

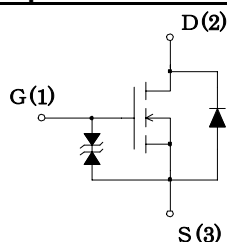
### Features

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

### Applications

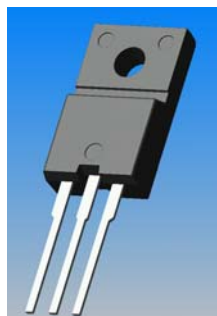
Automotive: EPS motor driver application  
Automotive: Other motor driver and solenoid driver application

### Internal Equivalent Circuit



### Package

FM20 (TO220 Full Mold)



### Key Specifications

### Absolute maximum ratings

(Ta=25°C)

Characteristic	Symbol	Rating	Unit
Drain to Source Voltage	V <sub>DSS</sub>	40	V
Gate to Source Voltage	V <sub>GSS</sub>	±20	V
Continuous Drain Current	I <sub>D</sub>	±70	A
Pulsed Drain Current	I <sub>D(pulse)</sub> <sup>※1</sup>	±140	A
Maximum Power Dissipation	P <sub>D</sub>	35 (T <sub>c</sub> =25°C)	W
Single Pulse Avalanche Energy	E <sub>AS</sub> <sup>※2</sup>	400	mJ
Avalanche Current	I <sub>AS</sub>	25	A
Maximum Drain to Source dv/dt 1	dv/dt 1 <sup>※2</sup>	0.3	V/ns
Peak diode recovery dv/dt 2	dv/dt 2 <sup>※3</sup>	1.0	V/ns
Peak diode recovery di/dt	di/dt <sup>※3</sup>	100	A/μs
Channel Temperature	T <sub>ch</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-55~150	°C

※1 PW ≤ 100 μ sec. duty cycle ≤ 1%

※2 V<sub>DD</sub>=20V, L=1mH, I<sub>L</sub>=20A, unclamped, R<sub>g</sub>=50Ω, See Fig.1

※3 I<sub>SD</sub>=25A, See Fig.2

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**Electrical characteristics**

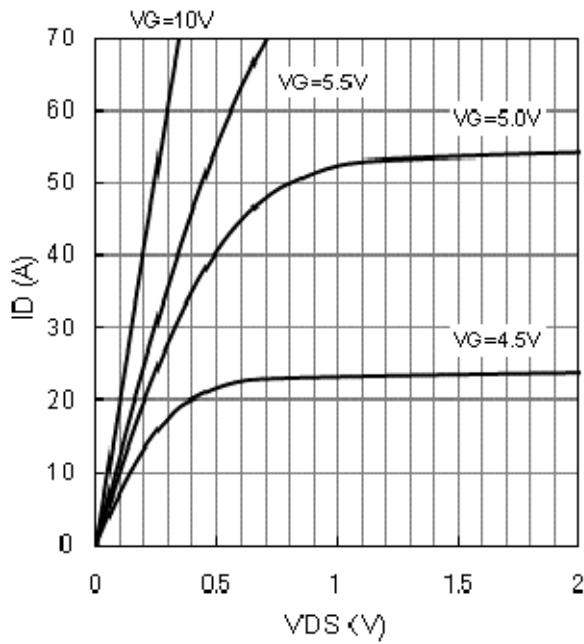
(Ta=25°C)

Characteristic	Symbol	Test Conditions	Limits			Unit
			MIN	TYP	MAX	
Drain to Source breakdown Voltage	$V_{(BR)DSS}$	$I_D=100\mu A, V_{GS}=0V$	40			V
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 15V$			$\pm 2$	$\mu A$
Drain to Source Leakage Current	$I_{DSS}$	$V_{DS}=40V, V_{GS}=0V$			100	$\mu A$
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	m $\Omega$
Input Capacitance	$C_{iss}$	$V_{DS}=10V$ $V_{GS}=0V$ $f=1MHz$		5100		pF
Output Capacitance	$C_{oss}$			1200		
Reverse Transfer Capacitance	$C_{rss}$			860		
Turn-On Delay Time	$t_{d(on)}$	$I_D=35A, V_{DD} \approx 20V$ $R_G=22\Omega, R_{GS}=50\Omega$ $R_L=0.57\Omega, V_{GS}=10V$ See Fig.3		100		ns
Rise Time	$t_r$			100		
Turn-Off Delay Time	$t_{d(off)}$			300		
Fall Time	$t_f$			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	$t_{rr}$	$I_{SD}=25A$ $di/dt=50A/\mu s$		100		ns
Thermal Resistance Junction to Case	$R_{th(ch-c)}$				3.57	$^{\circ}C/W$
Thermal Resistance Junction to Ambient	$R_{th(ch-a)}$				62.5	$^{\circ}C/W$

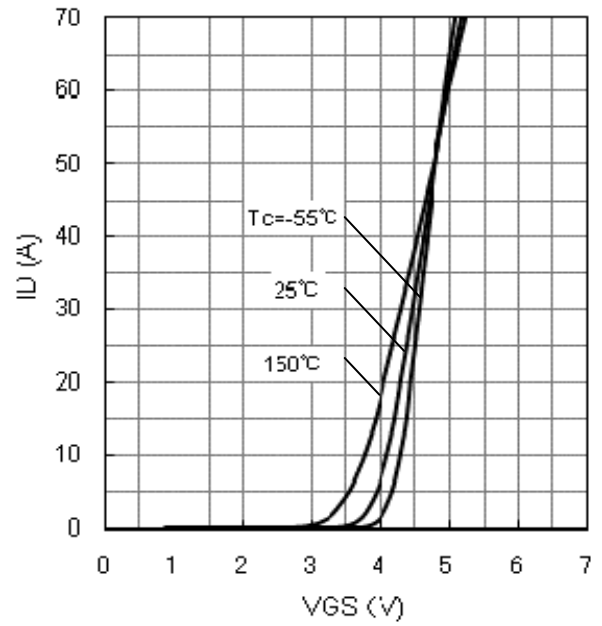
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**Characteristic Curves (Tc=25°C)**

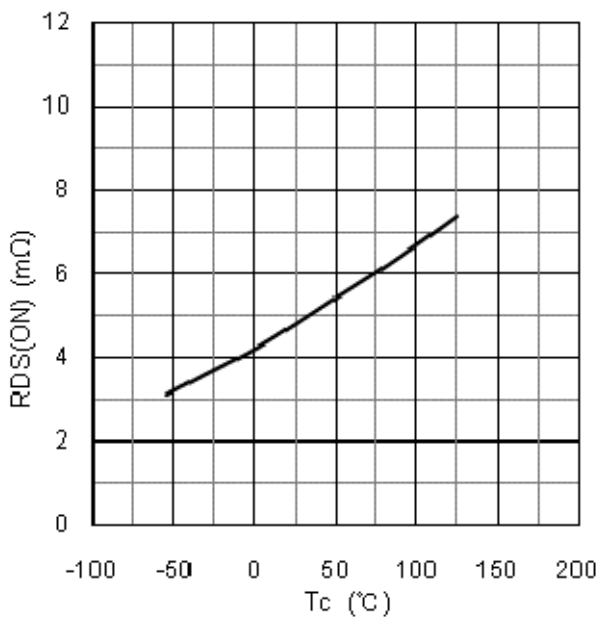
ID - VDS characteristics (typical)



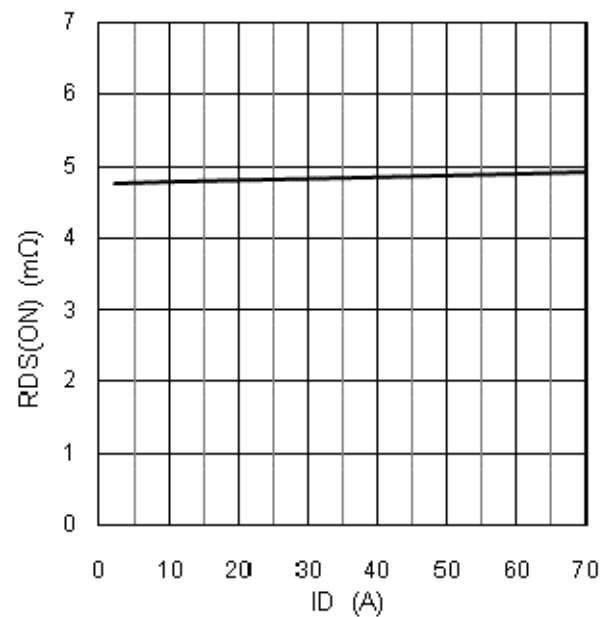
ID - VGS characteristics (typical)  
VDS=10V



RDS(ON) - Tc characteristics (typical)  
VGS=10V



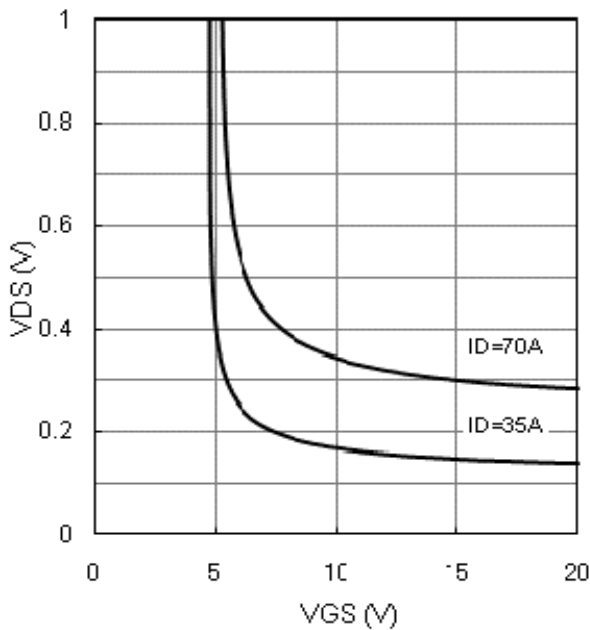
RDS(ON) - ID characteristics (typical)  
VGS=10V



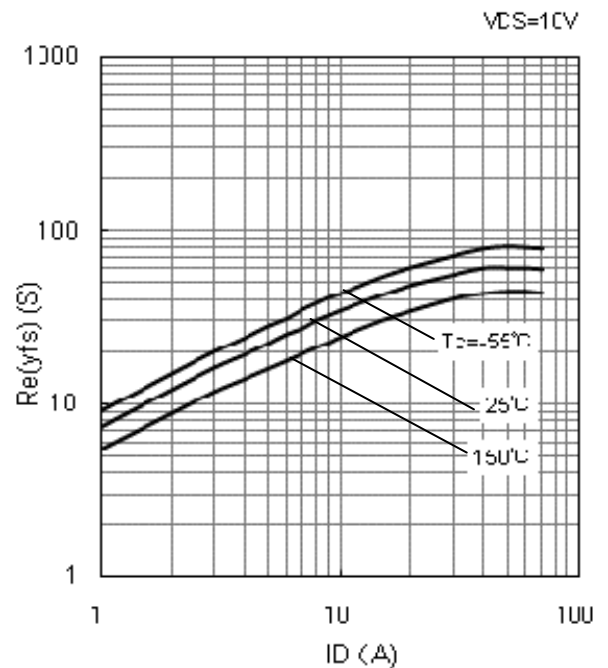
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**Characteristic Curves (Tc=25°C)**

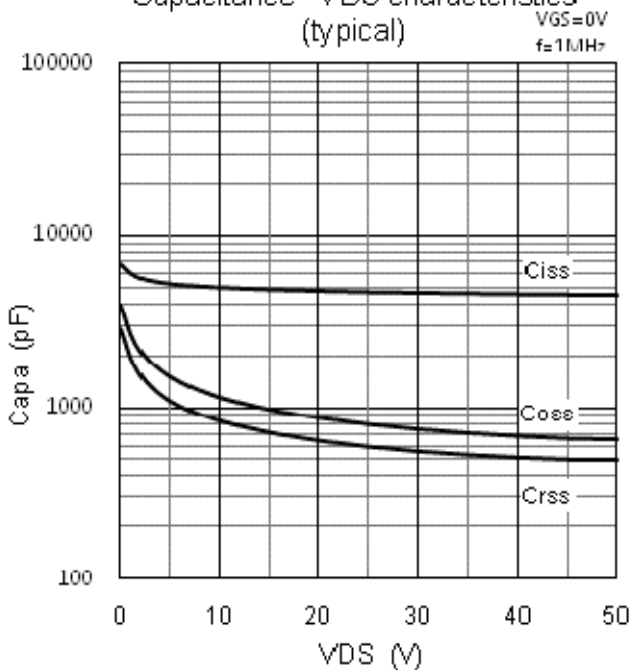
VDS - VGS characteristics (typical)



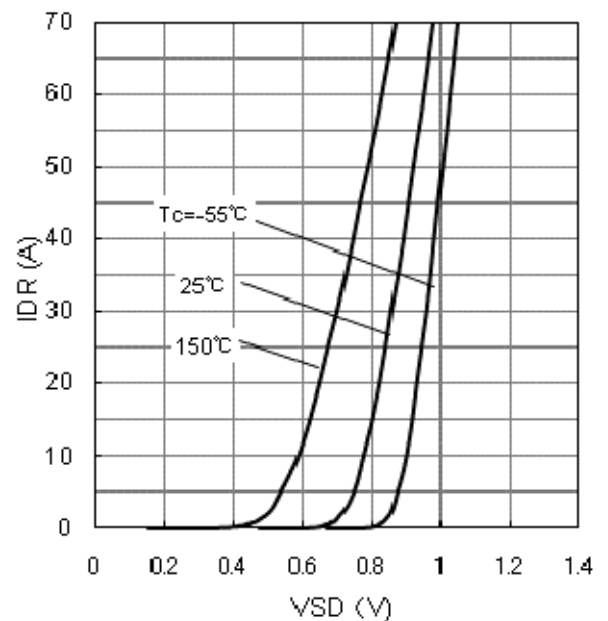
Re(yfs) - ID characteristics (typical)



Capacitance VDS characteristics (typical)

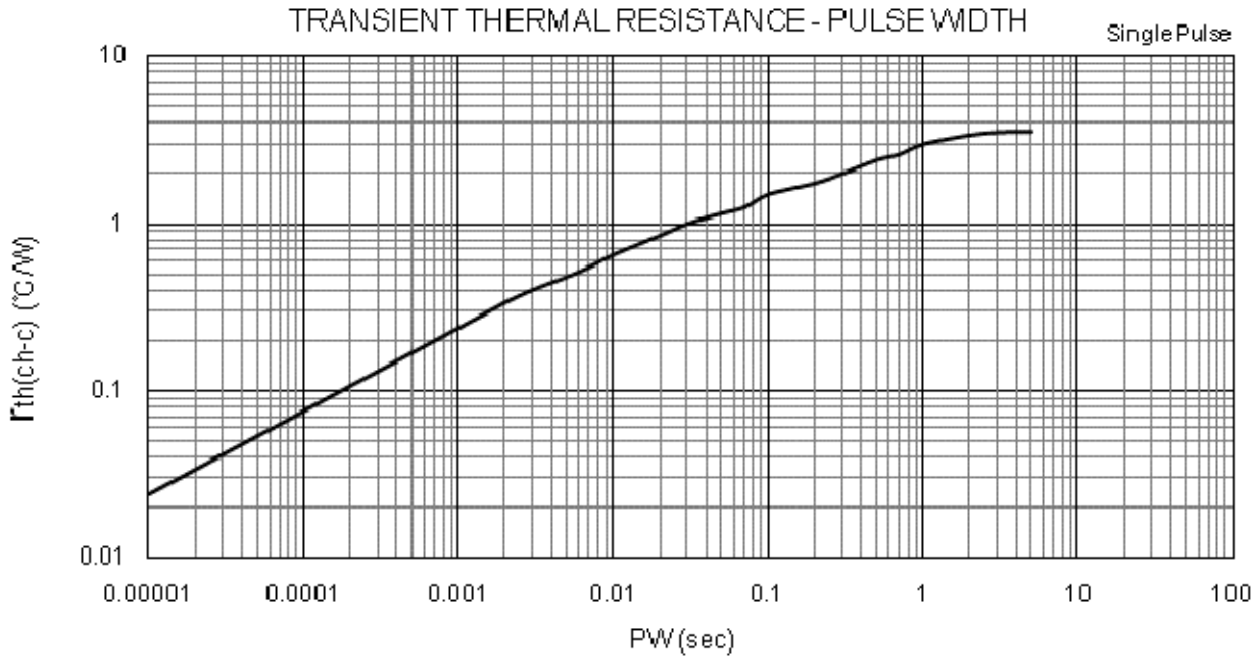


IDR - VSD characteristics (typical)

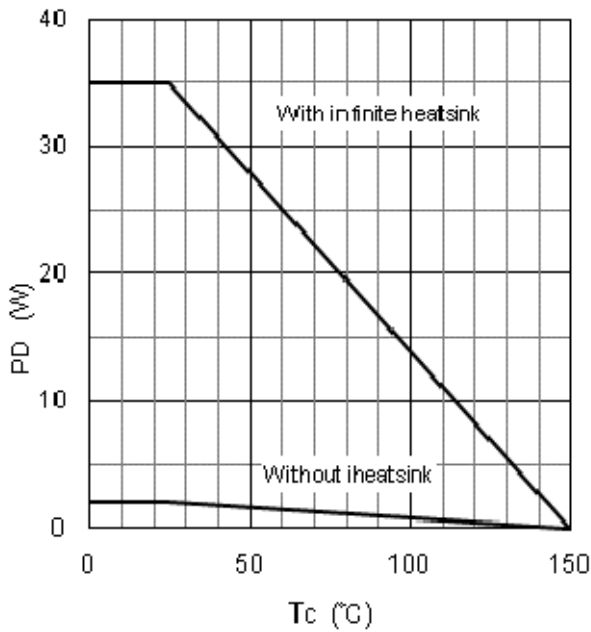


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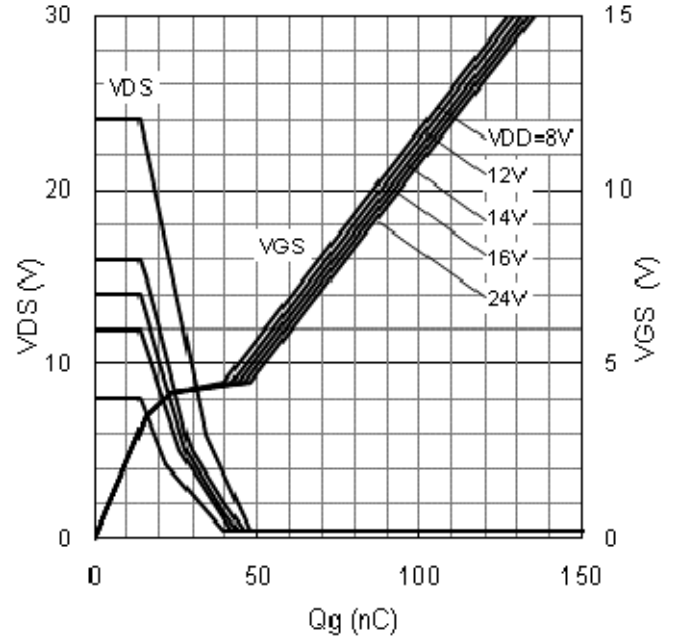
**Characteristic Curves (Tc=25°C)**



PD-Tc characteristics

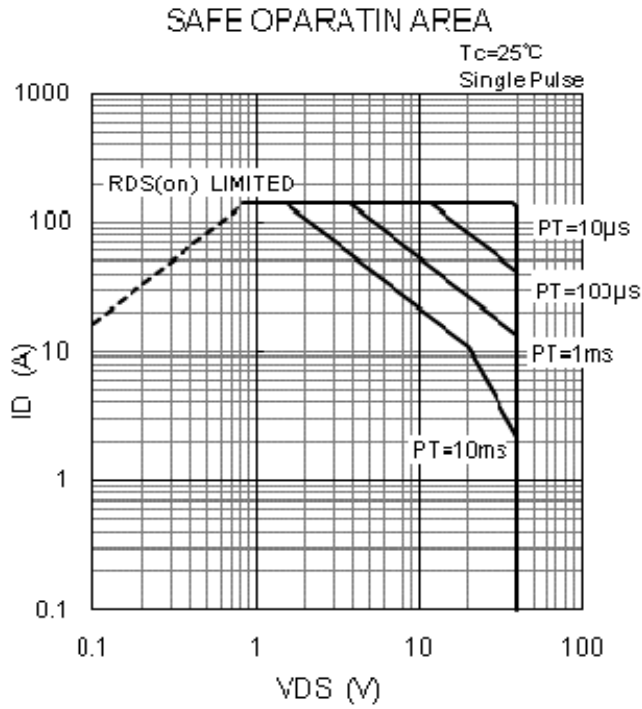


DYNAMIC INPUT/OUTPUT characteristics (typical) ID=35A



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**Characteristic Curves (Tc=25°C)**



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Fig.1 Unclamped Inductive Test Method

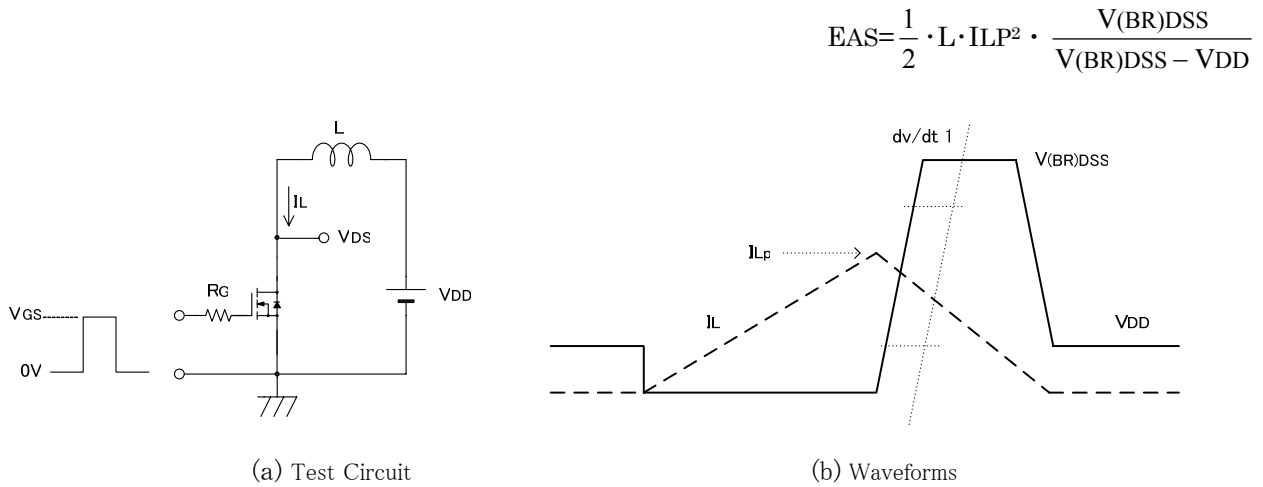


Fig.2 Diode Reverse Recovery Time Test Method

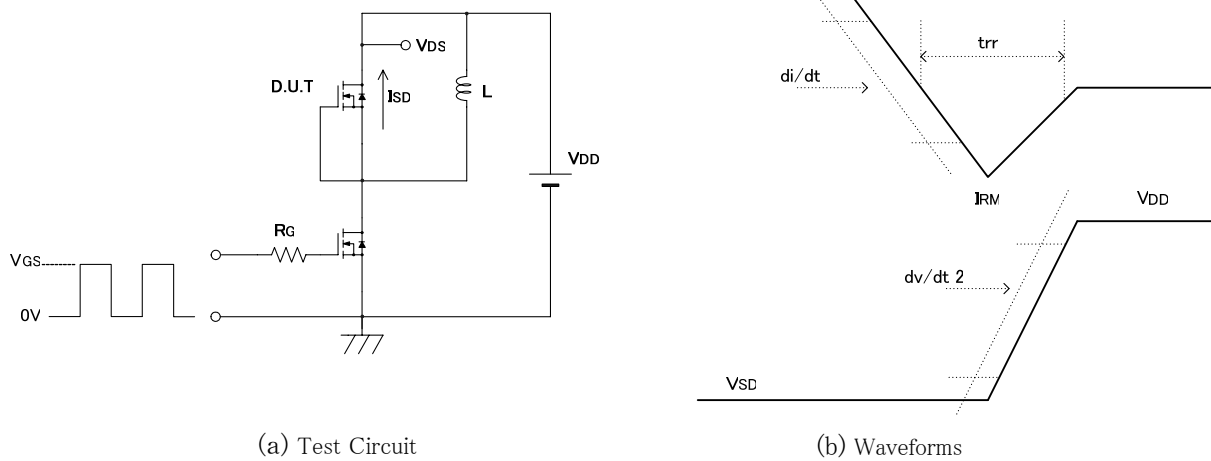
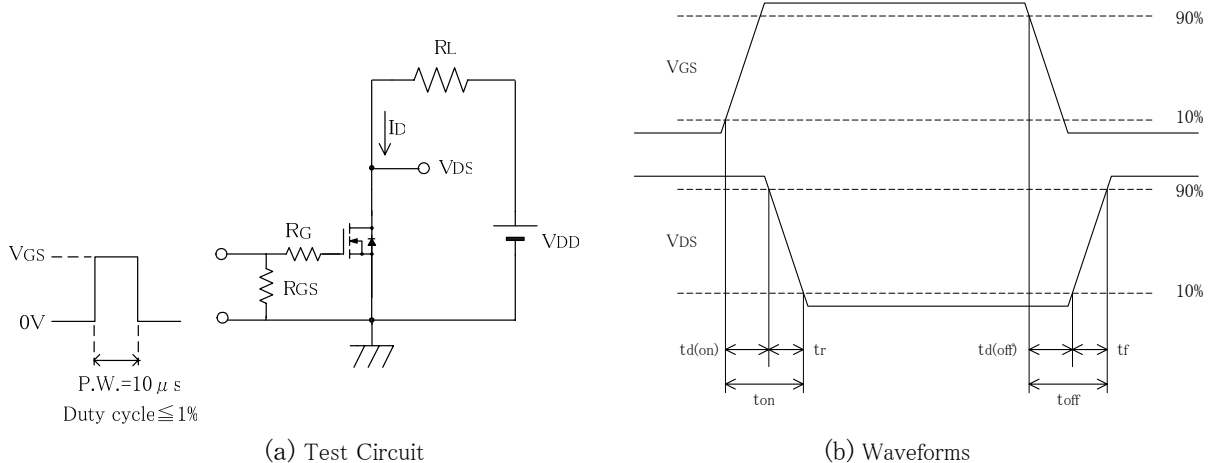


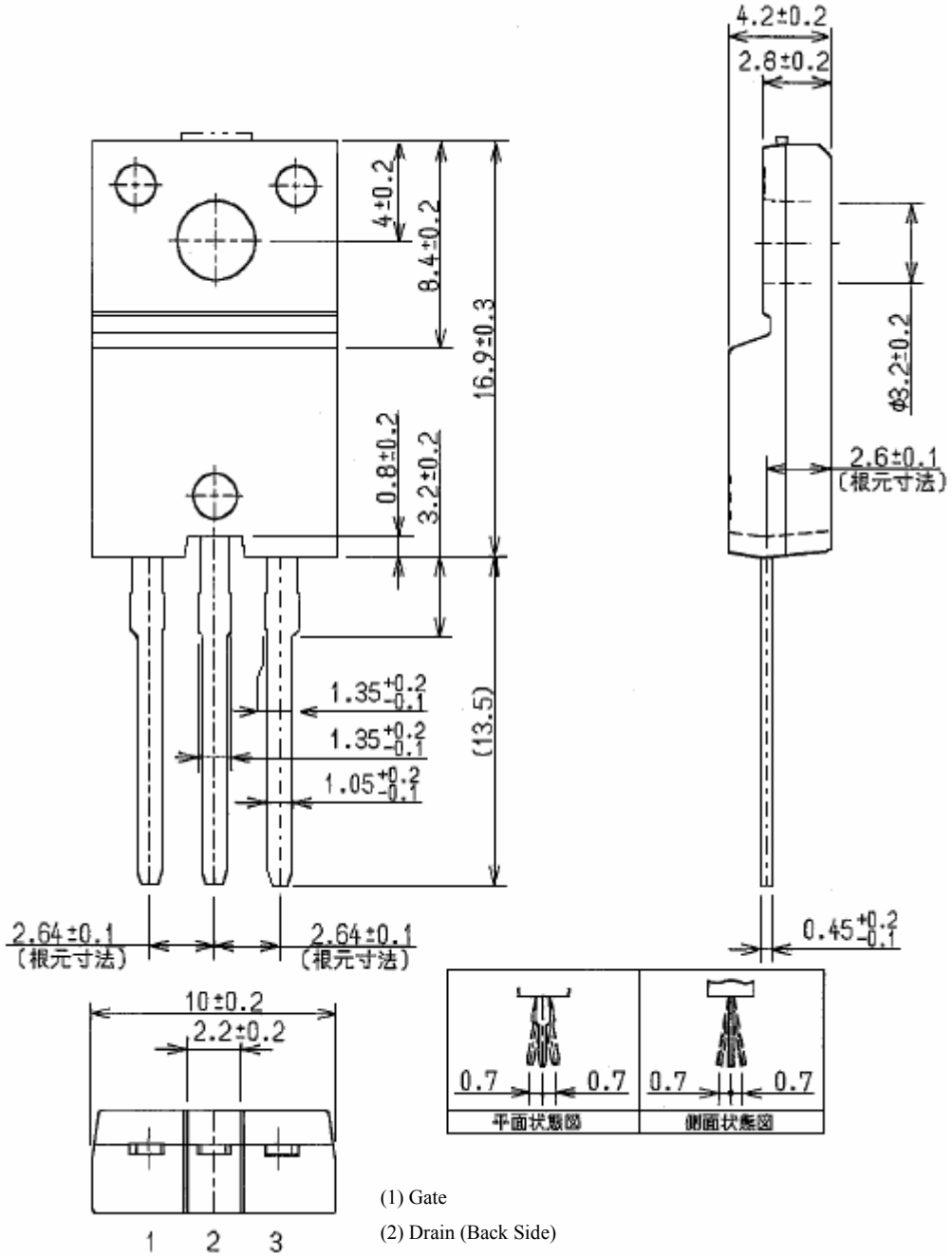
Fig.3 Switching Time Test Method



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Outline

FM20 (TO220 Full Mold)



Weight Approx. 2g

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