

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

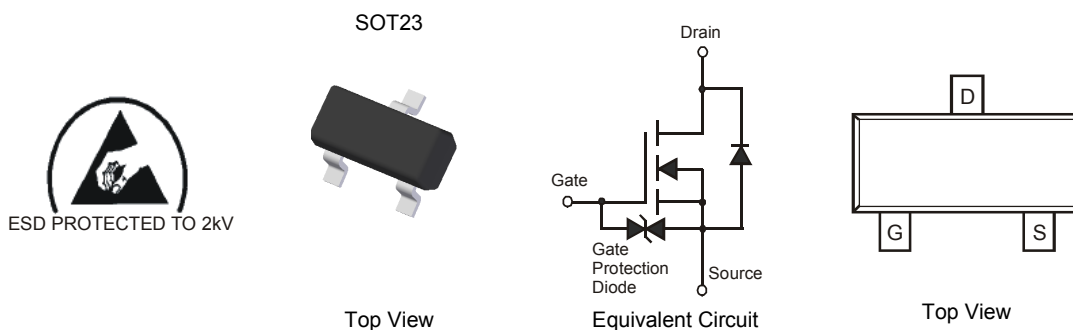
- DC-DC Converters
- Power Management Functions

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)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/200, 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

- Case: SOT23 (Standard)
- 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 e3
- Terminal Connections: See Diagram
- Weight: 0.008 grams (approximate)

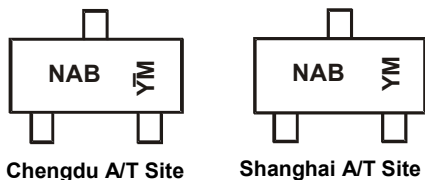


Ordering Information (Note 4)

Part Number	Case	Packaging
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 = Date Code Marking for SAT (Shanghai Assembly/ Test site)
 Y̅M = Date Code Marking for CAT (Chengdu Assembly/ Test site)
 Y or Y̅ = Year (ex: 1 = 2021)
 M = Month (ex: 9 = September)

Date Code Key

Year	2008	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Code	V	I	J	K	L	M	N	O	P	R	S

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°C, unless otherwise specified.)

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

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

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	P _D	350	mW
Thermal Resistance, Junction to Ambient	R _{θJA}	357	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-65 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	V	$V_{GS} = 0V, I_D = 10\mu A$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	$V_{DS} = 16V, V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	—	—	± 1	μA	$V_{GS} = \pm 4.5V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 7)						
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	Ω	$V_{GS} = 4.5V, I_D = 540mA$
			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	$V_{GS} = 0V, I_S = 500mA$
DYNAMIC CHARACTERISTICS						
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	
Gate Resistance	R_g	—	292	—	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz$
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	$I_S = 0.5A, di/dt = -100A/\mu s$

Notes: 5. Device mounted on FR-4 PCB, with minimum recommended pad layout, single sided.
6. Pulse width $\leq 10\mu s$, Duty Cycle $\leq 1\%$.
7. Short duration pulse test used to minimize self-heating effect.

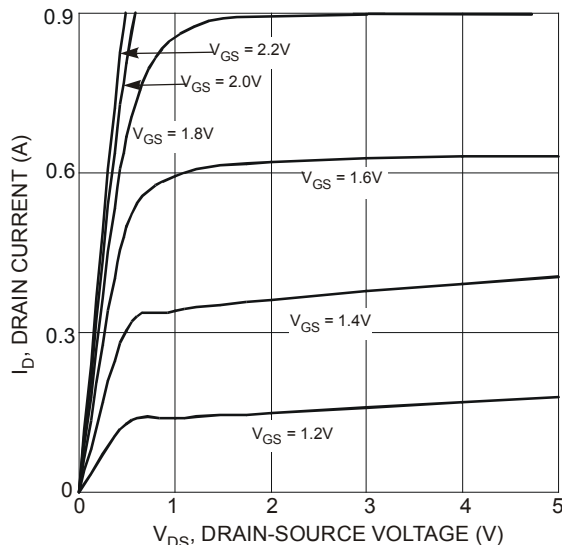


Figure 1 Typical Output Characteristics

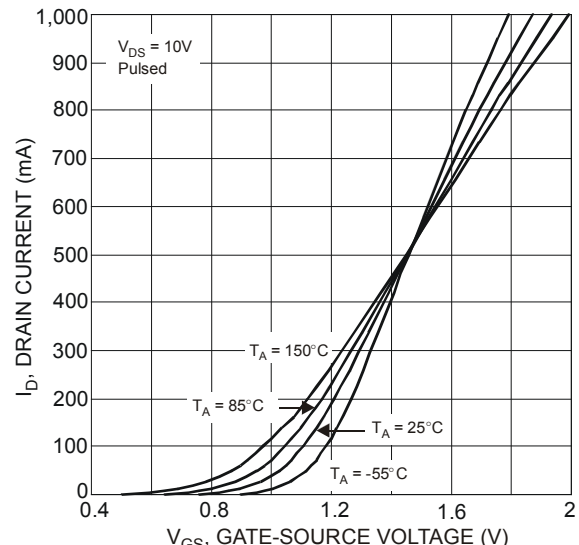


Figure 2 Reverse Drain Current vs. Source-Drain Voltage

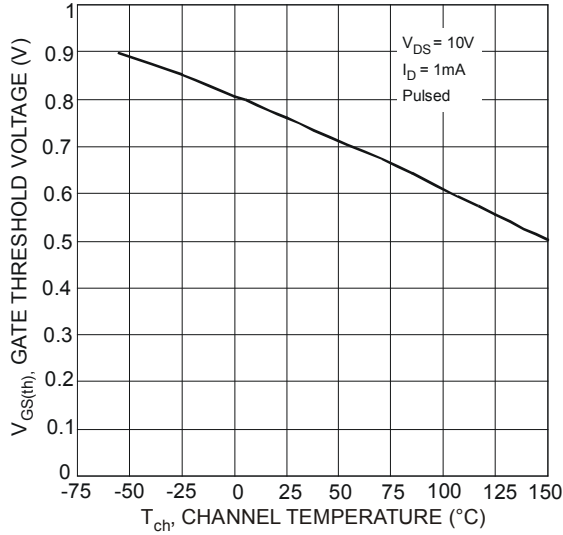


Figure 3 Gate Threshold Voltage vs. Channel Temperature

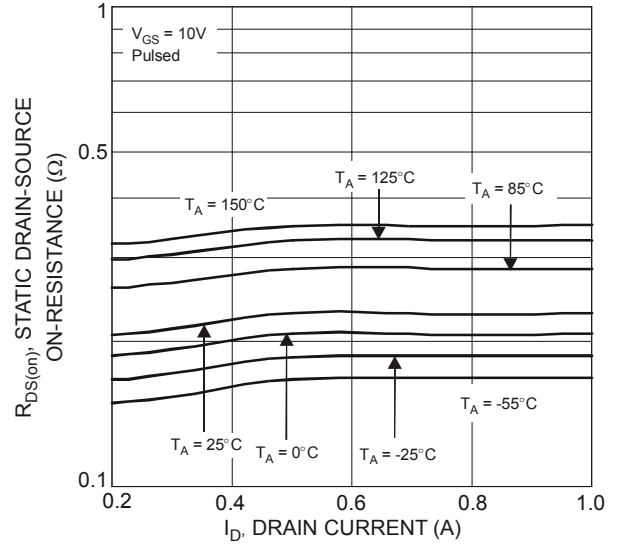


Figure 4 Static Drain-Source On-Resistance vs. Drain Current

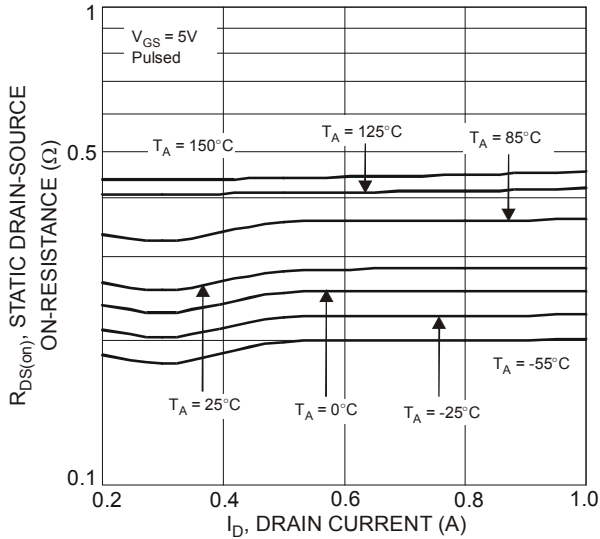


Figure 5 Static Drain-Source On-Resistance vs. Drain Current

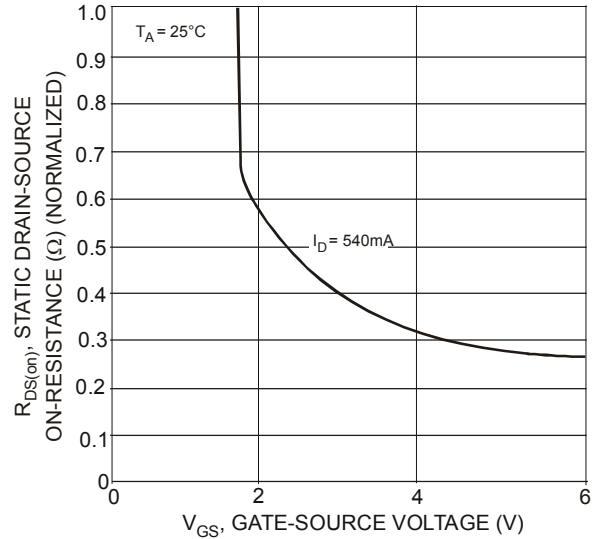


Figure 6 Static Drain-Source, On-Resistance vs. Gate-Source Voltage

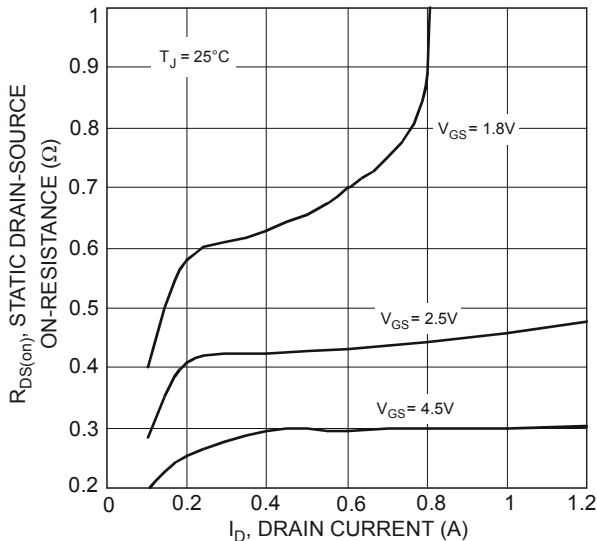


Figure 7 On-Resistance vs. Drain Current and Gate Voltage

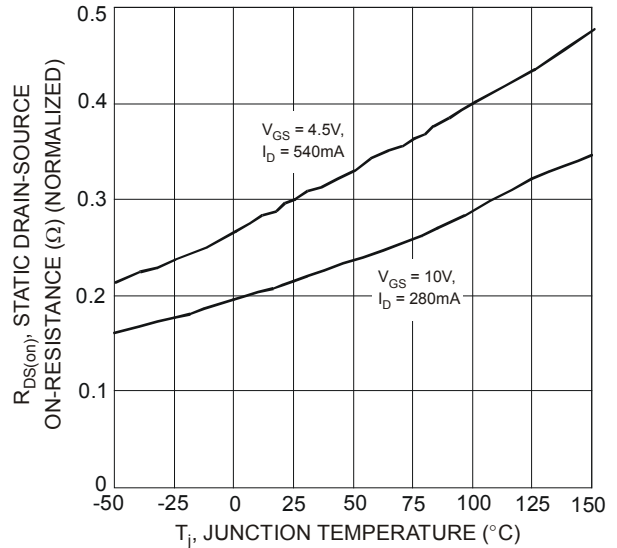


Figure 8 Static Drain-Source, On-Resistance vs. Temperature

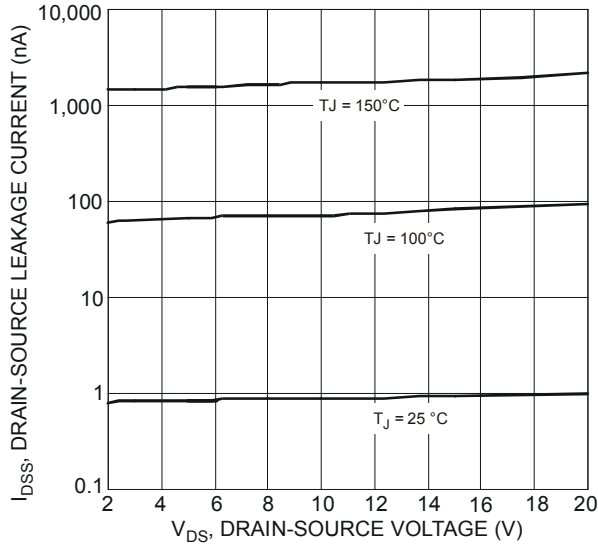


Figure 9 Drain Source Leakage Current vs. Voltage

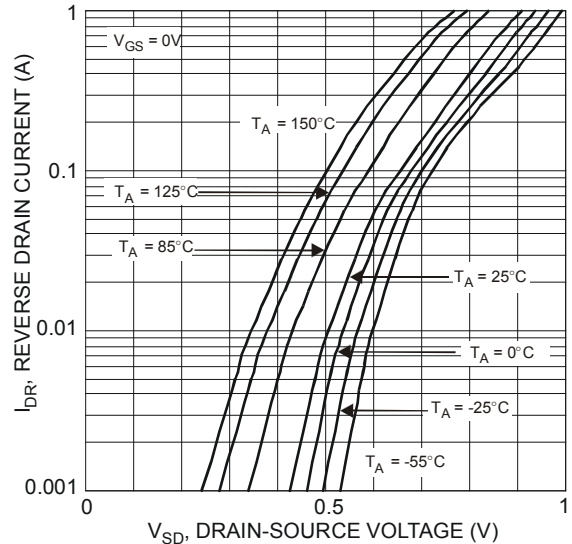


Figure 10 Reverse Drain Current vs. Source-Drain Voltage

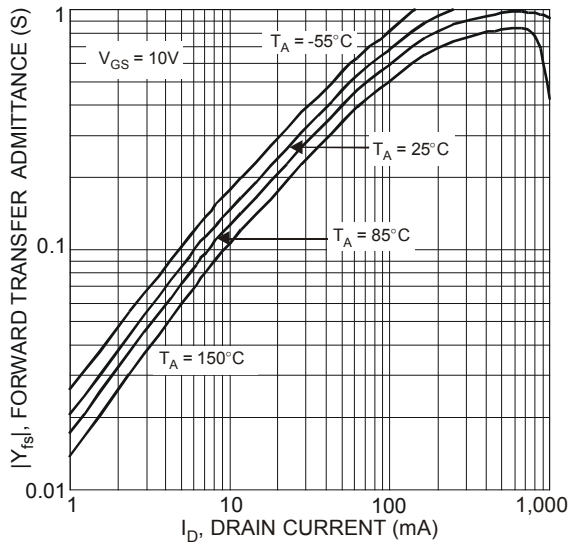


Figure 11 Forward Transfer Admittance vs. Drain Current

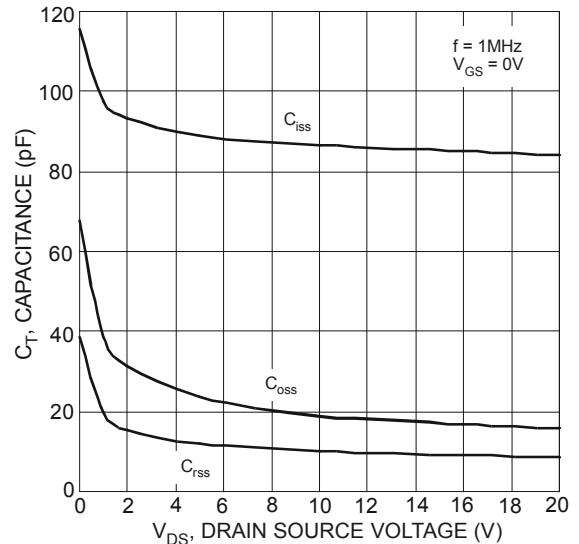


Figure 12 Capacitance Variation

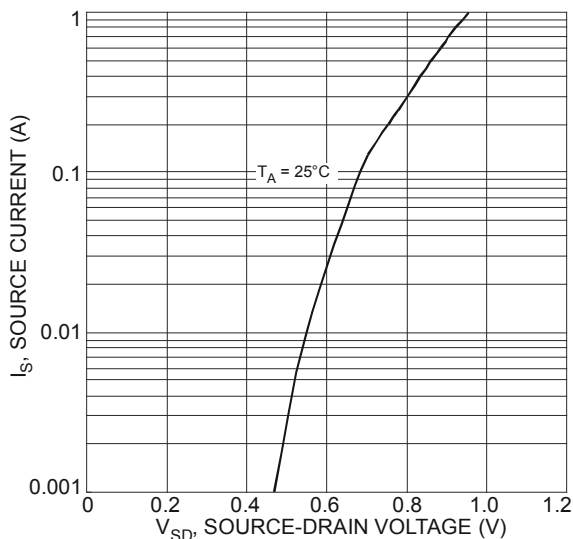


Figure 13 Diode Forward Voltage vs. Current

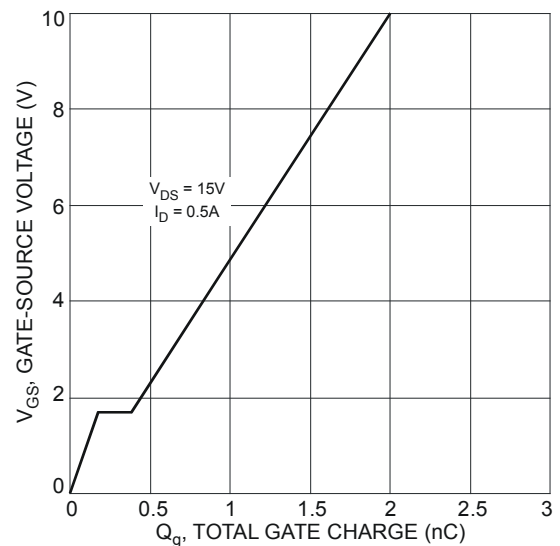
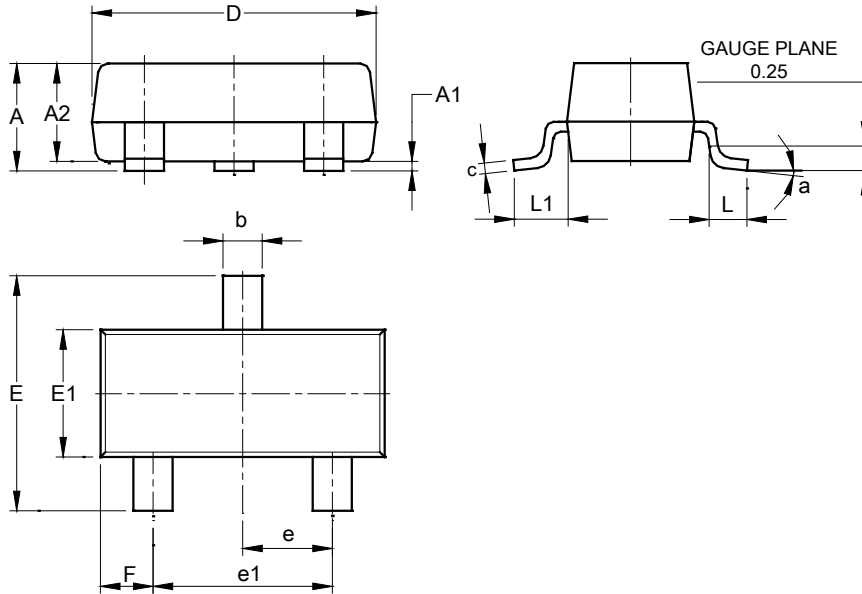


Figure 14 Gate-Charge Characteristics

Package Outline Dimensions

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

SOT23 (Standard)

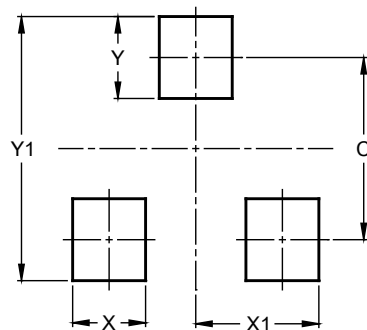


SOT23 (Standard)			
Dim	Min	Max	Typ
A	0.90	1.15	1.025
A1	0.00	0.10	0.05
A2	0.85	1.10	0.975
b	0.30	0.51	0.40
c	0.080	0.202	0.11
D	2.80	3.00	2.90
E	2.25	2.55	2.40
E1	1.20	1.40	1.30
e	0.89	1.03	0.915
e1	1.78	2.05	1.83
F	0.40	0.60	0.535
L1	0.45	0.61	0.55
L	0.25	0.55	0.40
a	0°	8°	—
All Dimensions in mm			

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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