

## Product Summary

BV <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub> T <sub>A</sub> = +25°C
20V	0.55Ω @ V <sub>GS</sub> = 4.5V	630mA
	0.9Ω @ V <sub>GS</sub> = 1.8V	410mA

## Description

This new generation MOSFET has been designed to minimize the on-state resistance (R<sub>DS(on)</sub>) yet maintain superior switching performance, making it ideal for high-efficiency power-management applications.

## Applications

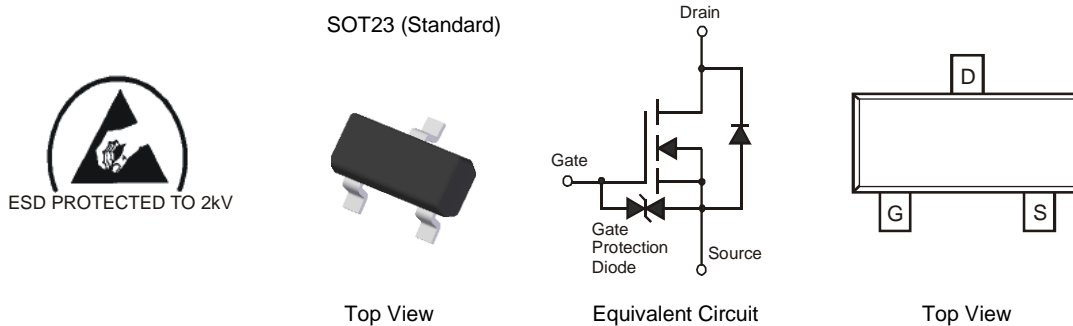
- DC-DC converters
- Power-management functions

## Features and Benefits

- Low On-Resistance: R<sub>DS(on)</sub> = 550mΩ (max) @ V<sub>GS</sub> = 4.5V
- 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)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at <https://www.diodes.com/products/automotive/automotive-products/>.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability.** <https://www.diodes.com/quality/product-definitions/>

## Mechanical Data

- Package: SOT23
- Package 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 **e3**
- Terminal Connections: See Diagram
- Weight: 0.008 grams (Approximate)

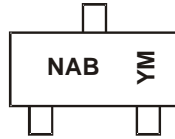


## Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMN2004K-7	SOT23 (Standard)	3000	Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



NAB = Product Type Marking Code  
 YM or  $\bar{Y}M$  or  $\underline{Y}M$  = Date Code Marking  
 Y or  $\bar{Y}$  or  $\underline{Y}$  = Year (ex: L = 2024)  
 M = Month (ex: 9 = September)

### Date Code Key

Year	2008	-	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Code	V	-	L	M	N	P	R	S	T	U	V	W

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

Characteristic		Symbol	Value	Units
Drain-Source Voltage		$V_{DSS}$	20	V
Gate-Source Voltage		$V_{GSS}$	$\pm 8$	V
Drain Current (Note 5) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	630	mA
		$T_A = +85^\circ\text{C}$	450	
Drain Current (Note 5) $V_{GS} = 1.8\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	410	mA
		$T_A = +85^\circ\text{C}$	300	
Pulsed Drain Current (Note 6)		$I_{DM}$	1.5	A

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

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	$P_D$	350	mW
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	357	$^\circ\text{C}/\text{W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-65 to +150	$^\circ\text{C}$

Notes: 5. Device mounted on FR-4 PCB, with minimum recommended pad layout, single sided.  
 6. Pulse width  $\leq 10\mu\text{s}$ , duty cycle  $\leq 1\%$ .

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	20	—	—	V	$V_{GS} = 0V, I_D = 10\mu A$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	1	$\mu A$	$V_{DS} = 16V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 1$	$\mu A$	$V_{GS} = \pm 4.5V, V_{DS} = 0V$
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	0.5	—	1.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(on)}$	—	0.4	0.55	$\Omega$	$V_{GS} = 4.5V, I_D = 540mA$
		—	0.5	0.70		$V_{GS} = 2.5V, I_D = 500mA$
		—	0.7	0.9		$V_{GS} = 1.8V, I_D = 350mA$
Forward Transfer Admittance	$ Y_{fs} $	200	—	—	ms	$V_{DS} = 10V, I_D = 0.2A$
Source Current	$I_S$	—	—	0.5	A	—
Diode Forward Voltage (Note 7)	$V_{SD}$	0.6	—	1	V	$V_{GS} = 0V, I_S = 500mA$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{iss}$	—	—	150	pF	$V_{DS} = 16V, V_{GS} = 0V$ $f = 1.0MHz$
Output Capacitance	$C_{oss}$	—	—	25	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	—	20	pF	$V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz$
Gate Resistance	$R_g$	—	292	—	$\Omega$	
Total Gate Charge	$Q_g$	—	0.9	—	nC	$V_{DS} = 15V, V_{GS} = 4.5V, I_D = 0.5A$
Gate-Source Charge	$Q_{gs}$	—	0.2	—		
Gate-Drain Charge	$Q_{gd}$	—	0.2	—		
Turn-On Delay Time	$t_{D(on)}$	—	5.7	—	ns	$V_{GS} = 8V, V_{DS} = 15V$ $R_g = 6\Omega, R_L = 30\Omega$
Turn-On Rise Time	$t_R$	—	8.4	—		
Turn-Off Delay Time	$t_{D(off)}$	—	59.4	—		
Turn-Off Fall Time	$t_F$	—	37.6	—		
Body Diode Reverse-Recovery Time	$t_{rr}$	—	5.5	—	ns	$I_S = 0.5A, di/dt = -100A/\mu s$
Body Diode Reverse-Recovery Charge	$Q_{rr}$	—	0.85	—	nC	$I_S = 0.5A, di/dt = -100A/\mu s$

Note: 7. Short duration pulse test used to minimize self-heating effect.

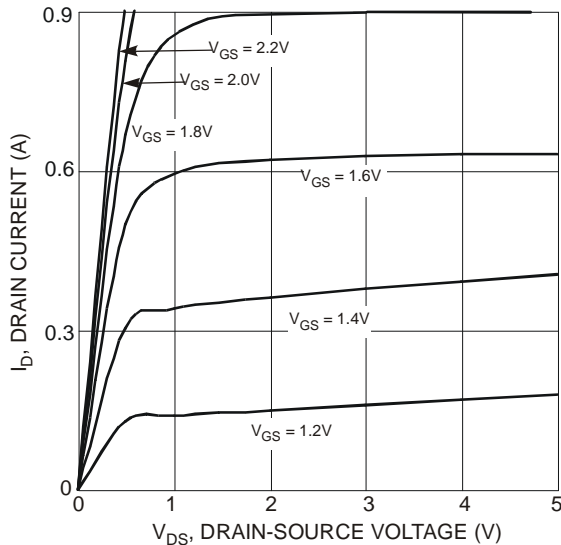


Figure 1 Typical Output Characteristics

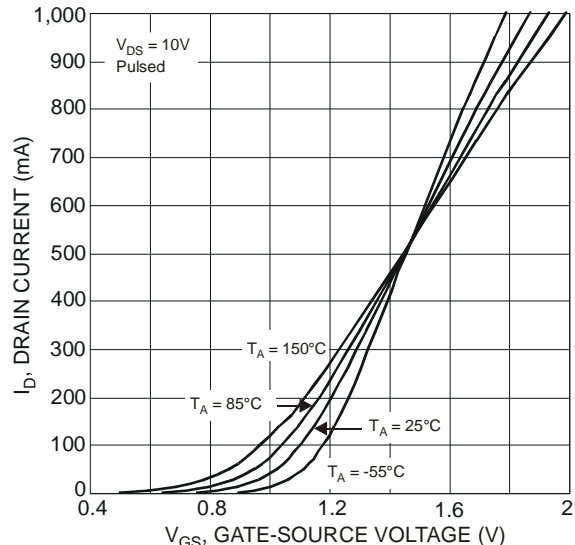


Figure 2 Reverse Drain Current vs. Source-Drain Voltage

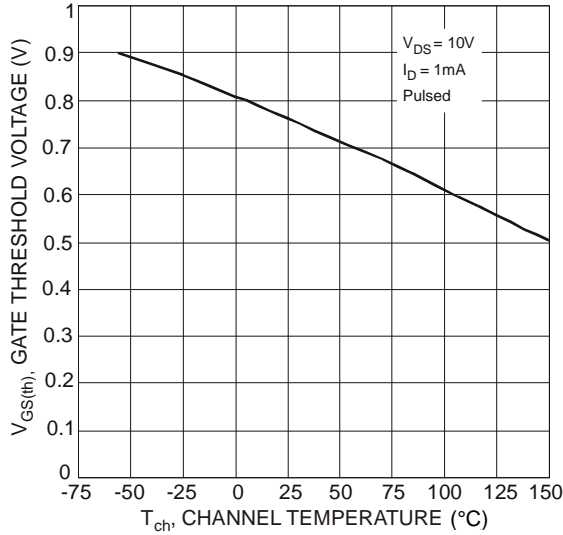


Figure 3 Gate Threshold Voltage vs. Channel Temperature

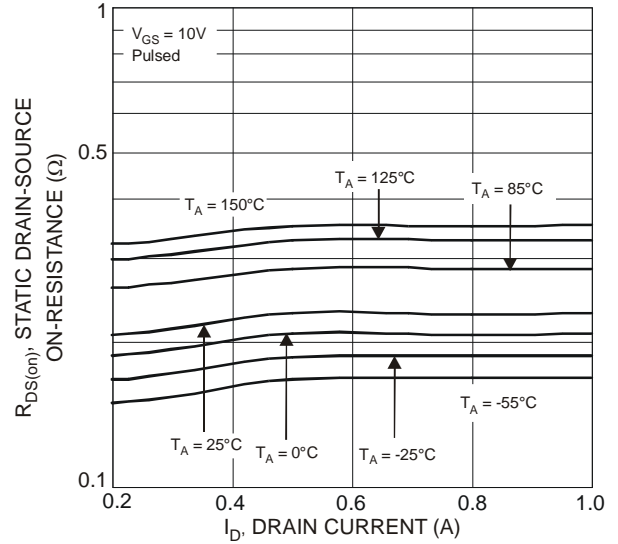


Figure 4 Static Drain-Source On-Resistance vs. Drain Current

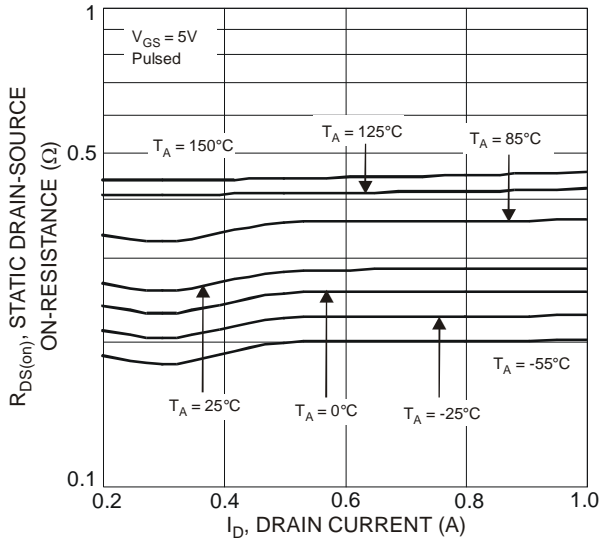


Figure 5 Static Drain-Source On-Resistance vs. Drain Current

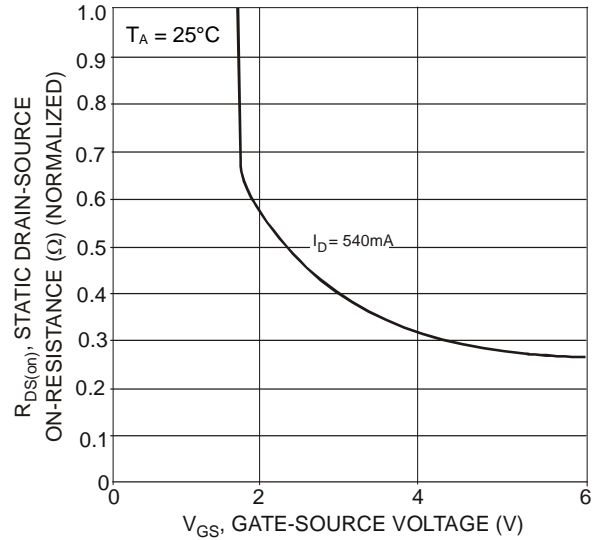


Figure 6 Static Drain-Source, On-Resistance vs. Gate-Source Voltage

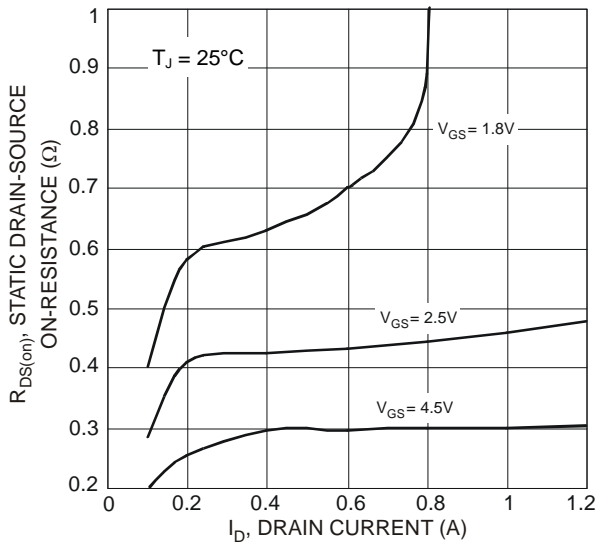


Figure 7 On-Resistance vs. Drain Current and Gate Voltage

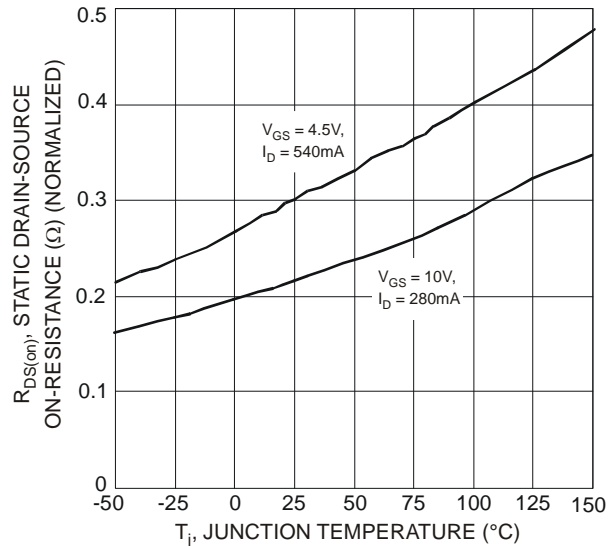


Figure 8 Static Drain-Source, On-Resistance vs. Temperature

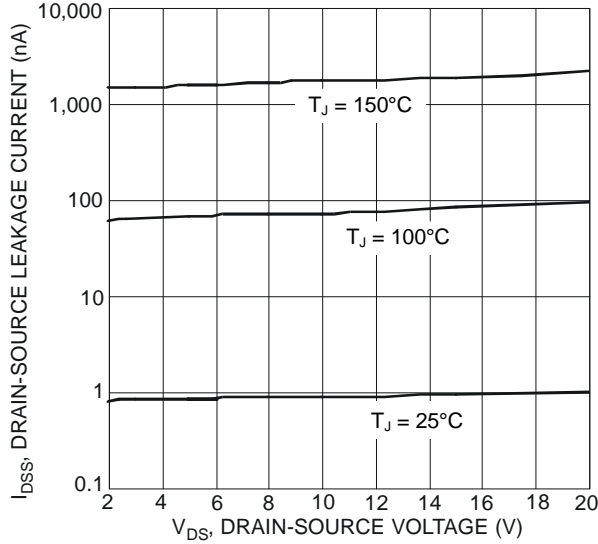


Figure 9 Drain Source Leakage Current vs. Voltage

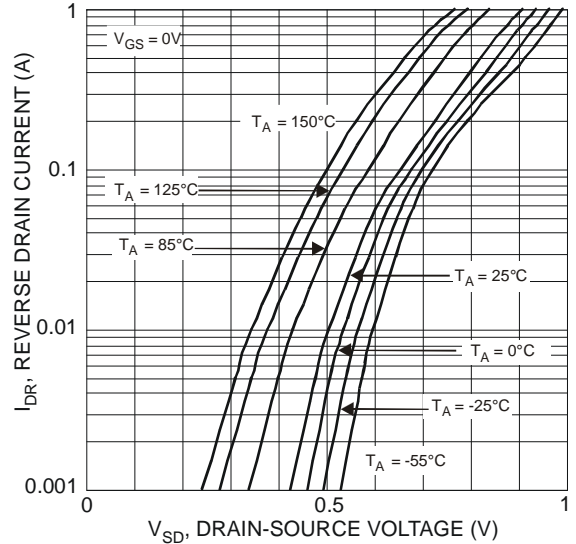


Figure 10 Reverse Drain Current vs. Source-Drain Voltage

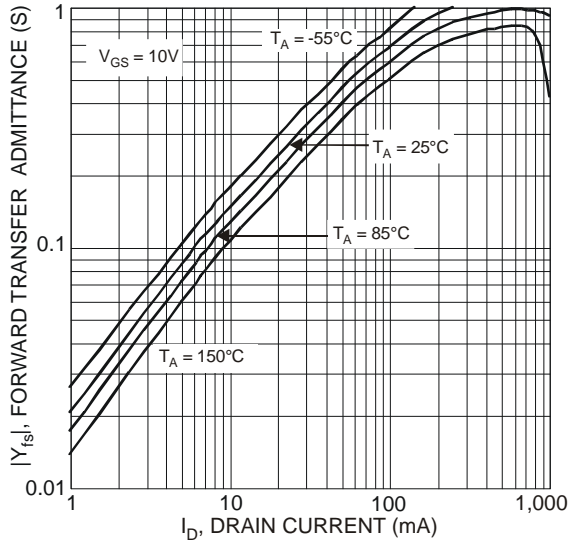


Figure 11 Forward Transfer Admittance vs. Drain Current

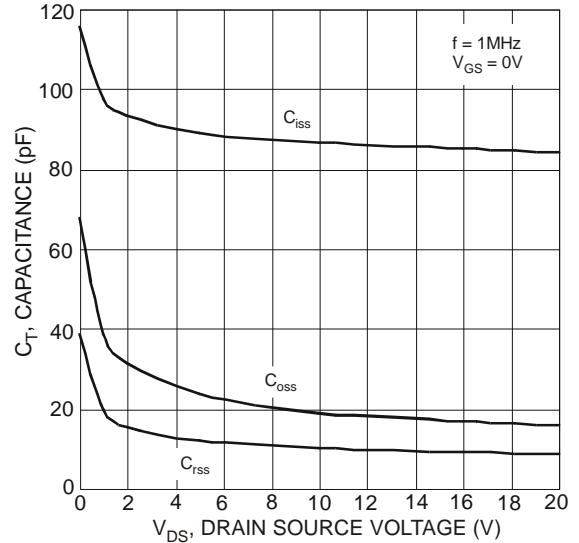


Figure 12 Capacitance Variation

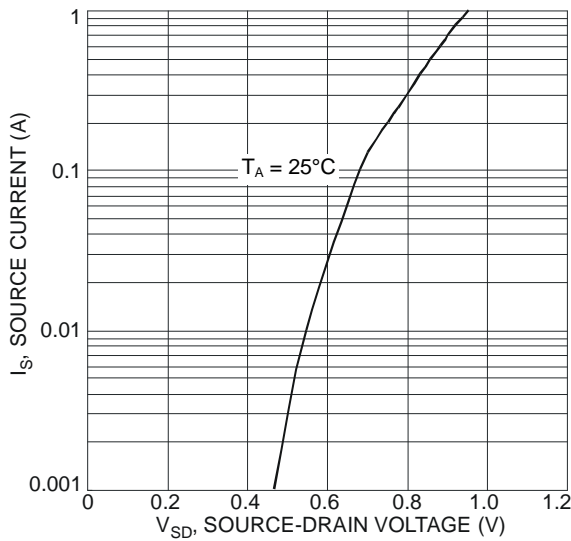


Figure 13 Diode Forward Voltage vs. Current

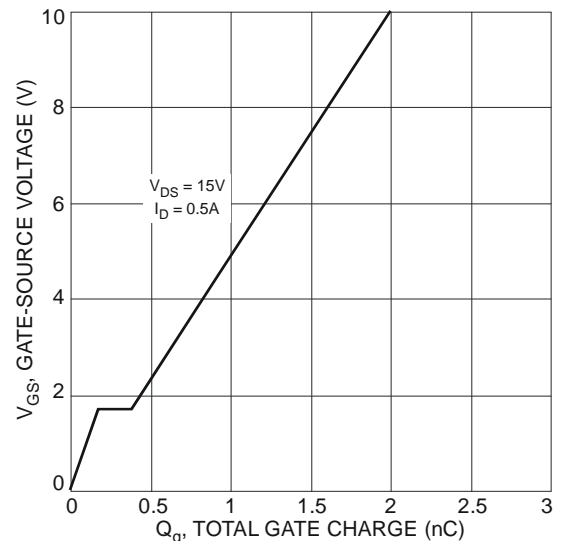
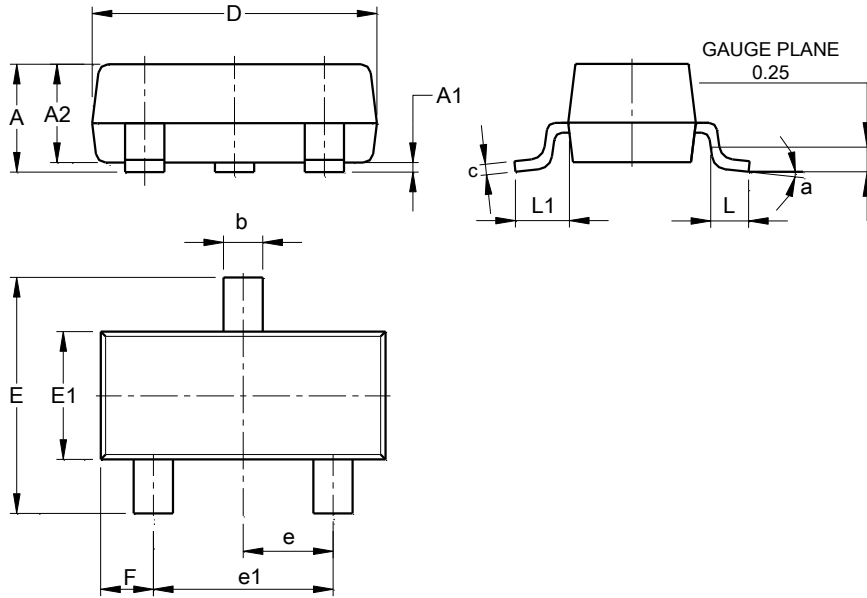


Figure 14 Gate-Charge Characteristics

## Package Outline Dimensions

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

### SOT23 (Standard)

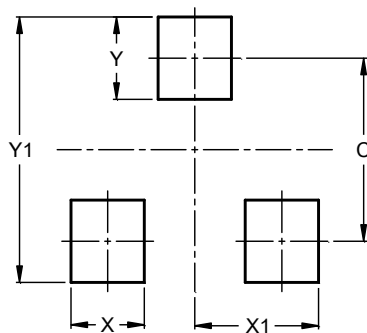


SOT23 (Standard)			
Dim	Min	Max	Typ
A	0.90	1.15	1.025
A1	0.00	0.10	0.05
A2	0.85	1.10	0.975
b	0.30	0.51	0.40
c	0.080	0.202	0.11
D	2.80	3.00	2.90
E	2.25	2.55	2.40
E1	1.20	1.40	1.30
e	0.89	1.03	0.915
e1	1.78	2.05	1.83
F	0.40	0.60	0.535
L1	0.45	0.61	0.55
L	0.25	0.55	0.40
a	0°	8°	--
All Dimensions in mm			

## Suggested Pad Layout

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

### SOT23 (Standard)



Dimensions	Value (in mm)
C	2.0
X	0.8
X1	1.35
Y	0.9
Y1	2.9

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