

IRFPE50PBF-VB Datasheet

Power MOSFET

PRODUCT SUMMARY

V_{DS} (V) at T_J max.	850	
$R_{DS(on)}$ typ. at 25 °C (Ω)	$V_{GS} = 10$ V	0.90
Q_g max. (nC)	43	
Q_{gs} (nC)	5	
Q_{gd} (nC)	22	
Configuration	Single	

FEATURES

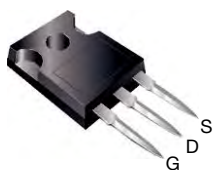
- Low figure-of-merit (FOM) $R_{on} \times Q_g$
- Low input capacitance (C_{iss})
- Reduced switching and conduction losses
- Ultra low gate charge (Q_g)
- Avalanche energy rated (UIS)



APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
 - High-intensity discharge (HID)
 - Fluorescent ballast lighting
- Industrial

TO-247AC



Top View



N-Channel MOSFET

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

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V _{DS}	850	V
Gate-Source Voltage			V _{GS}	± 30	
Continuous Drain Current (T _J = 150 °C)	V _{GS} at 10 V	T _C = 25 °C	I _D	10	A
		T _C = 100 °C		8.0	
Pulsed Drain Current ^a			I _{DM}	40	
Linear Derating Factor				3.2	W/°C
Single Pulse Avalanche Energy ^b			E _{AS}	280	mJ
Maximum Power Dissipation			P _D	106 /34	W
Operating Junction and Storage Temperature Range			T _J , T _{stg}	-55 to +150	°C
Drain-Source Voltage Slope	T _J = 125 °C		dV/dt	15	V/ns
Reverse Diode dV/dt ^d				4.1	
Soldering Recommendations (Peak Temperature) ^c	for 10 s			300	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 50$ V, starting $T_J = 25$ °C, $L = 28.2$ mH, $R_g = 25$ Ω , $I_{AS} = 4.5$ A.
- 1.6 mm from case.
- $I_{SD} \leq I_D$, $dI/dt = 100$ A/ μ s, starting $T_J = 25$ °C.

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	60	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.8	

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

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA		850	-	-	V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 1 mA		-	0.75	-	V/°C
Gate-Source Threshold Voltage (N)	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		2	-	4	V
Gate-Source Leakage	I _{GSS}	V _{GS} = ± 20 V		-	-	± 100	nA
		V _{GS} = ± 30 V		-	-	± 1	μA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 850 V, V _{GS} = 0 V		-	-	1	μA
		V _{DS} = 680 V, V _{GS} = 0 V, T _J = 125 °C		-	-	10	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 8 A	-	0.9	-	Ω
Forward Transconductance	g _{fs}	V _{DS} = 30 V, I _D = 8 A		-	16	-	S
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 100 V, f = 1 MHz		-	730	-	pF
Output Capacitance	C _{oss}			-	70	-	
Reverse Transfer Capacitance	C _{rss}			-	8	-	
Effective Output Capacitance, Energy Related ^a	C _{o(er)}	V _{DS} = 0 V to 680 V, V _{GS} = 0 V		-	63	-	
Effective Output Capacitance, Time Related ^b	C _{o(tr)}			-	213	-	
Total Gate Charge	Q _g	V _{GS} = 10 V	I _D = 8 A, V _{DS} = 680 V	-	43	96	nC
Gate-Source Charge	Q _{gs}			-	5	-	
Gate-Drain Charge	Q _{gd}			-	22	-	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 680 V, I _D = 8 A, V _{GS} = 10 V, R _g = 9.1 Ω		-	13	25	ns
Rise Time	t _r			-	11	35	
Turn-Off Delay Time	t _{d(off)}			-	81	90	
Fall Time	t _f			-	25	40	
Gate Input Resistance	R _g	f = 1 MHz, open drain		-	3.5	-	Ω
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I _S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	15	A
Pulsed Diode Forward Current	I _{SM}			-	-	40	
Diode Forward Voltage	V _{SD}	T _J = 25 °C, I _S = 8 A, V _{GS} = 0 V		-	-	1.5	V
Reverse Recovery Time	t _{rr}	T _J = 25 °C, I _F = I _S = 8 A, di/dt = 100 A/μs, V _R = 400 V		-	345	-	ns
Reverse Recovery Charge	Q _{rr}			-	4.5	-	μC
Reverse Recovery Current	I _{RRM}			-	35	-	A

Notes

- a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .
 b. $C_{oss(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

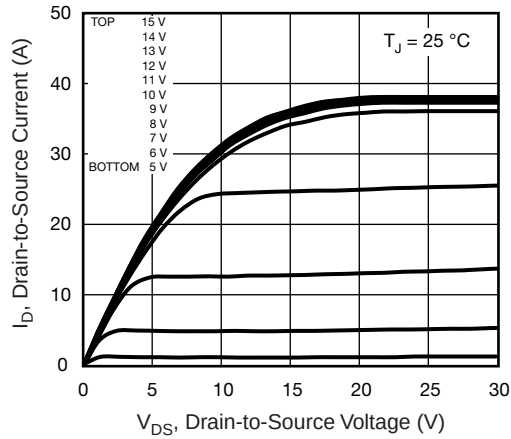


Fig. 1 - Typical Output Characteristics

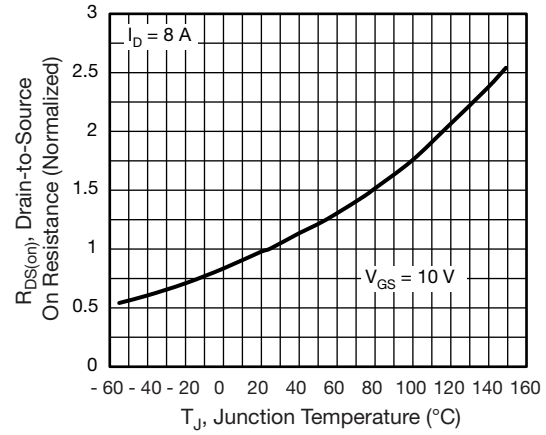


Fig. 4 - Normalized On-Resistance vs. Temperature

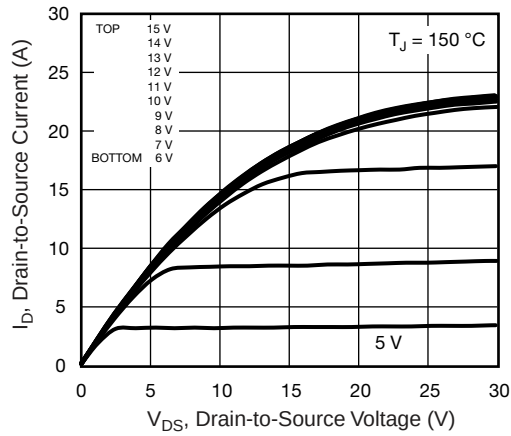


Fig. 2 - Typical Output Characteristics

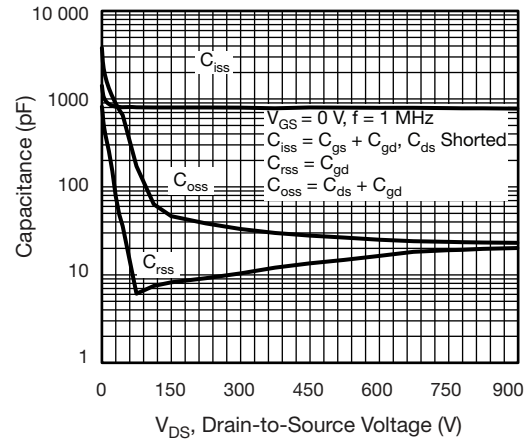


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

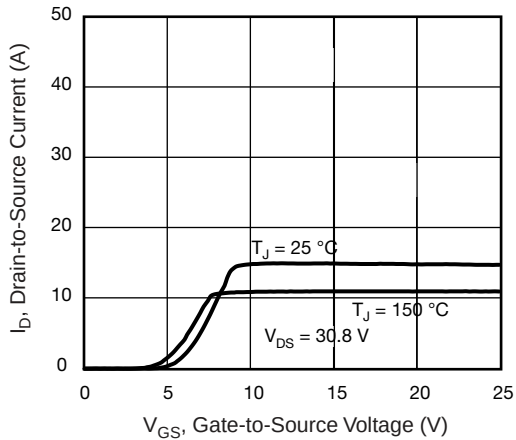


Fig. 3 - Typical Transfer Characteristics

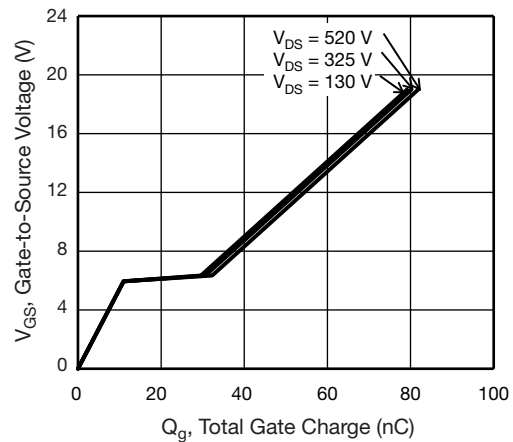


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

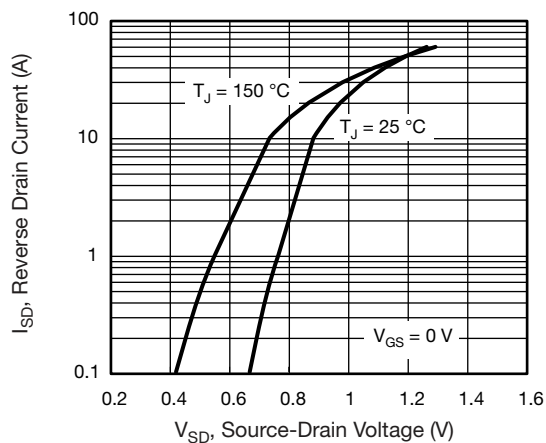


Fig. 7 - Typical Source-Drain Diode Forward Voltage

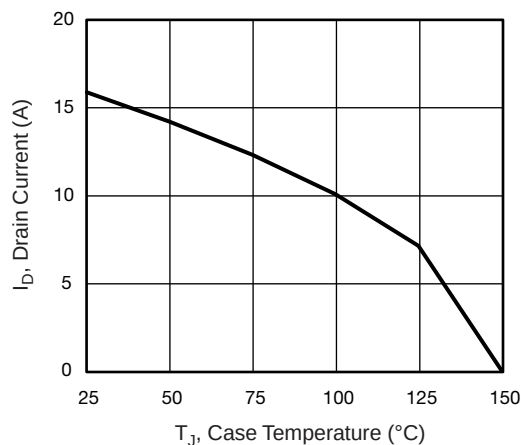


Fig. 9 - Maximum Drain Current vs. Case Temperature

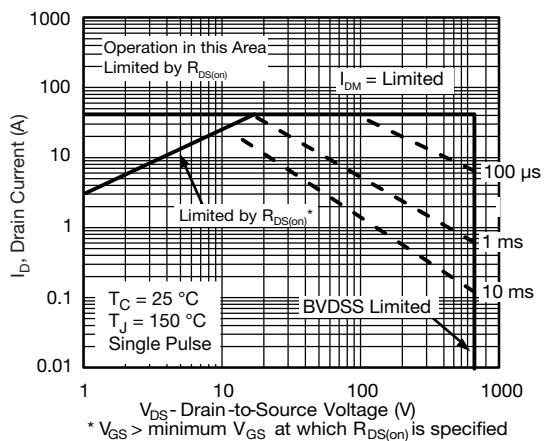


Fig. 8 - Maximum Safe Operating Area

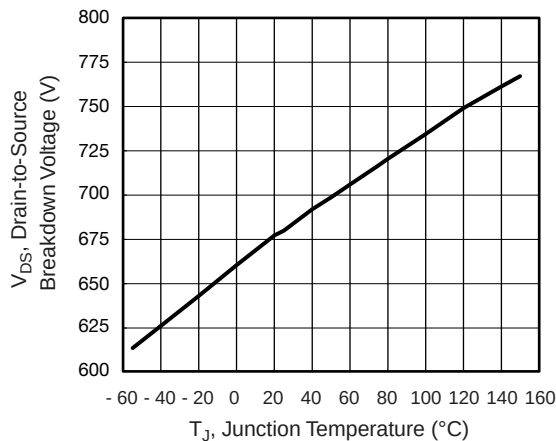


Fig. 10 - Temperature vs. Drain-to-Source Voltage

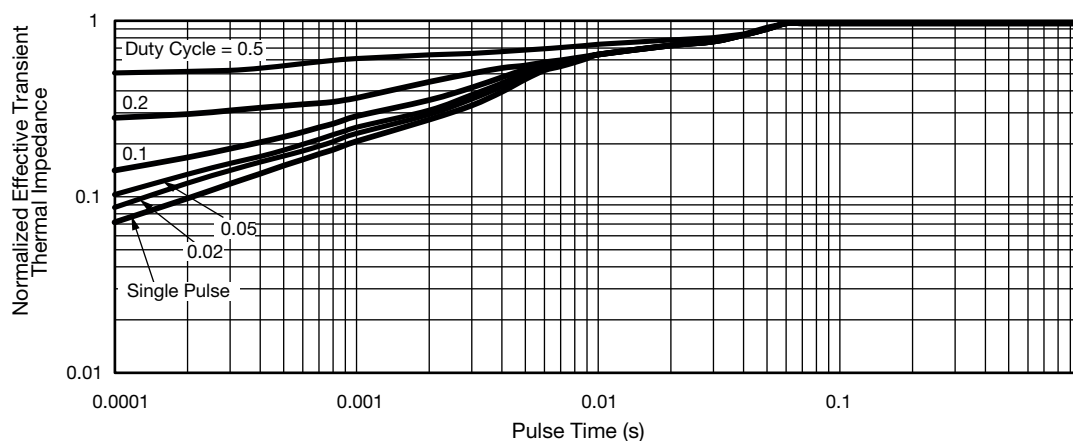


Fig. 11 - Normalized Thermal Transient Impedance, Junction-to-Case

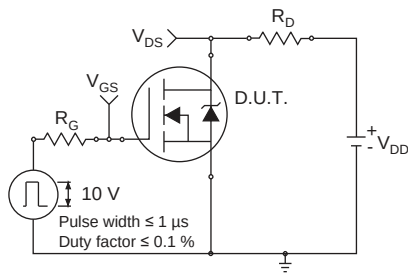


Fig. 12 - Switching Time Test Circuit

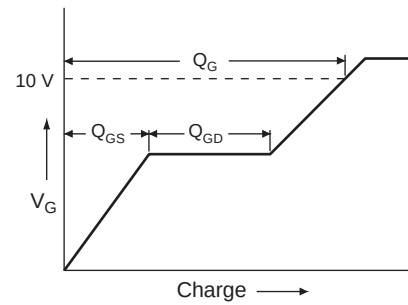


Fig. 16 - Basic Gate Charge Waveform

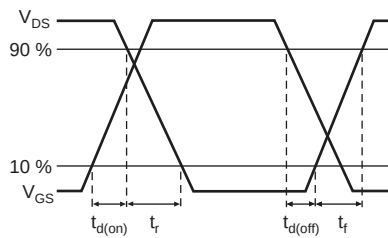


Fig. 13 - Switching Time Waveforms

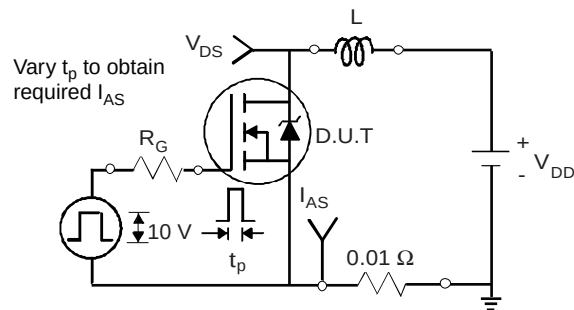


Fig. 14 - Unclamped Inductive Test Circuit

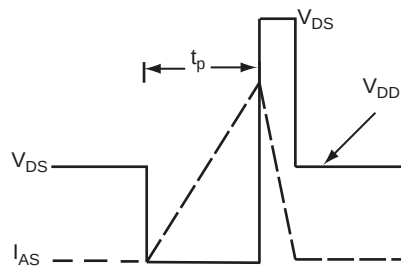


Fig. 15 - Unclamped Inductive Waveforms

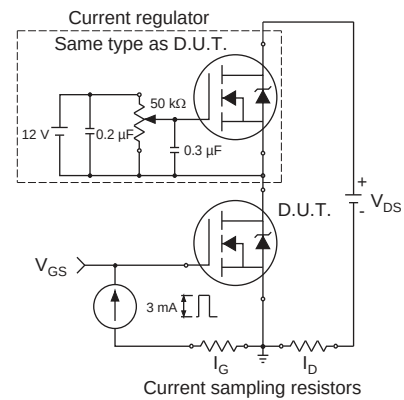
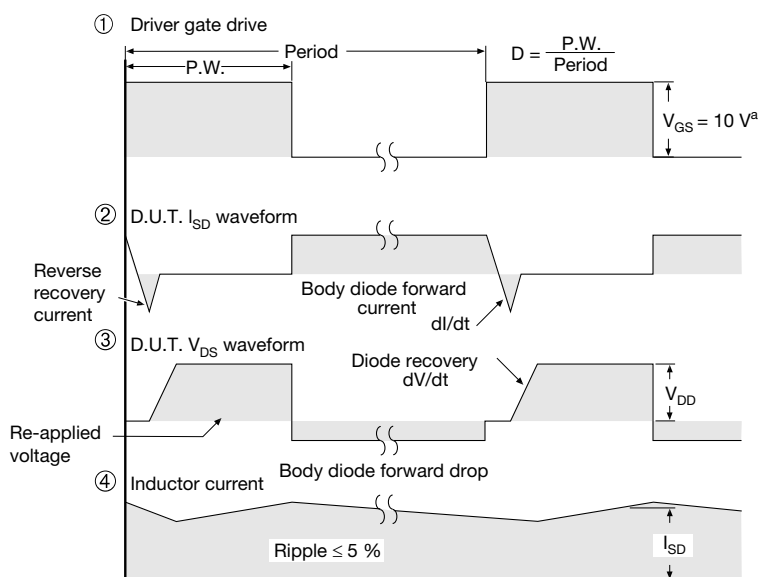
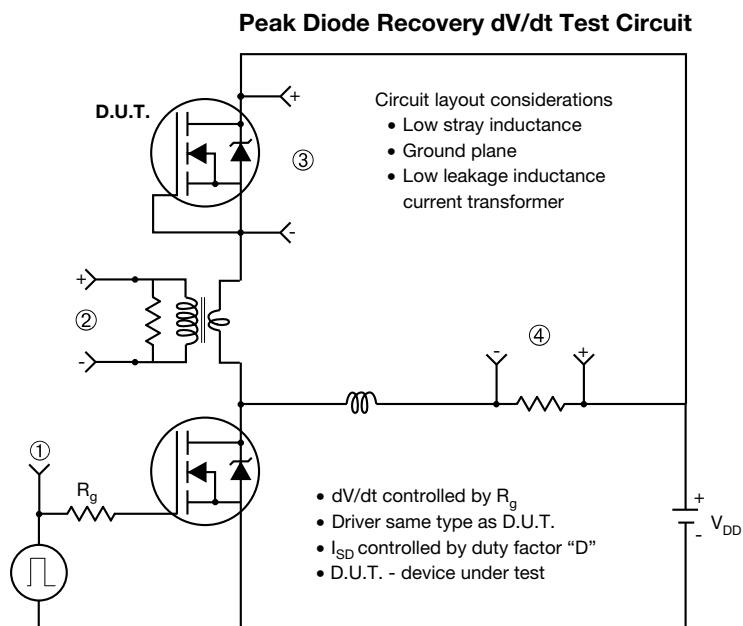


Fig. 17 - Gate Charge Test Circuit

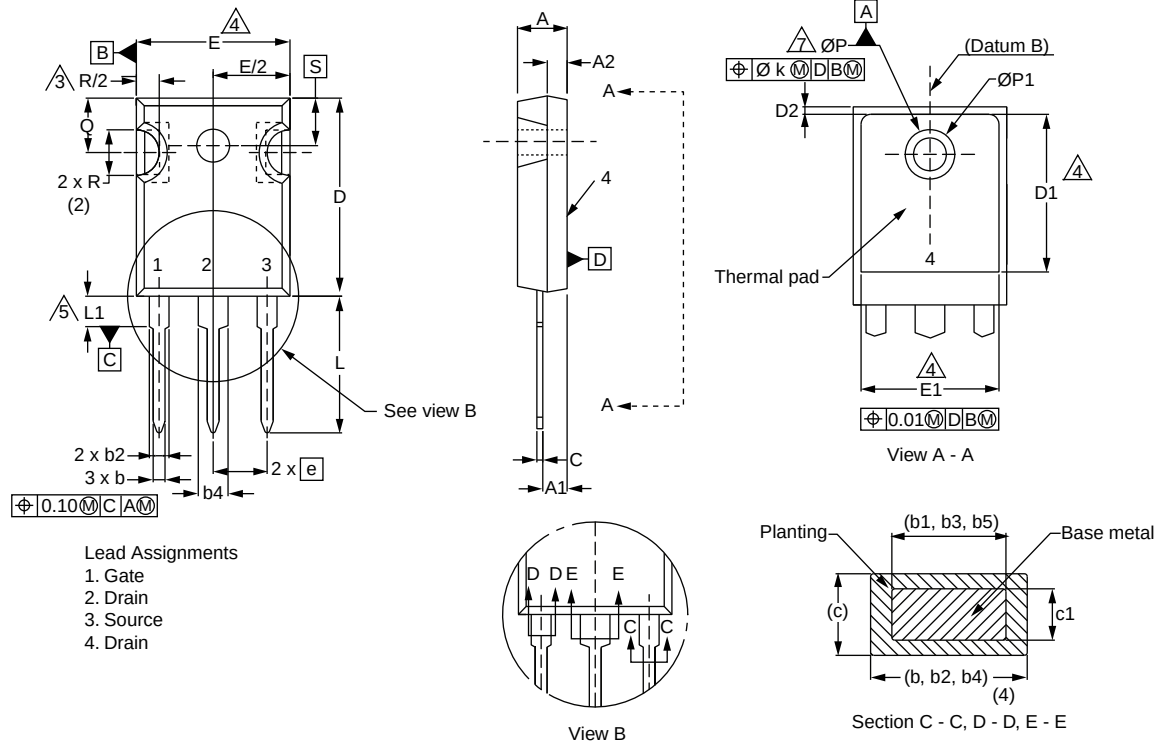


Note

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

Fig. 18 - For N-Channel

TO-247AC (High Voltage)



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.58	5.31	0.180	0.209
A1	2.21	2.59	0.087	0.102
A2	1.17	2.49	0.046	0.098
b	0.99	1.40	0.039	0.055
b1	0.99	1.35	0.039	0.053
b2	1.53	2.39	0.060	0.094
b3	1.65	2.37	0.065	0.093
b4	2.42	3.43	0.095	0.135
b5	2.59	3.38	0.102	0.133
c	0.38	0.86	0.015	0.034
c1	0.38	0.76	0.015	0.030
D	19.71	20.82	0.776	0.820
D1	13.08	-	0.515	-

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
D2	0.51	1.30	0.020	0.051
E	15.29	15.87	0.602	0.625
E1	13.72	-	0.540	-
e	5.46 BSC		0.215 BSC	
Ø k	0.254		0.010	
L	14.20	16.25	0.559	0.640
L1	3.71	4.29	0.146	0.169
N	7.62 BSC		0.300 BSC	
Ø P	3.51	3.66	0.138	0.144
Ø P1	-	7.39	-	0.291
Q	5.31	5.69	0.209	0.224
R	4.52	5.49	0.178	0.216
S	5.51 BSC		0.217 BSC	

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