

FQD10N20 / FQU10N20

200V N-Channel MOSFET

General 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 supply, DC-AC converters for uninterrupted power supply, motor control.

Features

- 7.6A, 200V, $R_{DS(on)} = 0.36\Omega$ @ $V_{GS} = 10\text{ V}$
- Low gate charge (typical 13.5 nC)
- Low C_{rss} (typical 13 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



Absolute Maximum Ratings

$T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	FQD10N20 / FQU10N20	Units
V_{DSS}	Drain-Source Voltage	200	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	7.6	A
	- Continuous ($T_C = 100^\circ\text{C}$)	4.8	A
I_{DM}	Drain Current - Pulsed	(Note 1)	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	mJ
I_{AR}	Avalanche Current	(Note 1)	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	V/ns
P_D	Power Dissipation ($T_A = 25^\circ\text{C}$) *	2.5	W
	Power Dissipation ($T_C = 25^\circ\text{C}$)	51	W
	- Derate above 25°C	0.41	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	2.48	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient *	--	50	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	110	$^\circ\text{C}/\text{W}$

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

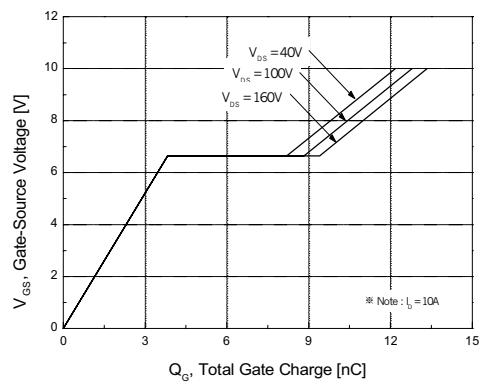
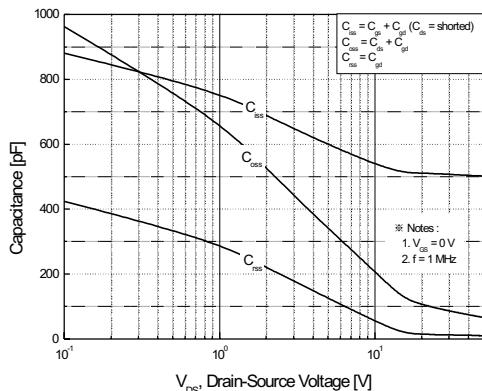
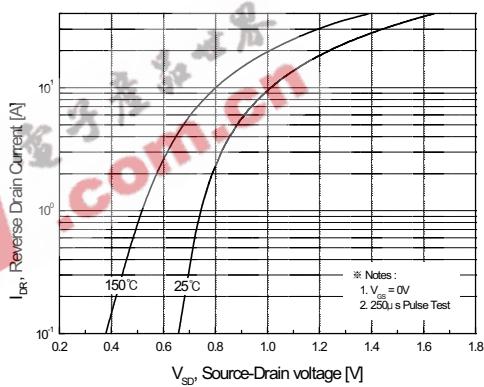
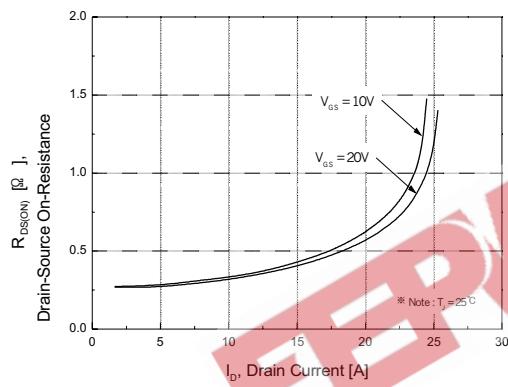
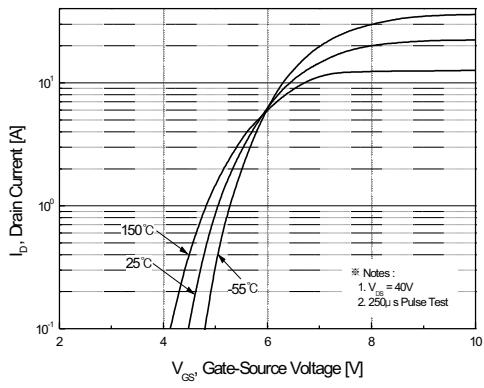
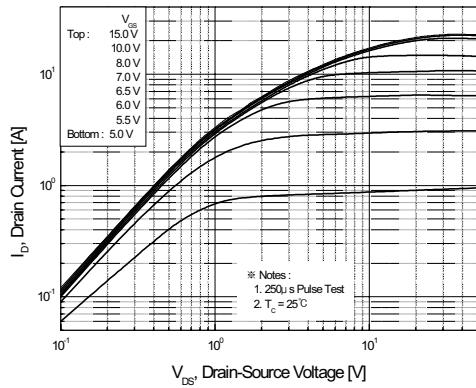
Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$	200	--	--	V
$\Delta \text{BV}_{\text{DSS}} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C	--	0.19	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 200 \text{ V}$, $V_{\text{GS}} = 0 \text{ V}$	--	--	1	μA
		$V_{\text{DS}} = 160 \text{ V}$, $T_C = 125^\circ\text{C}$	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{\text{GS}} = 30 \text{ V}$, $V_{\text{DS}} = 0 \text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{\text{GS}} = -30 \text{ V}$, $V_{\text{DS}} = 0 \text{ V}$	--	--	-100	nA
On Characteristics						
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}} = V_{\text{GS}}$, $I_D = 250 \mu\text{A}$	3.0	--	5.0	V
$R_{\text{DS(on)}}$	Static Drain-Source On-Resistance	$V_{\text{GS}} = 10 \text{ V}$, $I_D = 3.8 \text{ A}$	--	0.28	0.36	Ω
g_{FS}	Forward Transconductance	$V_{\text{DS}} = 40 \text{ V}$, $I_D = 3.8 \text{ A}$ (Note 4)	--	6	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{\text{DS}} = 25 \text{ V}$, $V_{\text{GS}} = 0 \text{ V}$, $f = 1.0 \text{ MHz}$	--	510	670	pF
C_{oss}	Output Capacitance		--	95	130	pF
C_{rss}	Reverse Transfer Capacitance		--	13	17	pF
Switching Characteristics						
$t_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{DD}} = 100 \text{ V}$, $I_D = 10 \text{ A}$, $R_G = 25 \Omega$	--	13	40	ns
t_r	Turn-On Rise Time		--	90	190	ns
$t_{\text{d(off)}}$	Turn-Off Delay Time		--	26	70	ns
t_f	Turn-Off Fall Time		--	50	110	ns
Q_g	Total Gate Charge	$V_{\text{DS}} = 160 \text{ V}$, $I_D = 10 \text{ A}$, $V_{\text{GS}} = 10 \text{ V}$	--	13.5	18	nC
Q_{gs}	Gate-Source Charge		--	3.8	--	nC
Q_{gd}	Gate-Drain Charge		--	5.5	--	μC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	7.6	--	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	30.4	--	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{\text{GS}} = 0 \text{ V}$, $I_S = 7.6 \text{ A}$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$V_{\text{GS}} = 0 \text{ V}$, $I_S = 10 \text{ A}$, $dI_F / dt = 100 \text{ A}/\mu\text{s}$	--	130	--	ns
Q_{rr}	Reverse Recovery Charge		--	0.6	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 4.7\text{mH}$, $I_{AS} = 7.6\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25 \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SP} \leq 10\text{A}$, $dI/dt \leq 300\text{A}/\mu\text{s}$, $V_{DP} \leq \text{BV}_{\text{DSS}}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Characteristics



Typical Characteristics (Continued)

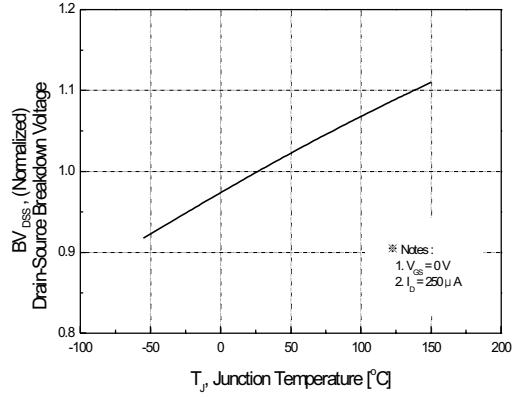


Figure 7. Breakdown Voltage Variation vs. Temperature

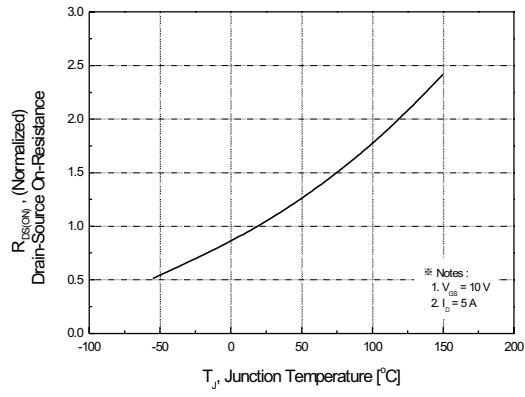


Figure 8. On-Resistance Variation vs. Temperature

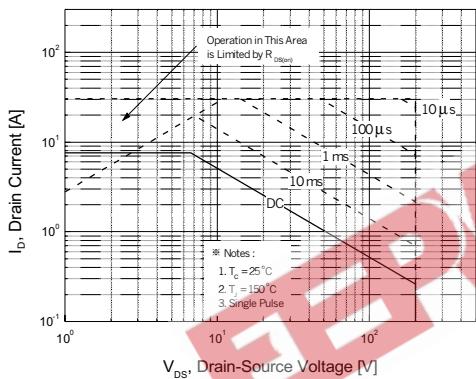


Figure 9. Maximum Safe Operating Area

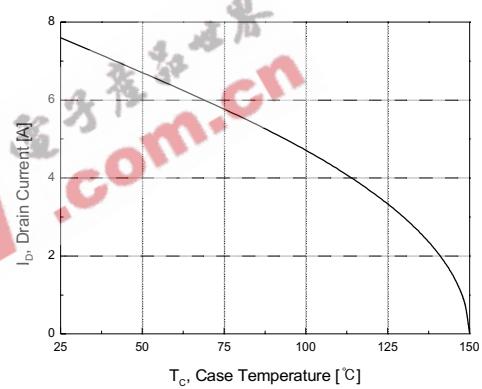


Figure 10. Maximum Drain Current vs. Case Temperature

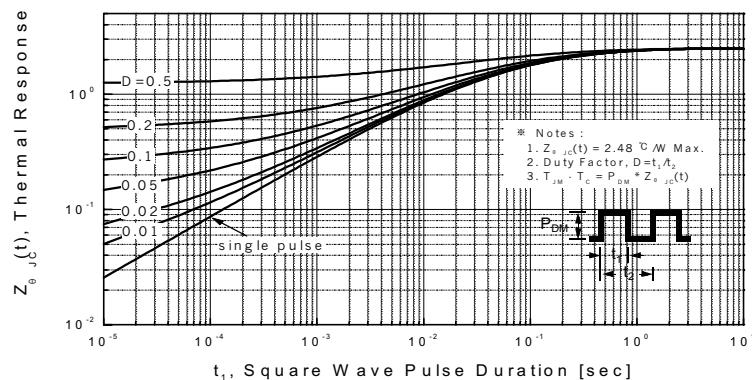
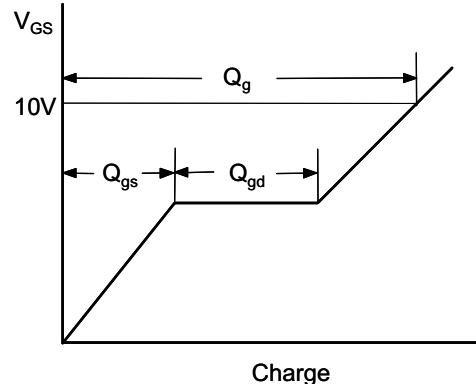
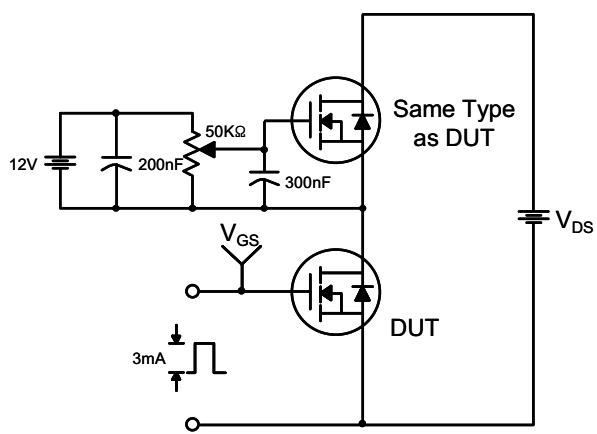
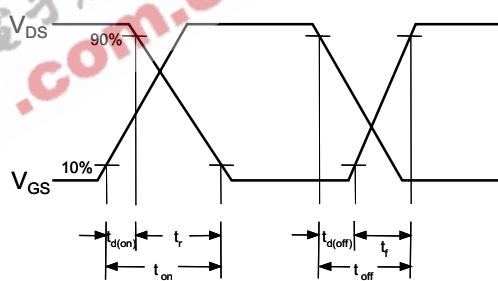
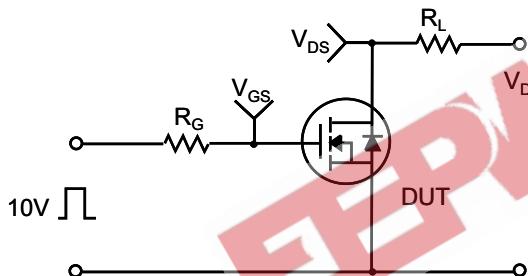


Figure 11. Transient Thermal Response Curve

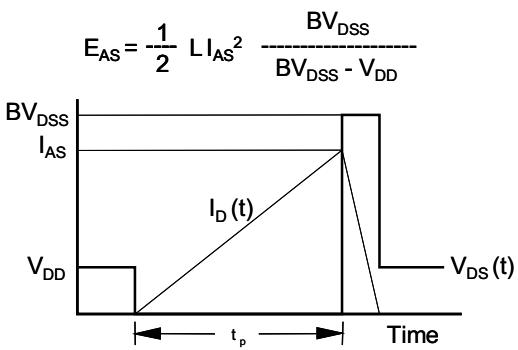
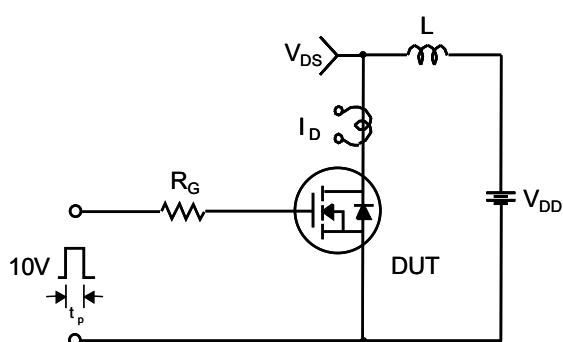
Gate Charge Test Circuit & Waveform



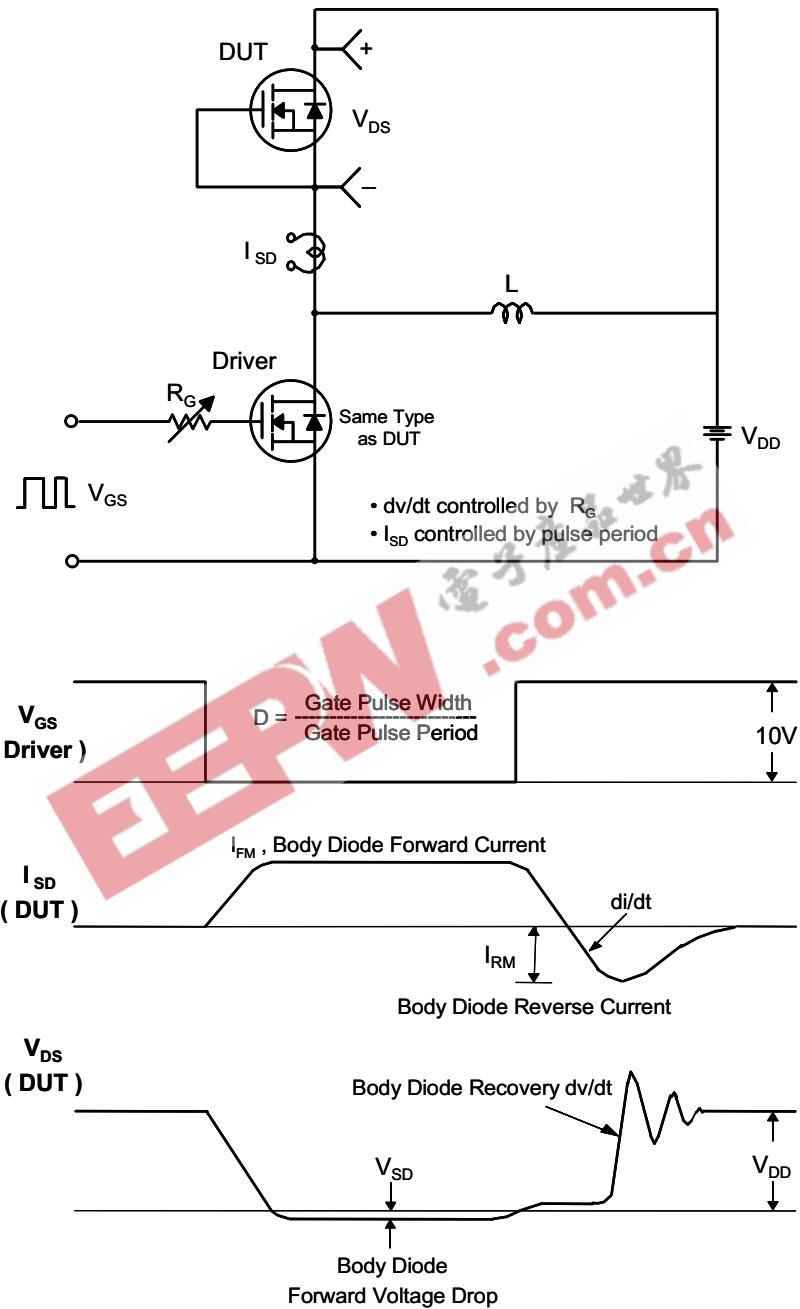
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

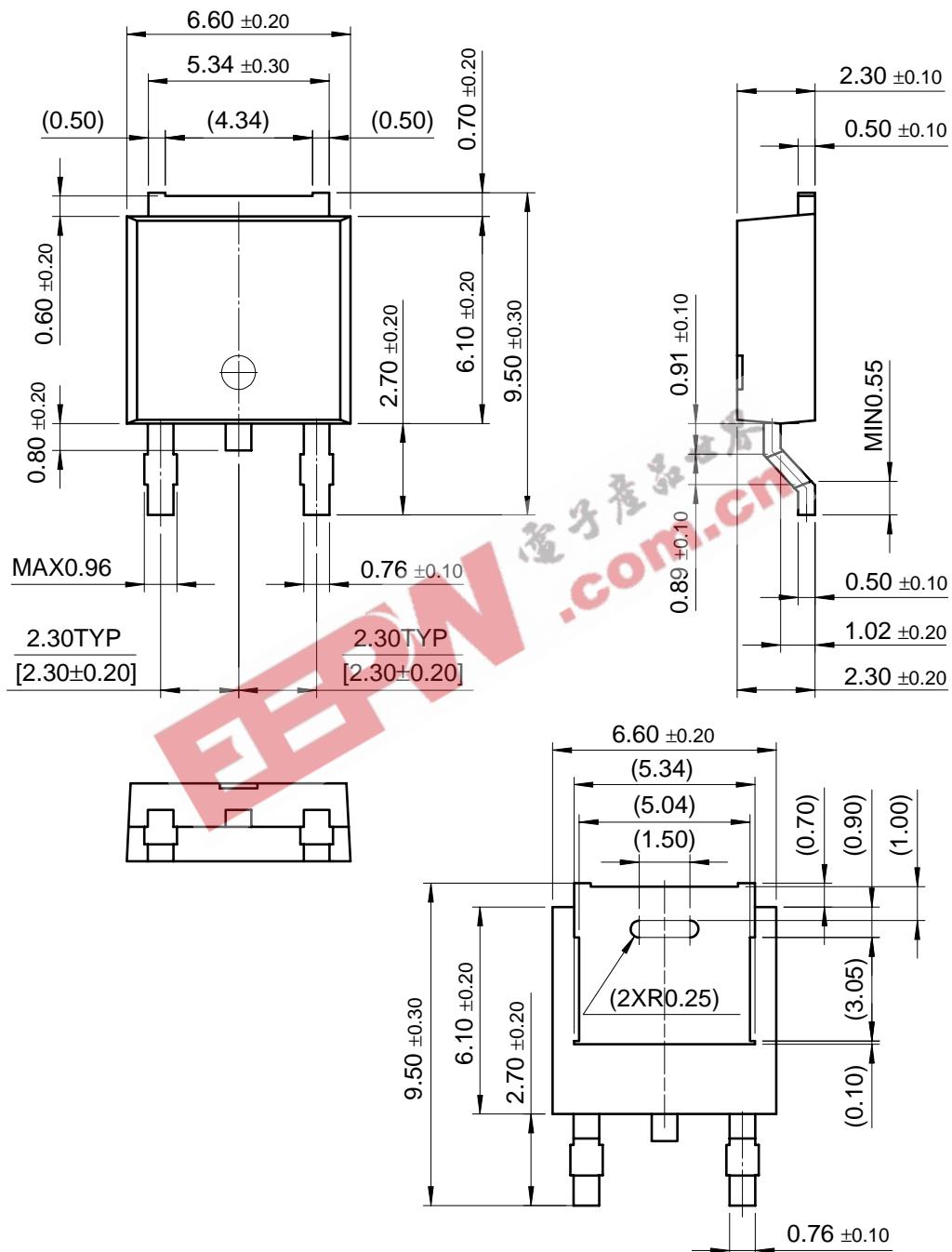


Peak Diode Recovery dv/dt Test Circuit & Waveforms



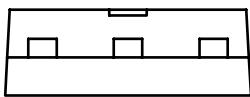
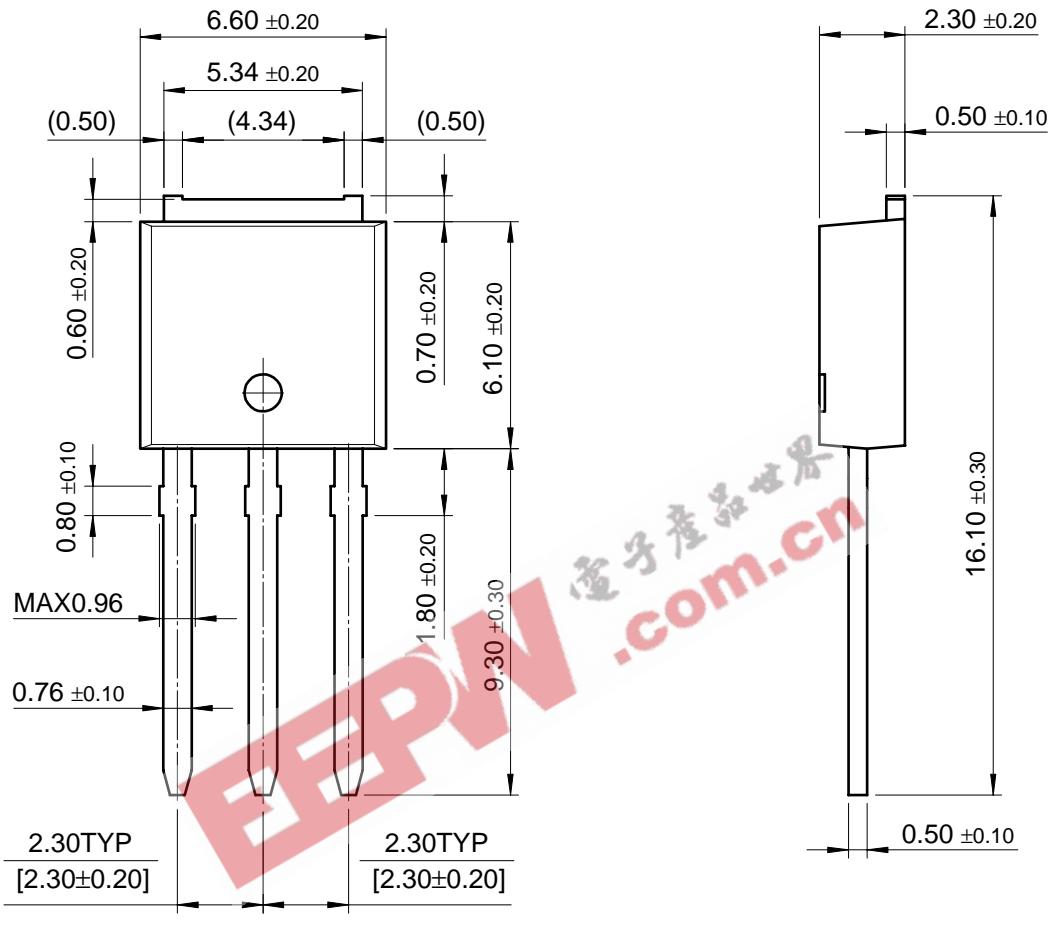
Package Dimensions

DPAK



Package Dimensions (Continued)

IPAK



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