θJA}	70	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C

- Notes:
4. Device mounted on FR-4 substrate PC board, with minimum recommended pad layout. The value in any given application depends on the user's specific board design. Device contains two active die running at equal power.
 5. Device mounted on 1 inch x 1 inch FR4 PCB with high coverage of single sided 1oz copper, in still air conditions. Device contains two active die running at equal power.
 6. Repetitive rating, pulse width limited by junction temperature.
 7. I_{AR} and E_{AR} rating are based on low frequency and duty cycles to keep T_J = 25°C

Electrical Characteristics – Q1 @ T_A = 25°C unless otherwise stated

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV _{DSS}	30	-	-	V	V _{GS} = 0V, I _D = 1mA
Zero Gate Voltage Drain Current	I _{DSS}	-	-	0.1	mA	V _{DS} = 30V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	-	-	±100	nA	V _{GS} = ±12V, V _{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	V _{GS(th)}	1.0	-	2.4	V	V _{DS} = V _{GS} , I _D = 250μA
Static Drain-Source On-Resistance	R _{DS(on)}	-	10 12	15 18	mΩ	V _{GS} = 10V, I _D = 9A V _{GS} = 4.5V, I _D = 7A
Forward Transfer Admittance	Y _{fs}	-	5	-	S	V _{DS} = 5V, I _D = 9A
Diode Forward Voltage	V _{SD}	-	0.4	1	V	V _{GS} = 0V, I _S = 1A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C _{iss}	-	1932	-	pF	V _{DS} = 15V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{oss}	-	154	-		
Reverse Transfer Capacitance	C _{rss}	-	121	-		
Gate Resistance	R _g	-	2.7	-	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = 4.5V)	Q _g	-	18.1	-	nC	V _{DS} = 15V, V _{GS} = 4.5V, I _D = 9A
Total Gate Charge (V _{GS} = 10V)	Q _g	-	42.0	-		
Gate-Source Charge	Q _{gs}	-	4.5	-		
Gate-Drain Charge	Q _{gd}	-	4.0	-		
Turn-On Delay Time	t _{D(on)}	-	6.16	-	ns	V _{GS} = 10V, V _{DS} = 15V, R _G = 3Ω, R _L = 1.7Ω
Turn-On Rise Time	t _r	-	7.22	-		
Turn-Off Delay Time	t _{D(off)}	-	36.76	-		
Turn-Off Fall Time	t _f	-	5.38	-		

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

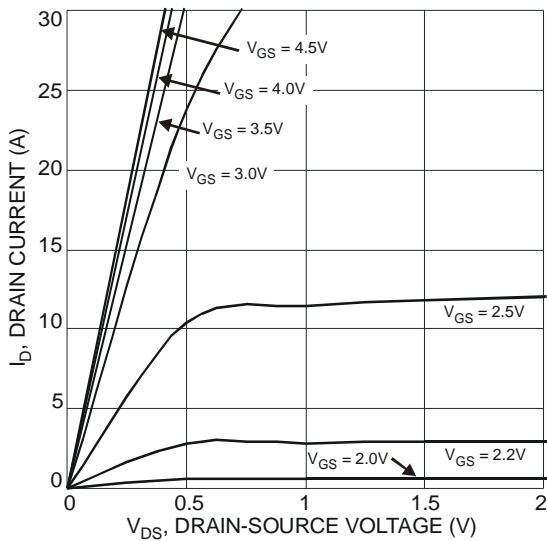


Fig. 1 Typical Output Characteristic

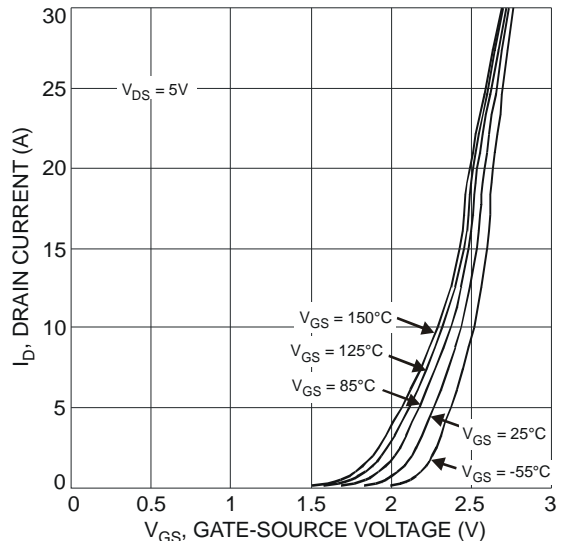
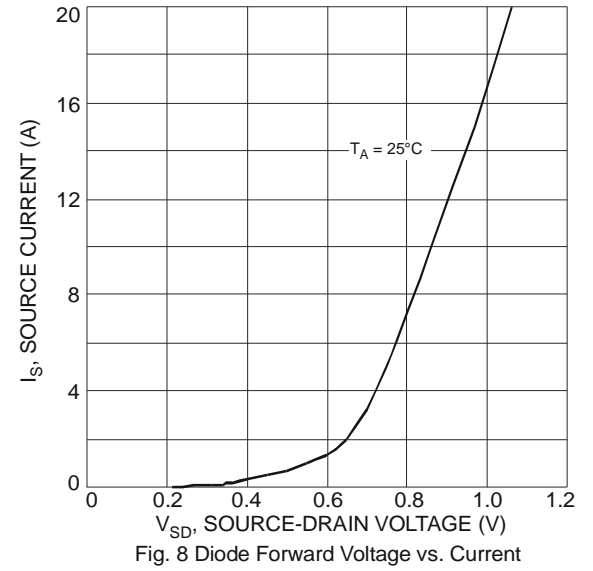
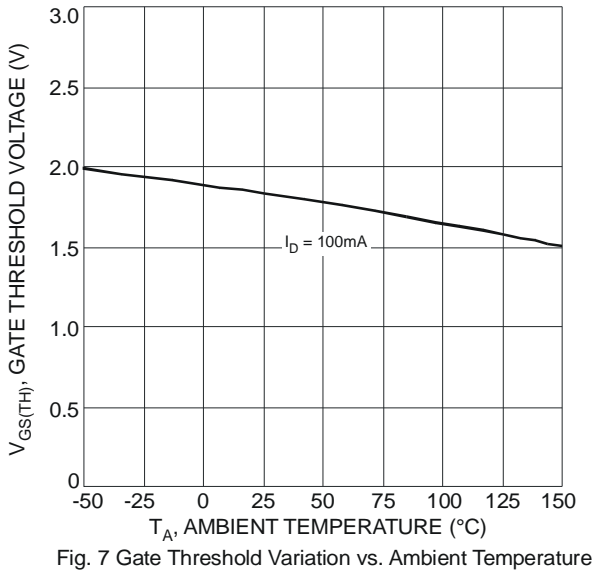
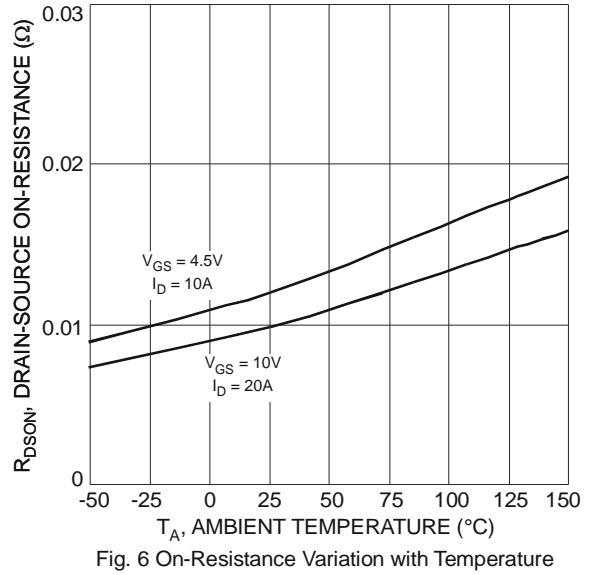
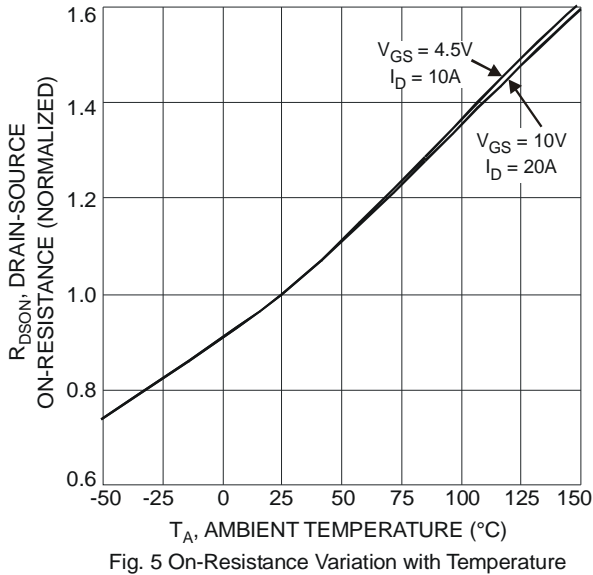
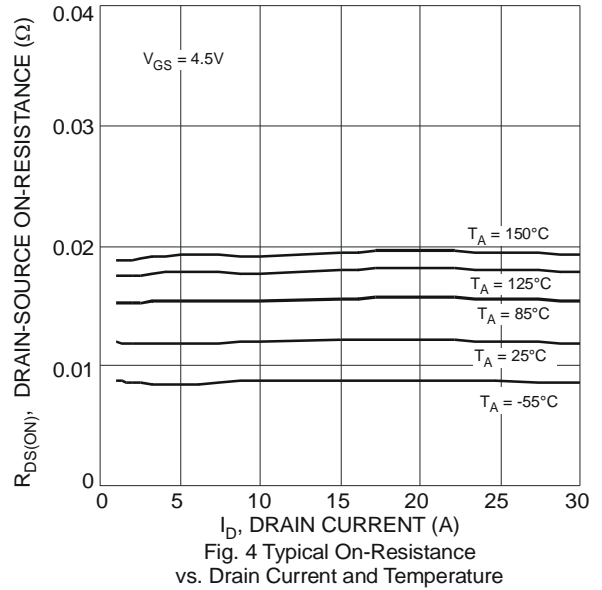
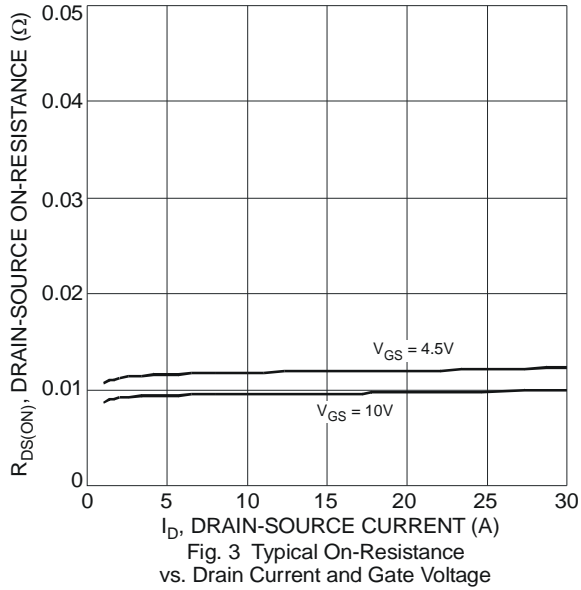


Fig. 2 Typical Transfer Characteristic



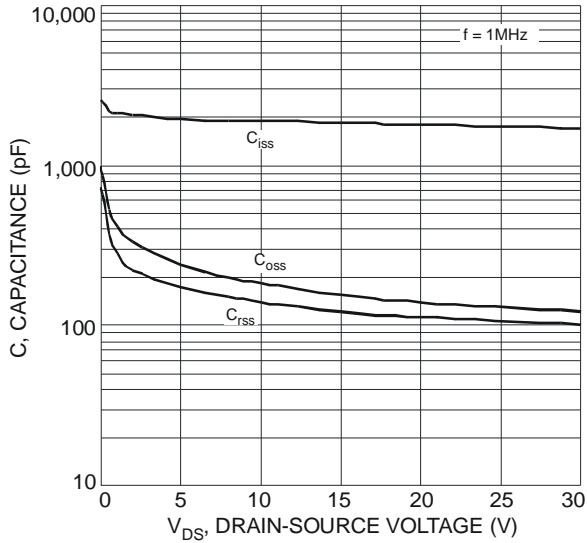


Fig. 9 Typical Total Capacitance

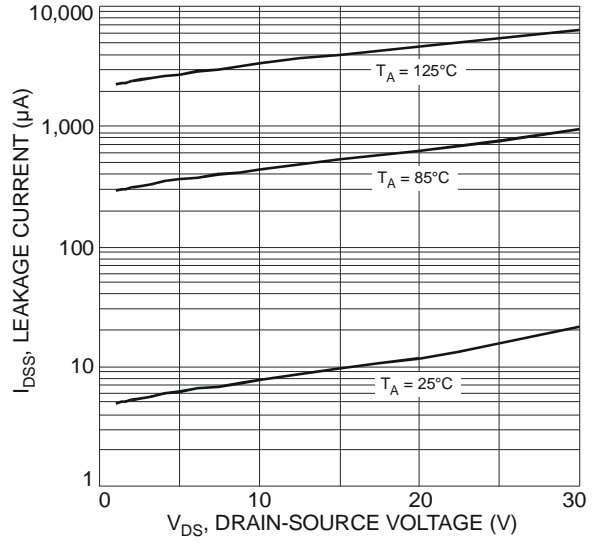


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

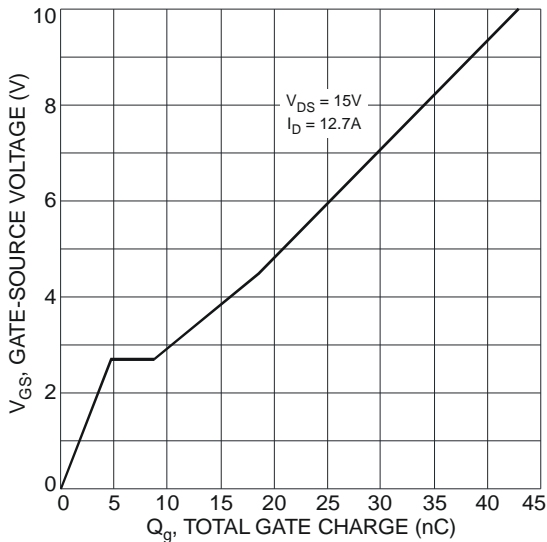


Fig. 11 Gate-Charge Characteristics

Electrical Characteristics – Q2 @ $T_A = 25^\circ\text{C}$ unless otherwise stated

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	30	-	-	V	$V_{GS} = 0V, I_D = 250\mu A$
Zero Gate Voltage Drain Current	I_{DSS}	-	-	1.0	μA	$V_{DS} = 30V, V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	-	-	± 100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(th)}$	1.0	-	2.4	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(on)}$	-	15	23	m Ω	$V_{GS} = 10V, I_D = 10A$
			25	33		$V_{GS} = 4.5V, I_D = 7.5A$
Forward Transfer Admittance	$ Y_{fs} $	-	2.5	-	S	$V_{DS} = 5V, I_D = 10A$
Diode Forward Voltage	V_{SD}	-	0.65	1.0	V	$V_{GS} = 0V, I_S = 1A$
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	-	478.9	-	pF	$V_{DS} = 15V, V_{GS} = 0V, f = 1.0MHz$
Output Capacitance	C_{oss}	-	96.7	-		
Reverse Transfer Capacitance	C_{rss}	-	61.4	-		
Gate Resistance	R_g	0.4	1.1	1.6	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$
Total Gate Charge ($V_{GS} = 4.5V$)	Q_g	-	5.0	-	nC	$V_{DS} = 15V, V_{GS} = 4.5V, I_D = 10A$
Total Gate Charge ($V_{GS} = 10V$)	Q_g	-	10.5	-		
Gate-Source Charge	Q_{gs}	-	1.8	-		
Gate-Drain Charge	Q_{gd}	-	1.6	-		
Turn-On Delay Time	$t_{D(on)}$	-	2.9	-	ns	$V_{GS} = 10V, V_{DS} = 15V, R_G = 3\Omega, R_L = 1.5\Omega$
Turn-On Rise Time	t_r	-	7.9	-		
Turn-Off Delay Time	$t_{D(off)}$	-	14.6	-		
Turn-Off Fall Time	t_f	-	3.1	-		

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

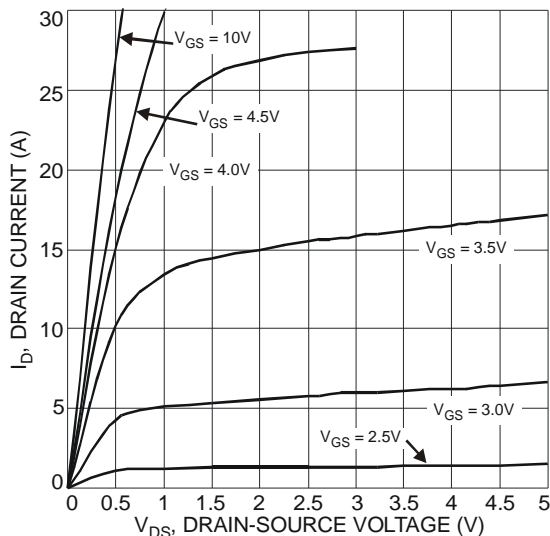


Fig. 12 Typical Output Characteristic

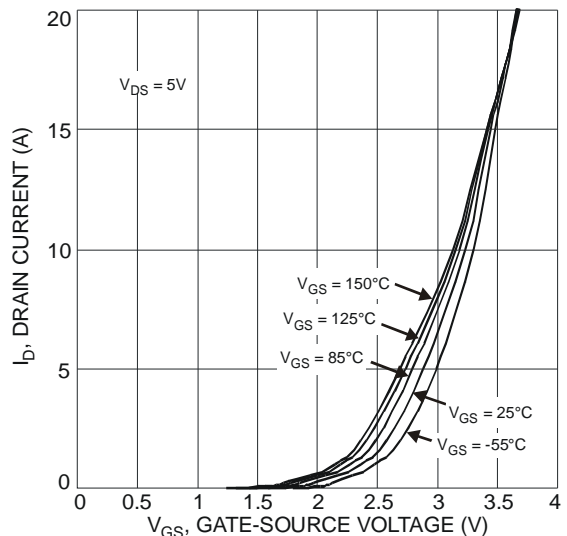


Fig. 13 Typical Transfer Characteristic

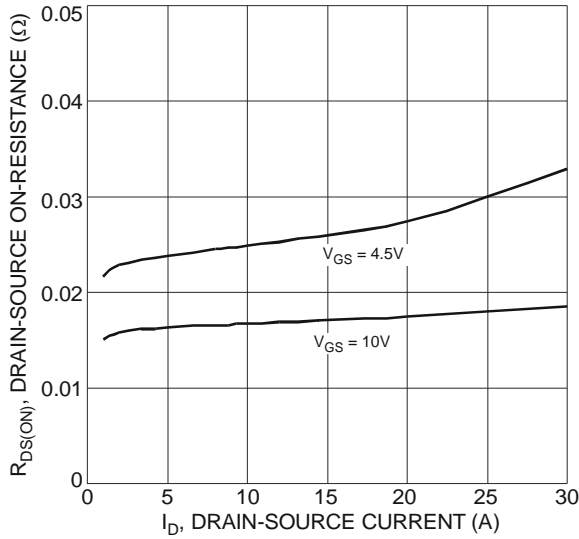


Fig. 14 Typical On-Resistance vs. Drain Current and Gate Voltage

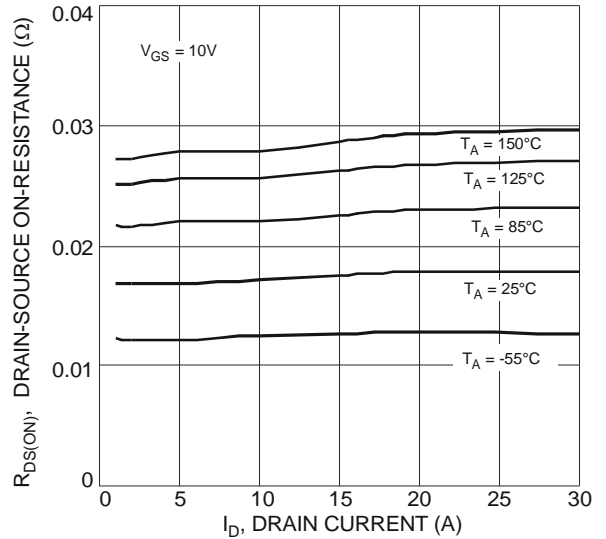


Fig. 15 Typical On-Resistance vs. Drain Current and Temperature

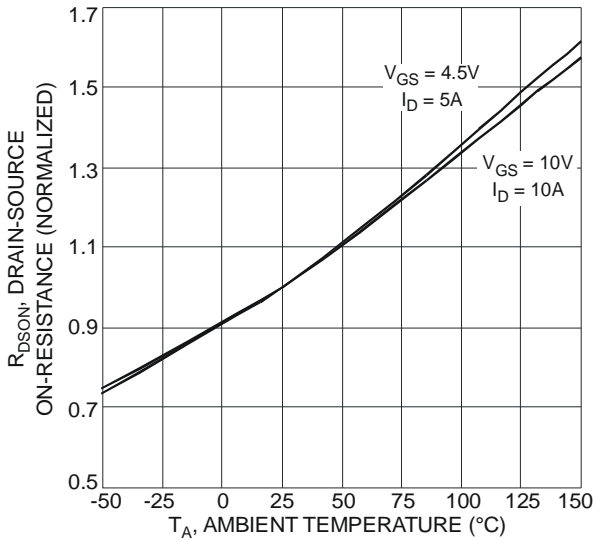


Fig. 16 On-Resistance Variation with Temperature

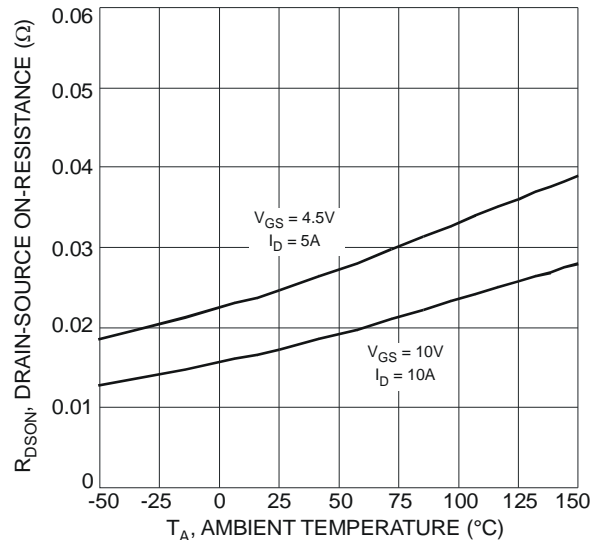


Fig. 17 On-Resistance Variation with Temperature

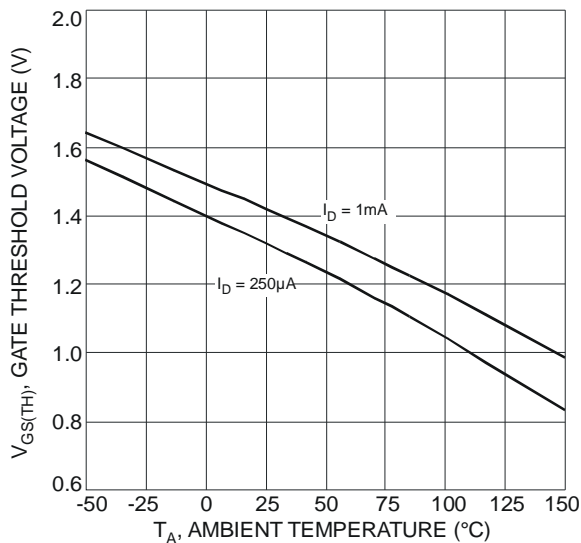


Fig. 18 Gate Threshold Variation vs. Ambient Temperature

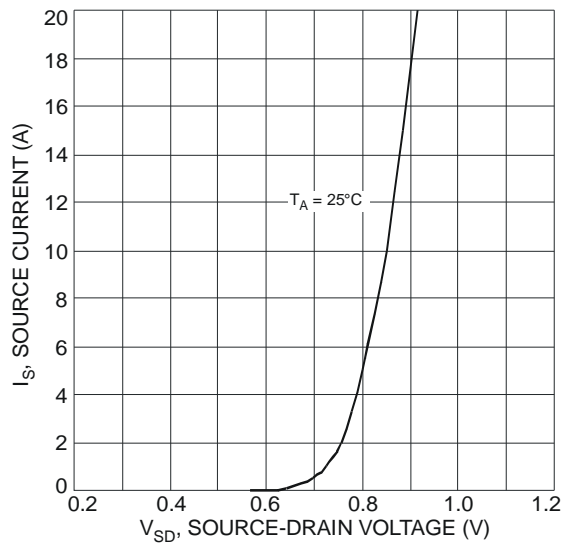


Fig. 19 Diode Forward Voltage vs. Current

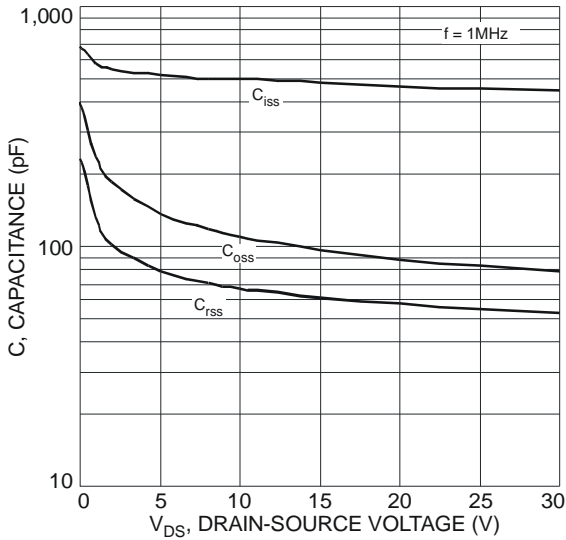


Fig. 20 Typical Total Capacitance

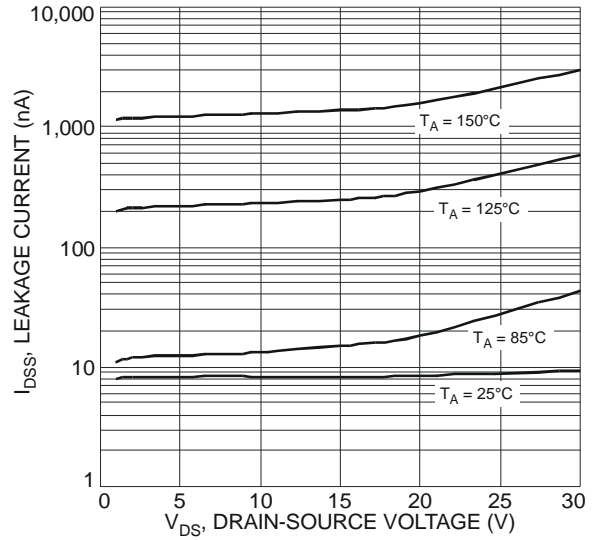


Fig. 21 Typical Leakage Current vs. Drain-Source Voltage

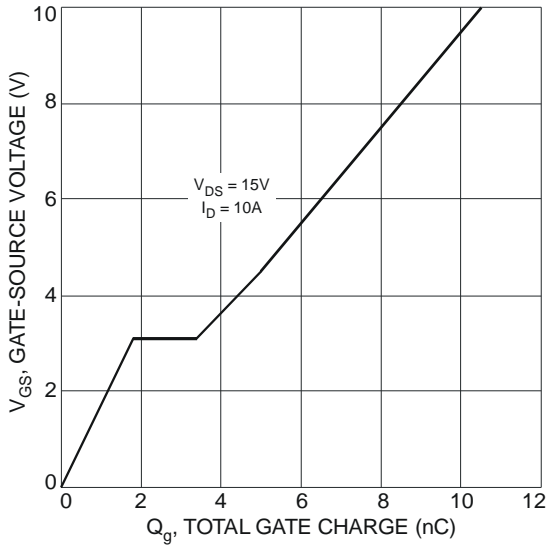


Fig. 22 Gate-Charge Characteristics

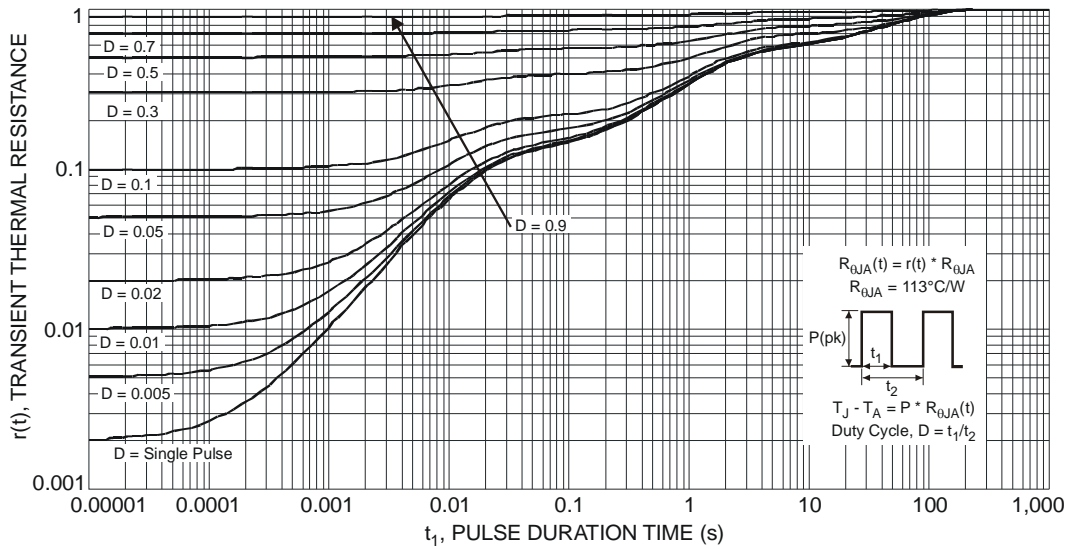
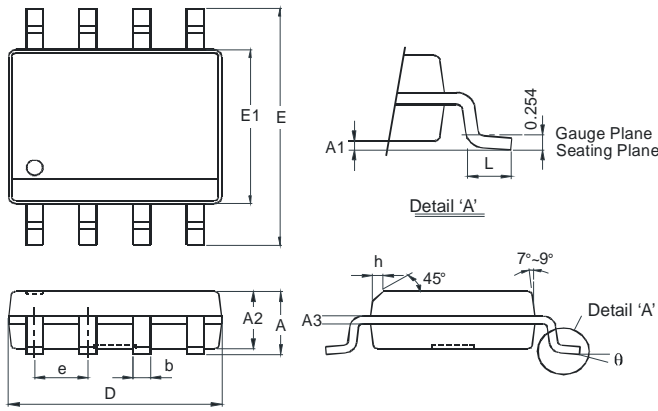


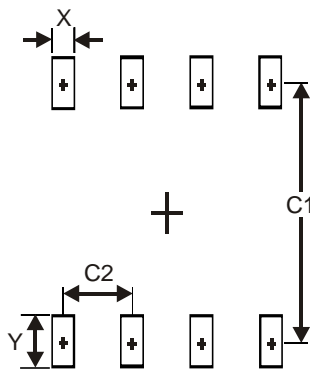
Fig. 23 Transient Thermal Response

Package Outline Dimensions



SO-8		
Dim	Min	Max
A	-	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	-	0.35
L	0.62	0.82
θ	0°	8°
All Dimensions in mm		

Suggested Pad Layout



Dimensions	Value (in mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27

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