FEATURES

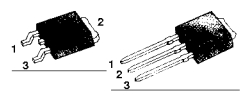
- Advanced New Design
- Avalanche Rugged Technology
- Rugged Gate Oxide Technology
- Very Low Intrinsic Capacitances
- Excellent Switching Characteristics
- Unrivalled Gate Charge: 42nC (Typ.)
- Extended Safe Operating Area
- Lower $R_{DS(ON)}$: 0.55Ω (Typ.)

BV_{DSS} = 600V

$R_{DS(ON)}$ = 0.7Ω

I_D = 10.5A

D^2-PAK I^2-PAK



FQB12N60 FQI12N60

1. Gate 2. Drain 3. Source

ABSOLUTE MAXIMUM RATINGS

Symbol	Characteristics	Value	Units
V_{DSS}	Drain-to-Source Voltage	600	V
I_D	Continuous Drain Current (T_C = 25°C)	10.5	A
	Continuous Drain Current (T_C = 100°C)	6.7	
I_{DM}	Drain Current-Pulsed ①	42	A
V_{GS}	Gate-to-Source Voltage	±30	V
E_{AS}	Single Pulsed Avalanche Energy ②	780	mJ
I_{AR}	Avalanche Current ①	10.5	A
E_{AR}	Repetitive Avalanche Energy ①	18	mJ
dv/dt	Peak Diode Recovery dv/dt ③	4.5	V/ns
P_D	Total Power Dissipation (T_A = 25°C) *	3.1	W
	Total Power Dissipation (T_C = 25°C) Linear Derating Factor	180 1.43	W W/°C
T_J, T_{STG}	Operating Junction and Storage Temperature Range	–55 to +150	°C
T_L	Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5-seconds	300	

THERMAL RESISTANCE

Symbol	Characteristics	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	–	0.7	°C/W
$R_{\theta JA}$	Junction-to-Ambient *	–	40	
$R_{\theta JA}$	Junction-to-Ambient	–	62.5	

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

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise specified)

Symbol	Characteristics	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage	600	–	–	V	V_{GS}=0V, I_D=250μA
$\Delta BV/\Delta T_J$	Breakdown Voltage Temp. Coeff.	–	0.71	–	V/°C	I_D=250μA, ***See Fig 7***
$V_{GS(th)}$	Gate Threshold Voltage	3.0	–	5.0	V	V_{DS}=5V, I_D=250μA
I_{GSS}	Gate-Source Leakage, Forward	–	–	100	nA	V_{GS}=30V
	Gate-Source Leakage, Reverse	–	–	–100		V_{GS}= –30V
I_{DSS}	Drain-to-Source Leakage Current	–	–	10	μA	V_{DS}=600V
		–	–	100		V_{DS}=480V, T_C=125°C
$R_{DS(on)}$	Static Drain-Source On-State Resistance	–	0.55	0.7	Ω	V_{GS}=10V, I_D=5.3A ④
g_{fs}	Forward Transconductance	–	10	–	S	V_{DS}=50V, I_D=5.3A ④
C_{iss}	Input Capacitance	–	1475	1900	pF	V_{GS}=0V, V_{DS}=25V f=1MHz ***See Fig 5***
C_{oss}	Output Capacitance	–	200	265		
C_{rss}	Reverse Transfer Capacitance	–	25	35		
$t_{d(on)}$	Turn-On Delay Time	–	30	70	ns	V_{DD}=300V, I_D=12A R_G=50Ω ***See Fig 13*** ④ ⑤
t_r	Rise Time	–	115	240		
$t_{d(off)}$	Turn-Off Delay Time	–	95	200		
t_f	Fall Time	–	85	180		
Q_g	Total Gate Charge	–	42	54	nC	V_{DS}=480V, V_{GS}=10V I_D=12A ***See Fig 6 & Fig 12*** ④ ⑤
Q_{gs}	Gate-Source Charge	–	8.6	–		
Q_{gd}	Gate-Drain (Miller) Charge	–	21	–		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristics	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current	–	–	10.5	A	Integral reverse pn-diode in the MOSFET
I_{SM}	Pulsed-Source Current ①	–	–	42		
V_{SD}	Diode Forward Voltage ④	–	–	1.4	V	T_J=25°C, I_S=10.5A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	–	380	–	ns	T_J=25°C, I_F=12A, V_{DD}=480V di_F/dt=100A/μs ④
Q_{rr}	Reverse Recovery Charge	–	3.5	–	μC	

Notes:

① Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

② L=13mH, I_{AS}=10.5A, V_{DD}=50V, R_G=25Ω, Starting T_J =25°C

③ I_{SD} ≤ 12A, 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

Fig 1. Output Characteristics

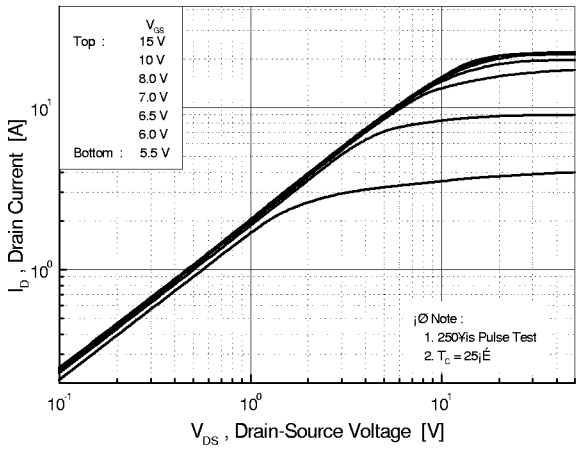


Fig 2. Transfer Characteristics

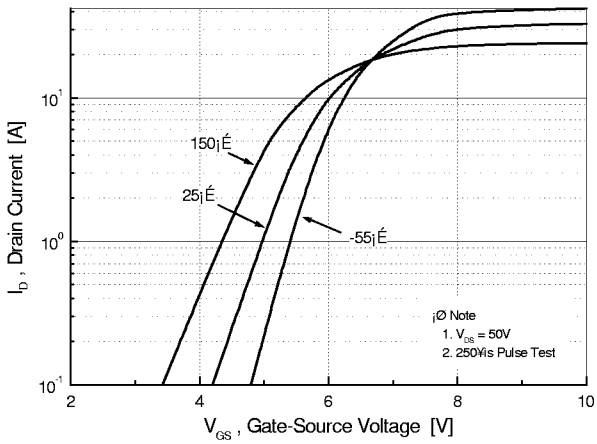


Fig 3. On-Resistance vs. Drain Current

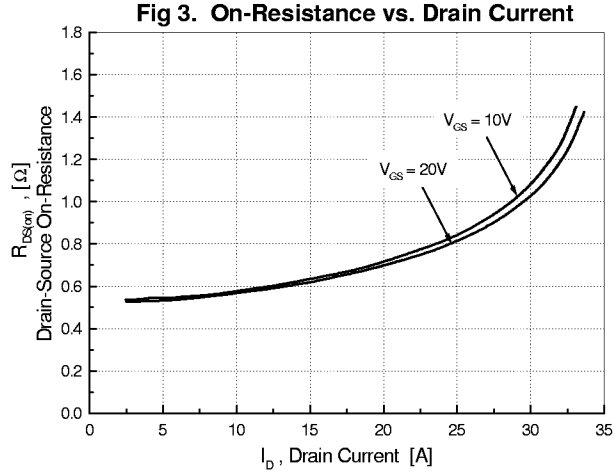


Fig 4. Source-Drain Diode Forward Voltage

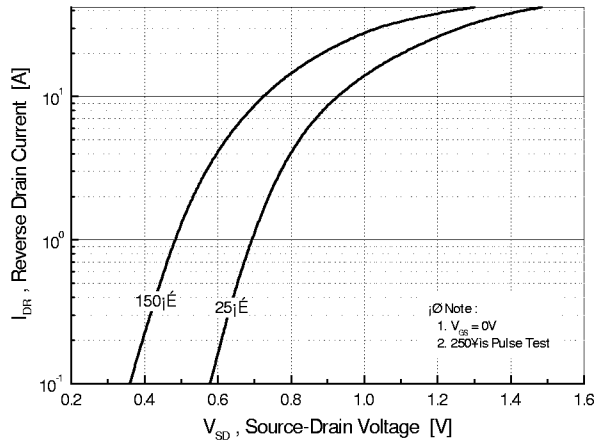


Fig 5. Capacitance vs. Drain-Source Voltage

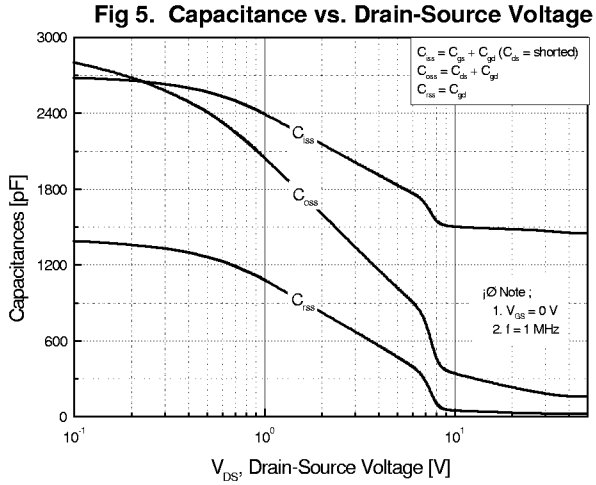


Fig 6. Gate Charge vs. Gate-Source Voltage

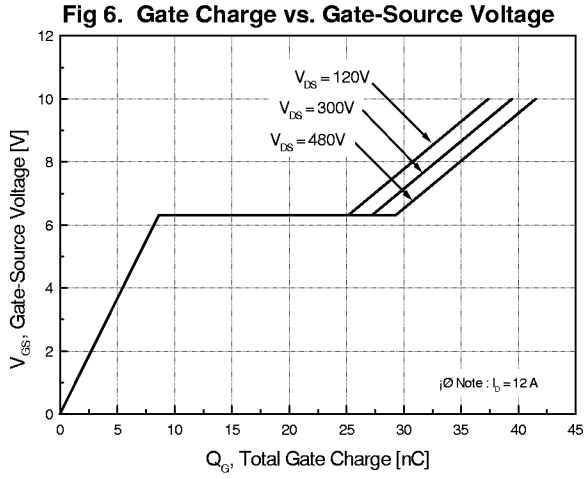


Fig 7. Breakdown Voltage vs. Temperature

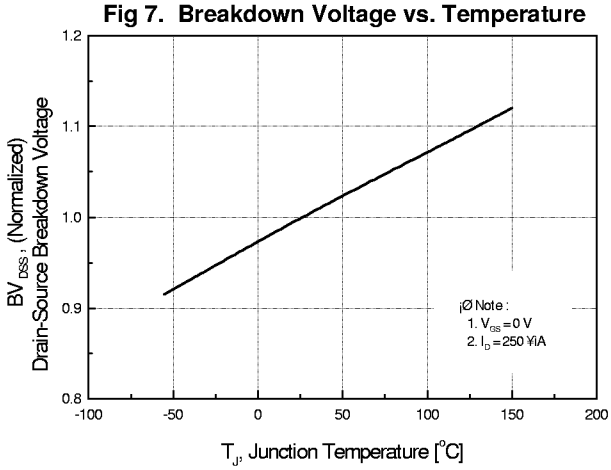


Fig 8. On-Resistance vs. Temperature

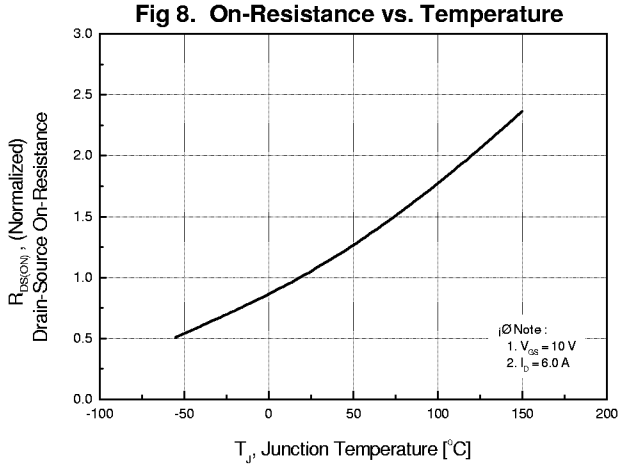


Fig 9. Max. Safe Operating Area

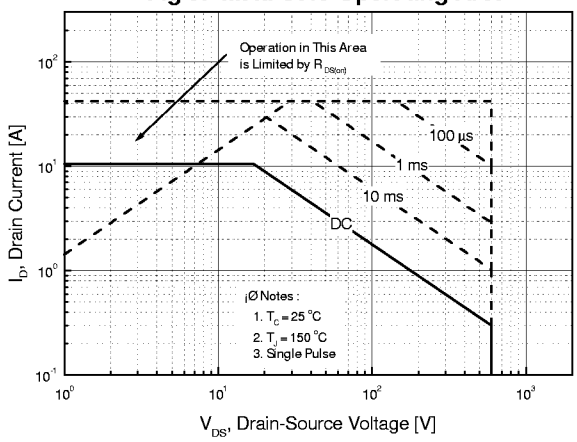


Fig 10. Max. Drain Current vs. Case Temperature

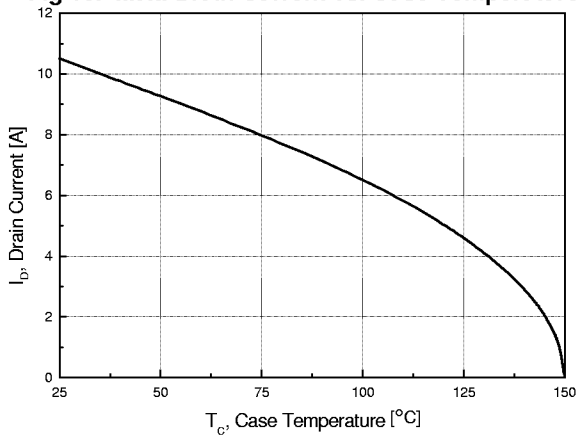
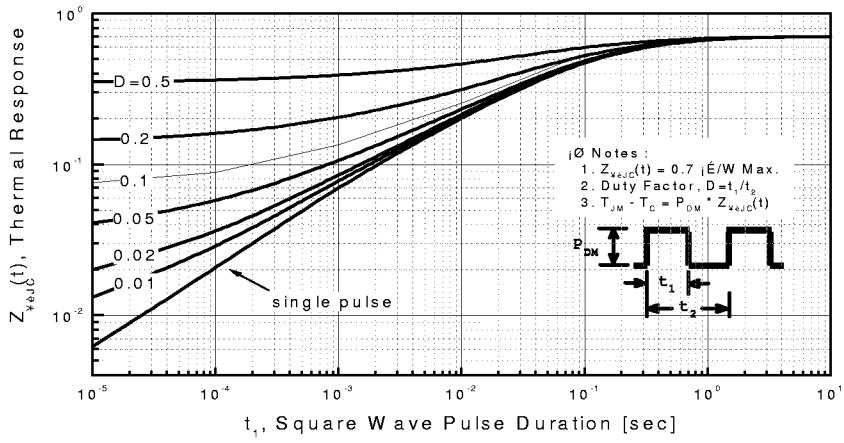


Fig 11. Thermal Response



FAIRCHILD SEMICONDUCTOR

Fig 12. Gate Charge Test Circuit & Waveform

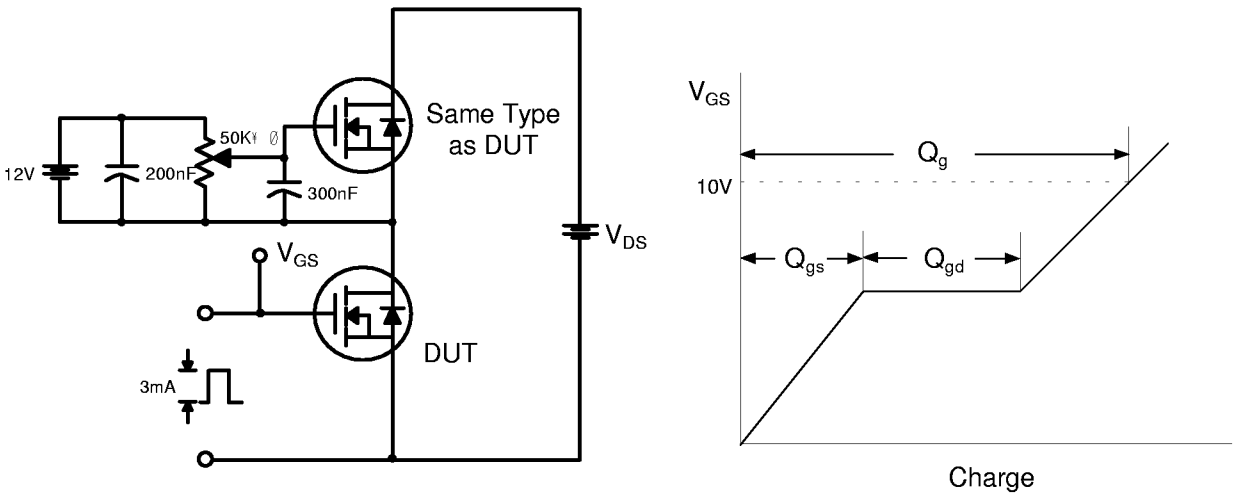


Fig 13. Resistive Switching Test Circuit & Waveforms

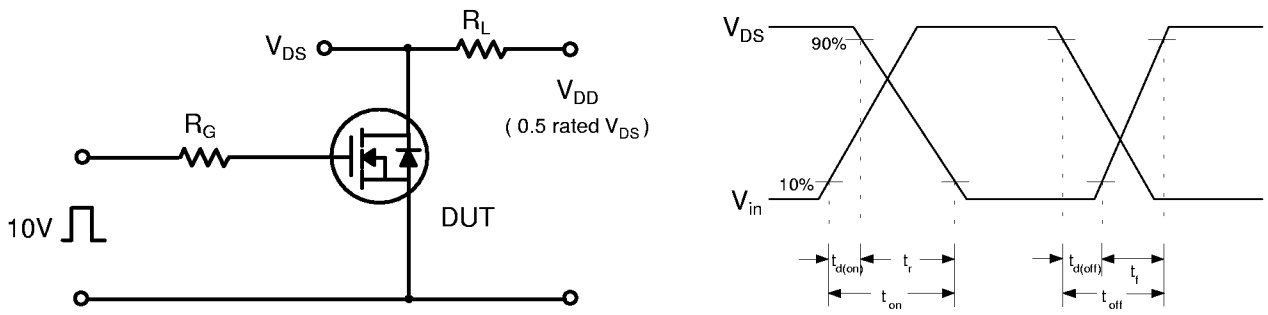


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

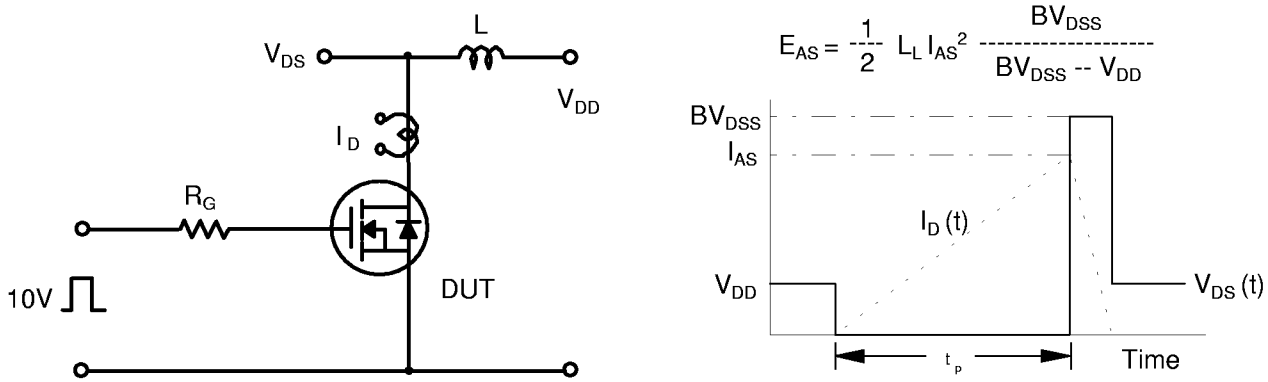
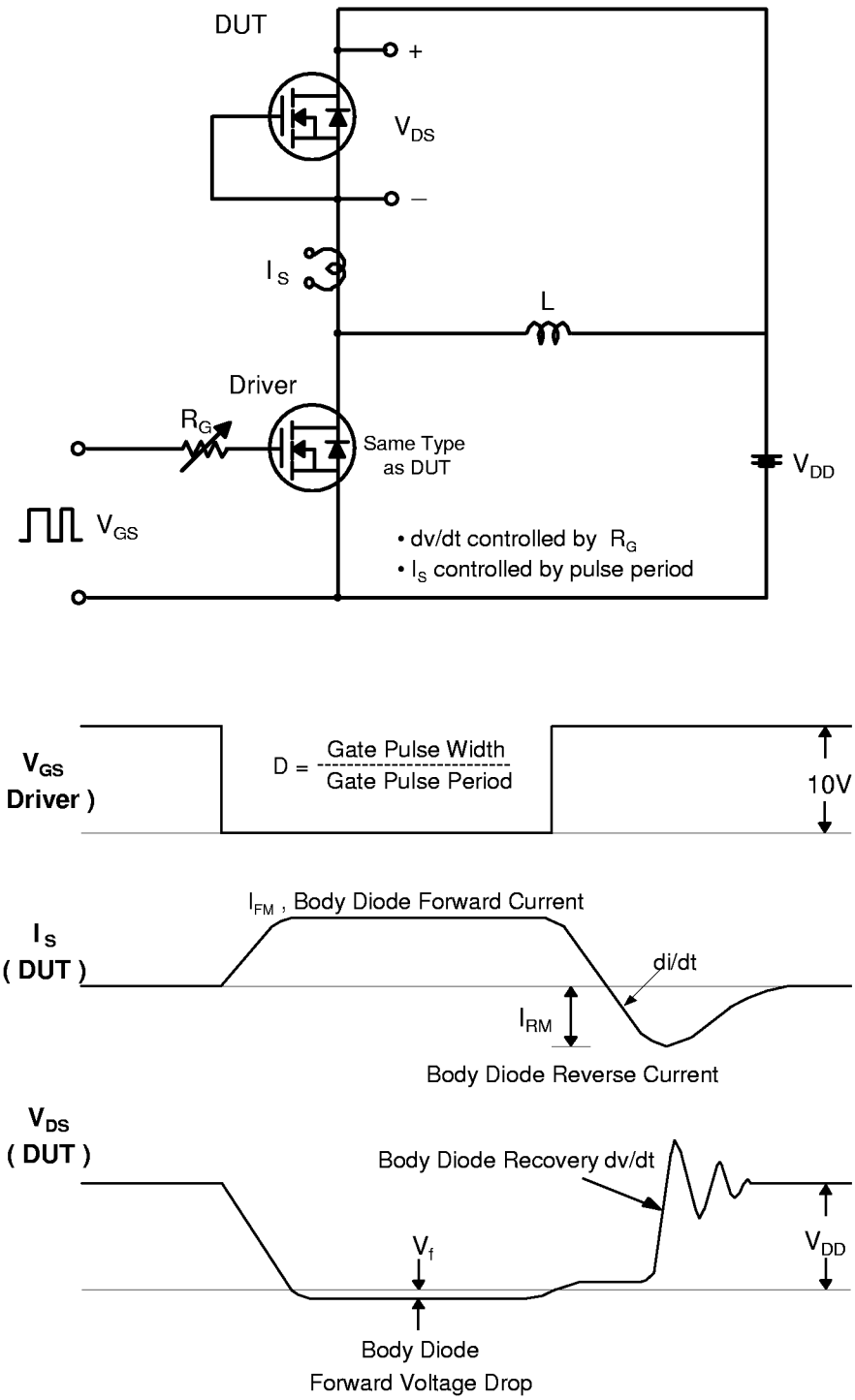
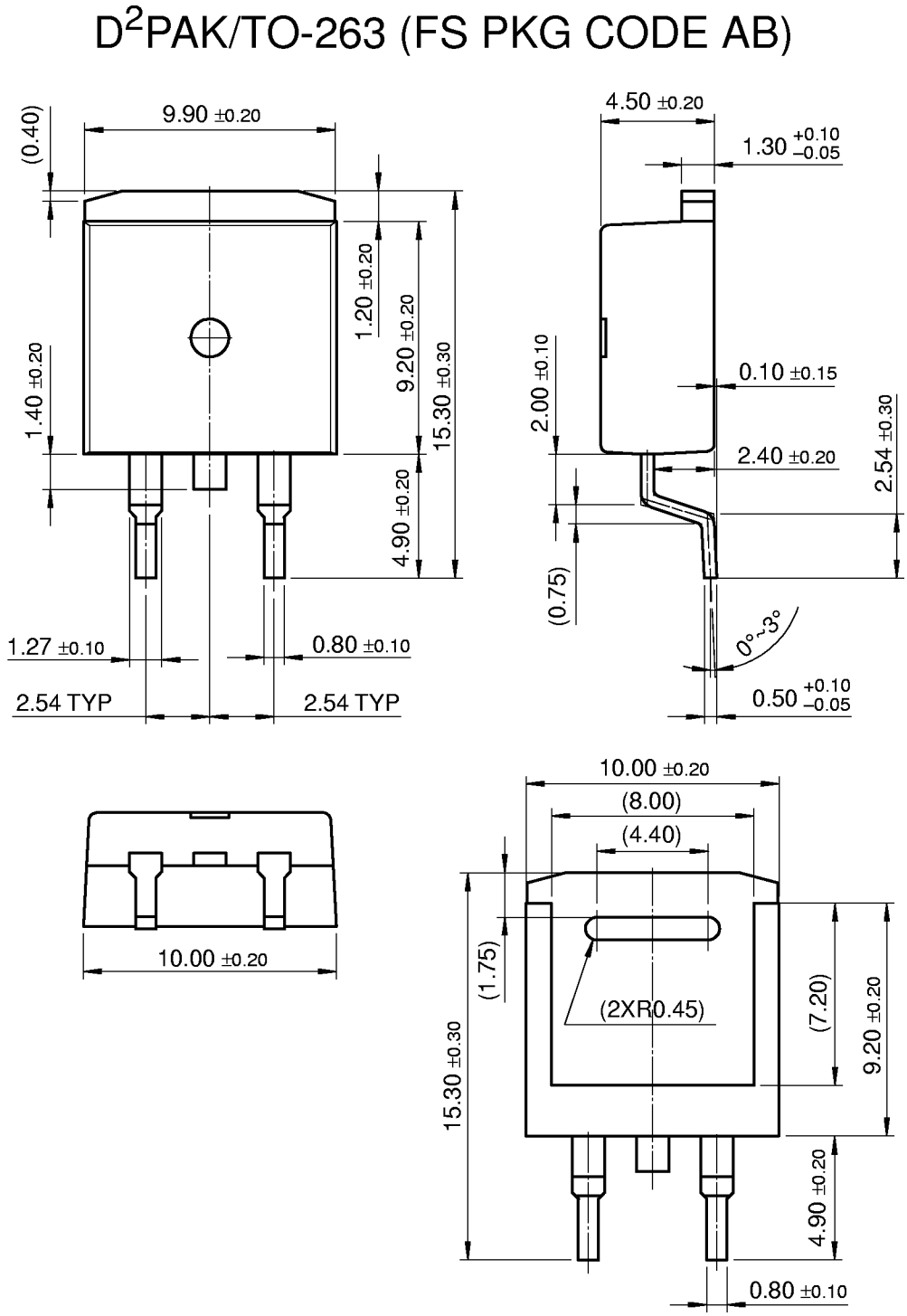


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



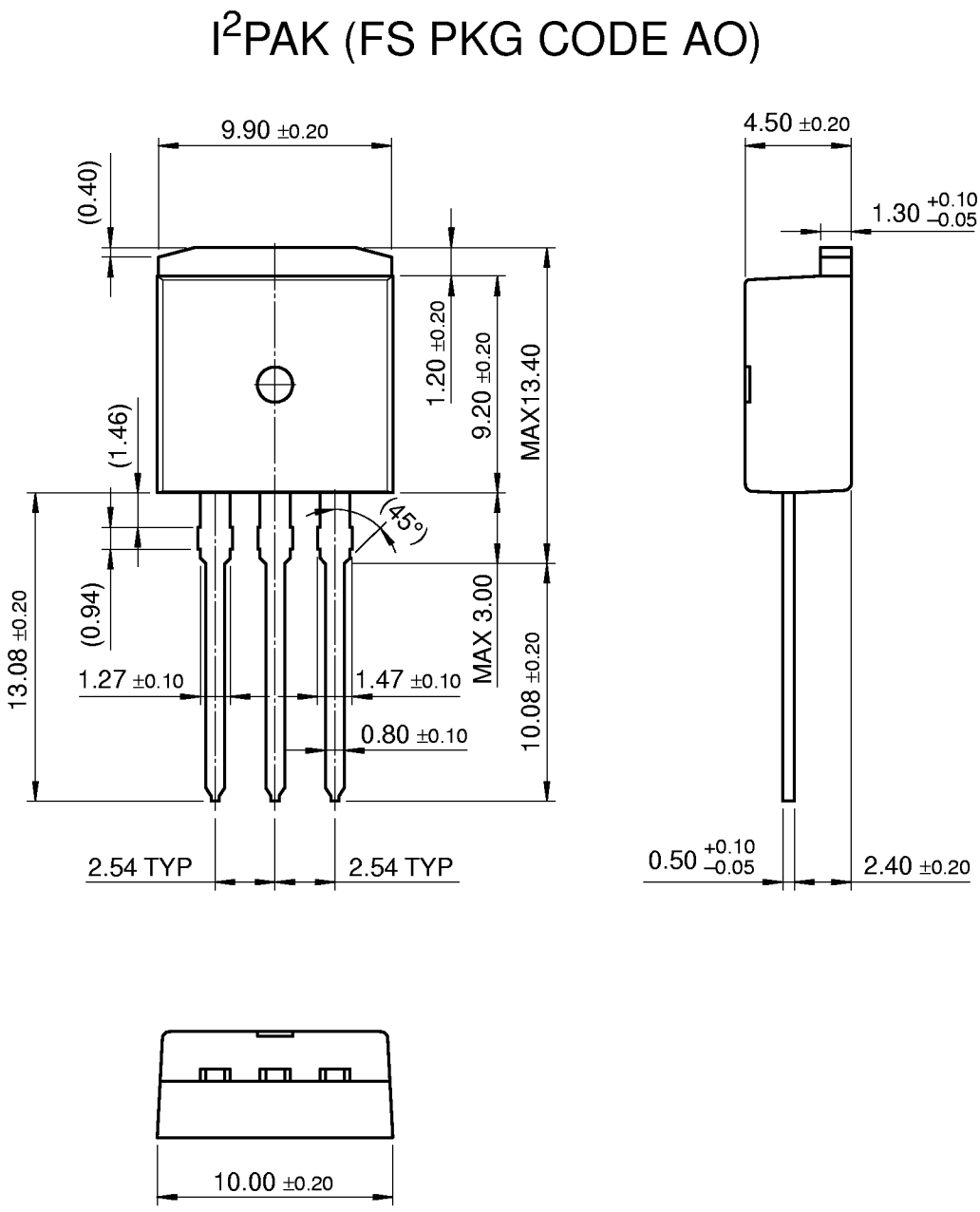
D²PAK/TO-263 Package Dimensions



Dimensions in Millimeters

September 1999, Rev B

I²PAK Package Dimensions



Dimensions in Millimeters

September 1999, Rev B