FAIRCHILD SEMICONDUCTOR®

March 2013

FQT1N60C

N-Channel QFET® MOSFET

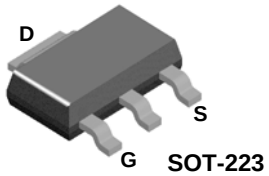
600V, 0.2 A, 11.5 Ω

Description

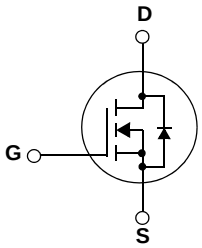
This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor®'s proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power factor correction (PFC), and electronic lamp ballasts.

Features

- 0.2 A, 600 V, $R_{DS(on)}$=9.3 Ω(Typ.)@V_{GS}=10 V, I_D=0.1 A
- Low Gate Charge (Typ. 4.8 nC)
- Low C_{rss} (Typ. 3.5 pF)
- 100% Avalanche Tested
- RoHS Compliant



SOT-223



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted*

Symbol	Parameter		FQT1N60C	Unit
V_{DSS}	Drain to Source Voltage		600	V
V_{GSS}	Gate to Source Voltage		±30	V
I_D	Drain Current	-Continuous (T_C = 25°C)	0.2	A
		-Continuous (T_C = 100°C)	0.12	
I_{DM}	Drain Current	- Pulsed (Note 1)	0.8	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	33	mJ
I_{AR}	Avalanche Current	(Note 1)	0.2	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	0.2	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5	V/ns
P_D	Power Dissipation	(T_C = 25°C)	2.1	W
		- Derate above 25°C	0.02	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	°C

Thermal Characteristics

Symbol	Parameter	Min.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient*	-	60	°C/W

* When mounted on the minimum pad size recommended (PCB Mount)

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Package Marking and Ordering Information $T_C = 25^oC$ unless otherwise noted

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQT1N60C	FQT1N60C	SOT-223	330mm	12mm	4000

Electrical Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V, T_J = 25°C	600	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	0.6	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 600V, V_{GS} = 0V	-	-	25	μA
		V_{DS} = 480V, T_C = 125°C	-	-	250	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±30V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 0.1A	-	9.3	11.5	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40V, I_D = 0.1A (Note 4)	-	0.75	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz	-	130	170	pF
C_{oss}	Output Capacitance		-	19	25	pF
C_{rss}	Reverse Transfer Capacitance		-	3.5	6	pF
Q_g	Total Gate Charge at 10V	V_{DS} = 480V, I_D = 1A, V_{GS} = 10V (Note 4, 5)	-	4.8	6.2	nC
Q_{gs}	Gate to Source Gate Charge		-	0.7	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	2.7	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 300V, I_D = 1A, R_G = 25Ω (Note 4, 5)	-	7	24	ns
t_r	Turn-On Rise Time		-	21	52	ns
$t_{d(off)}$	Turn-Off Delay Time		-	13	36	ns
t_f	Turn-Off Fall Time		-	27	64	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	0.2	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	0.8	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 0.2A	-	-	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 1A, dI_F/dt = 100A/μs (Note 4)	-	190	-	ns
Q_{rr}	Reverse Recovery Charge		-	0.53	-	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 59mH, I_{AS} = 1.1A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 0.2A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

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Typical Performance Characteristics

Figure 1. On-Region Characteristics

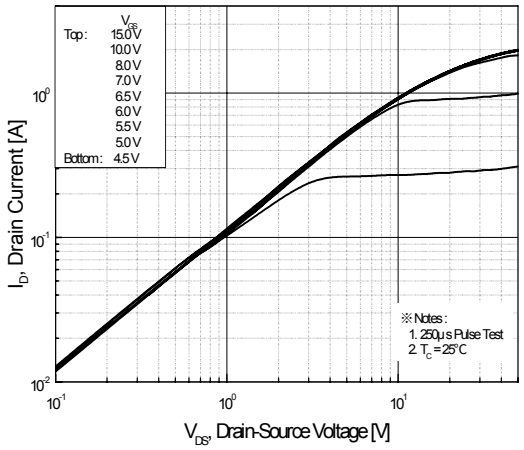


Figure 2. Transfer Characteristics

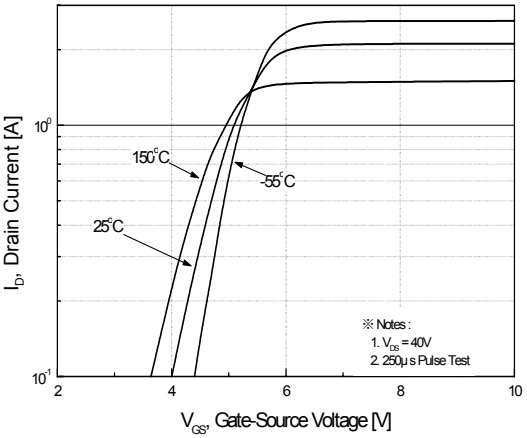


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

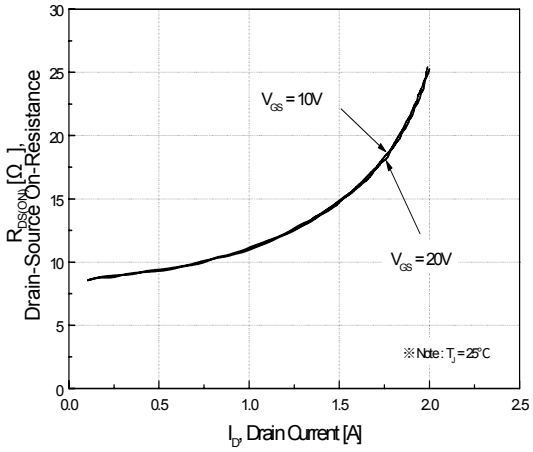


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

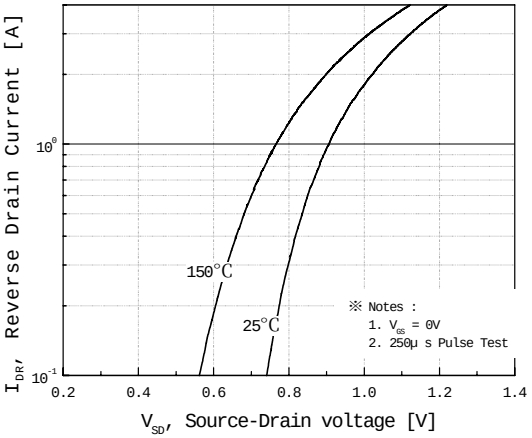


Figure 5. Capacitance Characteristics

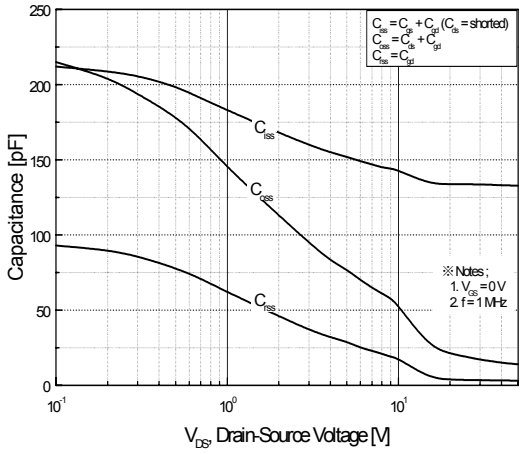
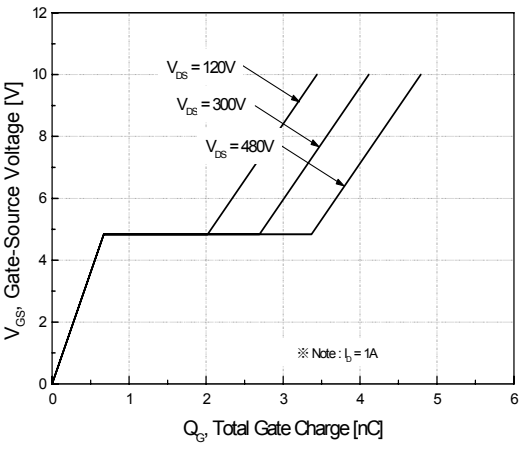


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

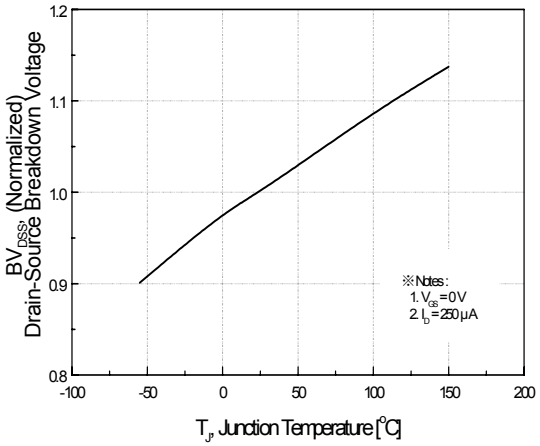


Figure 8. On-Resistance Variation vs. Temperature

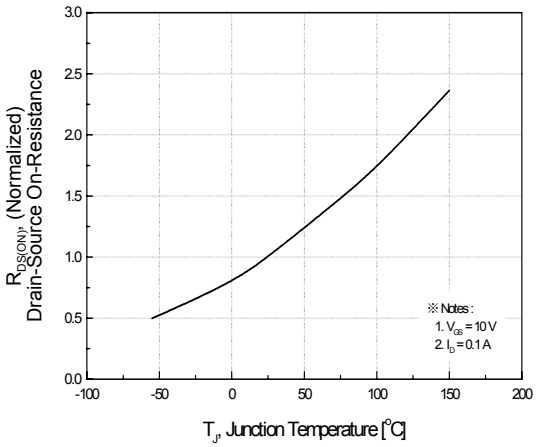


Figure 9. Maximum Safe Operating Area

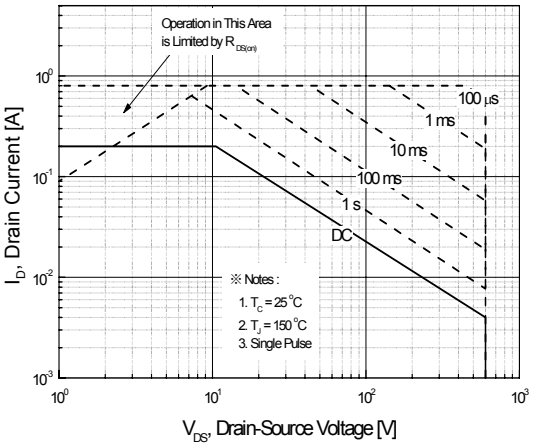


Figure 10. Maximum Drain Current vs. Case Temperature

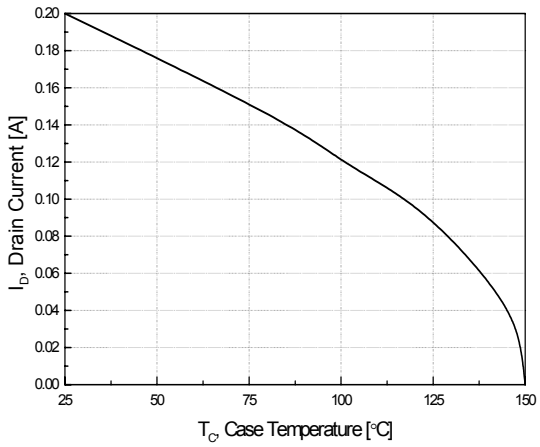
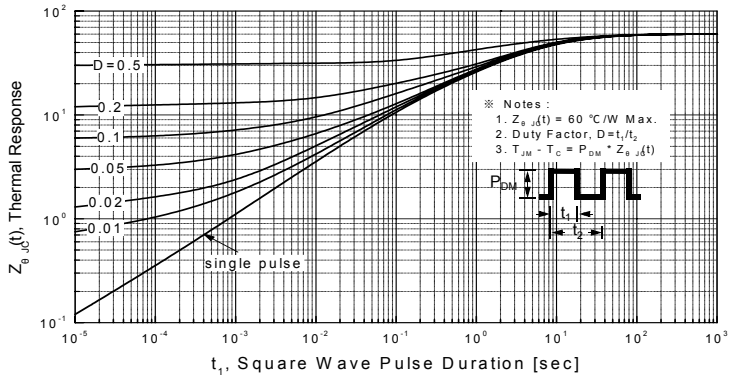
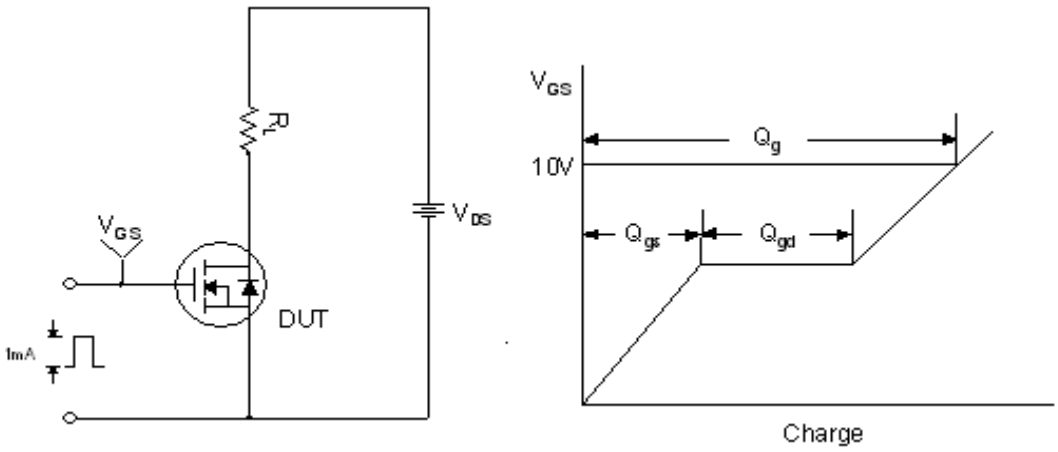


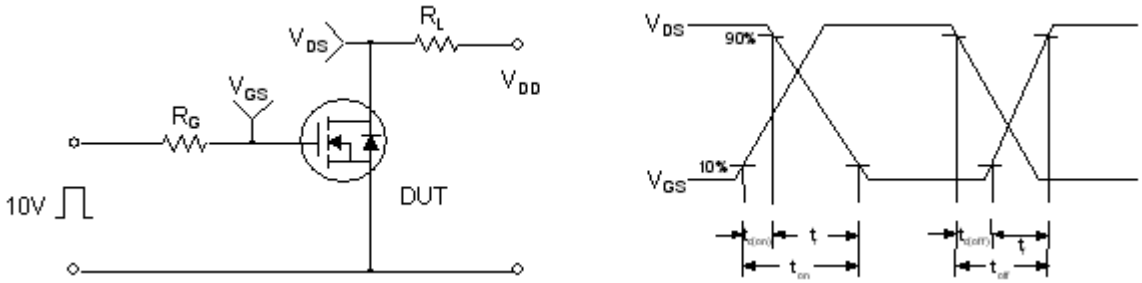
Figure 11. Transient Thermal Response Curve



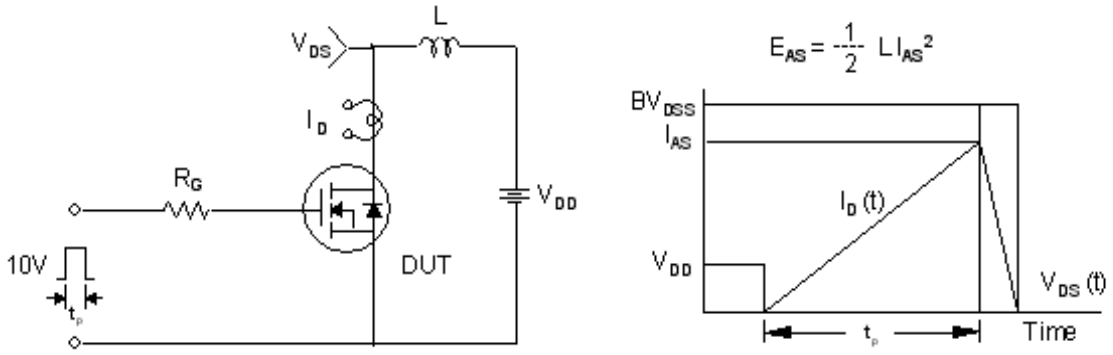
Gate Charge Test Circuit & Waveform



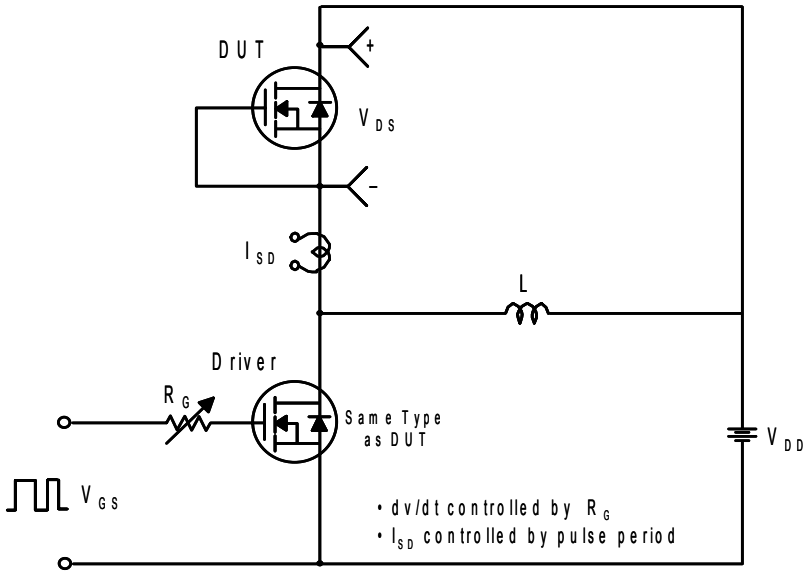
Resistive Switching Test Circuit & Waveforms

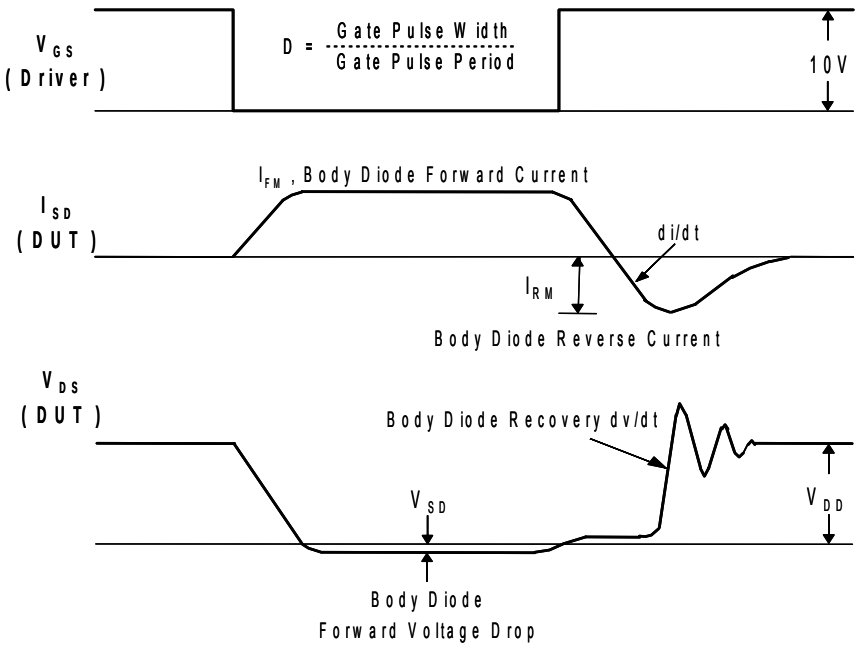


Unclamped Inductive Switching Test Circuit & Waveforms



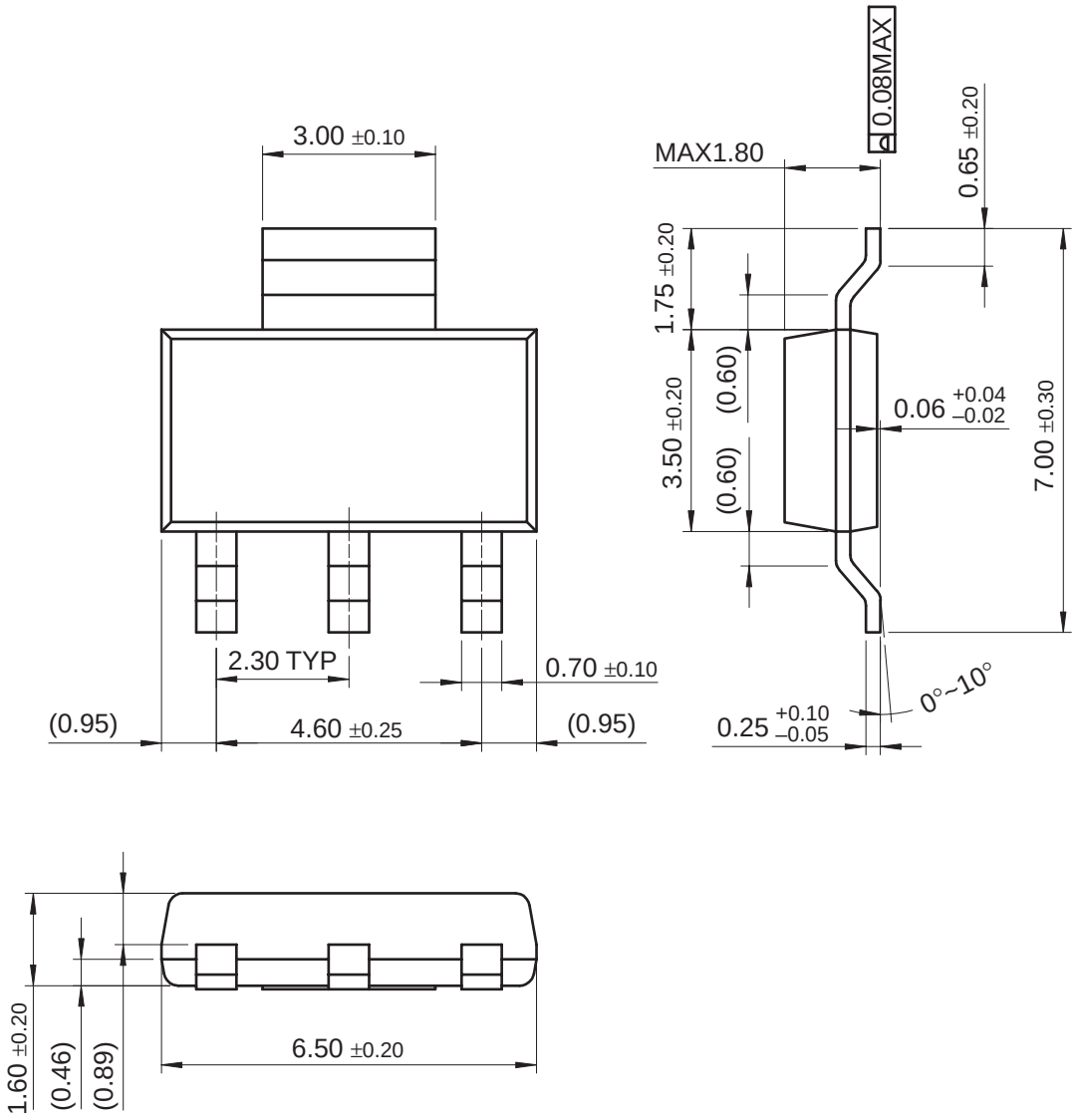
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Mechanical Dimensions

SOT-223



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