

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	$I_D$ $T_A = +25^\circ\text{C}$
20V	0.55Ω @ $V_{GS} = 4.5\text{V}$	630mA
	0.9Ω @ $V_{GS} = 1.8\text{V}$	410mA

## 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

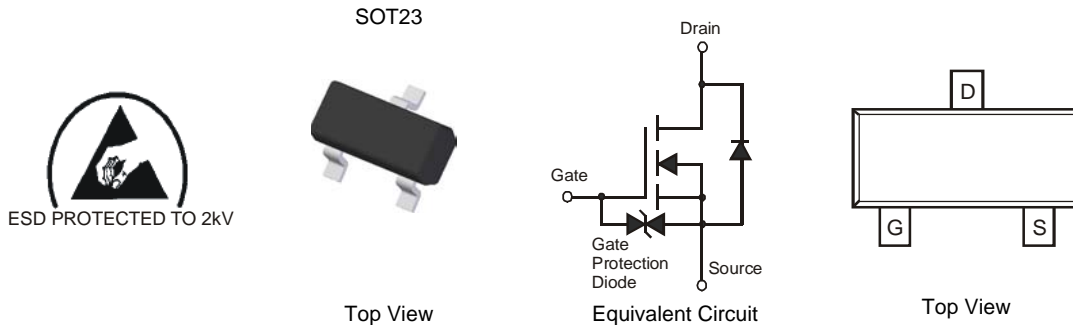
- DC-DC Converters
- Power Management Functions

## Features and Benefits

- Low On-Resistance:  $R_{DS(ON)} = 550_{(max)}\text{m}\Omega$  @  $V_{GS} = 4.5\text{V}$
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- ESD Protected up to 2KV**
- 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: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin annealed over Alloy 42 leadframe. Solderable per MIL-STD-202, Method 208  $\text{e3}$
- Terminal Connections: See Diagram
- Weight: 0.008 grams (approximate)

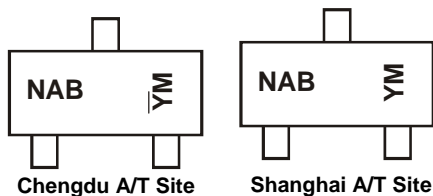


## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2004K-7	SOT23	3000/Tape & Reel

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  - See [http://www.diodes.com/quality/lead\\_free.html](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.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



NAB = Product Type Marking Code  
 YM = Date Code Marking for SAT (Shanghai Assembly/ Test site)  
 Y or Y̅ = Year (ex: A = 2013)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2008	2009	2010	2011	2012	2013	2014	2015
Code	V	W	X	Y	Z	A	B	C

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	20	V
Gate-Source Voltage			V <sub>GSS</sub>	±8	V
Drain Current (Note 5) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	630	mA
		T <sub>A</sub> = +85°C		450	
Drain Current (Note 5) V <sub>GS</sub> = 1.8V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	410	mA
		T <sub>A</sub> = +85°C		300	
Pulsed Drain Current (Note 6)			I <sub>DM</sub>	1.5	A

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	P <sub>D</sub>	350	mW
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	357	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-65 to +150	°C

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	20	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 10μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1	μA	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±1	μA	V <sub>GS</sub> = ±4.5V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	0.5	—	1.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	—	0.4	0.55	Ω	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 540mA
			0.5	0.70		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 500mA
			0.7	0.9		V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 350mA
Forward Transfer Admittance	Y <sub>fs</sub>	200	—	—	ms	V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.2A
Source Current	I <sub>S</sub>	—	—	0.5	A	—
Diode Forward Voltage (Note 7)	V <sub>SD</sub>	0.6	—	1	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 500mA
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>iss</sub>	—	—	150	pF	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	—	25	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	—	20	pF	
Gate Resistance	R <sub>g</sub>	—	292	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz
Total Gate Charge	Q <sub>g</sub>	—	0.9	—	nC	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 0.5A
Gate-Source Charge	Q <sub>gs</sub>	—	0.2	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	0.2	—		
Turn-On Delay Time	t <sub>D(on)</sub>	—	5.7	—	ns	V <sub>GS</sub> = 8V, V <sub>DS</sub> = 15V, R <sub>G</sub> = 6Ω, R <sub>L</sub> = 30Ω
Turn-On Rise Time	t <sub>r</sub>	—	8.4	—		
Turn-Off Delay Time	t <sub>D(off)</sub>	—	59.4	—		
Turn-Off Fall Time	t <sub>f</sub>	—	37.6	—		
Body Diode Reverse Recovery Time	t <sub>rr</sub>	—	5.5	—	ns	I <sub>S</sub> = 0.5A, dI/dt = -100A/μs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	—	0.85	—	nC	I <sub>S</sub> = 0.5A, dI/dt = -100A/μs

- Notes:
- Device mounted on FR-4 PCB, with minimum recommended pad layout, single sided.
  - Pulse width ≤10μS, Duty Cycle ≤1%.
  - Short duration pulse test used to minimize self-heating effect.

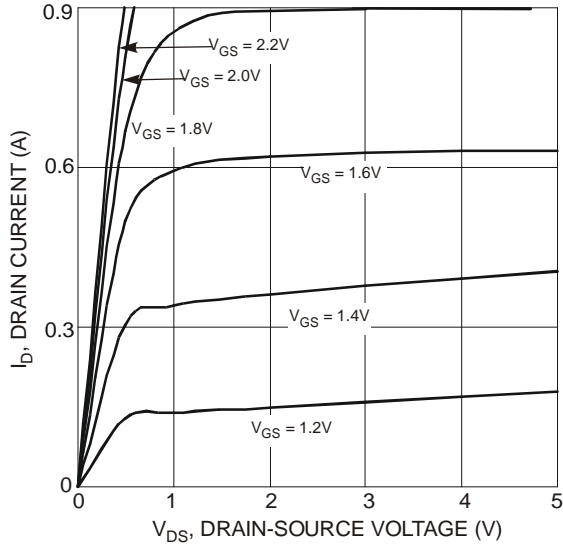


Figure 1 Typical Output Characteristics

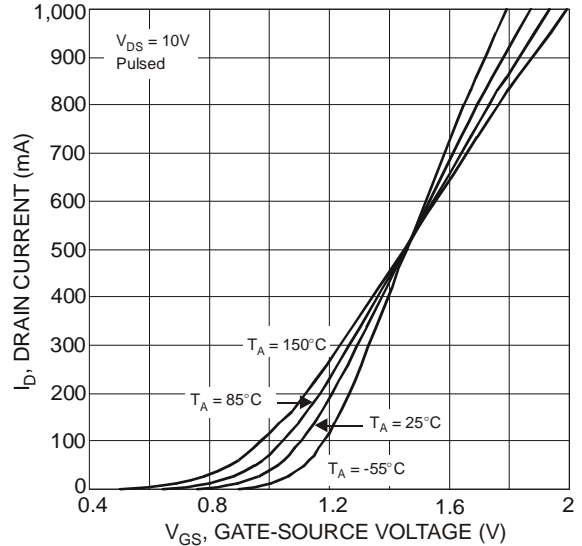


Figure 2 Reverse Drain Current vs. Source-Drain Voltage

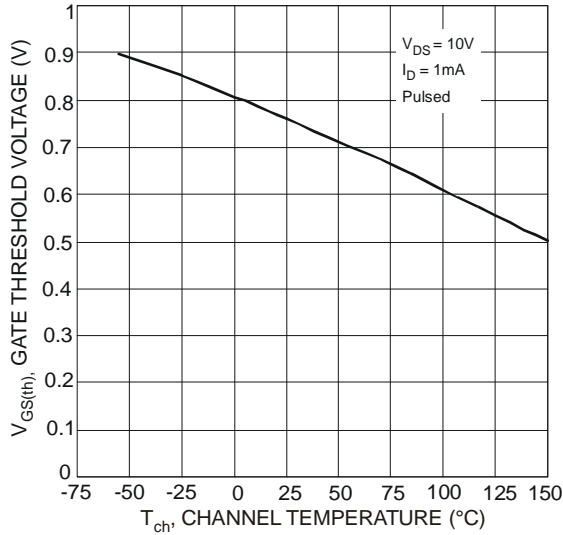


Figure 3 Gate Threshold Voltage vs. Channel Temperature

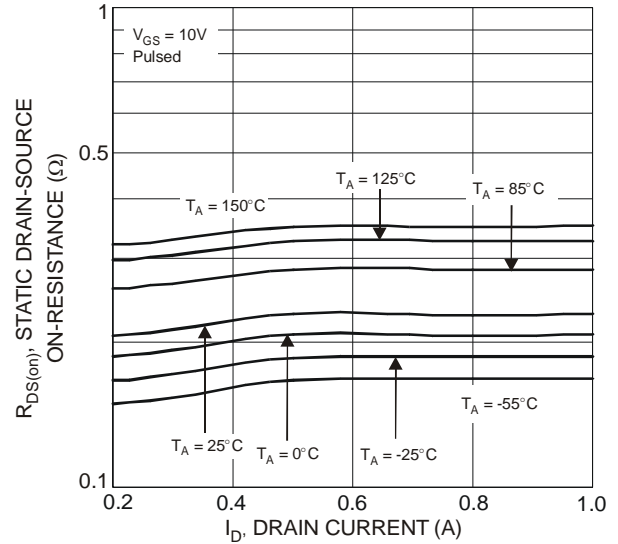


Figure 4 Static Drain-Source On-Resistance vs. Drain Current

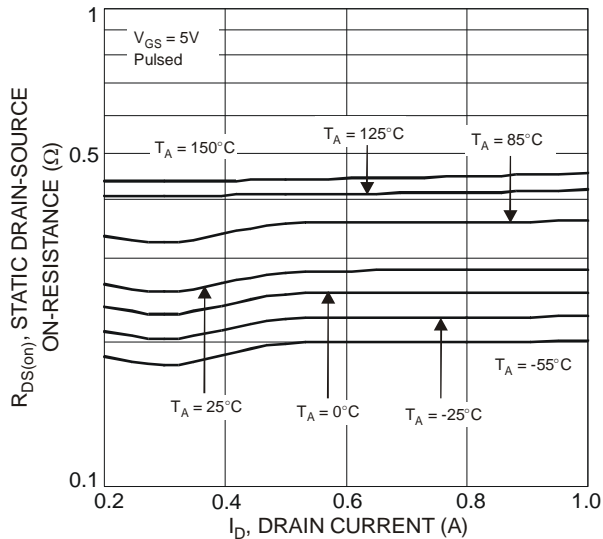


Figure 5 Static Drain-Source On-Resistance vs. Drain Current

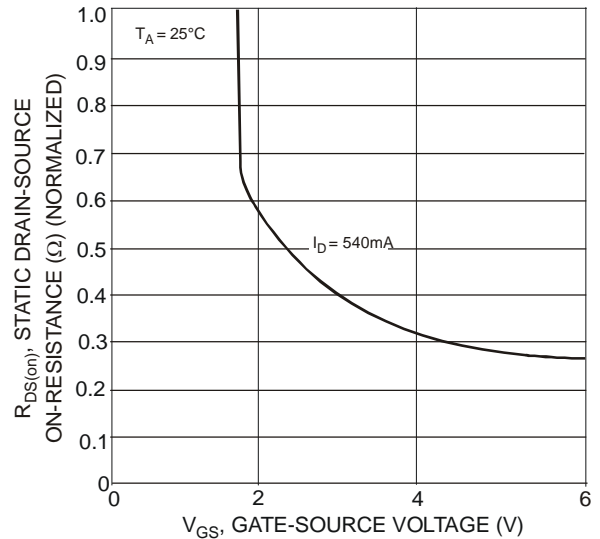


Figure 6 Static Drain-Source, On-Resistance vs. Gate-Source Voltage

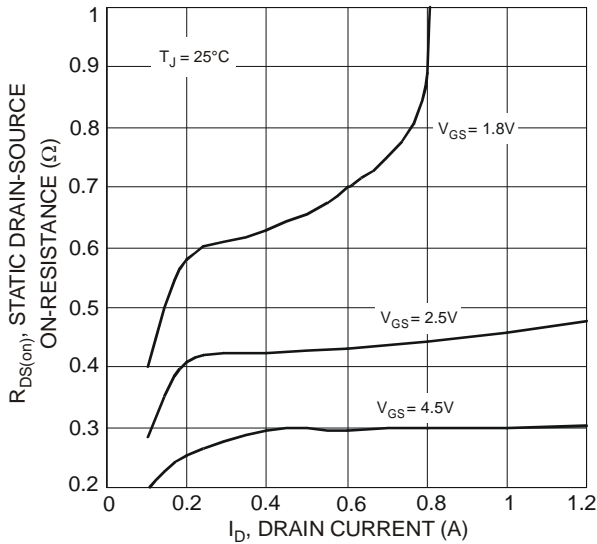


Figure 7 On-Resistance vs. Drain Current and Gate Voltage

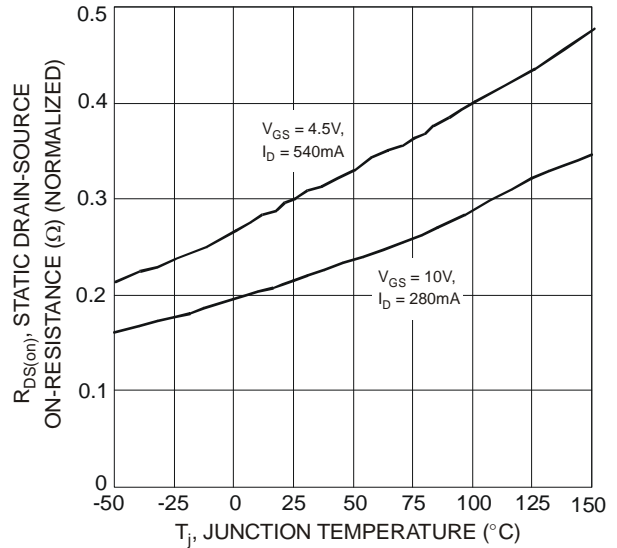


Figure 8 Static Drain-Source, On-Resistance vs. Temperature

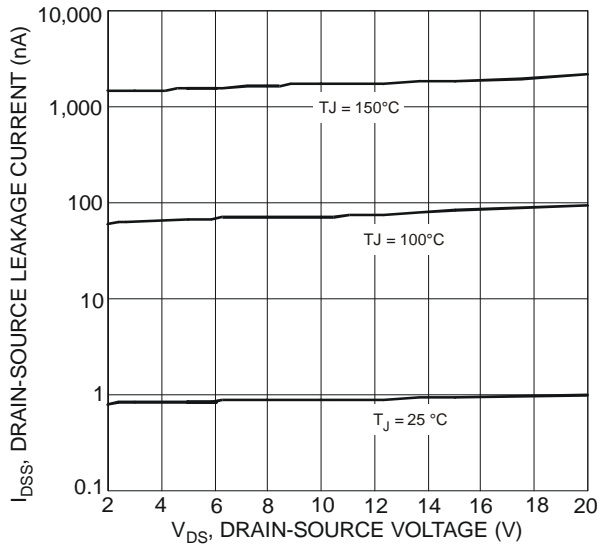


Figure 9 Drain Source Leakage Current vs. Voltage

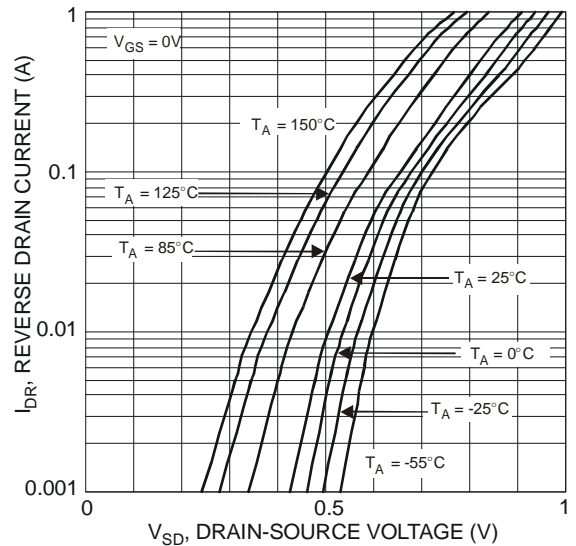


Figure 10 Reverse Drain Current vs. Source-Drain Voltage

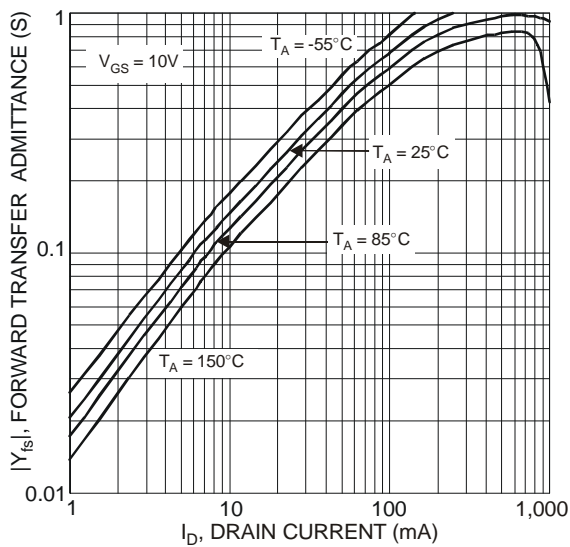


Figure 11 Forward Transfer Admittance vs. Drain Current

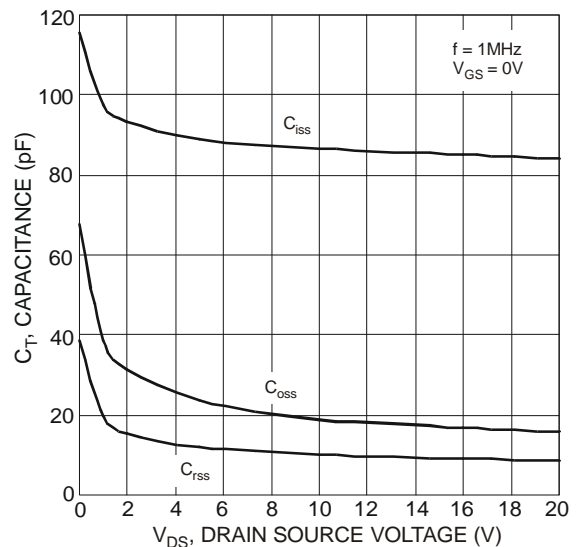


Figure 12 Capacitance Variation

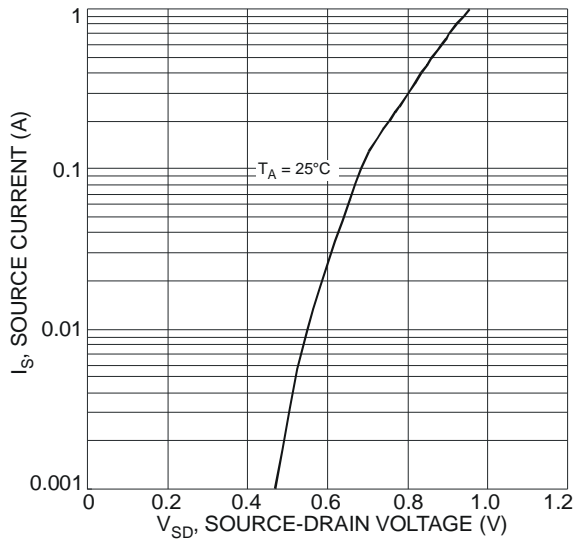


Figure 13 Diode Forward Voltage vs. Current

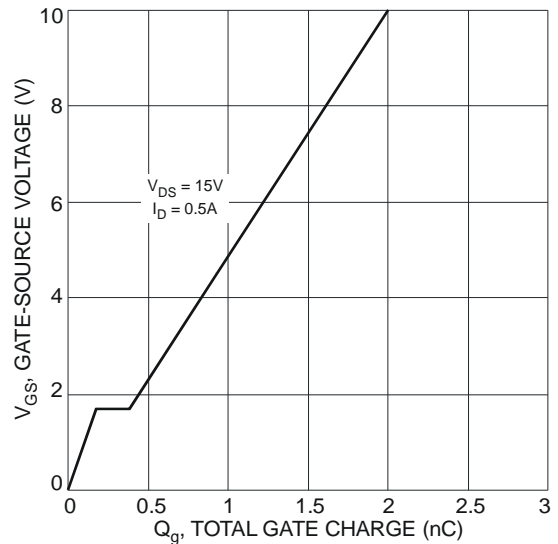
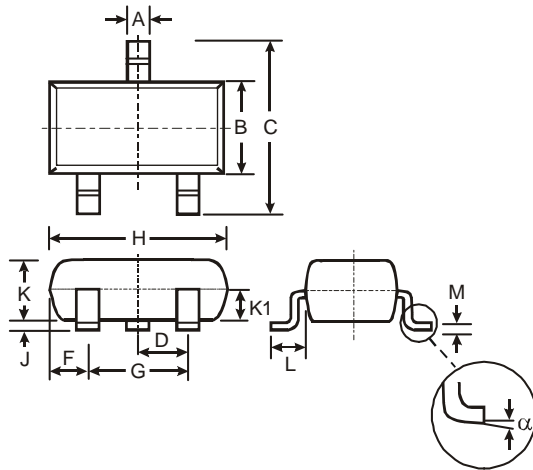


Figure 14 Gate-Charge Characteristics

## Package Outline Dimensions

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

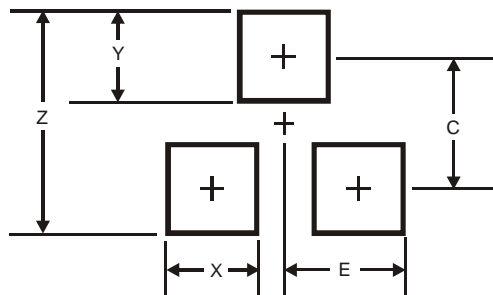


SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.903	1.10	1.00
K1	-	-	0.400
L	0.45	0.61	0.55
M	0.085	0.18	0.11
$\alpha$	0°	8°	-

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)
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

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