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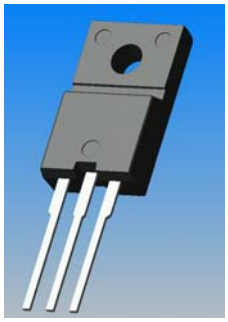
Nov. 2010

Features

N channel 40V MOSFET for automotive application
TO220F: wide pin package (for high current)

Package

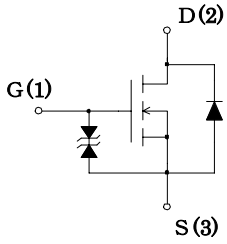
FM20 (TO220 Full Mold)



Applications

Automotive: EPS motor driver application
Automotive: Other motor driver and solenoid driver application

Internal Equivalent Circuit



Key Specifications

Absolute maximum ratings

(Ta=25°C)

Characteristic	Symbol	Rating	Unit
Drain to Source Voltage	V_{DSS}	40	V
Gate to Source Voltage	V_{GSS}	±20	V
Continuous Drain Current	I_D	±70	A
Pulsed Drain Current	$I_{D(pulse)}$ ※1	±140	A
Maximum Power Dissipation	P_D	35 （Tc=25℃）	W
Single Pulse Avalanche Energy	E_{AS} ※2	400	mJ
Avalanche Current	I_{AS}	25	A
Maximum Drain to Source dv/dt 1	dv/dt 1※2	0.3	V/ns
Peak diode recovery dv/dt 2	dv/dt 2※3	1.0	V/ns
Peak diode recovery di/dt	di/dt※3	100	A/μs
Channel Temperature	Tch	150	℃
Storage Temperature	Tstg	-55～150	℃

※1 PW≦100μsec. duty cycle≦1%
※2 V_{DD}=20V, L=1mH, I_L=20A, unclamped, Rg＝50Ω, See Fig.1
※3 I_{SD}=25A, See Fig.2

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Electrical characteristics

(Ta=25°C)

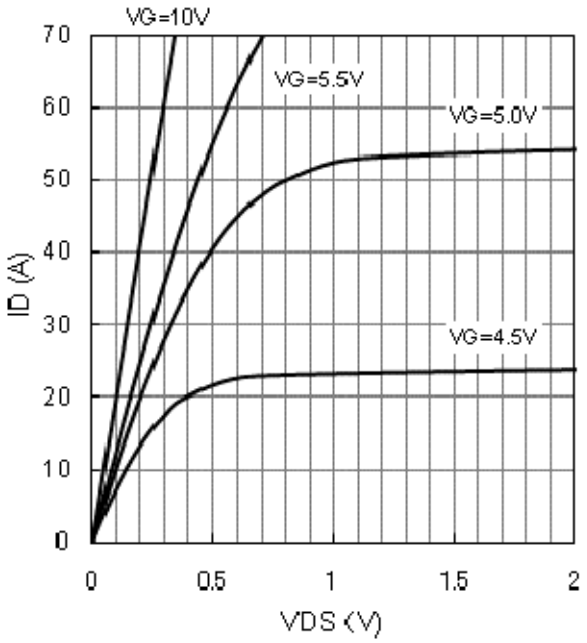
Characteristic	Symbol	Test Conditions	Limits			Unit
			MIN	TYP	MAX	
Drain to Source breakdown Voltage	$V_{(BR)DSS}$	I_D=100μA,V_{GS}=0V	40			V
Gate to Source Leakage Current	I_{GSS}	V_{GS}=±15V			±2	μA
Drain to Source Leakage Current	I_{DSS}	V_{DS}=40V, V_{GS}=0V			100	μA
Gate Threshold Voltage	V_{TH}	V_{DS}=10V, I_D=1mA	2.0	3.0	4.0	V
Forward Transconductance	Re(yfs)	V_{DS}=10V, I_D=35A	30	50		S
Static Drain to Source On-Resistance	$R_{DS(ON)}$	I_D=35A, V_{GS}=10V		5.0	6.0	mΩ
Input Capacitance	Ciss	V_{DS}=10V V_{GS}=0V f=1MHz		5100		pF
Output Capacitance	Coss			1200		
Reverse Transfer Capacitance	Crss			860		
Turn-On Delay Time	td(on)	I_D=35A, V_{DD}≒20V R_G=22Ω,R_{GS}=50Ω R_L=0.57Ω, V_{GS}=10V See Fig.3		100		ns
Rise Time	tr			100		
Turn-Off Delay Time	td(off)			300		
Fall Time	tf			130		
Source-Drain Diode Forward Voltage	V_{SD}	I_{SD}=50A,V_{GS}=0V		0.9	1.2	V
Source-Drain Diode Reverse Recovery Time	trr	I_{SD}=25A di/dt=50A/us		100		ns
Thermal Resistance Junction to Case	Rth(ch-c)				3.57	℃/W
Thermal Resistance Junction to Ambient	Rth(ch-a)				62.5	℃/W

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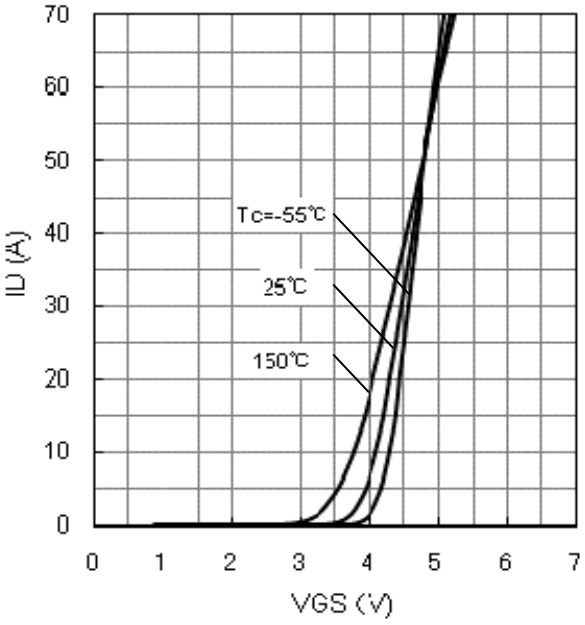
Characteristic Curves (Tc=25℃)

ID - VDS characteristics (typical)



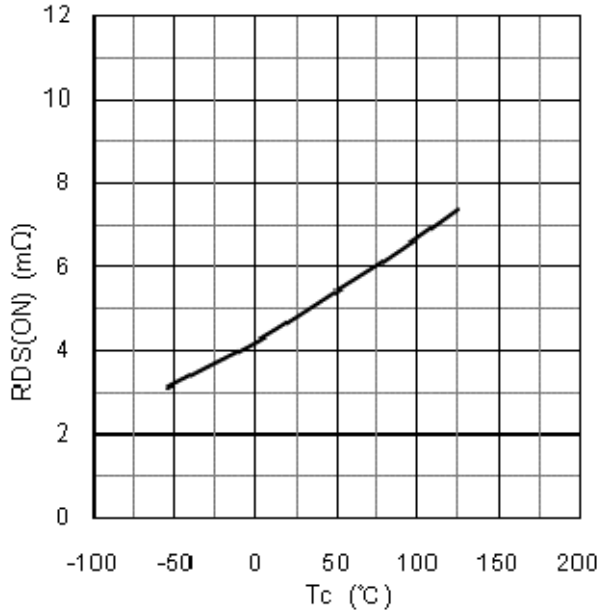
ID - VGS characteristics (typical)

VDS=10V



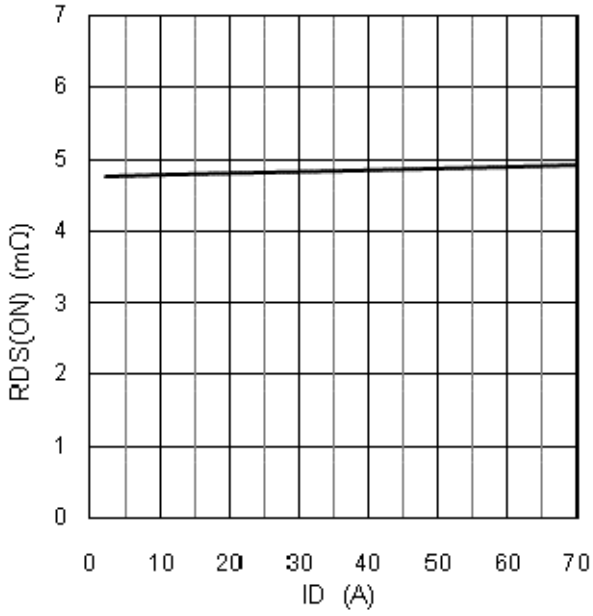
RDS(ON) - Tc characteristics (typical)

VGS=10V



RDS(ON) - ID characteristics (typical)

VGS=10V

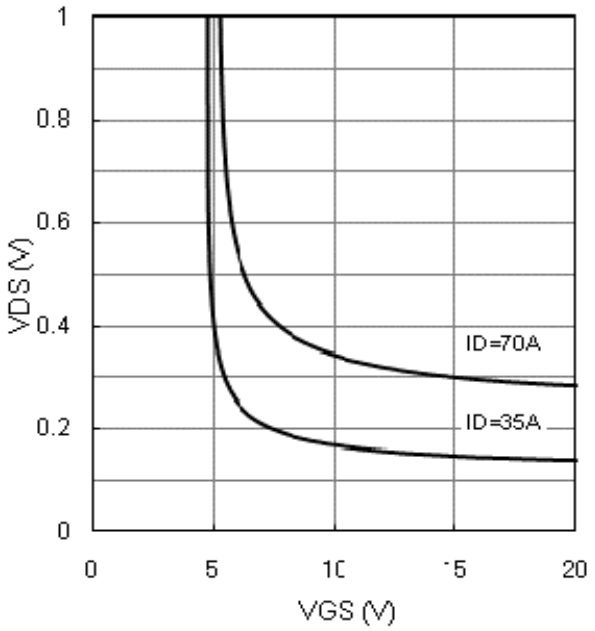


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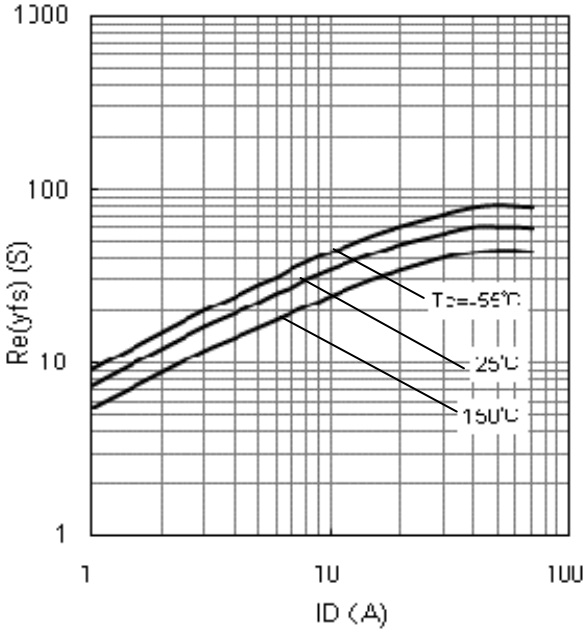
Characteristic Curves (Tc=25℃)

VDS - VGS characteristics (typica)



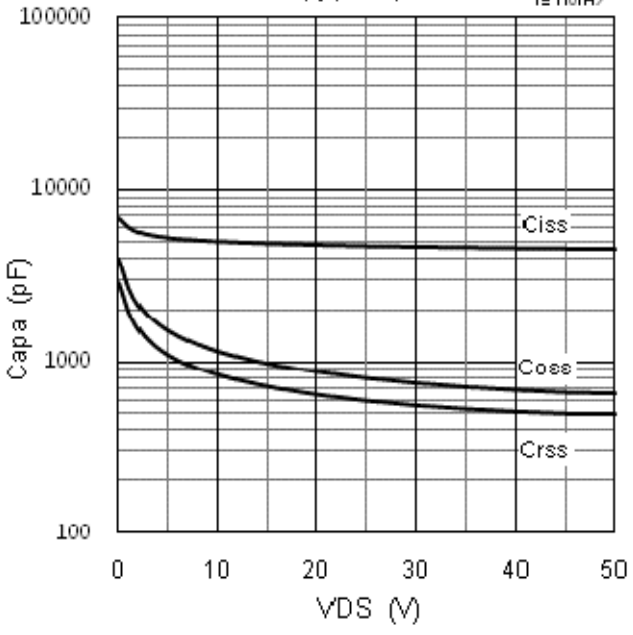
Rc(yfs) - ID characteristics (typical)

VDS=10V

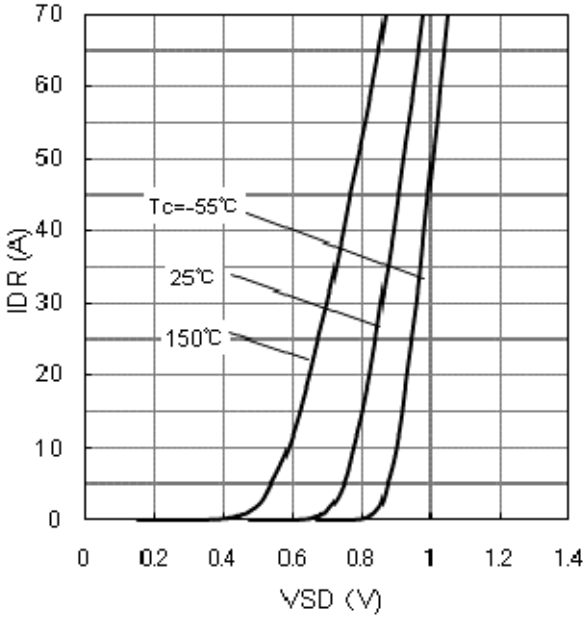


Capacitance VDS characteristics (typical)

VGS=0V
f=1MHz



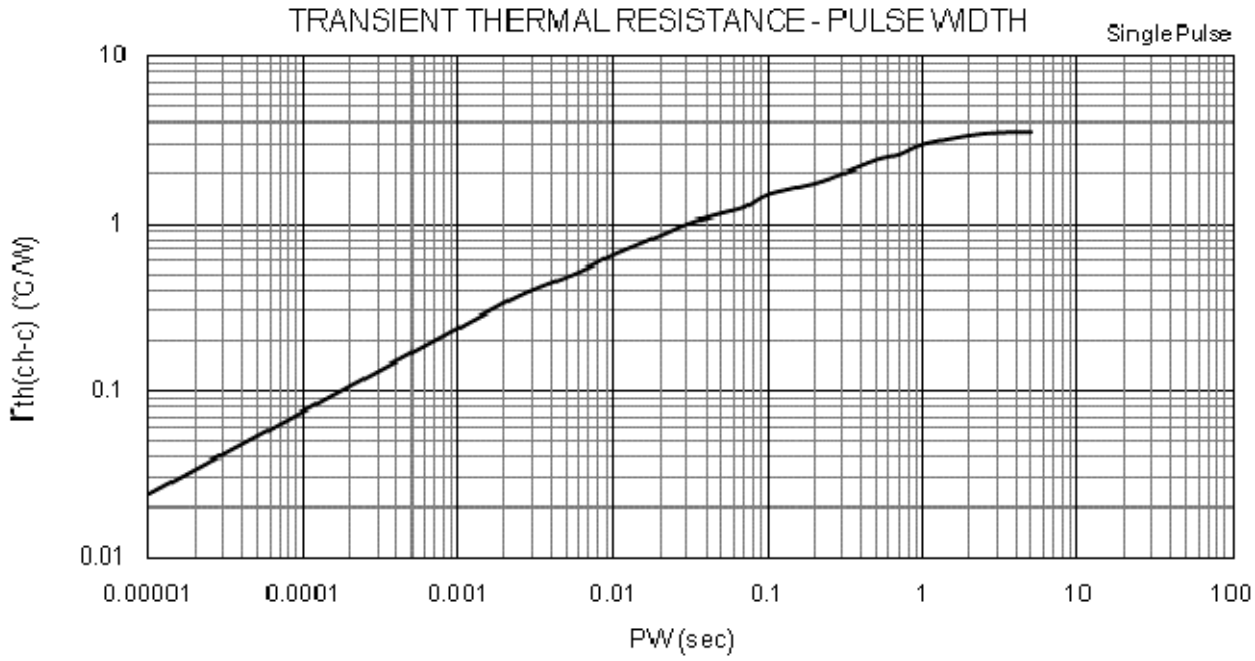
IDR - VSD characteristics (typical)

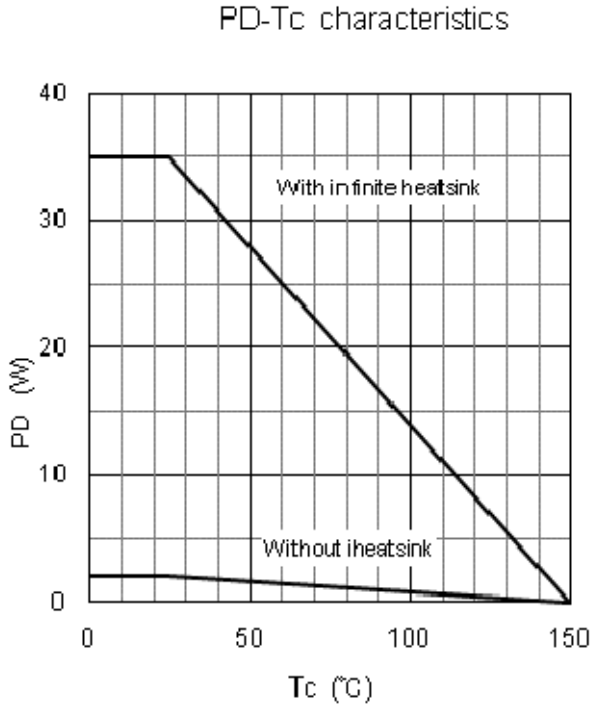


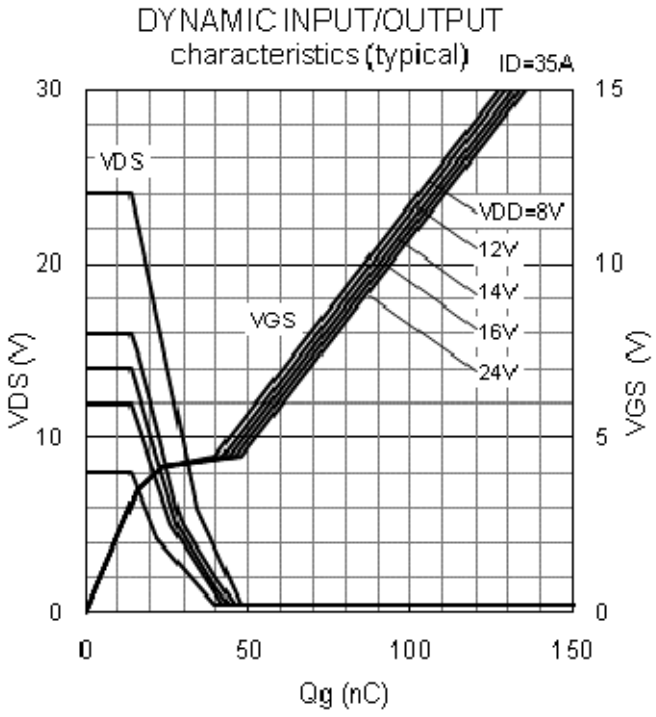
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Characteristic Curves (Tc=25℃)



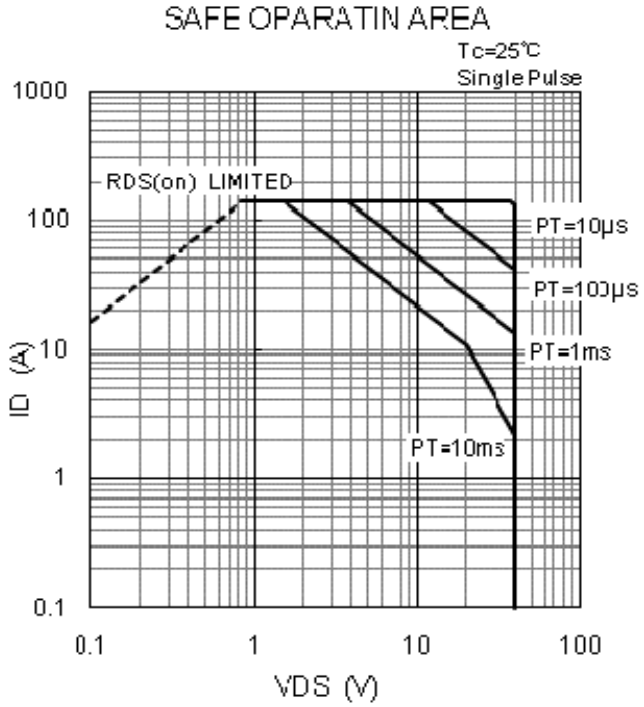




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Characteristic Curves (Tc=25℃)

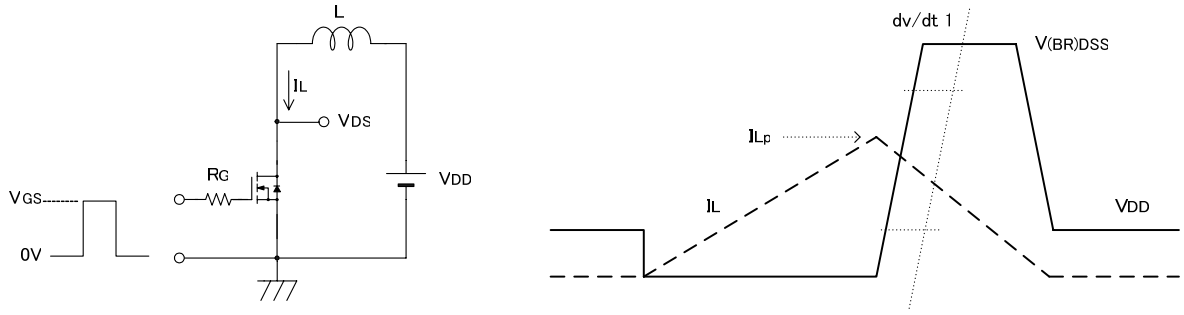


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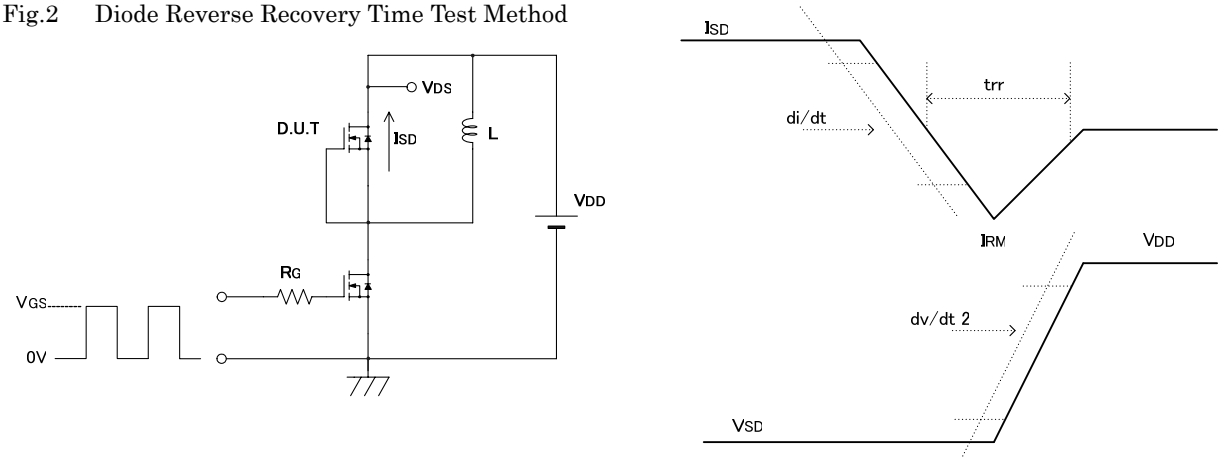
Fig.1 Unclamped Inductive Test Method

$$EAS=\frac{1}{2}\cdot L\cdot ILP^2\cdot\frac{V(BR)DSS}{V(BR)DSS-VDD}$$



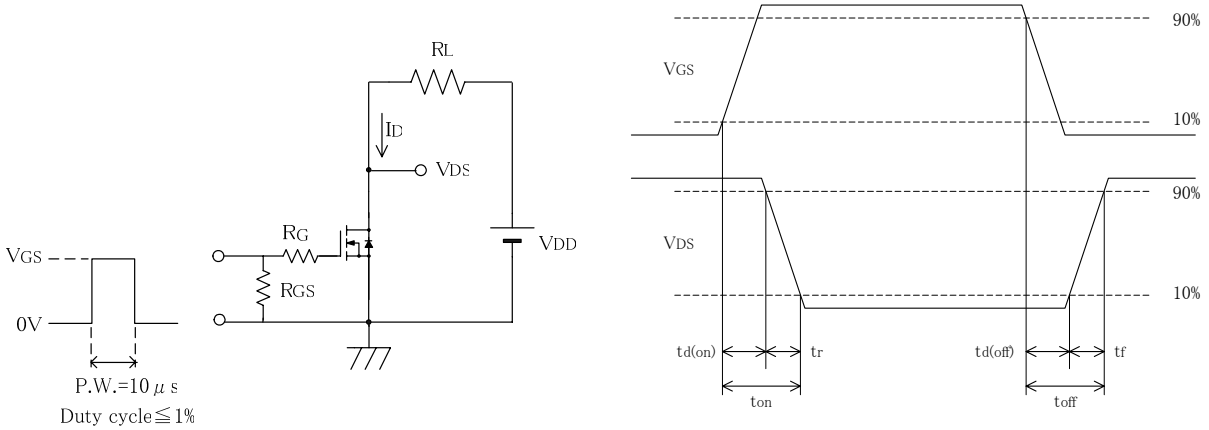
(a) Test Circuit (b) Waveforms

Fig.2 Diode Reverse Recovery Time Test Method



(a) Test Circuit (b) Waveforms

Fig.3 Switching Time Test Method



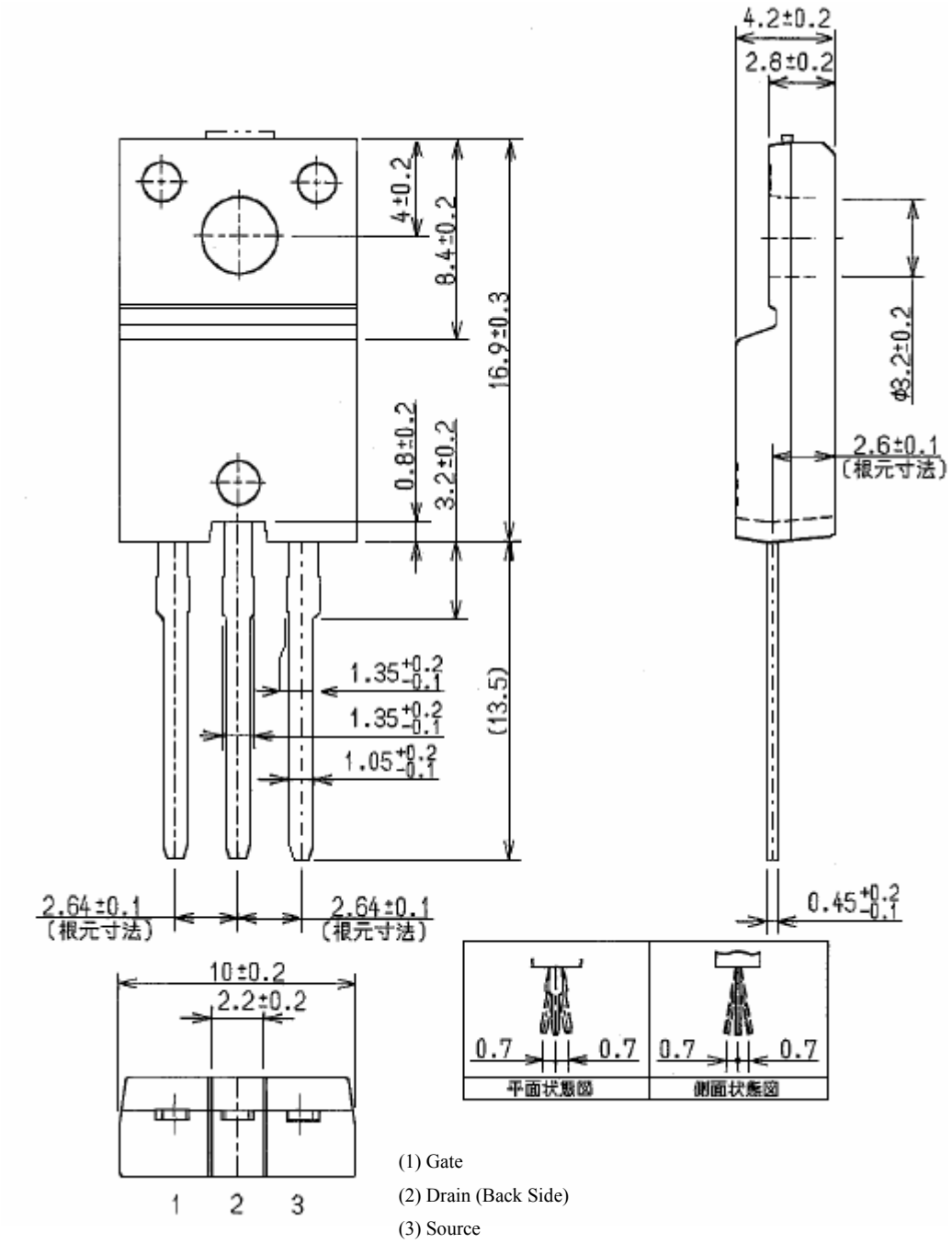
(a) Test Circuit (b) Waveforms

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Outline

FM20 (TO220 Full Mold)



(1) Gate
(2) Drain (Back Side)
(3) Source

Weight Approx. 2g

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