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}	$R_{DS(ON)}$ Max	I_D Max T_A = +25°C (Notes 6 & 8)
Q1	40V	25mΩ @ V_{GS} = 10V	7.5A
		40mΩ @ V_{GS} = 4.5V	6.2A
Q2	-40V	25mΩ @ V_{GS} = -10V	-7.3A
		45mΩ @ V_{GS} = -4.5V	-5.7A

Features and Benefits

- Reduced Footprint with Two Discrete Devices in Single SO-8
- Low On-Resistance
- Fast Switching Speed
- Low Input/Output Leakage

Description and Applications

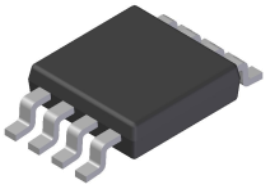
This MOSFET has been designed to ensure that $R_{DS(ON)}$ of n-channel and p-channel FETs are matched to minimize losses in both arms of the bridge. The NK-DMC4040SSDQ is optimized for use in 3 phases brushless DC motor circuits (BLDC) and CCFL backlighting.

- 3 phases BLDC motors
- CCFL backlighting

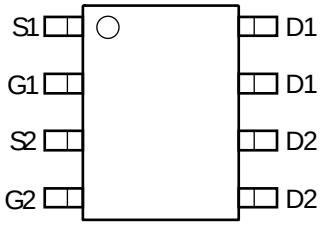
Mechanical Data

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

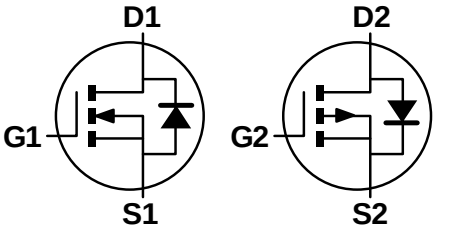
SO-8



Top View



Top View



Q1 N-Channel Q2 P-Channel

Equivalent Circuit

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

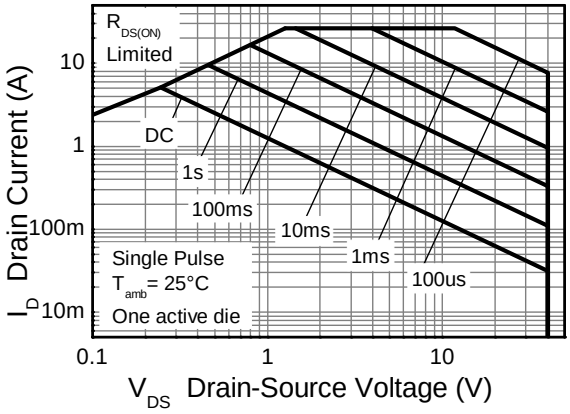
Characteristic			Symbol	N-Channel - Q1	P-Channel - Q2	Unit
Drain-Source Voltage			V_{DSS}	40	-40	V
Gate-Source Voltage			V_{GSS}	±20	±20	V
Continuous Drain Current	V_{GS} = 10V	(Notes 6 & 8)	I_D	7.5	-7.5	A
		T_A = +70°C (Notes 6 & 8)		5.8	-5.8	
		(Notes 5 & 8)		5.7	-5.7	
		(Notes 5 & 9)		6.8	-6.8	
Pulsed Drain Current	V_{GS} = 10V	(Notes 7 & 8)	I_{DM}	29.0	-29.0	A
Continuous Source Current (Body Diode)		(Notes 6 & 8)	I_S	3.0	-3.0	A
Pulsed Source Current (Body Diode)		(Notes 7 & 8)	I_{SM}	29.0	-29.0	A

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

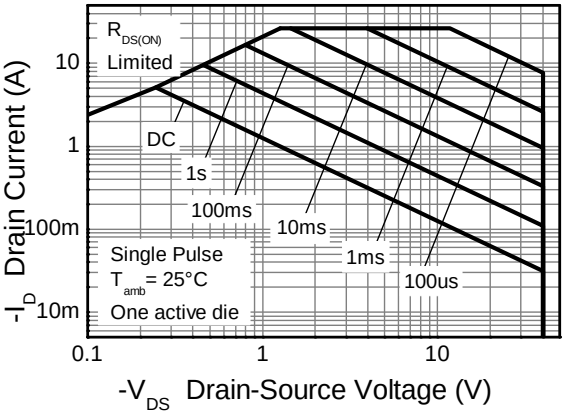
Characteristic		Symbol	N-Channel - Q1 / P-Channel - Q2	Unit
Power Dissipation Linear Derating Factor	(Notes 5 & 8)	P_D	1.25 10	W mW/°C
	(Notes 5 & 9)		1.8 14.3	
	(Notes 6 & 8)		2.14 17.2	
Thermal Resistance, Junction to Ambient	(Notes 5 & 8)	$R_{\theta JA}$	100	°C/W
	(Notes 5 & 9)		70	
	(Notes 6 & 8)		58	
Thermal Resistance, Junction to Lead	(Notes 8 & 10)	$R_{\theta JL}$	51	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes:
5. For a device surface-mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
6. Same as Note 5, except the device is measured at t ≤ 10sec.
7. Same as Note 5, except the device is pulsed with D = 0.02 and pulse width = 300µs. The pulse current is limited by the maximum junction temperature.
8. For a dual device with one active die.
9. For a device with two active dies running at equal power.
10. Thermal resistance from junction to solder-point (at the end of the drain lead).

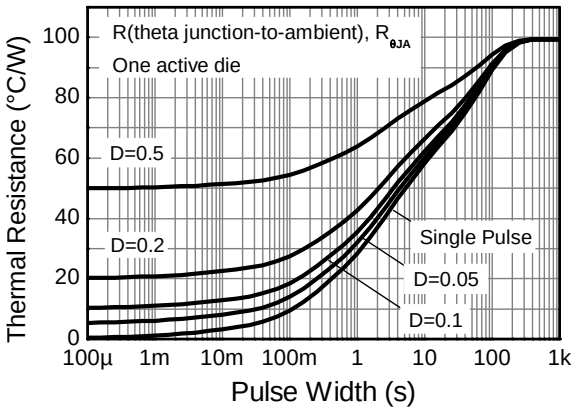
Thermal Characteristics



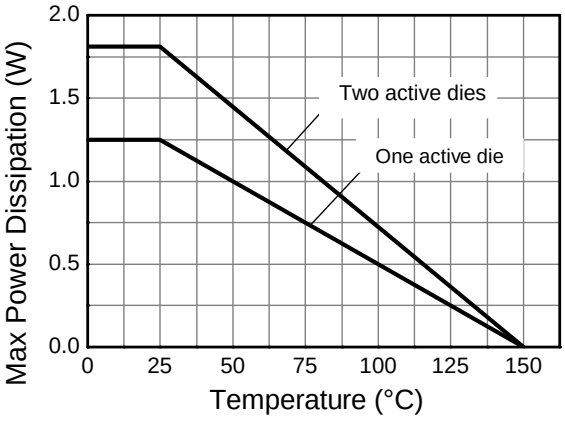
N-Channel Safe Operating Area



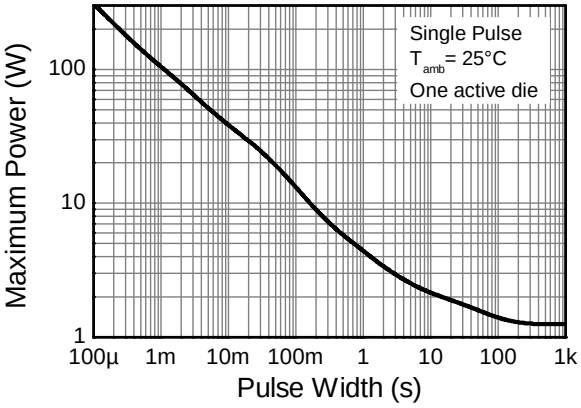
P-Channel Safe Operating Area



Transient Thermal Impedance



Derating Curve



Pulse Power Dissipation

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	40	—	—	V	I_D = 250μA, V_{GS} = 0V
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1.0	μA	V_{DS} = 40V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	0.8	1.3	1.8	V	I_D = 250μA, V_{DS} = V_{GS}
Static Drain-Source On-Resistance (Note 11)	$R_{DS(ON)}$	—	0.013	0.025	Ω	V_{GS} = 10V, I_D = 3A
			0.028	0.040		V_{GS} = 4.5V, I_D = 3A
Forward Transconductance (Notes 11 & 12)	g_{fs}	—	12.6	—	S	V_{DS} = 5V, I_D = 3A
Diode Forward Voltage (Note 7)	V_{SD}	—	0.7	1.0	V	I_S = 1A, V_{GS} = 0V
DYNAMIC CHARACTERISTICS (Note 12)						
Input Capacitance	C_{iss}	—	1790	—	pF	V_{DS} = 20V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	160	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	120	—	pF	
Gate Resistance	R_g	—	1.03	—	Ω	V_{DS} = 0V, V_{GS}= 0V, f = 1MHz
Total Gate Charge (Note 13)	Q_g	—	16.0	—	nC	V_{GS} = 4.5V; V_{DS} = 20V, I_D = 3A
Total Gate Charge (Note 13)	Q_g	—	37.6	—	nC	V_{GS} = 10V; V_{DS} = 20V, I_D = 3A
Gate-Source Charge (Note 13)	Q_{gs}	—	7.8	—	nC	V_{GS} = 10V; V_{DS} = 20V, I_D = 3A
Gate-Drain Charge (Note 13)	Q_{gd}	—	6.6	—	nC	V_{GS} = 10V; V_{DS} = 20V, I_D = 3A
Turn-On Delay Time (Note 13)	$t_{D(ON)}$	—	8.1	—	ns	V_{DD} = 20V, V_{GS} = 10V I_D = 3A
Turn-On Rise Time (Note 13)	t_R	—	15.1	—	ns	
Turn-Off Delay Time (Note 13)	$t_{D(OFF)}$	—	24.3	—	ns	
Turn-Off Fall Time (Note 13)	t_F	—	5.3	—	ns	

Notes: 11. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%.
12. For design aid only, not subject to production testing.
13. Switching characteristics are independent of operating junction temperatures.

Typical Characteristics – Q1 N-Channel

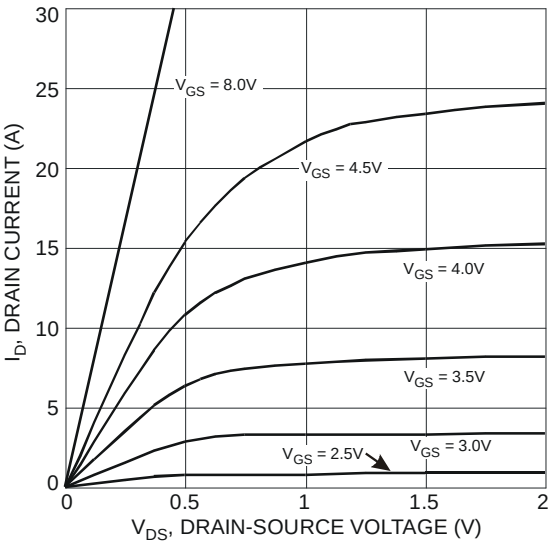


Fig. 1 Typical Output Characteristic

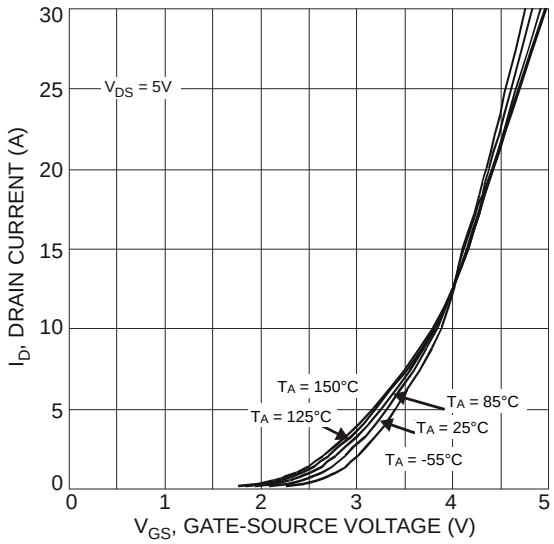


Fig. 2 Typical Transfer Characteristic

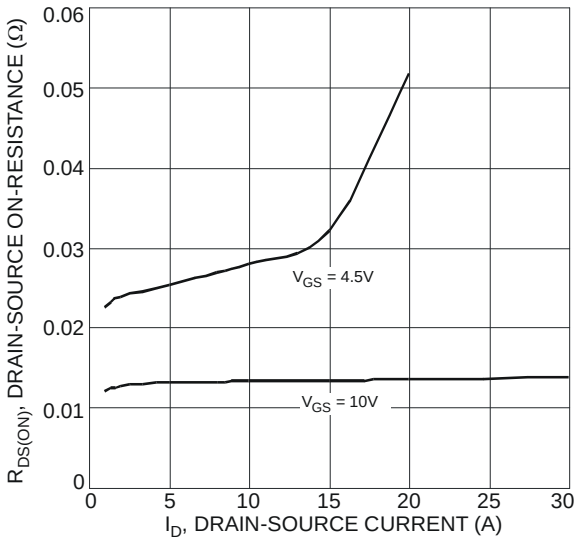


Fig. 3 Typical On-Resistance
vs. Drain Current and Gate Voltage

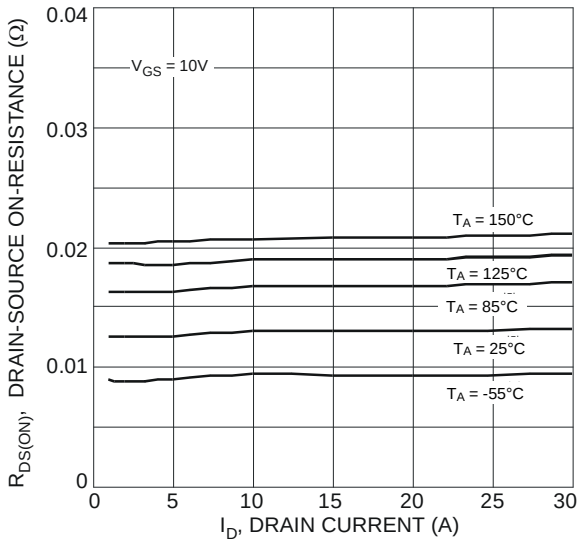


Fig. 4 Typical On-Resistance
vs. Drain Current and Temperature

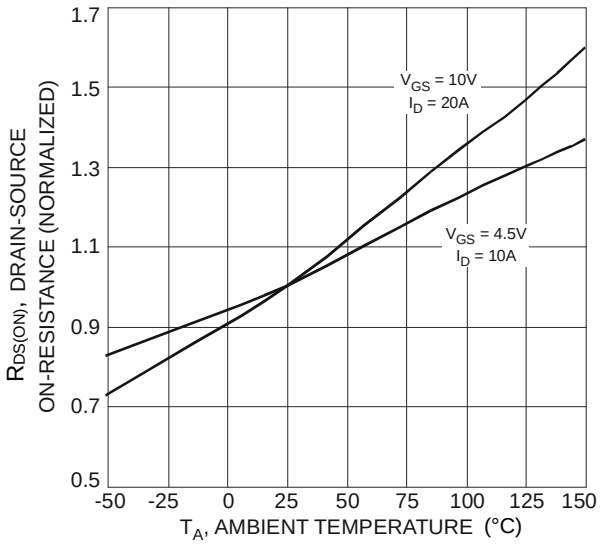


Fig. 5 On-Resistance Variation with Temperature

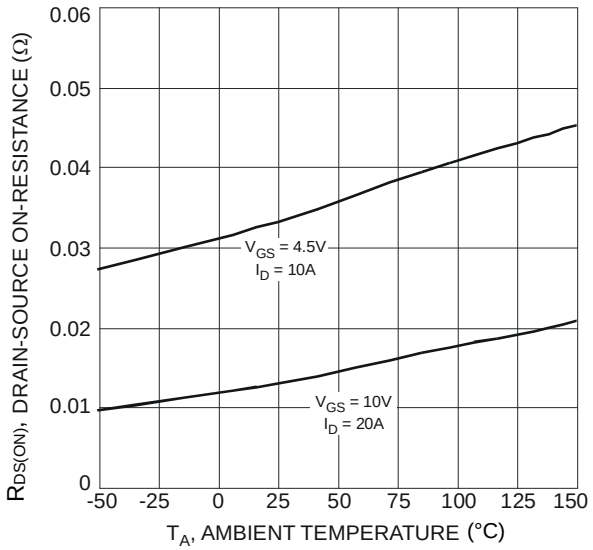


Fig. 6 On-Resistance Variation with Temperature

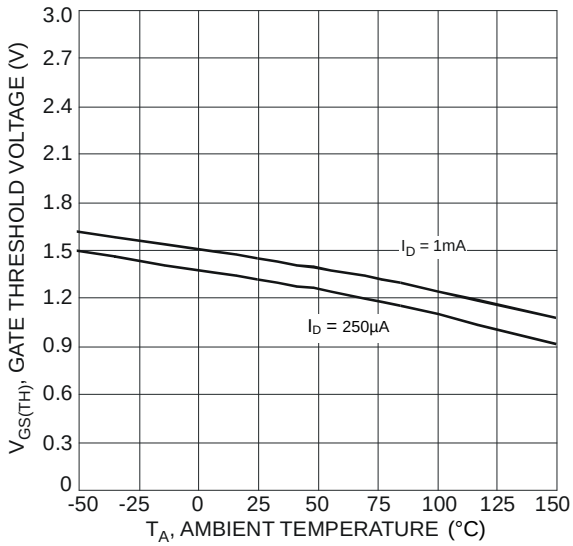


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

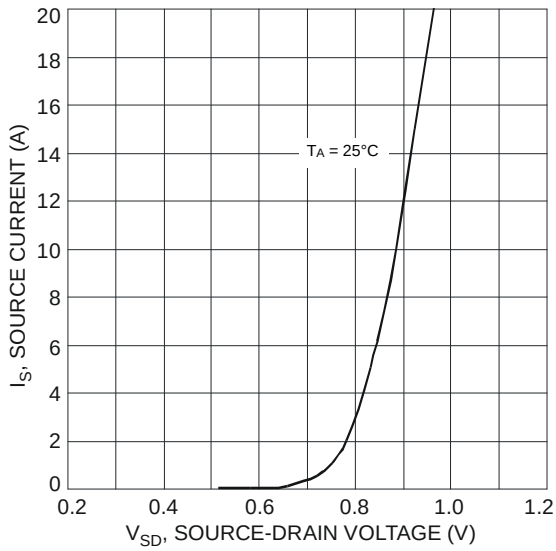


Fig. 8 Diode Forward Voltage vs. Current

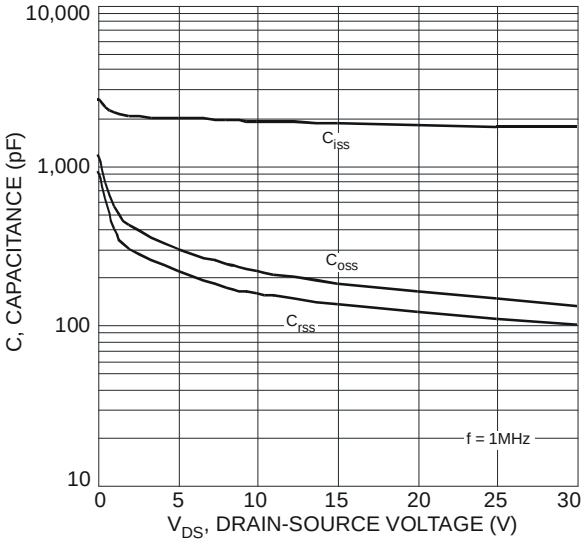


Fig. 9 Typical Total Capacitance

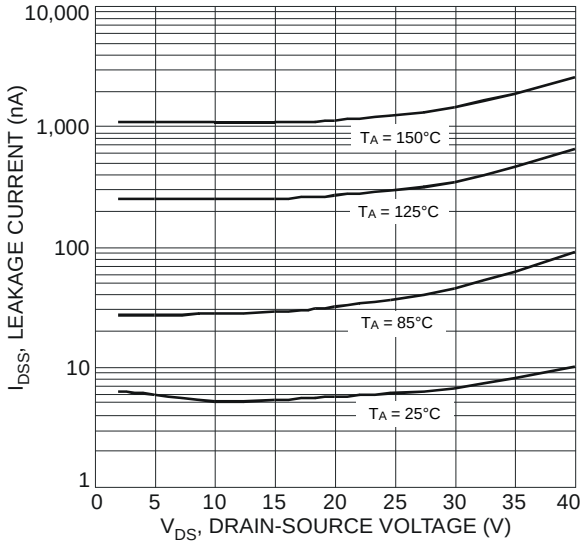


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

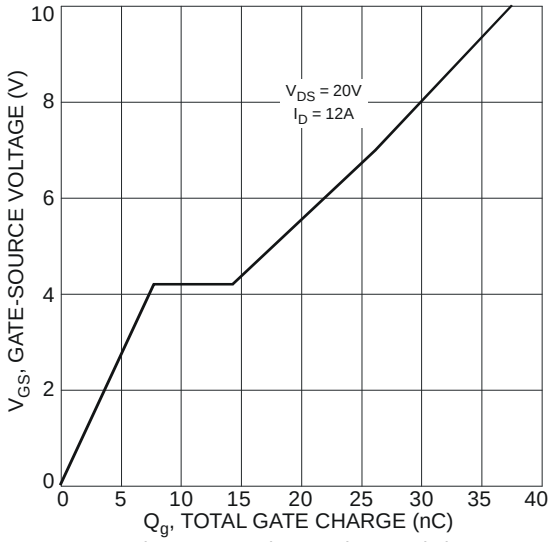


Fig. 11 Gate-Charge Characteristics

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	-40	—	—	V	I_D = -250μA, V_{GS} = 0V
Zero Gate Voltage Drain Current	I_{DSS}	—	—	-1.0	μA	V_{DS} = -40V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.8	-1.3	-1.8	V	I_D = -250μA, V_{DS} = V_{GS}
Static Drain-Source On-Resistance (Note 14)	$R_{DS(ON)}$	—	0.018	0.025	Ω	V_{GS} = -10V, I_D = -3A
			0.030	0.045		V_{GS} = -4.5V, I_D = -3A
Forward Transconductance (Notes 14 & 15)	g_{fs}	—	16.6	—	S	V_{DS} = -5V, I_D = -3A
Diode Forward Voltage (Note 14)	V_{SD}	—	-0.7	-1.0	V	I_S = -1A, V_{GS} = 0V
DYNAMIC CHARACTERISTICS (Note 15)						
Input Capacitance	C_{iss}	—	1643	—	pF	V_{DS} = -20V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	179	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	128	—	pF	
Gate Resistance	R_g	—	6.43	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (Note 16)	Q_g	—	14.0	—	nC	V_{GS} = -4.5V; V_{DS} = -20V, I_D = -3A
Total Gate Charge (Note 16)	Q_g	—	33.7	—	nC	V_{GS} = -10V; V_{DS} = -20V, I_D = -3A
Gate-Source Charge (Note 16)	Q_{gs}	—	5.5	—	nC	V_{GS} = -10V; V_{DS} = -20V, I_D = -3A
Gate-Drain Charge (Note 16)	Q_{gd}	—	7.3	—	nC	V_{GS} = -10V; V_{DS} = -20V, I_D = -3A
Turn-On Delay Time (Note 16)	$t_{D(ON)}$	—	6.9	—	ns	V_{DD} = -20V, V_{GS} = -10V I_D = -3A
Turn-On Rise Time (Note 16)	t_R	—	14.7	—	ns	
Turn-Off Delay Time (Note 16)	$t_{D(OFF)}$	—	53.7	—	ns	
Turn-Off Fall Time (Note 16)	t_F	—	30.9	—	ns	

Notes: 14. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%.
15. For design aid only, not subject to production testing.
16. Switching characteristics are independent of operating junction temperatures.

Typical Characteristics – Q2 P-Channel

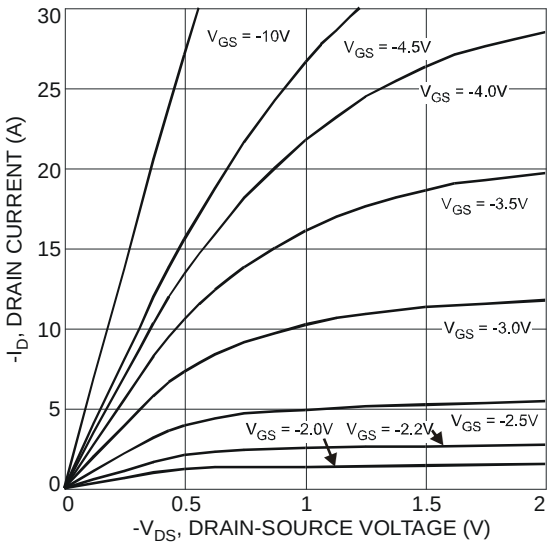


Fig. 12 Typical Output Characteristic

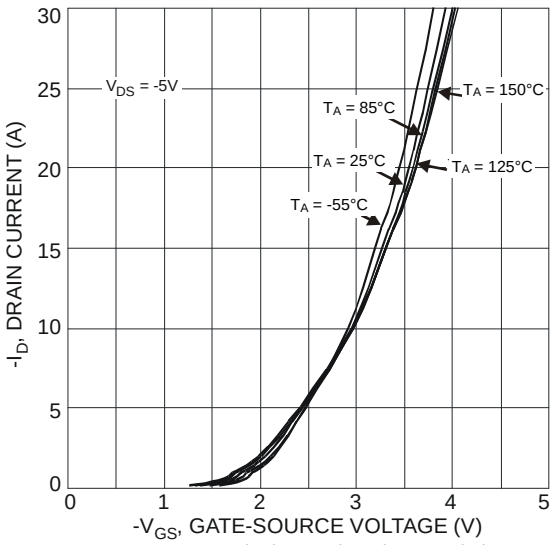


Fig. 13 Typical Transfer Characteristic

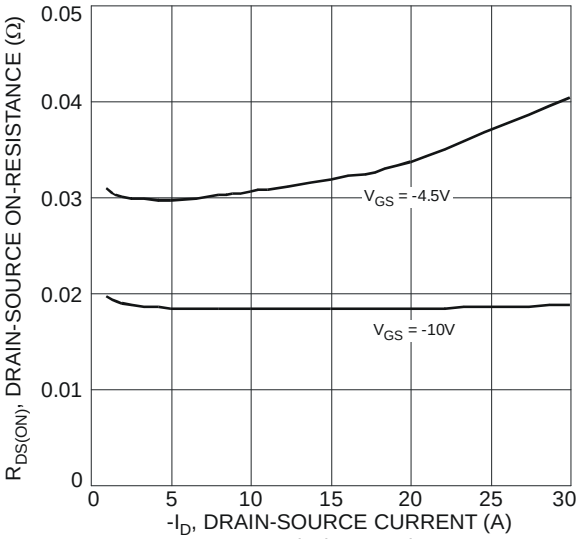


Fig. 14 Typical On-Resistance vs. Drain Current and Gate Voltage

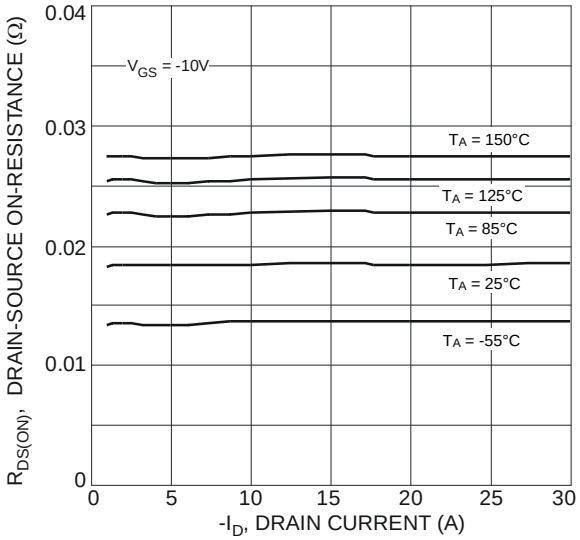


Fig. 15 Typical On-Resistance vs. Drain Current and Temperature

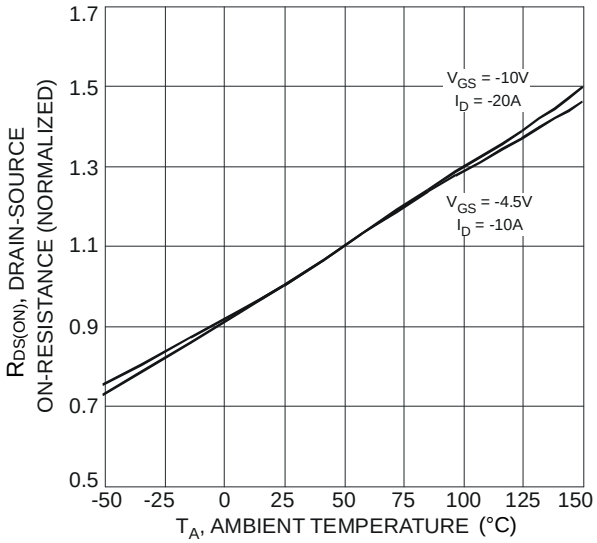


Fig. 16 On-Resistance Variation with Temperature

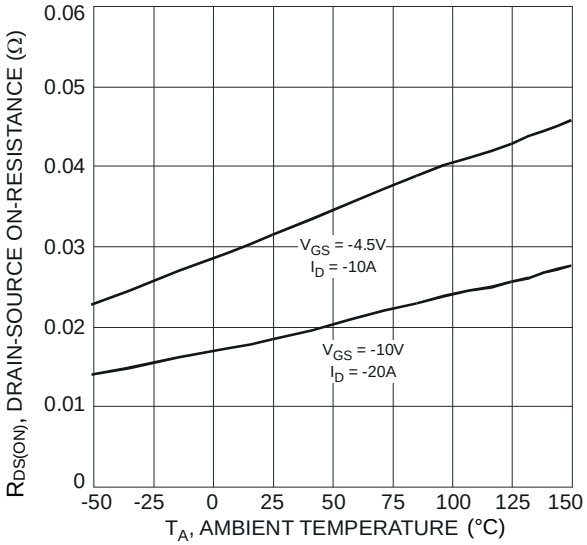


Fig. 17 On-Resistance Variation with Temperature

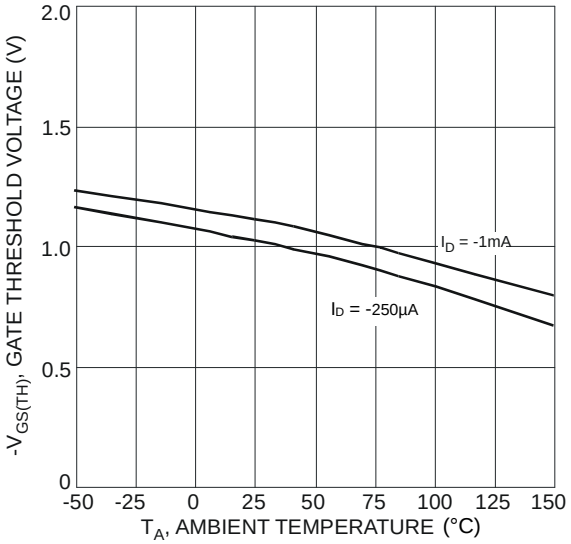


Fig. 18 Gate Threshold Variation vs. Ambient Temperature

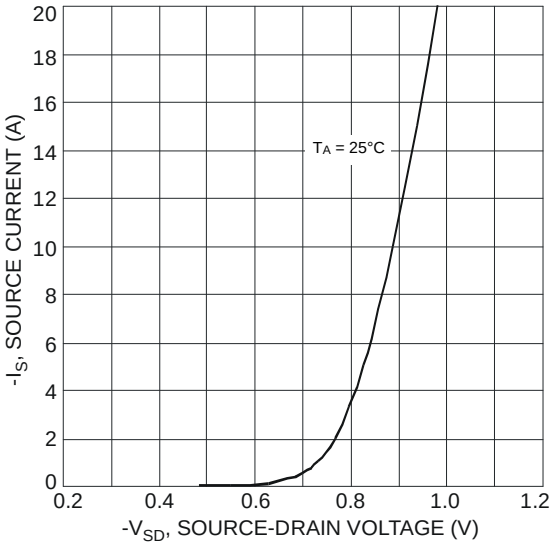


Fig. 19 Diode Forward Voltage vs. Current

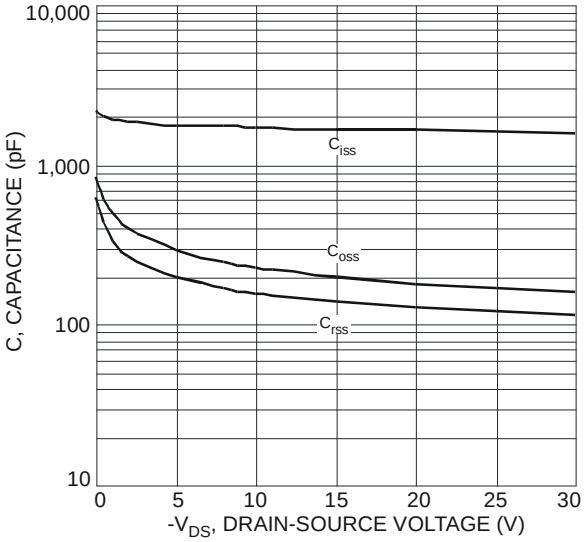


Fig. 20 Typical Total Capacitance

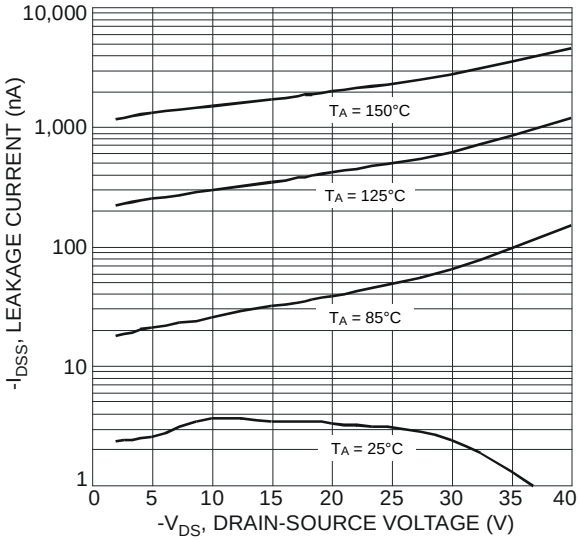


Fig. 21 Typical Leakage Current vs. Drain-Source Voltage

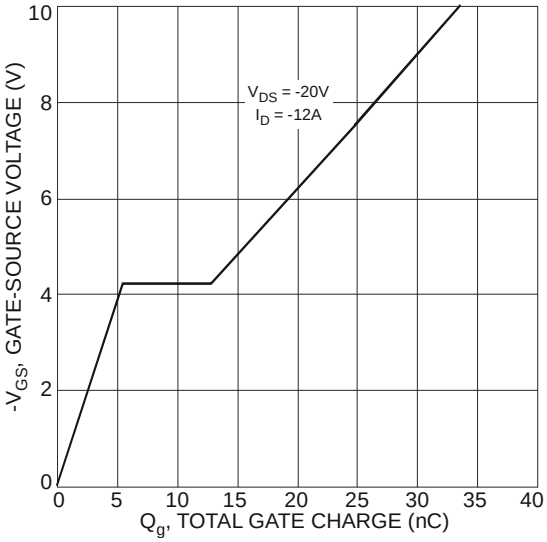
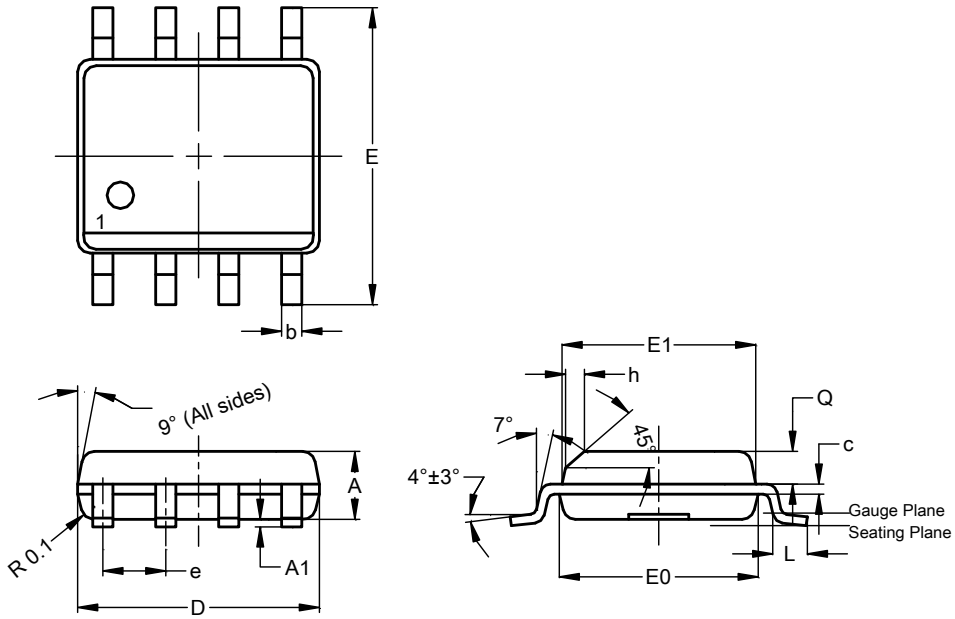


Fig. 22 Gate-Charge Characteristics

Package Outline Dimensions

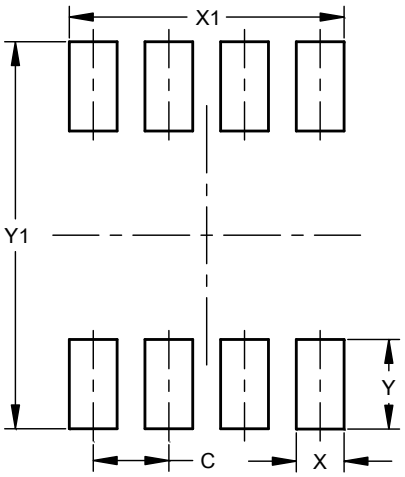
SO-8



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

SO-8



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