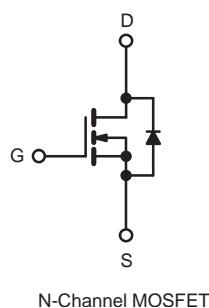


Power MOSFET

PRODUCT SUMMARY	
V _{DS} (V)	500
R _{DSON} (Ω)	V _{GS} = 10 V 0.85
Q _g (Max.) (nC)	38
Q _{gs} (nC)	9.0
Q _{gd} (nC)	18
Configuration	Single



ORDERING INFORMATION

Package	TO-220AB
Lead (Pb)-free	IRF840APbF SiHF840A-E3
SnPb	IRF840A SiHF840A

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V _{DS}	500	V
Gate-Source Voltage	V _{GS}	± 30	
Continuous Drain Current	I _D	8.0	A
		5.1	
Pulsed Drain Current ^a	I _{DM}	32	
Linear Derating Factor		1.0	W/°C
Single Pulse Avalanche Energy ^b	E _{AS}	510	mJ
Repetitive Avalanche Current ^a	I _{AR}	8.0	A
Repetitive Avalanche Energy ^a	E _{AR}	13	mJ
Maximum Power Dissipation	P _D	125	W
Peak Diode Recovery dV/dt ^c	dV/dt	5.0	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

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).

b. V_{DD} = 50 V, starting T_J = 25 °C, L = 16 mH, R_G = 25 Ω, I_{AS} = 8.0 A (see fig. 12).

c. I_{SD} ≤ 8.0 A, dI/dt ≤ 100 A/μs, V_{DD} ≤ V_{DS}, T_J ≤ 150 °C.

d. 1.6 mm from case.

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



THERMAL RESISTANCE RATINGS

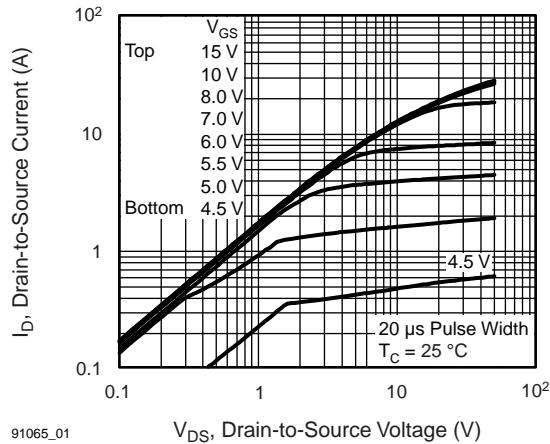
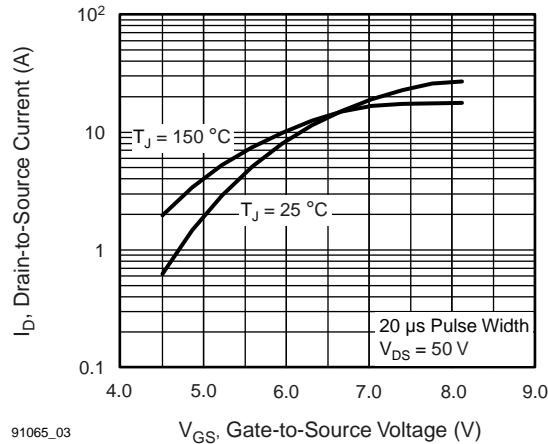
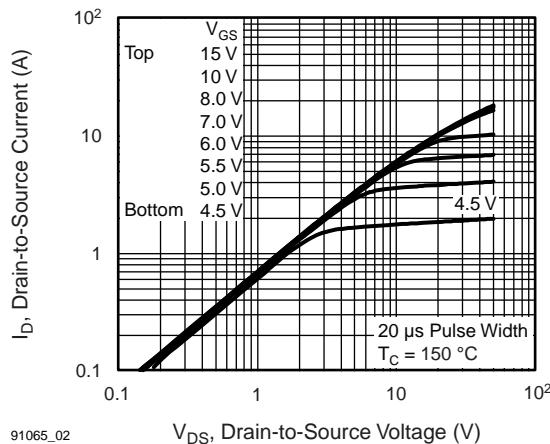
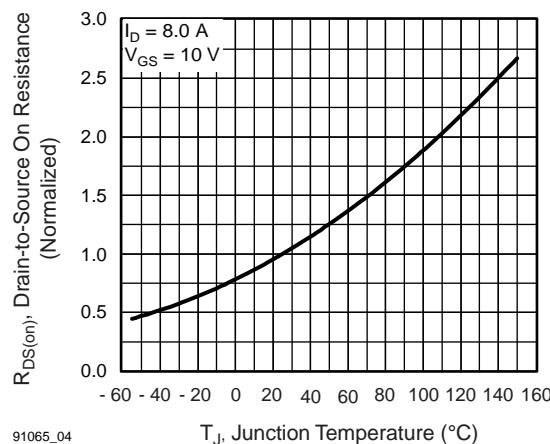
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	$^{\circ}\text{C}/\text{W}$
Case-to-Sink, Flat, Greased Surface	R_{thCS}	0.50	-	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	1.0	

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

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
Static								
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0 \text{ V}$	$I_D = 250 \mu\text{A}$	500	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25 \text{ }^{\circ}\text{C}$, $I_D = 1 \text{ mA}$		-	0.58	-	$\text{V}/^{\circ}\text{C}$	
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}	$V_{DS} = 500 \text{ V}$, $V_{GS} = 0 \text{ V}$		-	-	25	μA	
		$V_{DS} = 400 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 125 \text{ }^{\circ}\text{C}$		-	-	250		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}$	$I_D = 4.8 \text{ A}^b$	-	-	0.85	Ω	
Forward Transconductance	g_{fs}	$V_{DS} = 50 \text{ V}$, $I_D = 4.8 \text{ A}^b$		3.7	-	-	S	
Dynamic								
Input Capacitance	C_{iss}	$V_{GS} = 0 \text{ V}$, $V_{DS} = 25 \text{ V}$, $f = 1.0 \text{ MHz}$, see fig. 5		-	1018	-	pF	
Output Capacitance	C_{oss}			-	155	-		
Reverse Transfer Capacitance	C_{rss}			-	8.0	-		
Output Capacitance	C_{oss}	$V_{GS} = 0 \text{ V}$; $V_{DS} = 1.0 \text{ V}$, $f = 1.0 \text{ MHz}$			1490			
Output Capacitance	C_{oss}	$V_{GS} = 0 \text{ V}$; $V_{DS} = 400 \text{ V}$, $f = 1.0 \text{ MHz}$			42			
Effective Output Capacitance	$C_{oss eff.}$	$V_{GS} = 0 \text{ V}$; $V_{DS} = 0 \text{ V}$ to 400 V^c			56			
Total Gate Charge	Q_g	$V_{GS} = 10 \text{ V}$	$I_D = 8 \text{ A}$, $V_{DS} = 400 \text{ V}$, see fig. 6 and 13 ^b	-	-	38	nC	
Gate-Source Charge	Q_{gs}			-	-	9.0		
Gate-Drain Charge	Q_{gd}			-	-	18		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250 \text{ V}$, $I_D = 8 \text{ A}$ $R_g = 9.1 \Omega$, $R_D = 31 \Omega$, see fig. 10 ^b		-	11	-	ns	
Rise Time	t_r			-	23	-		
Turn-Off Delay Time	$t_{d(off)}$			-	26	-		
Fall Time	t_f			-	19	-		
Drain-Source Body Diode Characteristics								
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	8.0	A	
Pulsed Diode Forward Current ^a	I_{SM}			-	-	32		
Body Diode Voltage	V_{SD}	$T_J = 25 \text{ }^{\circ}\text{C}$, $I_S = 8 \text{ A}$, $V_{GS} = 0 \text{ V}^b$		-	-	2.0	V	
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25 \text{ }^{\circ}\text{C}$, $I_F = 8 \text{ A}$, $dI/dt = 100 \text{ A}/\mu\text{s}^b$		-	422	633	ns	
Body Diode Reverse Recovery Charge	Q_{rr}			-	2.16	3.24	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} .

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Fig. 1 - Typical Output Characteristics, $T_C = 25 \text{ }^\circ\text{C}$

Fig. 3 - Typical Transfer Characteristics

Fig. 2 - Typical Output Characteristics, $T_C = 150 \text{ }^\circ\text{C}$

Fig. 4 - Normalized On-Resistance vs. Temperature

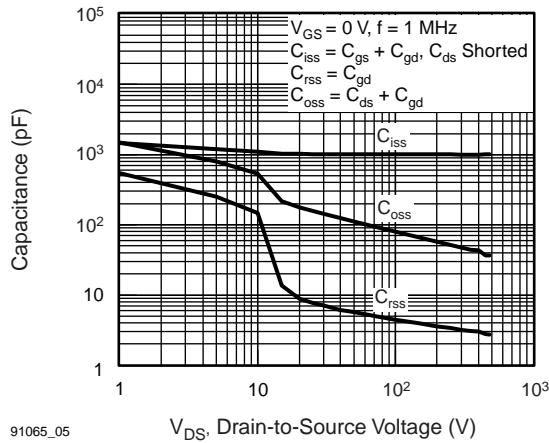


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

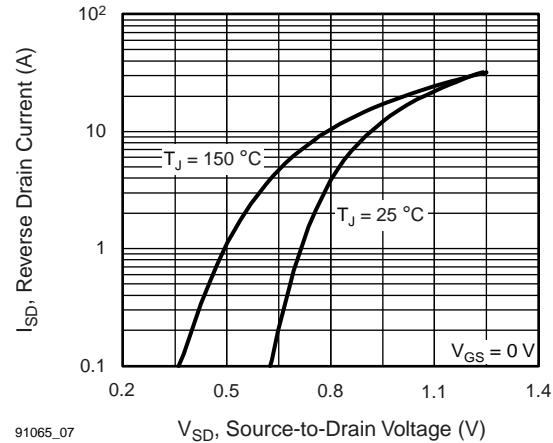


Fig. 7 - Typical Source-Drain Diode Forward Voltage

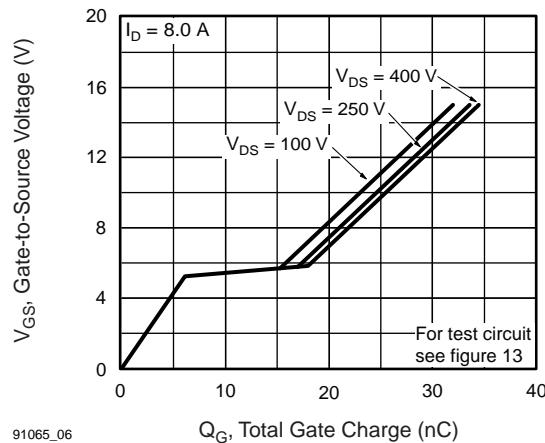


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

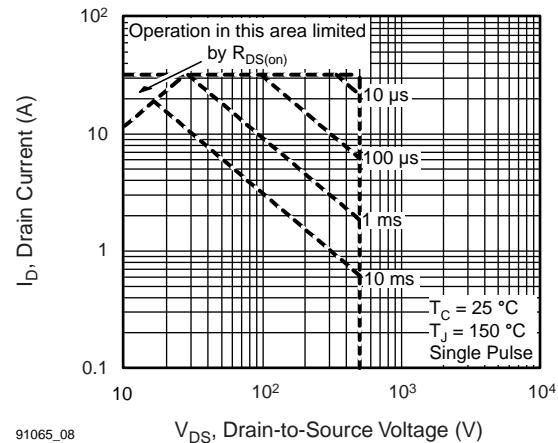
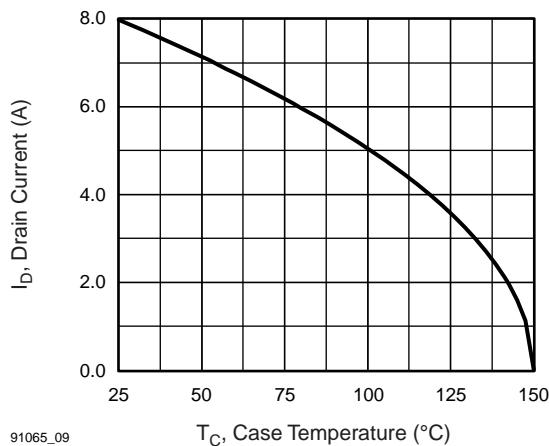
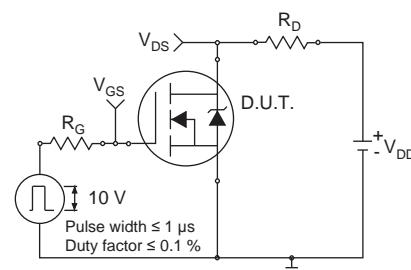
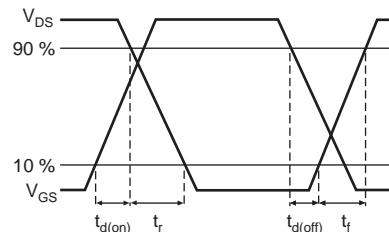
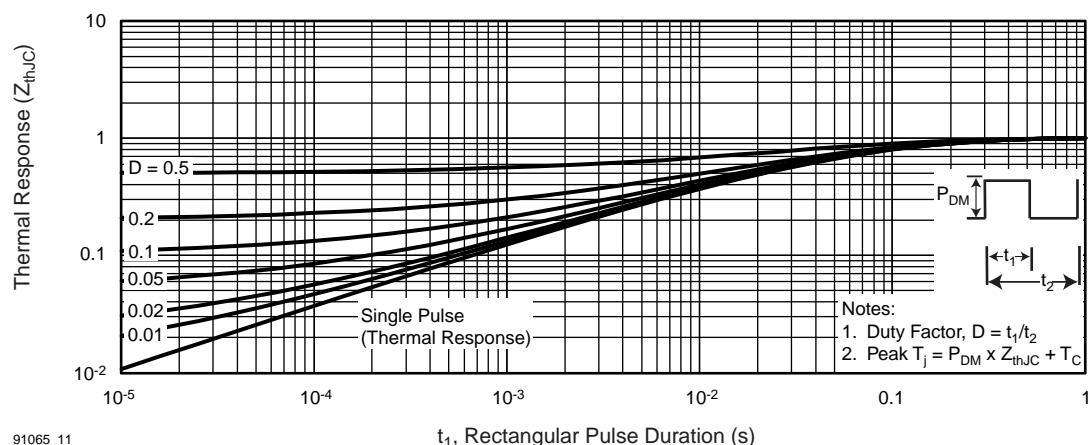


Fig. 8 - Maximum Safe Operating Area


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

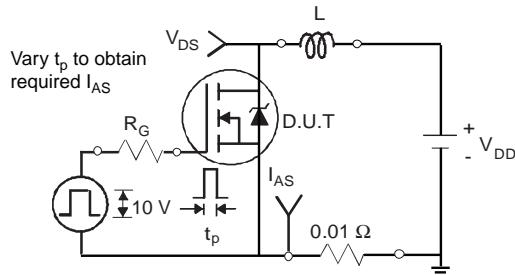


Fig. 12a - Unclamped Inductive Test Circuit

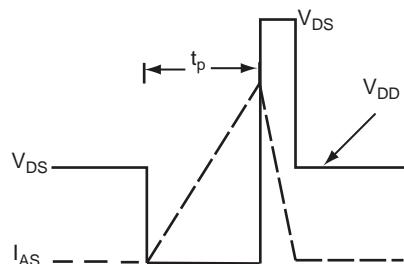
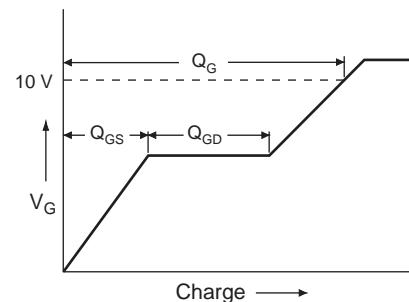


Fig. 12b - Unclamped Inductive Waveforms

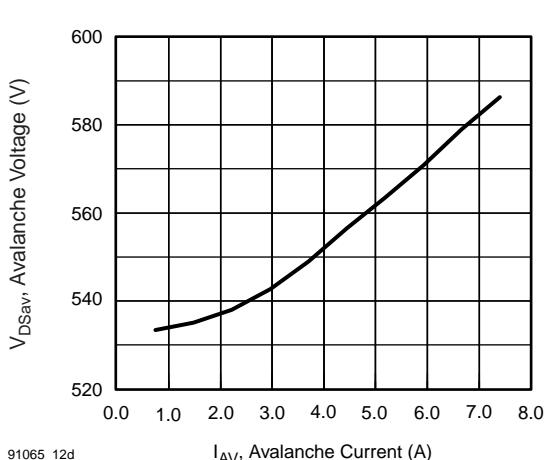


Fig. 13a - Typical Drain-to-Source Voltage vs. Avalanche Current

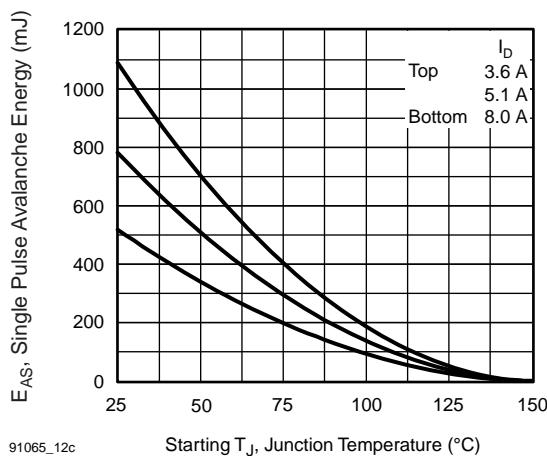


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

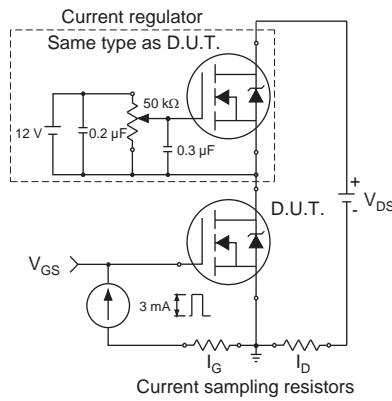
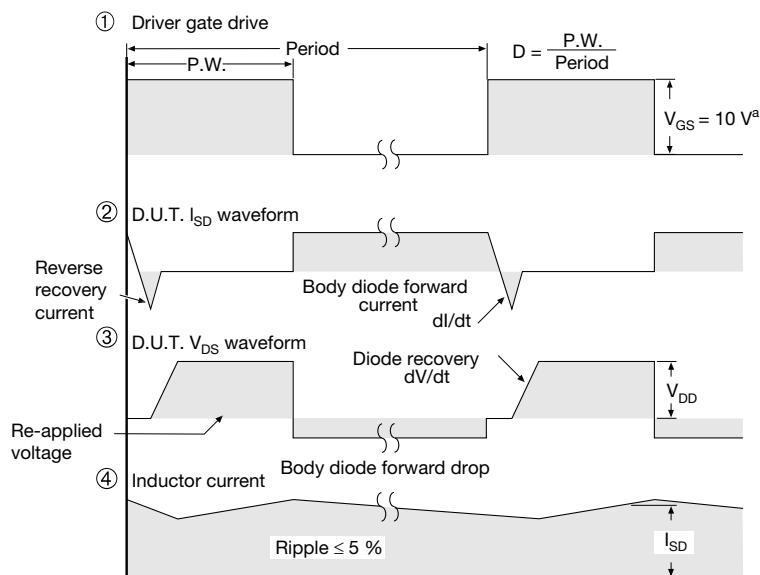
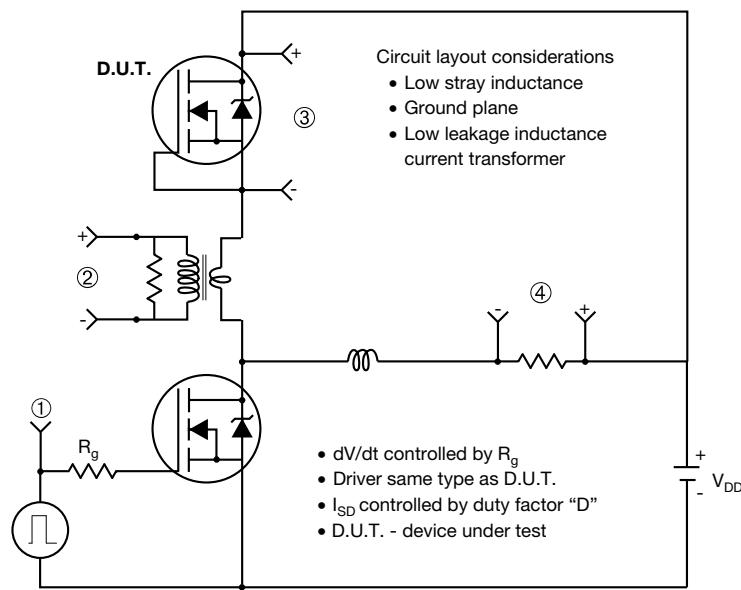


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



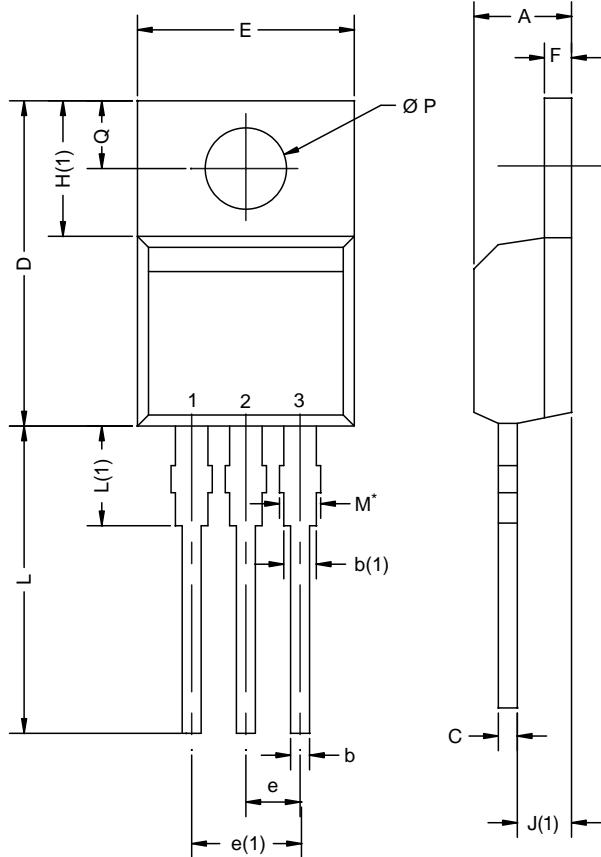
Note

a. $V_{CS} = 5$ V for logic level devices

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

ECN: X12-0208-Rev. N, 08-Oct-12
DWG: 5471

Notes

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

- Xi'an and Mingxin actual photo

