COMPLEMENTARY 60V ENHANCEMENT MODE MOSFET

NEW PRODUCT

Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(on)\ max}$	I_D T_A = +25°C
Q2	60V	55mΩ @ V_{GS} = 10V	4.7A
Q1	-60V	105mΩ @ V_{GS} = -10V	-3.9A

Description

This new generation MOSFET has been 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.

Applications

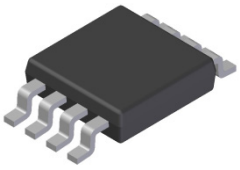
- DC-DC Converters
- Power Management Functions
- Backlighting

Features and Benefits

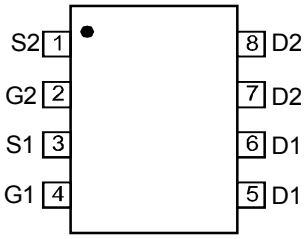
- Low Input Capacitance
- Low On-Resistance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

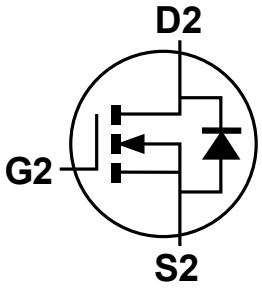
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Tin Finish annealed over Copper leadframe Solderable per MIL-STD-202, Method 208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



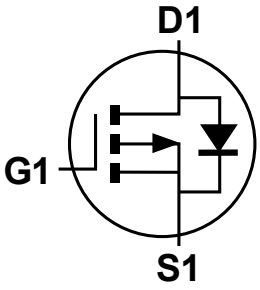
Top View



TOP VIEW
Internal Schematic



N-Channel MOSFET



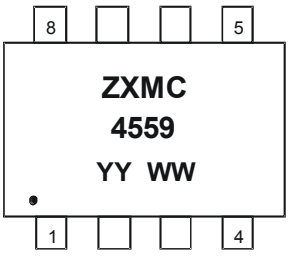
P-Channel MOSFET

Ordering Information (Note 4)

Part Number	Compliance	Case	Packaging
ZXMC4559DN8TA	Standard	SO-8	500/Tape & Reel
ZXMC4559DN8TC	Standard	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



ZXMC4559 = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 14 = 2014)
WW = Week (01 - 53)

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

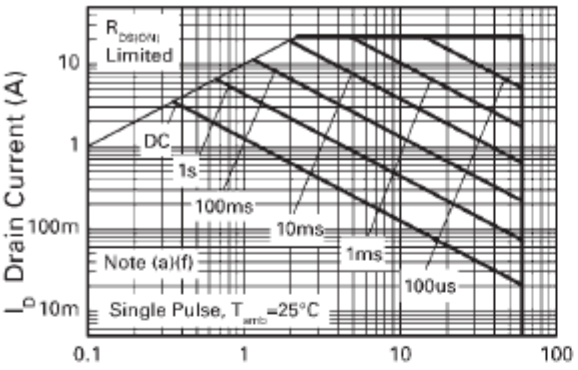
Characteristic		Symbol	Value_Q2	Value_Q1	Units
Drain-Source Voltage		V_{DSS}	60	-60	V
Gate-Source Voltage		V_{GSS}	±20	±20	V
Continuous Drain Current V_{GS} = 10V	SteadyState (Note 5)	I_D	3.6	-2.6	A
	t<10s (Note 6)	I_D	4.7	-3.9	A
Maximum Body Diode Forward Current at t<10s (Note 6)		I_S	3.4	-3.2	A
Pulsed Drain Current (300µs pulse, duty cycle = 2%)		I_{DM}	22.2	-18.3	A
Pulsed Source Current (Body Diode) (300µs pulse, duty cycle = 2%)		I_{SM}	22.2	-18.3	A

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

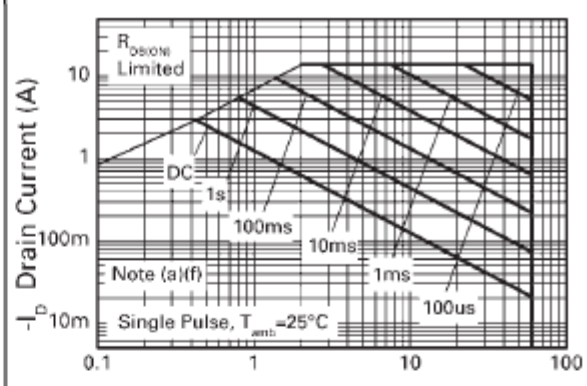
Characteristic	Symbol	Value	Units
Power Dissipation Linear Derating Factor (Note 5)	P_D	1.25 10	W mW/°C
Power Dissipation Linear Derating Factor (Note 6)	P_D	2.1 17	W mW/°C
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	100	°C/W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	58	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

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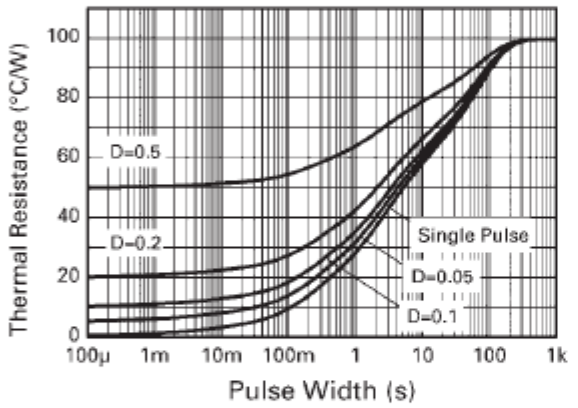
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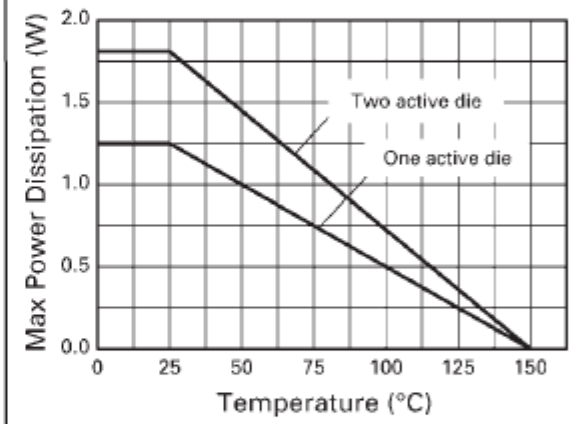
N-channel Safe Operating Area



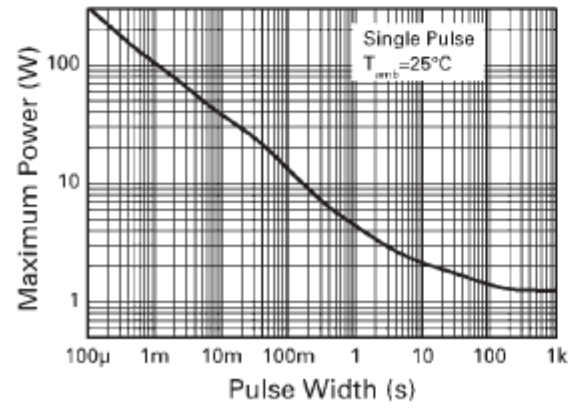
P-channel Safe Operating Area



Transient Thermal Impedance



Derating Curve



Pulse Power Dissipation

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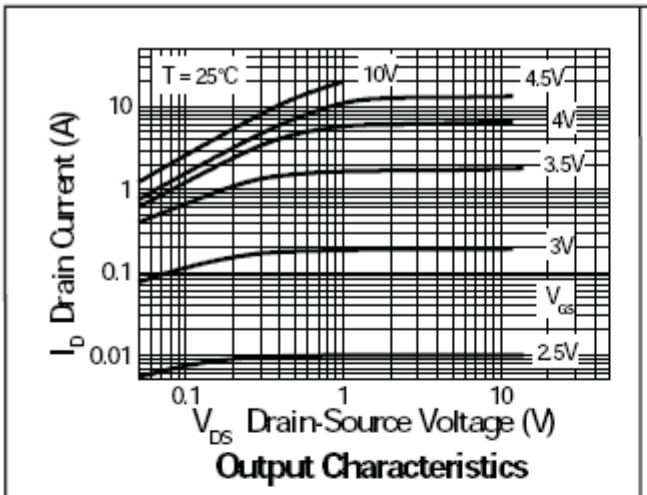
Electrical Characteristics N-Channel Q2 (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	V_{GS} = 0V, I_D = 250μA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1.0	μA	V_{DS} = 60V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	1.0	—	—	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	—	55	mΩ	V_{GS} = 10V, I_D = 4.5A
		—	—	75		V_{GS} = 4.5V, I_D = 4.0A
Diode Forward Voltage	V_{SD}	—	0.85	1.2	V	V_{GS} = 0V, I_S = 5.5A
Forward Transconductance	g_{fs}	—	10.2	—	S	V_{DS}=15V,I_D=4.5A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	1063	—	pF	V_{DS} = 30V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	104	—		
Reverse Transfer Capacitance	C_{rss}	—	64	—		
Total Gate Charge (V_{GS} = 5.0V)	Q_g	—	11	—	nC	V_{DS} = 30V, I_D = 4.5A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	20.4	—		
Gate-Source Charge	Q_{gs}	—	4.1	—		
Gate-Drain Charge	Q_{gd}	—	5.1	—		
Turn-On Delay Time	$t_{D(on)}$	—	3.5	—	nS	V_{DD} = 30V, I_D = 1.0A V_{GS} = 10V, R_G = 6.0Ω
Turn-On Rise Time	t_r	—	4.1	—		
Turn-Off Delay Time	$t_{D(off)}$	—	26.2	—		
Turn-Off Fall Time	t_f	—	10.6	—		
Body Diode Reverse Recovery Time	t_{rr}	—	22	—	nS	I_F = 2.2A, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q_{rr}	—	21.4	—	nC	I_F = 2.2A, di/dt = 100A/μs

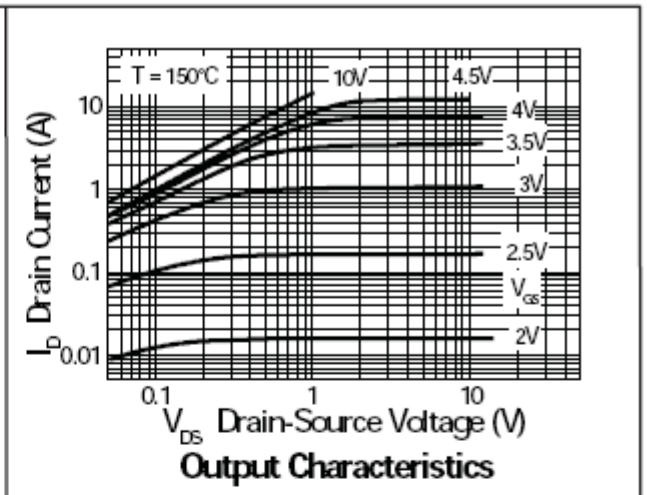
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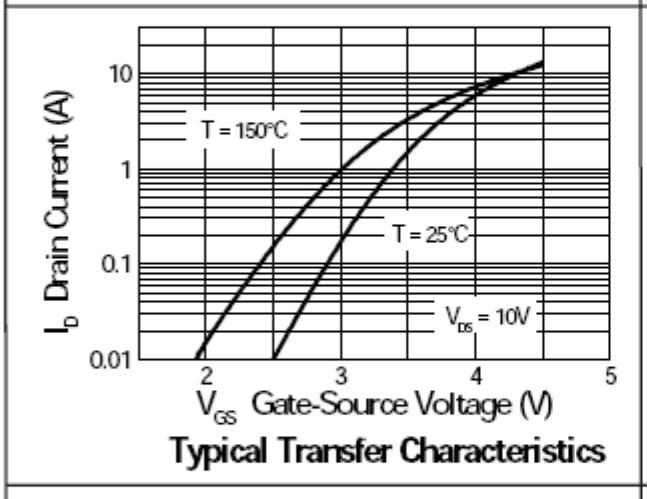
N-Channel Typical Characteristics



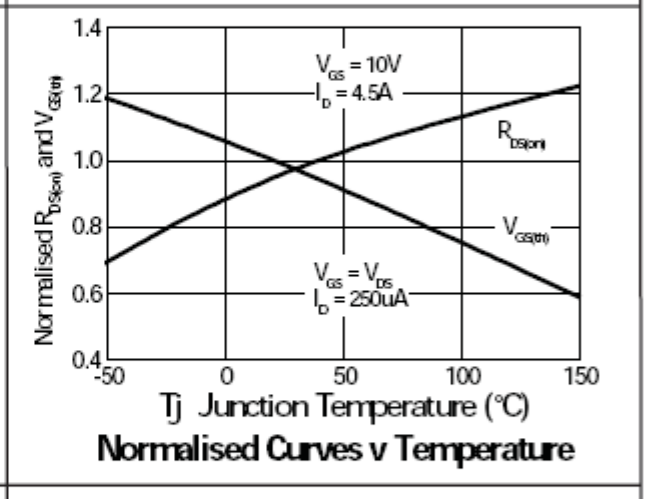
Output Characteristics



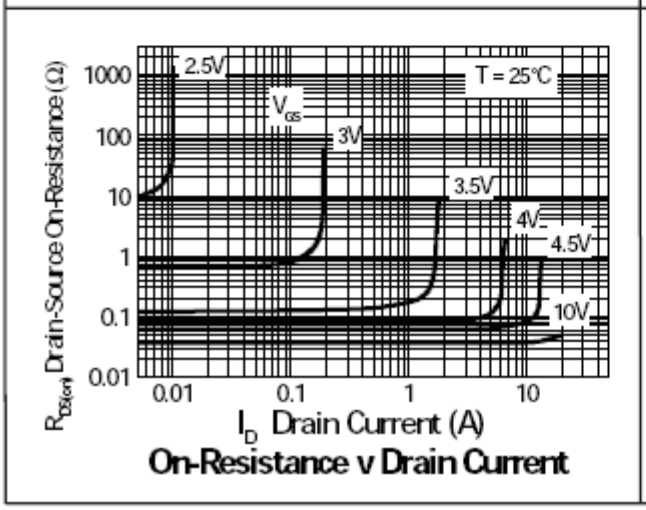
Output Characteristics



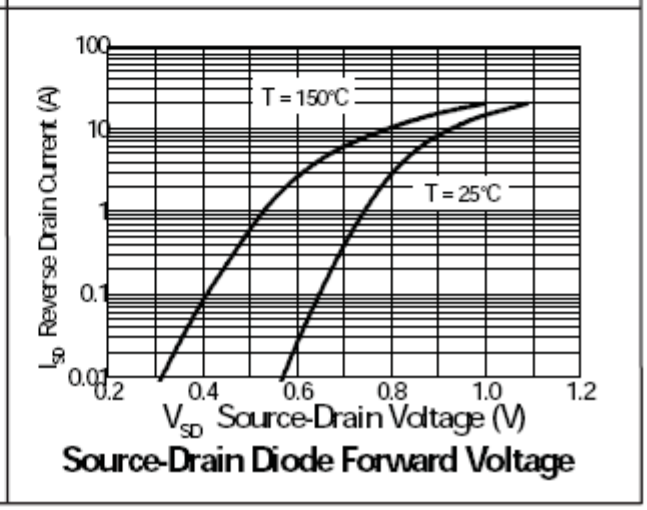
Typical Transfer Characteristics



Normalised Curves v Temperature



On-Resistance v Drain Current

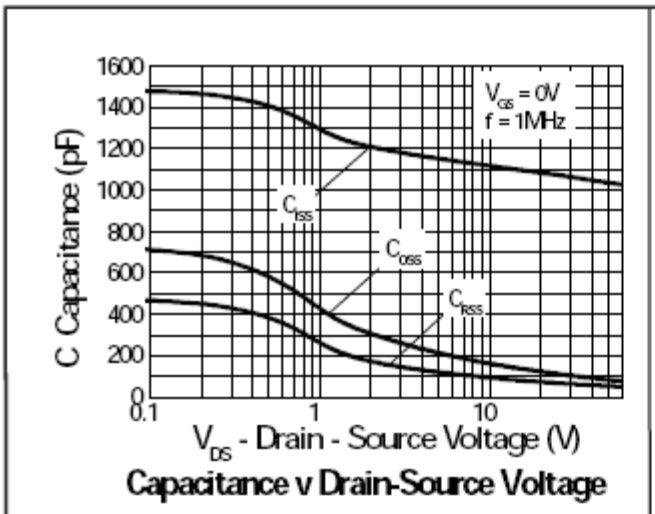


Source-Drain Diode Forward Voltage

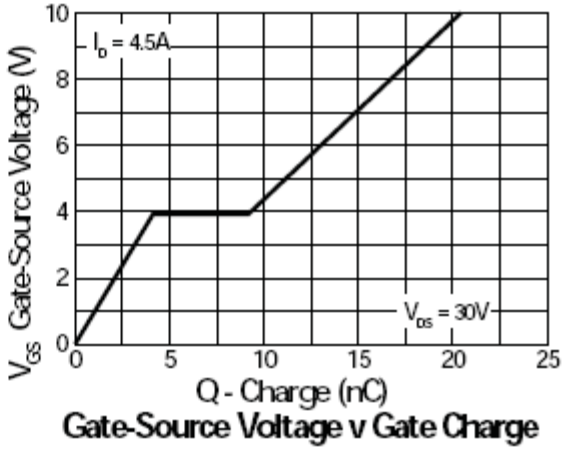
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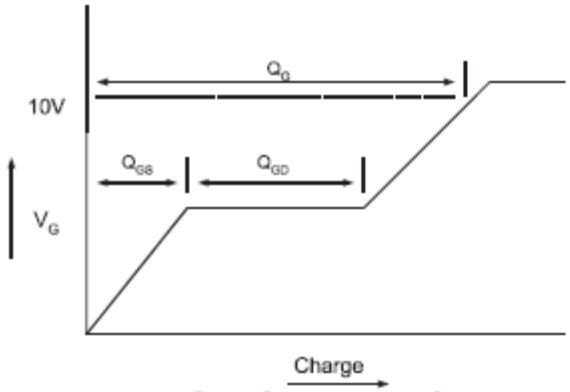
N-Channel Typical Characteristics (cont.)



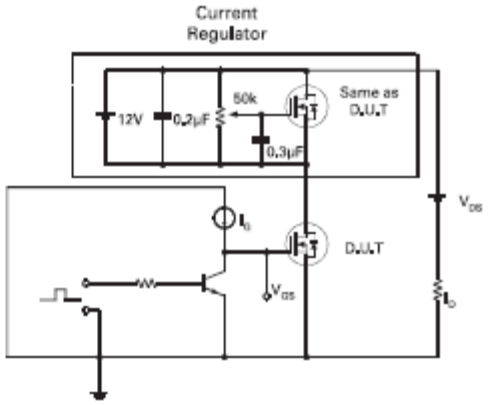
Capacitance v Drain-Source Voltage



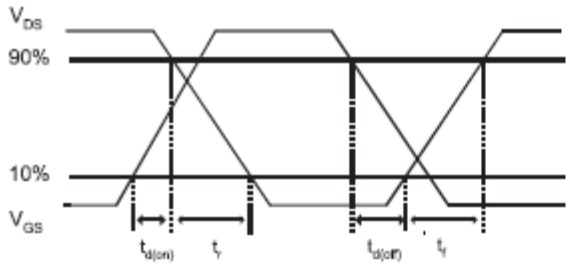
Gate-Source Voltage v Gate Charge



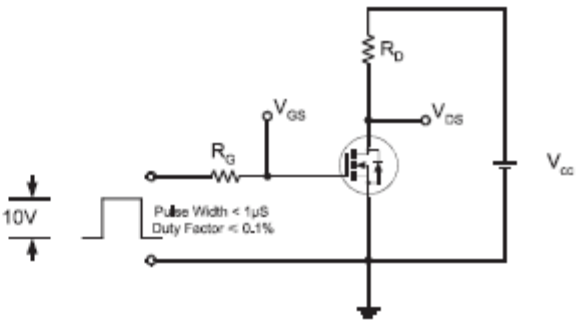
Basic Gate Charge Waveform



Gate Charge Test Circuit



Switching Time Waveforms



Switching Time Test Circuit

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

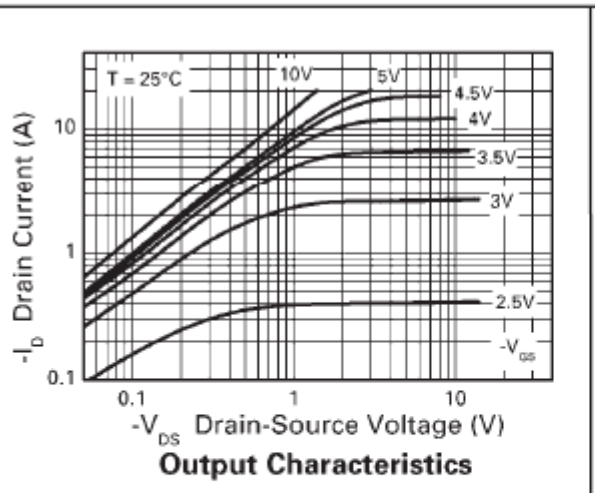
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	-60	—	—	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	-1.0	µA	V_{DS} = -60V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	-1.0	—	—	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	—	85	mΩ	V_{GS} = -10V, I_D = -2.9A
		—	—	125		V_{GS} = -4.5V, I_D = -2.4A
Diode Forward Voltage	V_{SD}	—	-0.85	-0.95	V	V_{GS} = 0V, I_S = -3.4A
Forward Transconductance	g_{fs}	—	7.2	—	S	V_{DS}=-15V,I_D=-2.9A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	1021	—	pF	V_{DS} = -30V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	83.1	—		
Reverse Transfer Capacitance	C_{rss}	—	56.4	—		
Total Gate Charge (V_{GS} = -5.0V)	Q_g	—	12.1	—	nC	V_{DS} = -30V, I_D = -2.9A
Total Gate Charge (V_{GS} = -10V)	Q_g	—	24.2	—		
Gate-Source Charge	Q_{gs}	—	2.5	—		
Gate-Drain Charge	Q_{gd}	—	3.7	—		
Turn-On Delay Time	$t_{D(on)}$	—	3.5	—	nS	V_{DD} = -30V, I_D = -1.0A V_{GS} = -10V, R_G = 6.0Ω
Turn-On Rise Time	t_r	—	4.1	—		
Turn-Off Delay Time	$t_{D(off)}$	—	35	—		
Turn-Off Fall Time	t_f	—	10	—		
Body Diode Reverse Recovery Time	t_{rr}	—	29.2	—	nS	I_S = -2.0A, dI/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{rr}	—	39.6	—	nC	I_S = -2.0A, dI/dt = 100A/µs

Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

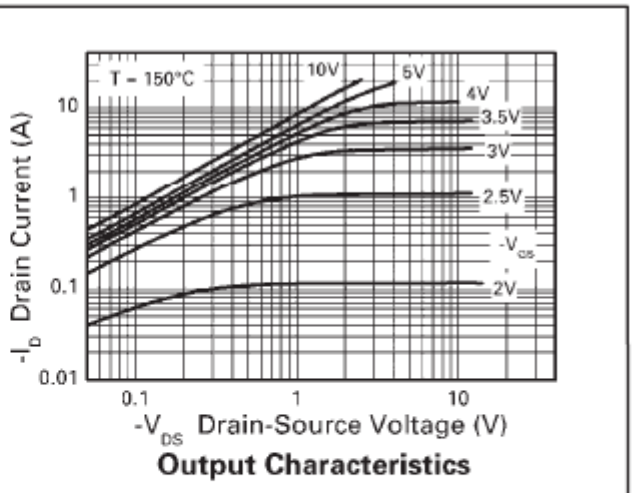
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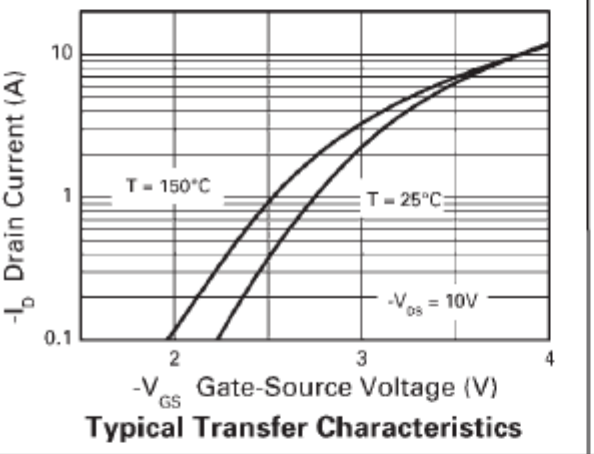
P-Channel Typical Characteristics



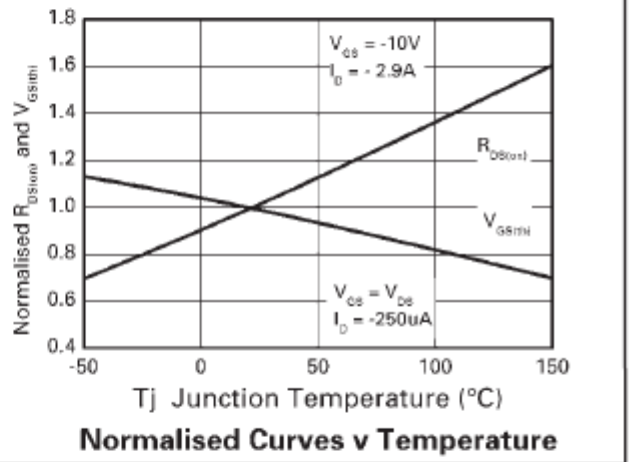
Output Characteristics



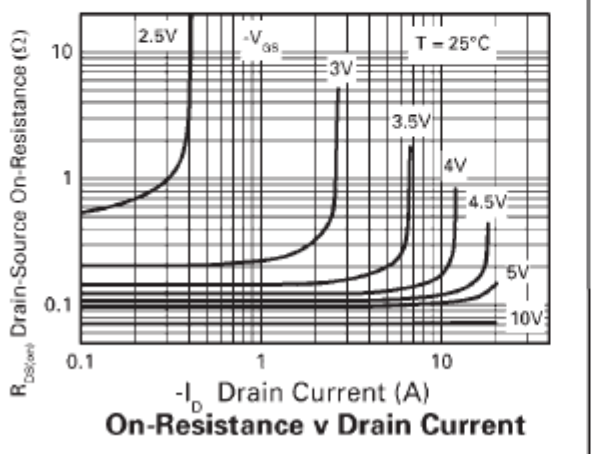
Output Characteristics



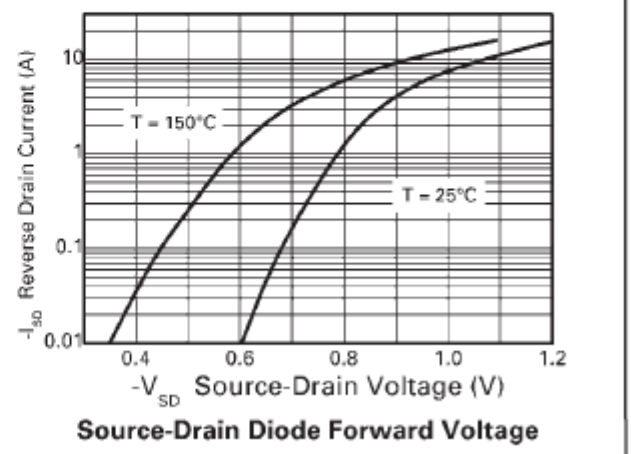
Typical Transfer Characteristics



Normalised Curves v Temperature



On-Resistance v Drain Current

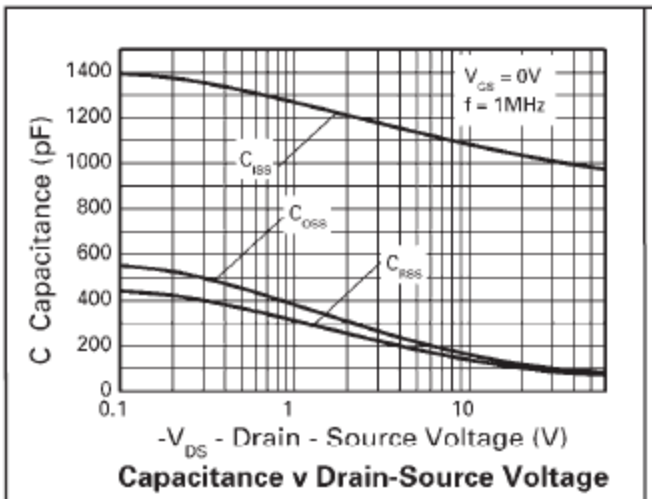


Source-Drain Diode Forward Voltage

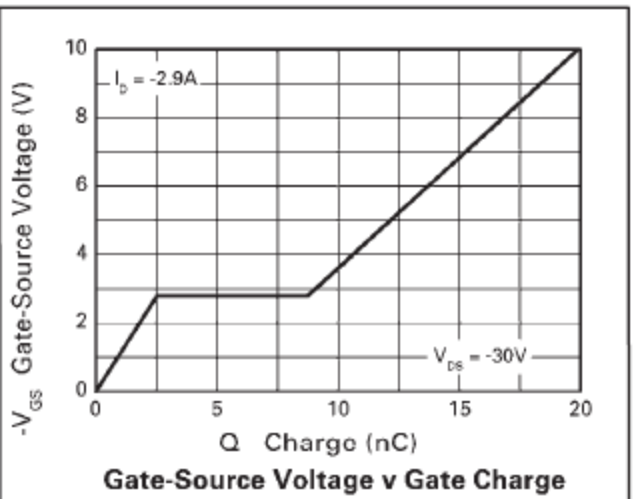
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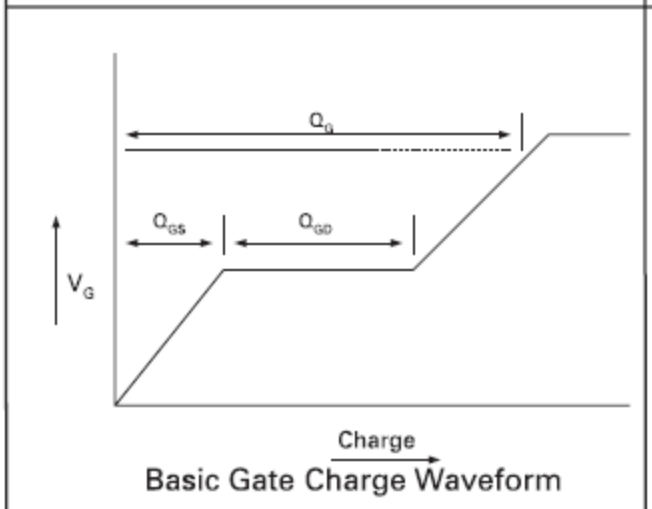
P-Channel Typical Characteristics (cont.)



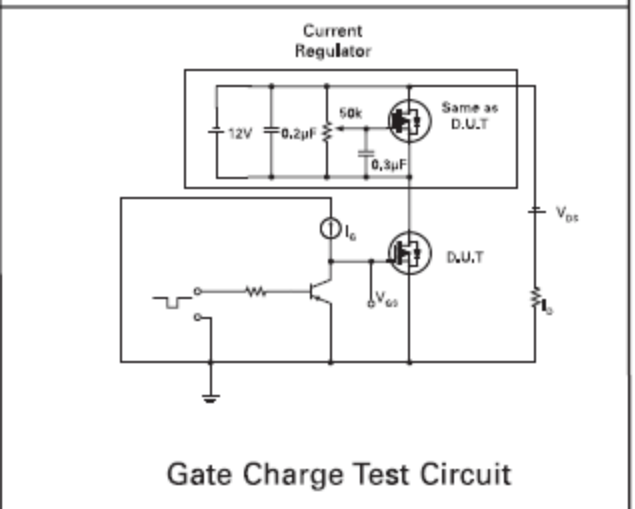
Capacitance v Drain-Source Voltage



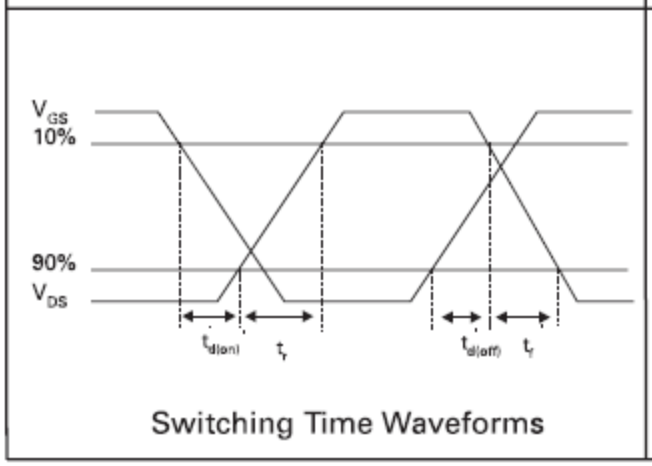
Gate-Source Voltage v Gate Charge



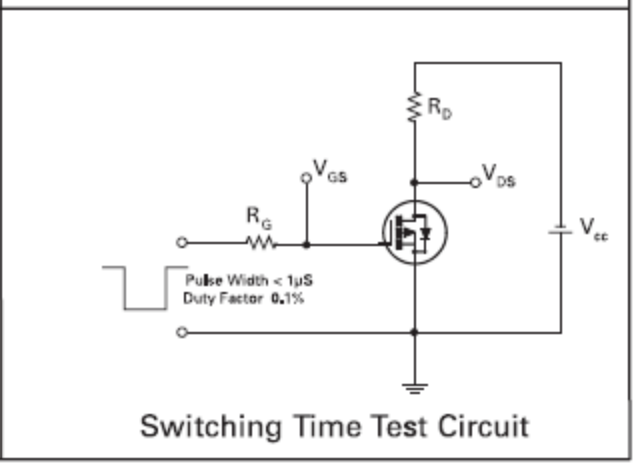
Basic Gate Charge Waveform



Gate Charge Test Circuit



Switching Time Waveforms



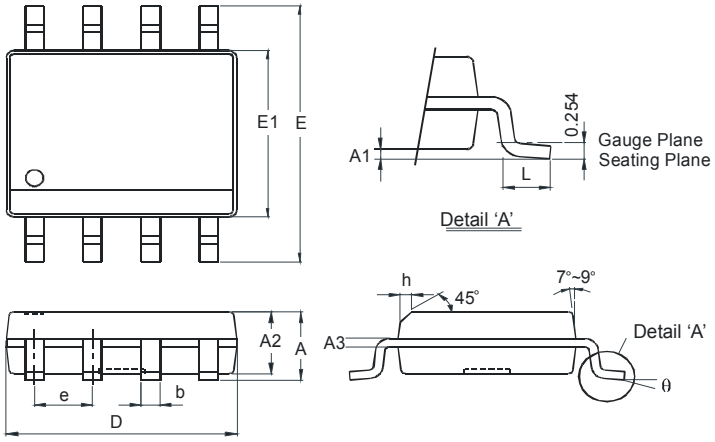
Switching Time Test Circuit

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Package Outline Dimensions

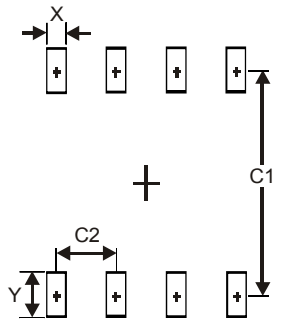
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



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

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for latest version.



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

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Entegreci is an online electronic components store based in Türkiye. Search by manufacturer part number to see stock, prices and datasheets for integrated circuits, microcontrollers, transistors, passive components and connectors, or request a quote for parts that are not listed.

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