



June 2006  
**QFET**®

# FQB16N25C/FQI16N25C

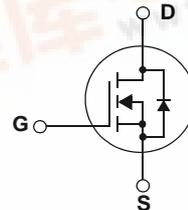
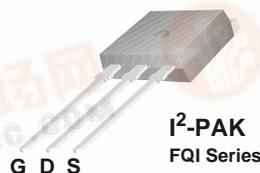
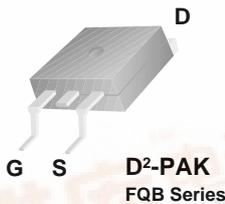
## 250V N-Channel MOSFET

### Features

- 15.6A, 250V,  $R_{DS(on)} = 0.27 \Omega @ V_{GS} = 10V$
- Low gate charge ( typical 41nC)
- Low Crss ( typical 68pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

### Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switching DC/DC converters, switch mode power supplies, DC-AC converters for uninterrupted power supplies and motor controls.



### Absolute Maximum Ratings

Symbol	Parameter	FQB16N25C / FQI16N25C	Units
$V_{DSS}$	Drain-Source Voltage	250	V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ C$ )	15.6	A
	Drain Current - Continuous ( $T_C = 100^\circ C$ )	9.8	A
$I_{DM}$	Drain Current - Pulsed (Note 1)	62.4	A
$V_{GSS}$	Gate-Source Voltage	$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	410	mJ
$I_{AR}$	Avalanche Current (Note 1)	15.6	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	13.9	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5.5	V/ns
$P_D$	Power Dissipation ( $T_A = 25^\circ C$ )*	3.13	W
	Power Dissipation ( $T_C = 25^\circ C$ )	139	W
	- Derate above $25^\circ C$	1.11	W/ $^\circ C$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ C$
$T_L$	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ C$

### Thermal Characteristics

Symbol	Parameter	FQB16N25C / FQI16N25C	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.9	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient*	40	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	$^\circ C/W$

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



## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQB16N25C	FQB16N25CTM	D2-PAK	330mm	24mm	800
FQI16N25C	FQI16N25CTU	I2-PAK	--	--	50

## Electrical Characteristics T<sub>C</sub> = 25°C unless otherwise noted

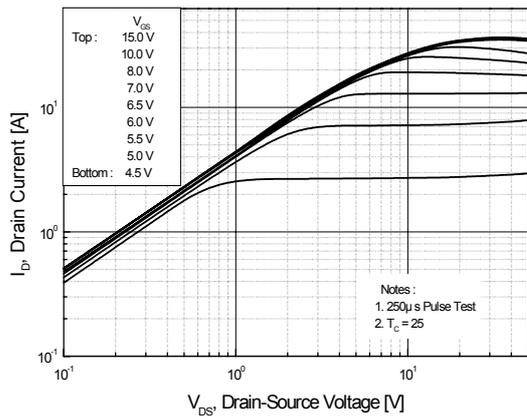
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	250	--	--	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C	--	0.31	--	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V	--	--	10	μA
		V <sub>DS</sub> = 200 V, T <sub>C</sub> = 125°C	--	--	100	μA
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0 V	--	--	100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -30 V, V <sub>DS</sub> = 0 V	--	--	-100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2.0	--	4.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 7.8 A	--	0.22	0.27	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40 V, I <sub>D</sub> = 7.8 A (Note 4)	--	10.5	--	S
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz	--	830	1080	pF
C <sub>oss</sub>	Output Capacitance		--	170	220	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	68	89	pF
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 125 V, I <sub>D</sub> = 15.6 A, R <sub>G</sub> = 25 Ω	--	15	40	ns
t <sub>r</sub>	Turn-On Rise Time		--	130	270	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	135	280	ns
t <sub>f</sub>	Turn-Off Fall Time		(Note 4, 5)	--	105	220
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 200 V, I <sub>D</sub> = 15.6 A, V <sub>GS</sub> = 10 V	--	41	53.5	nC
Q <sub>gs</sub>	Gate-Source Charge		--	5.6	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		(Note 4, 5)	--	22.7	--
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current		--	--	15.6	A
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		--	--	62.4	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 15.6 A	--	--	1.5	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 15.6 A, di <sub>F</sub> / dt = 100 A/μs (Note 4)	--	260	--	ns
Q <sub>rr</sub>	Reverse Recovery Charge		--	2.47	--	μC

### NOTES:

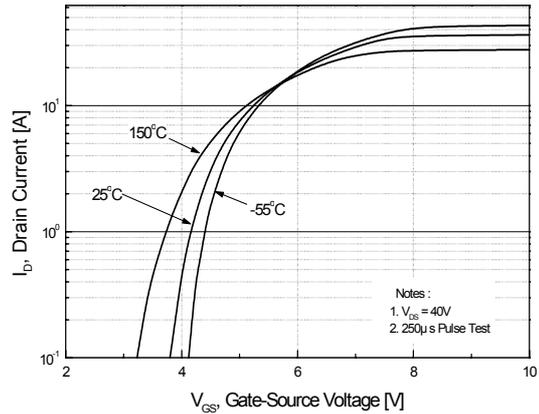
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 2.7mH, I<sub>AS</sub> = 15.6A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25 Ω, Starting T<sub>J</sub> = 25°C
3. I<sub>SD</sub> ≤ 15.6A, di/dt ≤ 300A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C
4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

## Typical Performance Characteristics

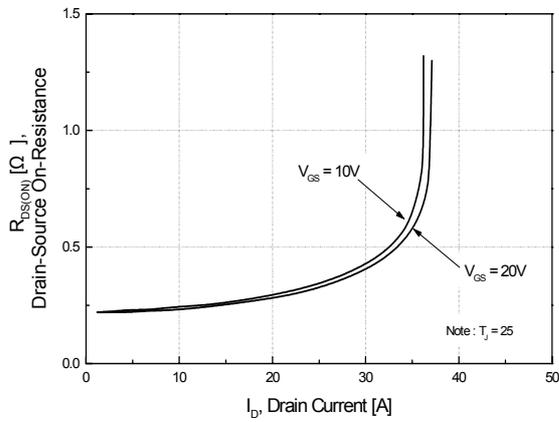
**Figure 1. On-Region Characteristics**



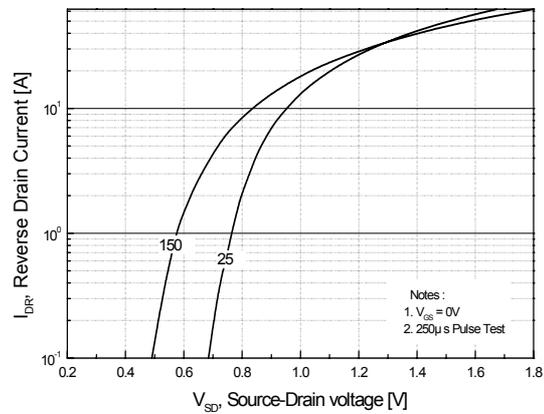
**Figure 2. Transfer Characteristics**



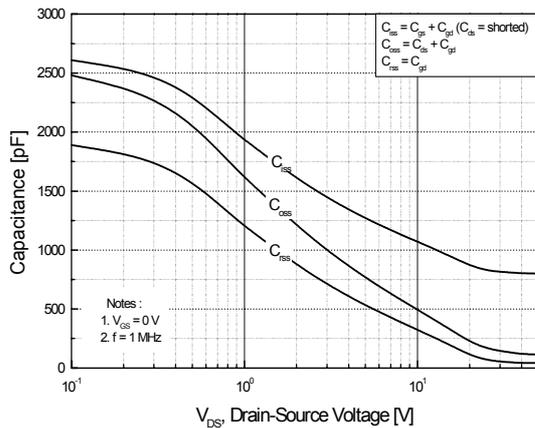
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



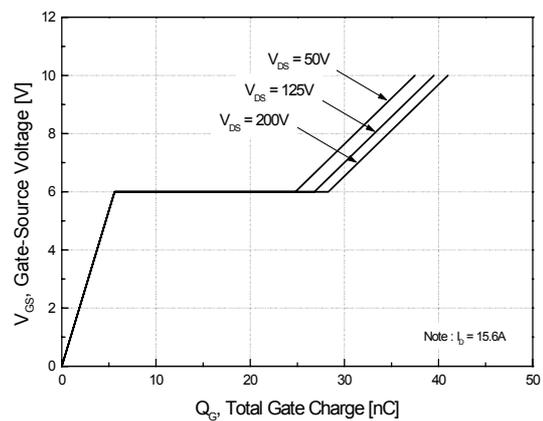
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

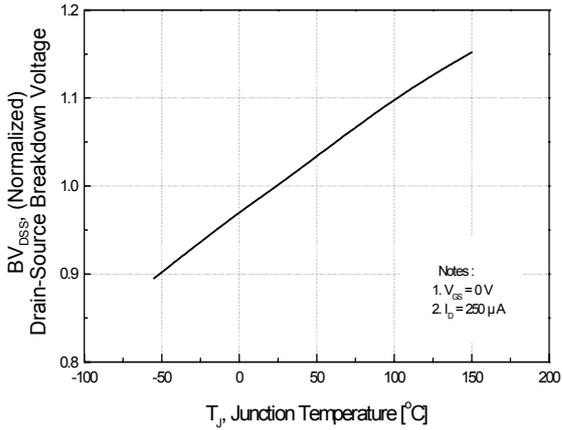


**Figure 6. Gate Charge Characteristics**

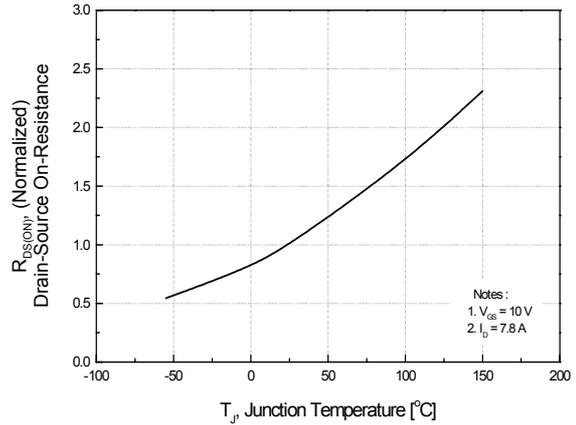


**Typical Performance Characteristics** (Continued)

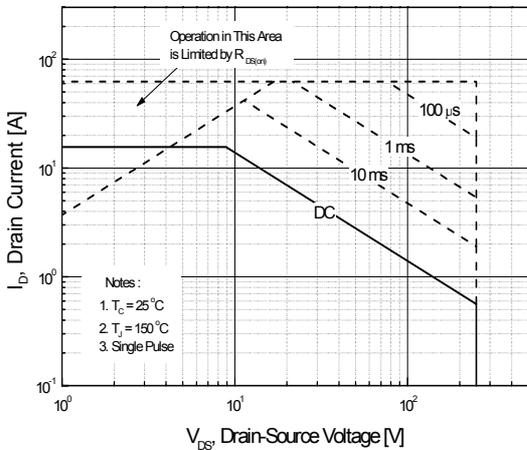
**Figure 7. Breakdown Voltage Variation vs. Temperature**



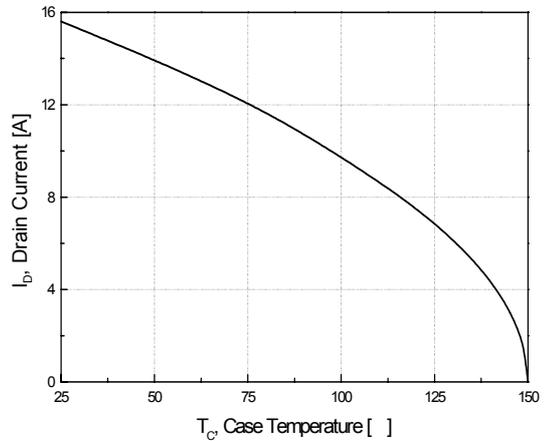
**Figure 8. On-Resistance Variation vs. Temperature**



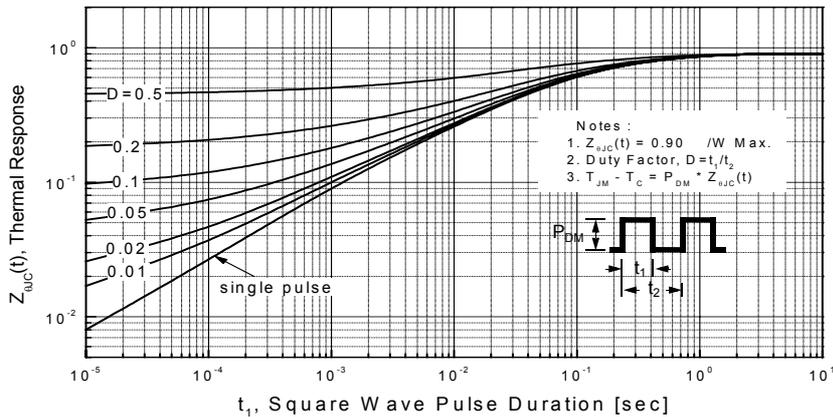
**Figure 9. Maximum Safe Operating Area**



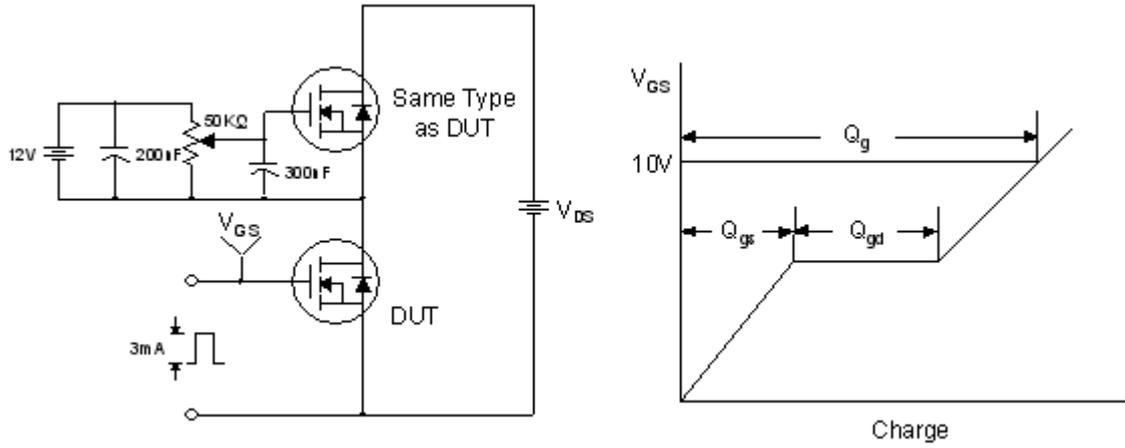
**Figure 10. Maximum Drain Current vs. Case Temperature**



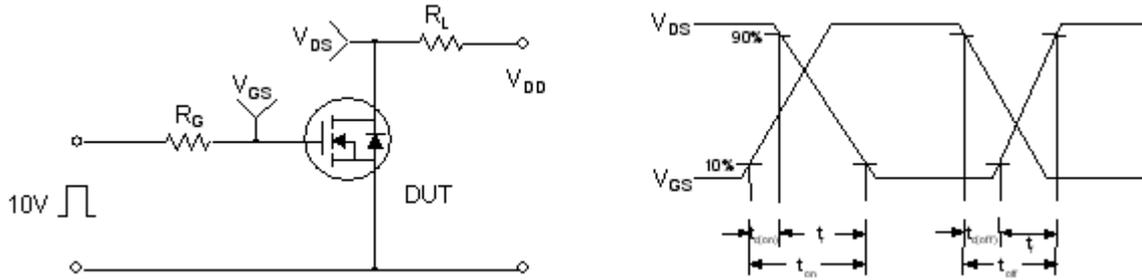
**Figure 11. Transient Thermal Response Curve**



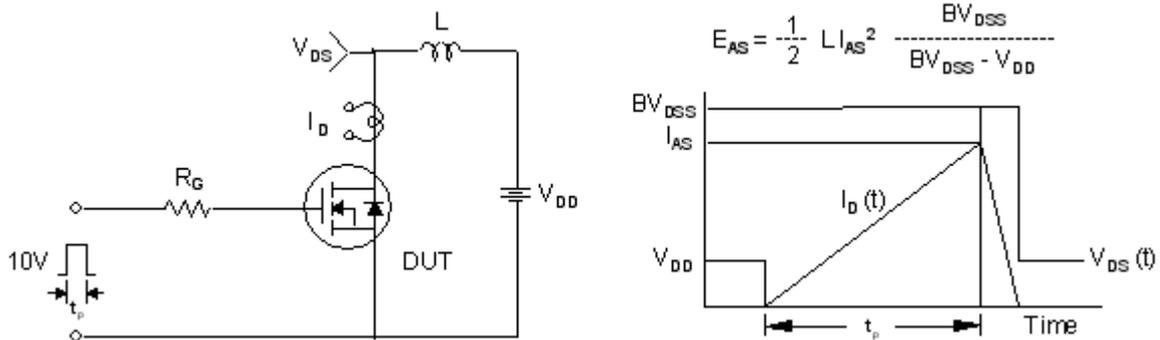
**Gate Charge Test Circuit & Waveform**



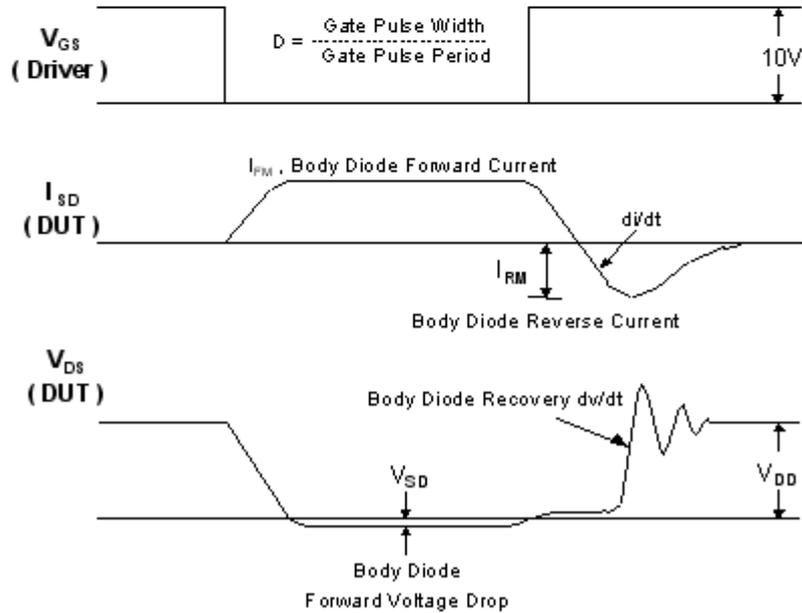
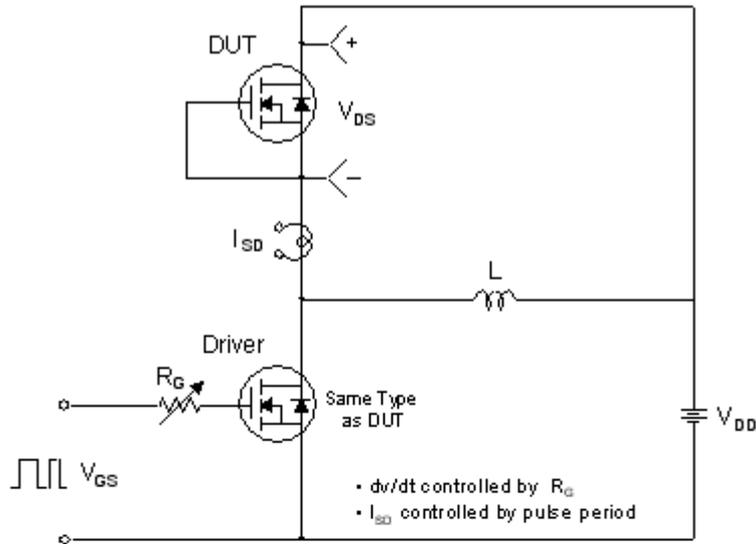
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

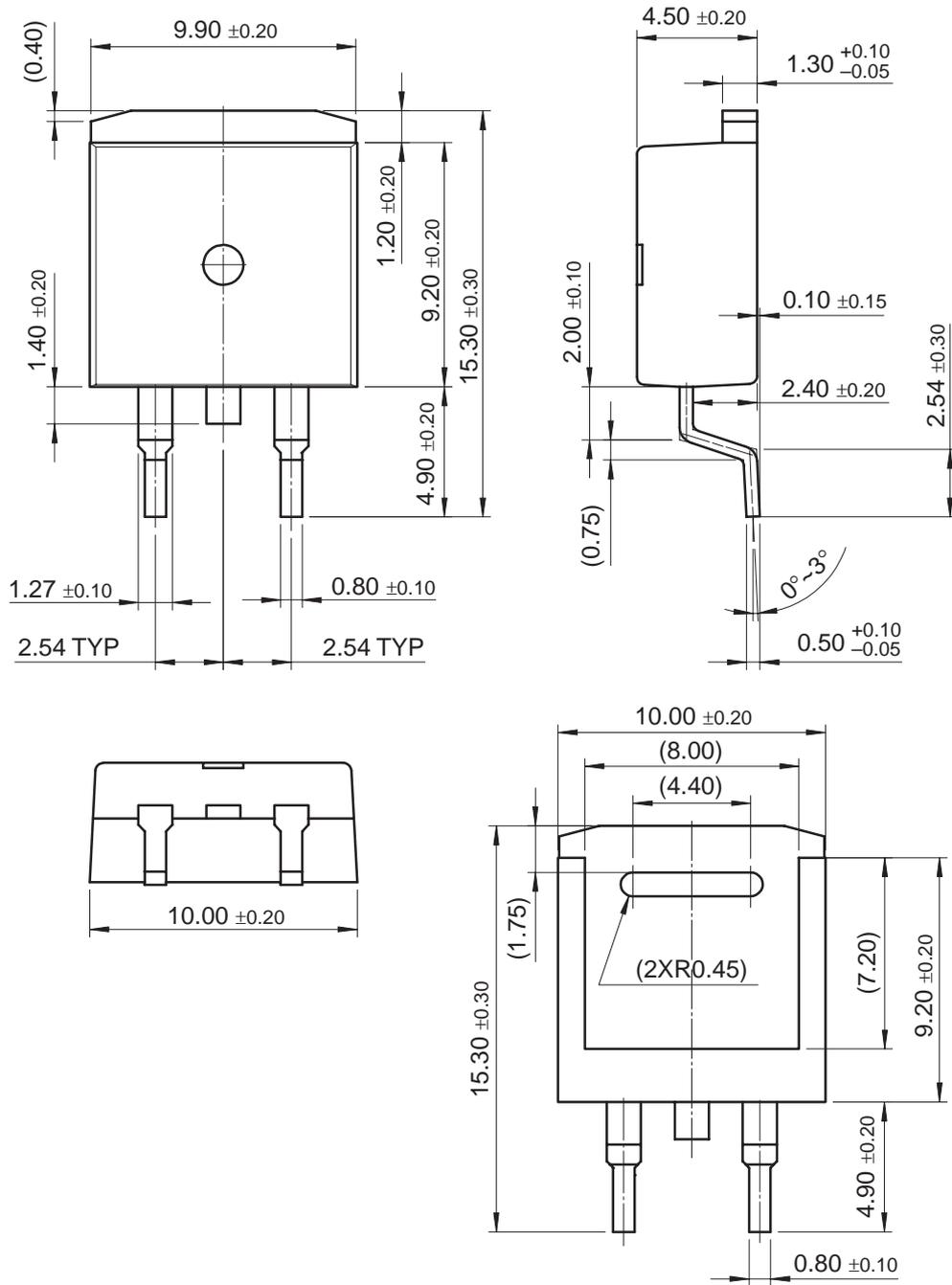


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

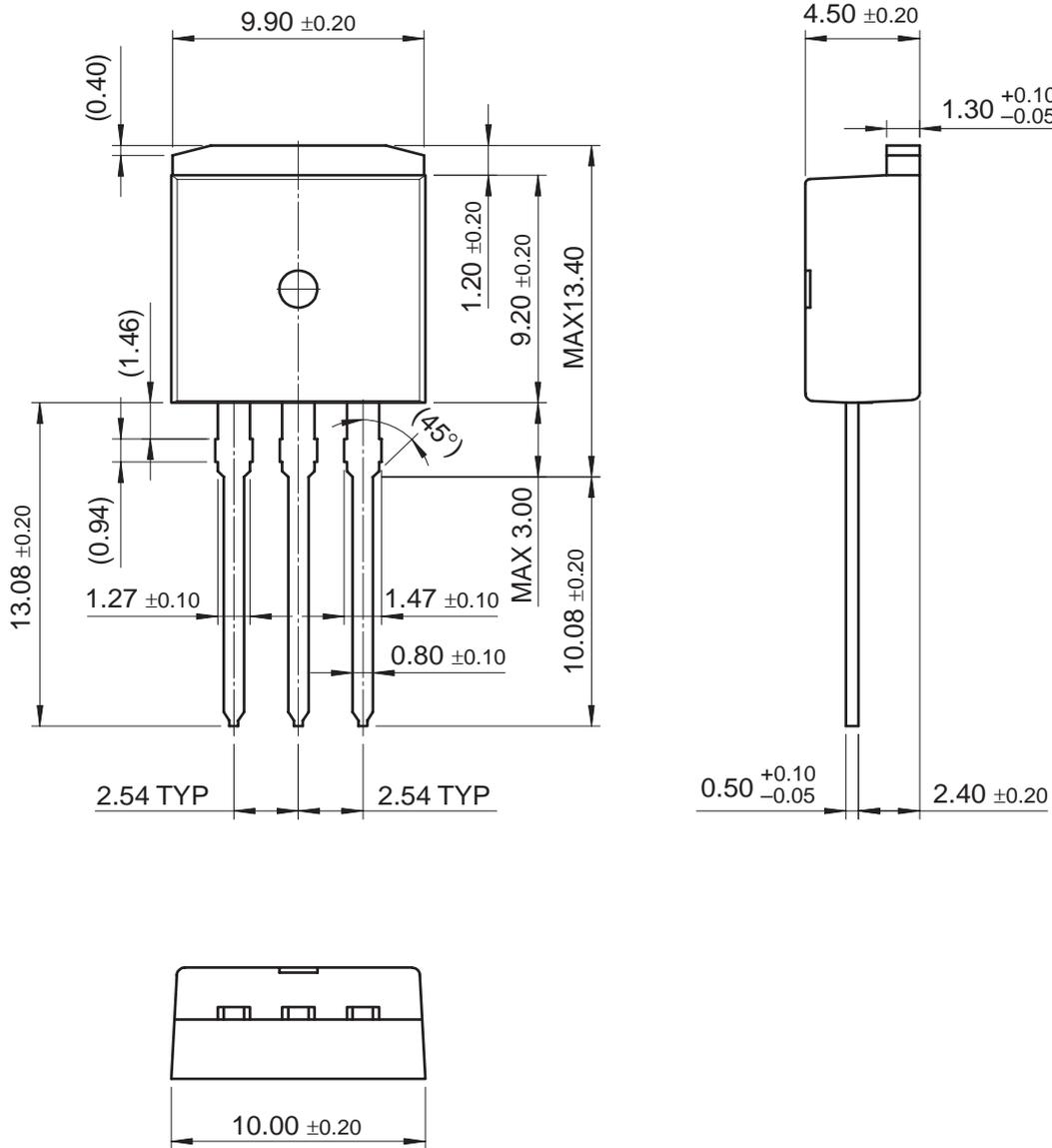
D<sup>2</sup>-PAK



Dimensions in Millimeters

Package Dimensions (Continued)

I<sup>2</sup>-PAK



Dimensions in Millimeters

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