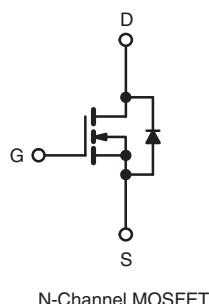
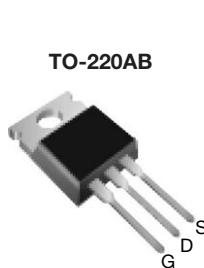


Power MOSFET

PRODUCT SUMMARY	
V _{DS} (V)	650
R _{DSON} (Ω)	V _{GS} = 10 V 0.93
Q _g (Max.) (nC)	48
Q _{gs} (nC)	12
Q _{gd} (nC)	19
Configuration	Single



FEATURES

- Low Gate Charge Q_g Results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dV/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Compliant to RoHS Directive 2002/95/EC


RoHS*
COMPLIANT

APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply
- High Speed Power Switching

TYPICAL SMPS TOPOLOGIES

- Single Transistor Flyback
- Single Transistor Forward

ORDERING INFORMATION

Package	TO-220AB
Lead (Pb)-free	IRFB9N65APbF SiHFB9N65A-E3
SnPb	IRFB9N65A SiHFB9N65A

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V _{DS}	650	V
Gate-Source Voltage	V _{GS}	± 30	
Continuous Drain Current	V _{GS} at 10 V	T _C = 25 °C	8.5
		T _C = 100 °C	5.4
Pulsed Drain Current ^a	I _{DM}	21	A
Linear Derating Factor		1.3	W/°C
Single Pulse Avalanche Energy ^b	E _{AS}	325	mJ
Repetitive Avalanche Current ^a	I _{AR}	5.2	A
Repetitive Avalanche Energy ^a	E _{AR}	16	mJ
Maximum Power Dissipation	P _D	167	W
Peak Diode Recovery dV/dt ^c	dV/dt	2.8	V/ns
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to + 150	°C
Soldering Recommendations (Peak Temperature)	for 10 s	300 ^d	
Mounting Torque	6-32 or M3 screw	10	lbf · in
		1.1	N · m

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Starting T_J = 25 °C, L = 24 mH, R_g = 25 Ω, I_{AS} = 5.2 A (see fig. 12).
- I_{SD} ≤ 5.2 A, dI/dt ≤ 90 A/μs, V_{DD} ≤ V_{DS}, T_J ≤ 150 °C.
- 1.6 mm from case.

* Pb containing terminations are not RoHS compliant, exemptions may apply

THERMAL RESISTANCE RATINGS

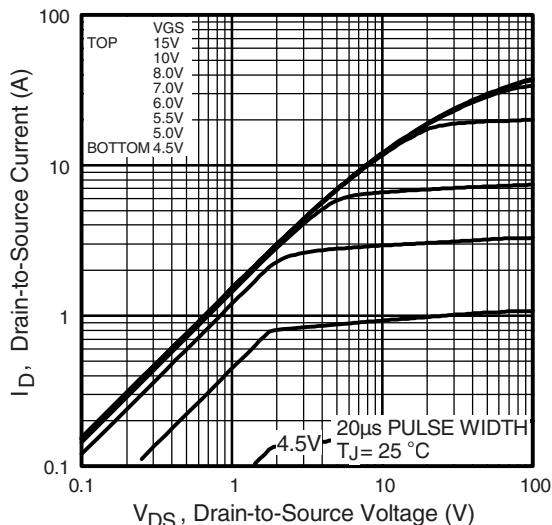
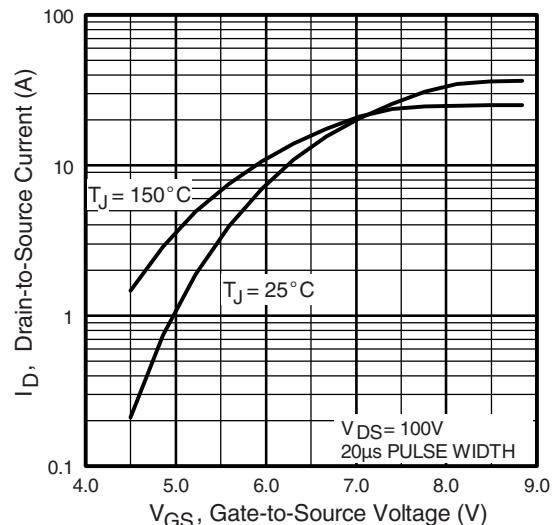
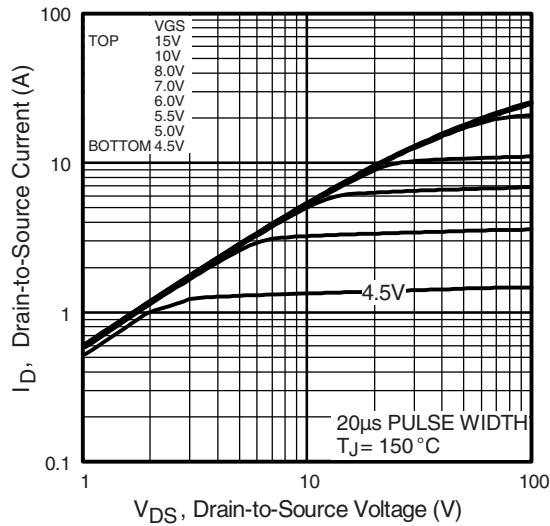
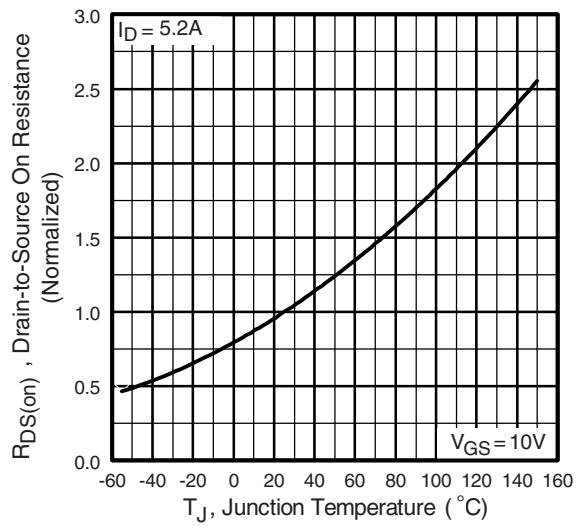
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Case-to-Sink, Flat, Greased Surface	R_{thCS}	0.50	-	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.75	

SPECIFICATIONS ($T_J = 25^\circ\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$		650	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25°C , $I_D = 1 \text{ mA}^d$		-	670	-	mV/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$		2.0	-	4.0	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 30 \text{ V}$		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 650 \text{ V}$, $V_{GS} = 0 \text{ V}$		-	-	25	μA
		$V_{DS} = 520 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 125^\circ\text{C}$		-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$	$I_D = 5.1 \text{ A}^b$	-	-	0.93	Ω
Forward Transconductance	g_f	$V_{DS} = 50 \text{ V}$, $I_D = 3.1 \text{ A}$		3.9	-	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0 \text{ V}$, $V_{DS} = 25 \text{ V}$, $f = 1.0 \text{ MHz}$, see fig. 5		-	1417	-	pF
Output Capacitance	C_{oss}			-	177	-	
Reverse Transfer Capacitance	C_{rss}			-	7.0	-	
Output Capacitance	C_{oss}	$V_{GS} = 0 \text{ V}$	$V_{DS} = 1.0 \text{ V}$, $f = 1.0 \text{ MHz}$	-	1912	-	pF
			$V_{DS} = 520 \text{ V}$, $f = 1.0 \text{ MHz}$	-	48	-	
Effective Output Capacitance	$C_{oss eff.}$		$V_{DS} = 0 \text{ V}$ to 520 V^c	-	84	-	
Total Gate Charge	Q_g	$V_{GS} = 10 \text{ V}$	$I_D = 5.2 \text{ A}$, $V_{DS} = 400 \text{ V}$ see fig. 6 and 13 ^b	-	-	48	nC
Gate-Source Charge	Q_{gs}			-	-	12	
Gate-Drain Charge	Q_{gd}			-	-	19	
Turn-On Delay Time	$t_{d(on)}$			-	14	-	
Rise Time	t_r	$V_{DD} = 325 \text{ V}$, $I_D = 5.2 \text{ A}$ $R_g = 9.1 \Omega$, $R_D = 62 \Omega$, see fig. 10 ^b		-	20	-	ns
Turn-Off Delay Time	$t_{d(off)}$			-	34	-	
Fall Time	t_f			-	18	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	5.2	A
Pulsed Diode Forward Current ^a	I_{SM}			-	-	21	
Body Diode Voltage	V_{SD}	$T_J = 25^\circ\text{C}$, $I_S = 5.2 \text{ A}$, $V_{GS} = 0 \text{ V}^b$		-	-	1.5	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25^\circ\text{C}$, $I_F = 5.2 \text{ A}$, $dI/dt = 100 \text{ A}/\mu\text{s}^b$		-	493	739	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	2.1	3.2	μC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b. Pulse width $\leq 300 \mu\text{s}$; duty cycle $\leq 2 \%$.
- c. $C_{oss eff.}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DS} .
- d. Uses SiHFIB5N65A data and test conditions.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Fig. 1 - Typical Output Characteristics

Fig. 3 - Typical Transfer Characteristics

Fig. 2 - Typical Output Characteristics

Fig. 4 - Normalized On-Resistance vs. Temperature

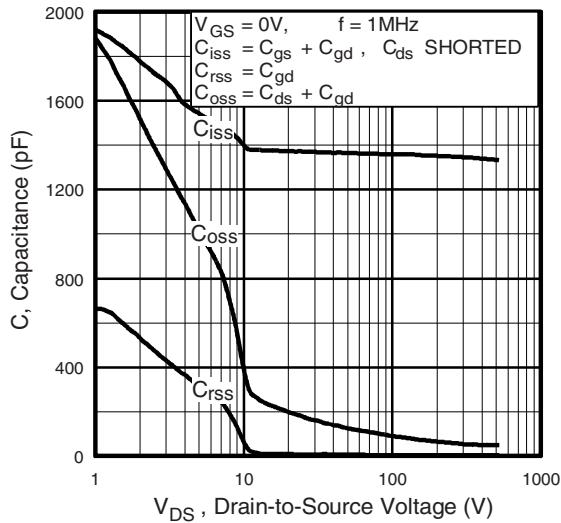


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

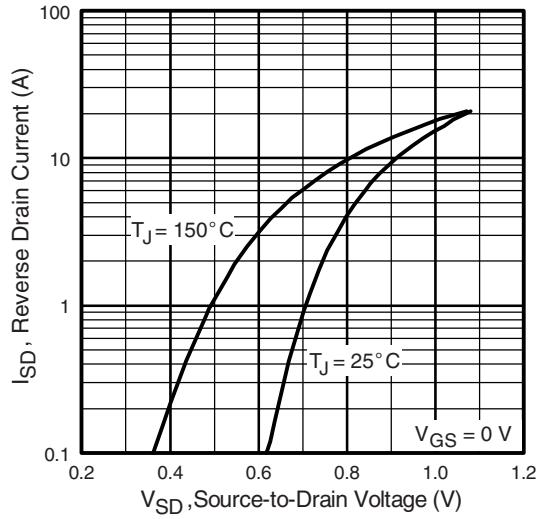


Fig. 7 - Typical Source-Drain Diode Forward Voltage

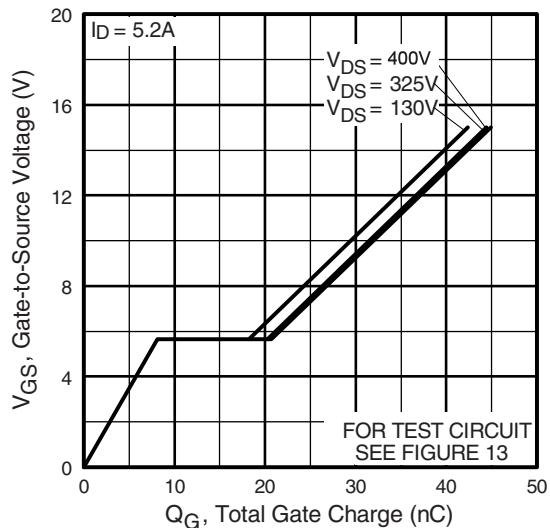


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

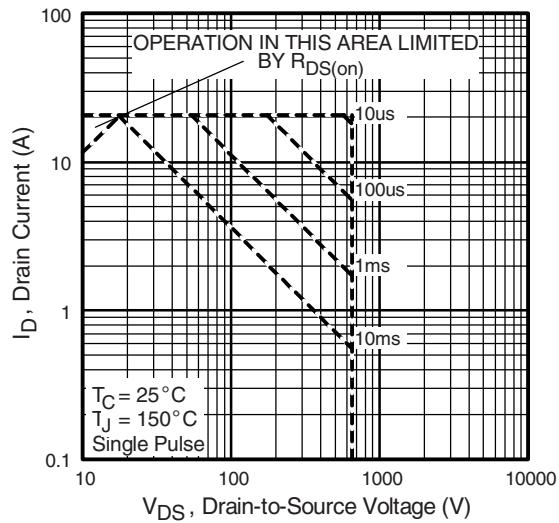
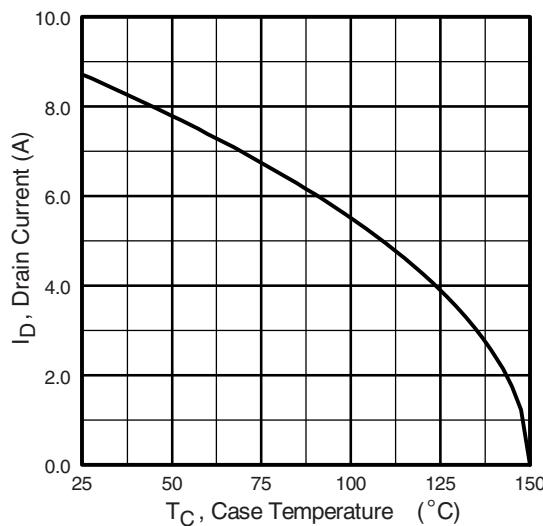
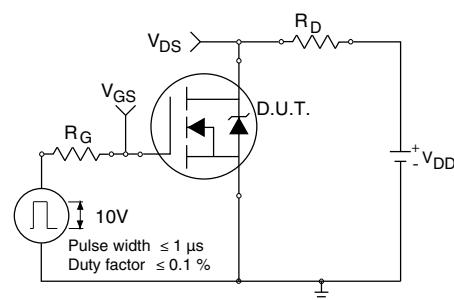
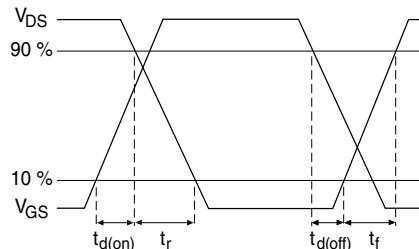
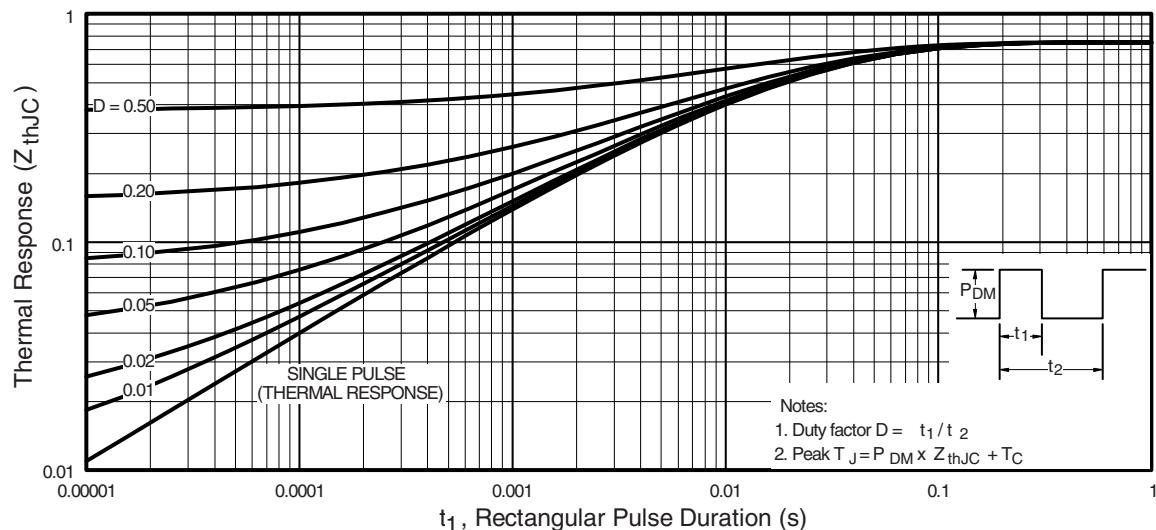


Fig. 8 - Maximum Safe Operating Area


Fig. 9 - Maximum Drain Current vs. Case Temperature

Fig. 10a - Switching Time Test Circuit

Fig. 10b - Switching Time Waveforms

Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

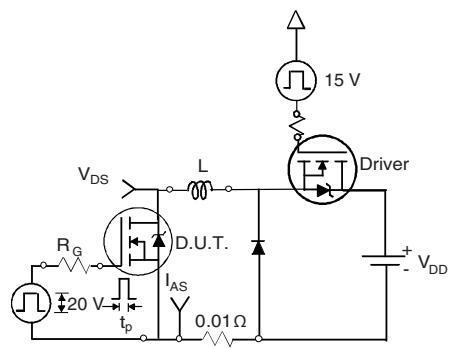


Fig. 12a - Unclamped Inductive Test Circuit

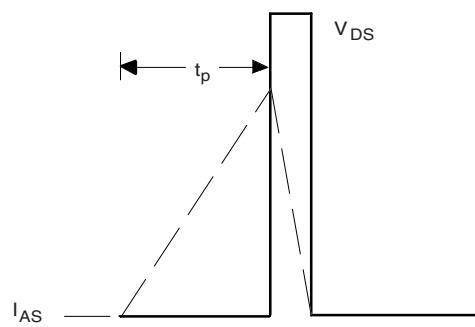


Fig. 12b - Unclamped Inductive Waveforms

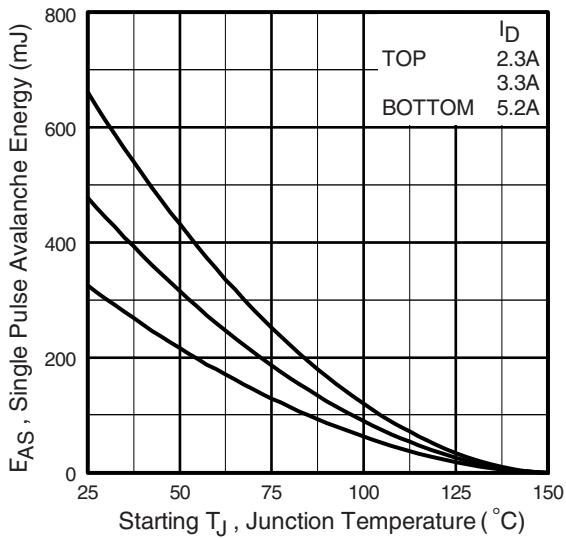


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

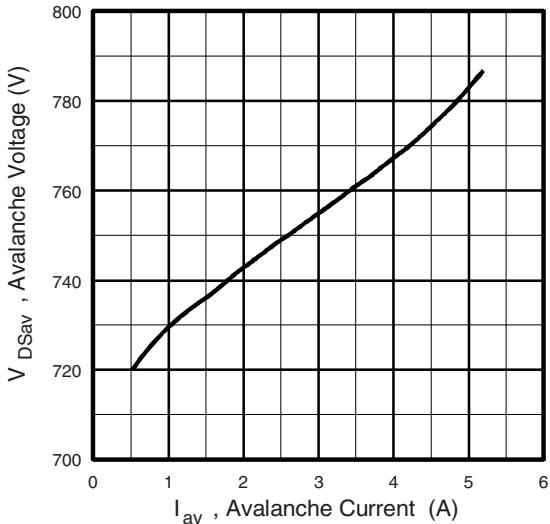


Fig. 12d - Typical Drain-to-Source Voltage vs. Avalanche Current

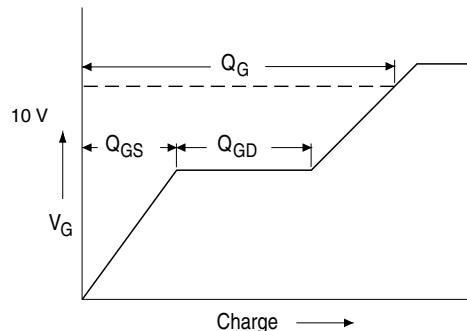


Fig. 13a - Basic Gate Charge Waveform

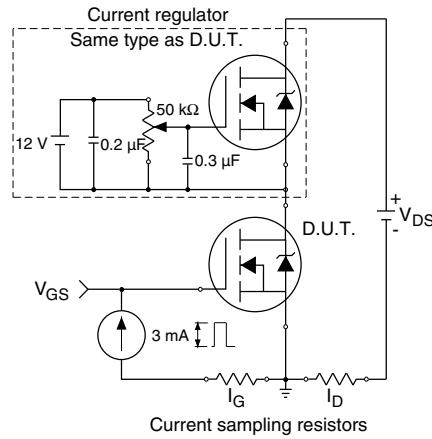
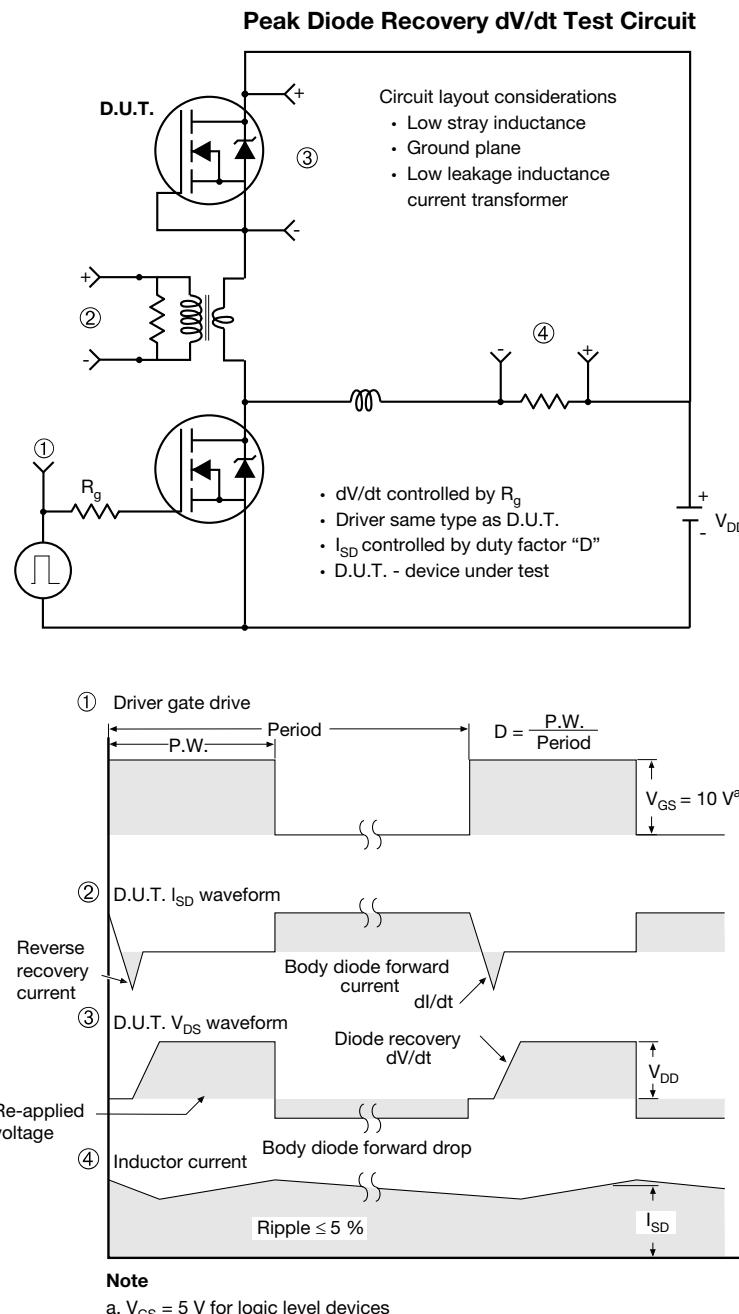
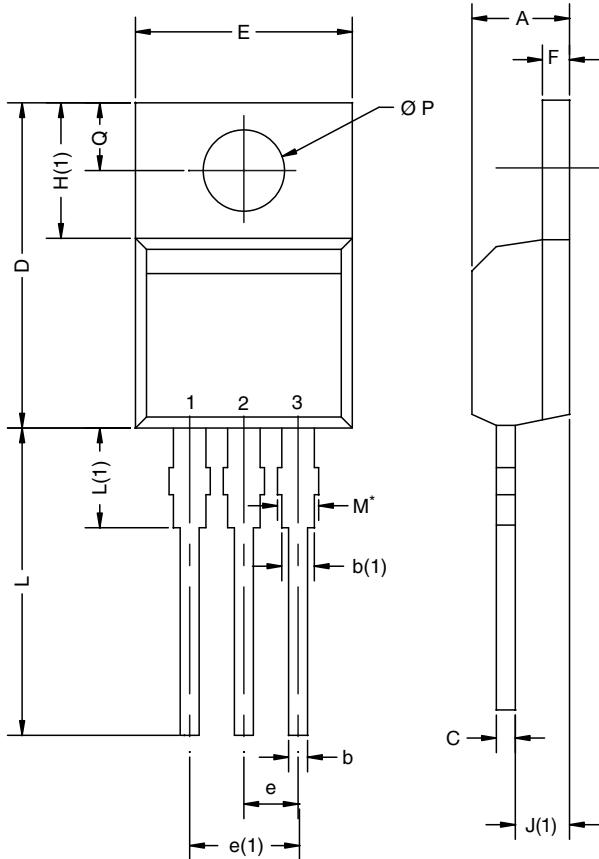


Fig. 13b - Gate Charge Test Circuit


Fig. 14 - For N-Channel

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TO-220AB

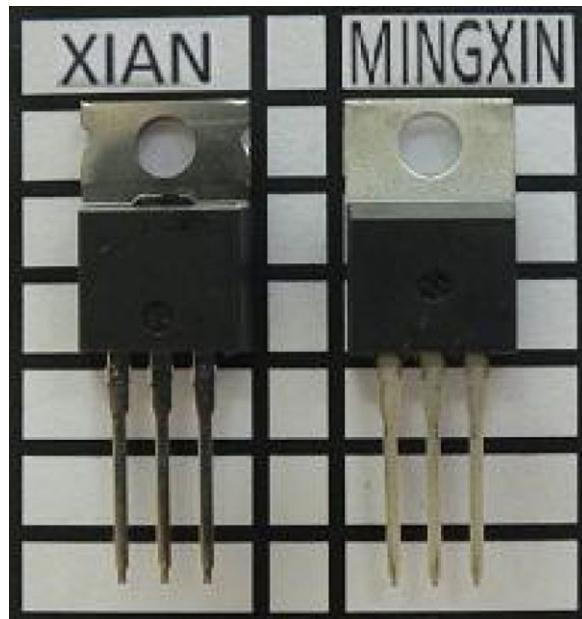


DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
Ø P	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118

Notes

* M = 1.32 mm to 1.62 mm (dimension including protrusion)
Heatsink hole for HVM

- Xi'an and Mingxin actual photo





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- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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