

Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	500	
$R_{DS(on)}$ (Max.) (Ω)	$V_{GS} = 10\text{ V}$	1.40
Q_g (Max.) (nC)	24	
Q_{gs} (nC)	6.3	
Q_{gd} (nC)	11	
Configuration	Single	

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- 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
- Effective C_{OSS} specified
- Compliant to RoHS Directive 2002/95/EC



RoHS*
COMPLIANT
HALOGEN
FREE
Available

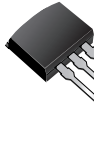
APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply
- High speed power switching

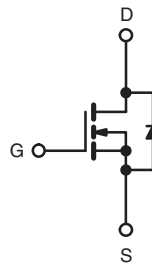
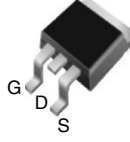
TYPICAL SMPS TOPOLOGIES

- Two Transistor Forward
- Half Bridge and Full Bridge

I²PAK
(TO-262)



D²PAK
(TO-263)



N-Channel MOSFET

ORDERING INFORMATION

Package	D ² PAK (TO-263)	D ² PAK (TO-263)	I ² PAK (TO-262)
Lead (Pb)-free and Halogen-free	SiHF830AS-GE3	SiHF830ASTRL-GE3 ^a	SiHF830AL-GE3 ^a
Lead (Pb)-free	IRF830ASPbF	IRF830ASTRLPbF ^a	IRF830ALPbF
	SiHF830AS-E3	SiHF830ASTL-E3 ^a	SiHF830AL-E3

Note

- a. See device orientation.

ABSOLUTE MAXIMUM RATINGS ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	V_{DS}	500	V	
Gate-Source Voltage	V_{GS}	± 30		
Continuous Drain Current	V_{GS} at 10 V	$T_C = 25\text{ }^\circ\text{C}$	A	
		$T_C = 100\text{ }^\circ\text{C}$		
Pulsed Drain Current ^{a, e}	I_{DM}	20		
Linear Derating Factor		0.59	W/ $^\circ\text{C}$	
Single Pulse Avalanche Energy ^{b, e}	E_{AS}	230	mJ	
Avalanche Current ^a	I_{AR}	5.0	A	
Repetitive Avalanche Energy ^a	E_{AR}	7.4	mJ	
Maximum Power Dissipation	P_D	$T_A = 25\text{ }^\circ\text{C}$	3.1	W
		$T_C = 25\text{ }^\circ\text{C}$	74	
Peak Diode Recovery dV/dt ^{c, e}	dV/dt	5.3	V/ns	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 150	$^\circ\text{C}$	
Soldering Recommendations (Peak Temperature)	for 10 s	300 ^d		

Notes


- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Starting $T_J = 25\text{ }^\circ\text{C}$, $L = 18\text{ mH}$, $R_g = 25\text{ }^\circ\Omega$, $I_{AS} = 5.0\text{ A}$ (see fig. 12).
- $I_{SD} \leq 5.0\text{ A}$, $dI/dt \leq 370\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^\circ\text{C}$.
- 1.6 mm from case.
- Uses SiHF830A data and test conditions.

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

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient (PCB Mounted, Steady-State) ^a	R_{thJA}	-	40	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	1.7	

Note

a. When mounted on 1" square PCB (FR-4 or G-10 material).

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}	$V_{GS} = 0, I_D = 250\text{ }\mu\text{A}$	500	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}^d$	-	0.60	-	V/°C	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.0	-	4.5	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	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ $I_D = 3.0\text{ A}^b$	-	-	1.4	Ω	
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}, I_D = 3.0\text{ A}^d$	2.8	-	-	S	
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1.0\text{ MHz}$, see fig. 5 ^d	-	620	-	pF	
Output Capacitance	C_{oss}		-	93	-		
Reverse Transfer Capacitance	C_{rss}		-	4.3	-		
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V}$	$V_{DS} = 1.0\text{ V}, f = 1.0\text{ MHz}$	-	886	-	
Effective Output Capacitance	$C_{oss\text{ eff.}}$		$V_{DS} = 400\text{ V}, f = 1.0\text{ MHz}$	-	27	-	
			$V_{DS} = 0\text{ V to } 400\text{ V}^{c, d}$	-	39	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 5.0\text{ A}, V_{DS} = 400\text{ V}$, see fig. 6 and 13 ^{b, d}	-	-	24	nC
Gate-Source Charge	Q_{gs}			-	-	6.3	
Gate-Drain Charge	Q_{gd}			-	-	11	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250\text{ V}, I_D = 5.0\text{ A}, R_g = 14\text{ }\Omega, R_D = 49\text{ }\Omega$, see fig. 10 ^{b, d}	-	10	-	ns	
Rise Time	t_r		-	21	-		
Turn-Off Delay Time	$t_{d(off)}$		-	21	-		
Fall Time	t_f		-	15	-		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	5.0	A	
Pulsed Diode Forward Current ^a	I_{SM}		-	-	20		
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = 5.0\text{ A}, V_{GS} = 0\text{ V}^b$	-	-	1.5	V	
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = 5.0\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}^{b, d}$	-	430	650	ns	
Body Diode Reverse Recovery Charge	Q_{rr}		-	2.0	3.0	μC	
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.
- $C_{oss\text{ eff.}}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80 % V_{DS} .
- Uses SiHF830A data and test conditions.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

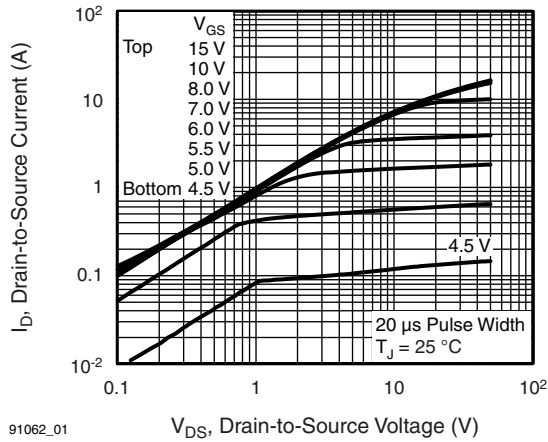


Fig. 1 - Typical Output Characteristics

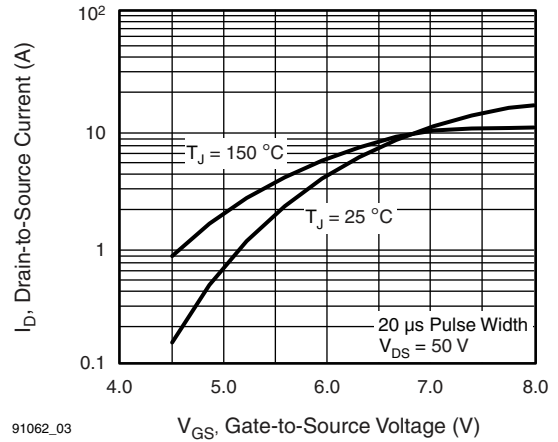


Fig. 3 - Typical Transfer Characteristics

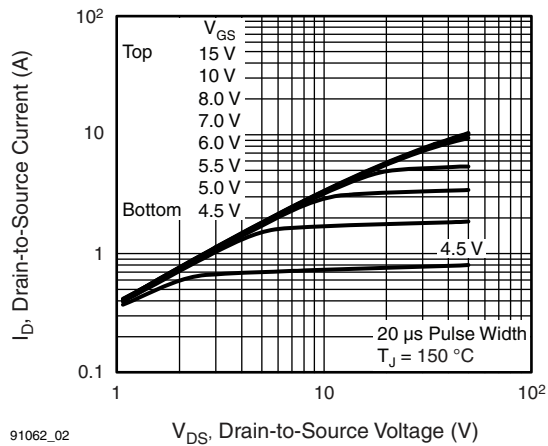


Fig. 2 - Typical Output Characteristics

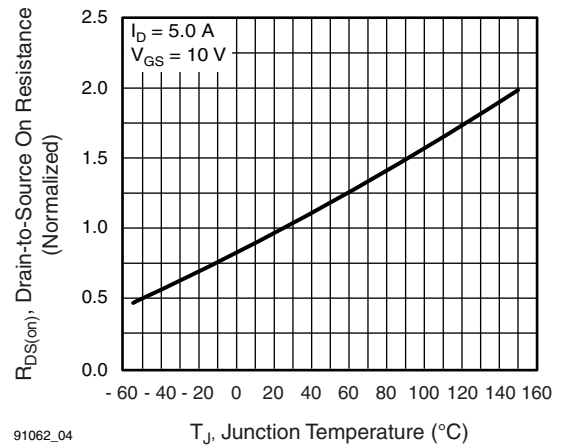
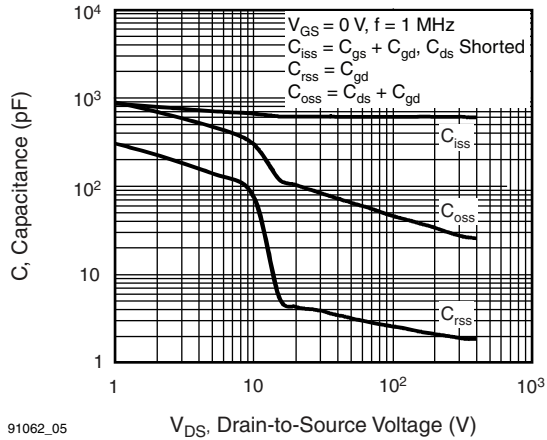
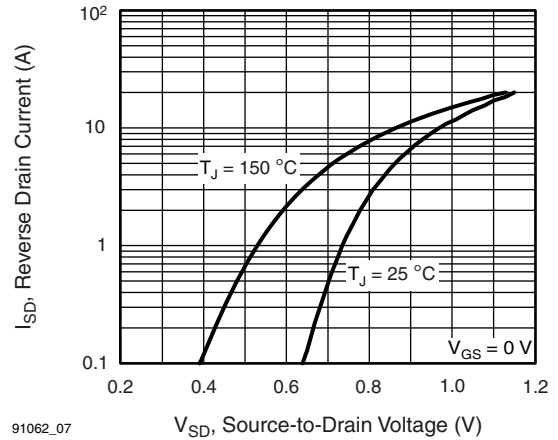


Fig. 4 - Normalized On-Resistance vs. Temperature



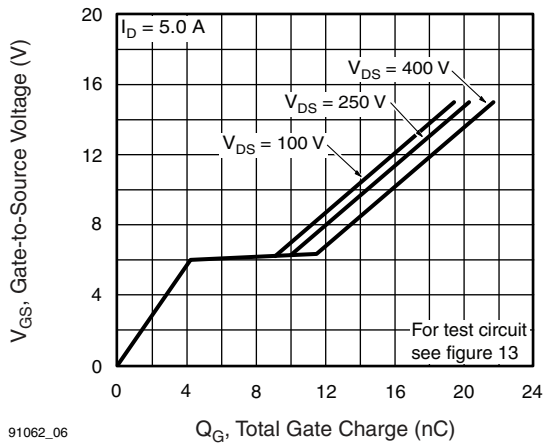
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Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage



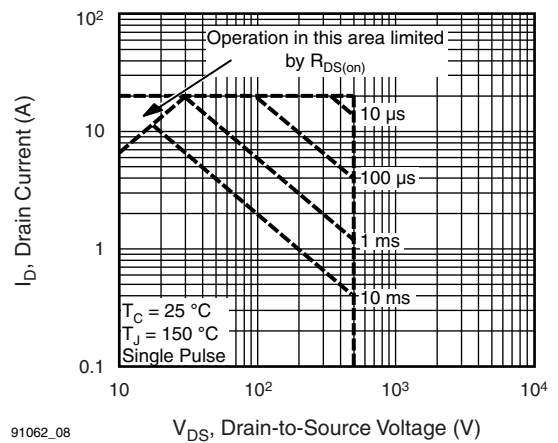
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Fig. 7 - Typical Source-Drain Diode Forward Voltage



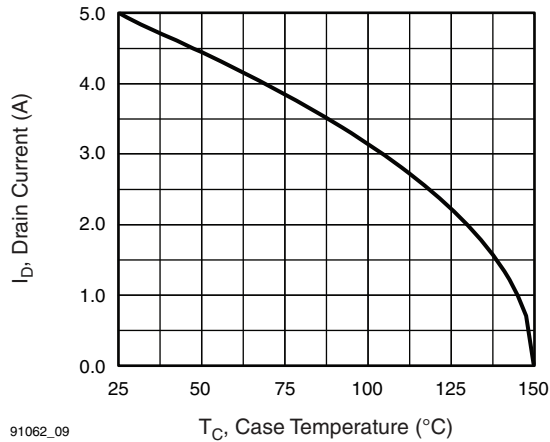
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Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage



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Fig. 8 - Maximum Safe Operating Area



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Fig. 9 - Maximum Drain Current vs. Case Temperature

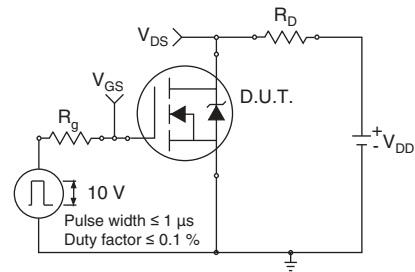


Fig. 10a - Switching Time Test Circuit

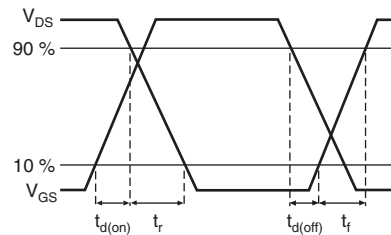
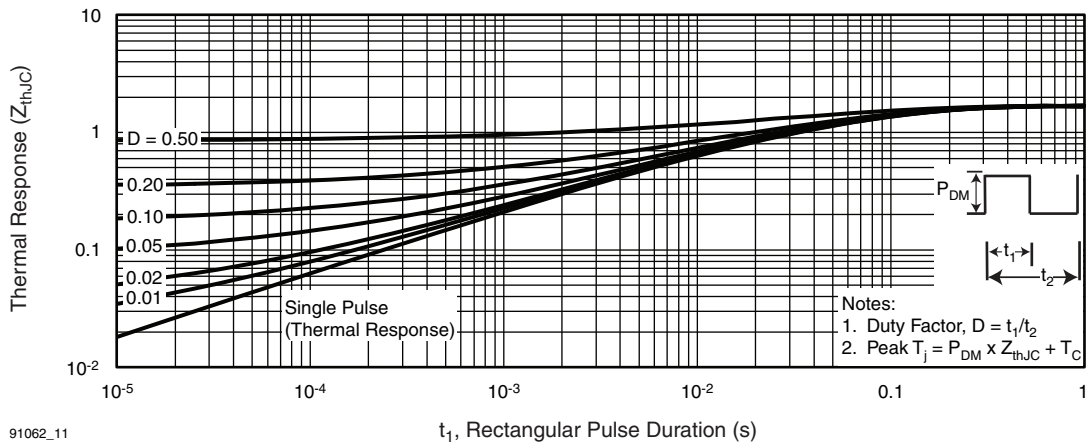


Fig. 10b - Switching Time Waveforms



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

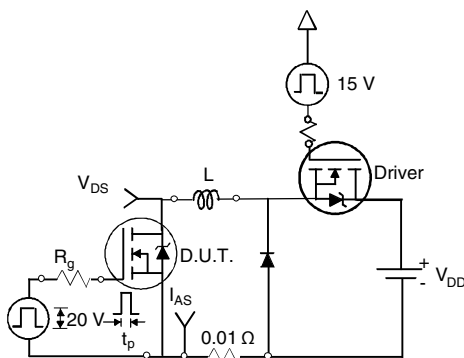


Fig. 12a - Unclamped Inductive Test Circuit

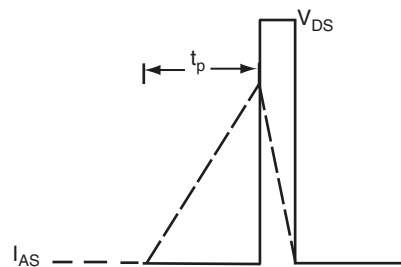
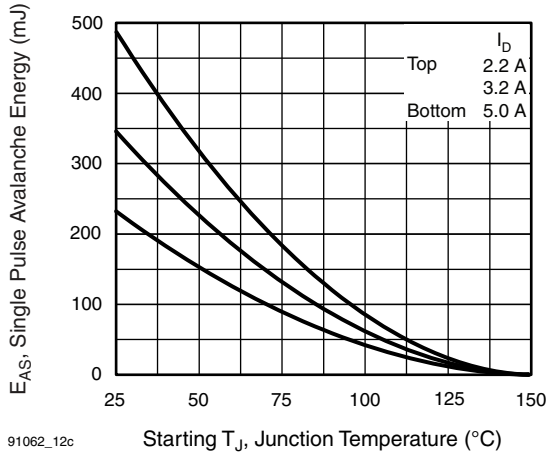
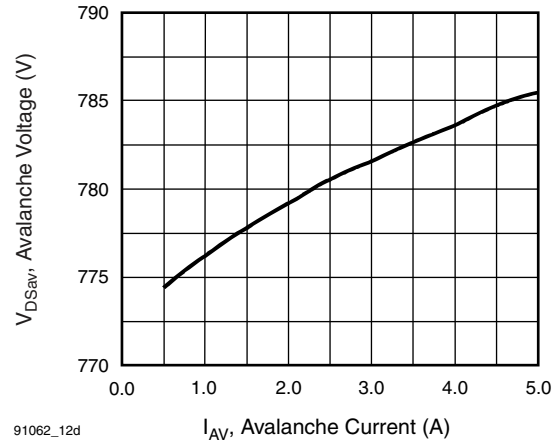


Fig. 12b - Unclamped Inductive Waveforms



91062_12c

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



91062_12d

Fig. 12d - Basic Gate Charge Waveform

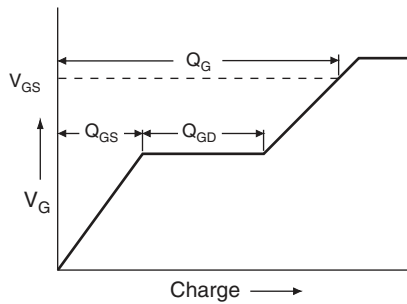


Fig. 13a - Maximum Avalanche Energy vs. Drain Current

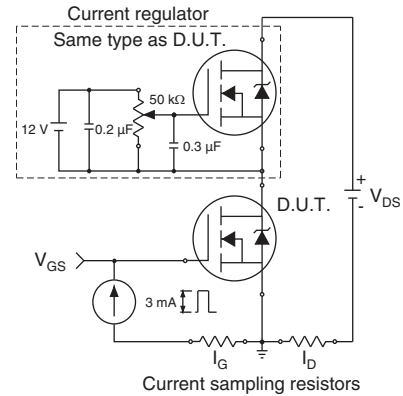
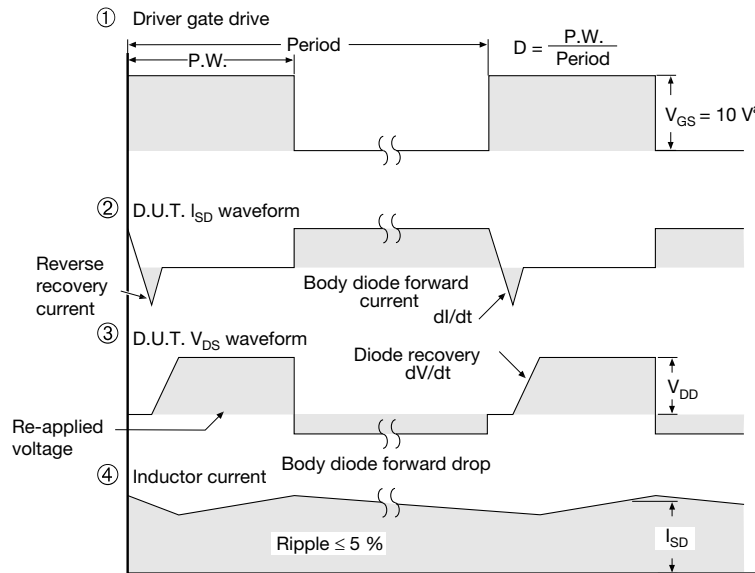


Fig. 13b - Gate Charge Test Circuit



Note

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

Fig. 14 - For N-Channel

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TO-263AB (HIGH VOLTAGE)



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	0.00	0.25	0.000	0.010
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
c	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065
D	8.38	9.65	0.330	0.380

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	-	1.65	-	0.066
L2	-	1.78	-	0.070
L3	0.25 BSC		0.010 BSC	
L4	4.78	5.28	0.188	0.208

ECN: S-82110-Rev. A, 15-Sep-08
DWG: 5970

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body at datum A.
4. Thermal PAD contour optional within dimension E, L1, D1 and E1.
5. Dimension b1 and c1 apply to base metal only.
6. Datum A and B to be determined at datum plane H.
7. Outline conforms to JEDEC outline to TO-263AB.

I²PAK (TO-262) (HIGH VOLTAGE)



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	2.03	3.02	0.080	0.119
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
c	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
D	8.38	9.65	0.330	0.380
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
L	13.46	14.10	0.530	0.555
L1	-	1.65	-	0.065
L2	3.56	3.71	0.140	0.146

ECN: S-82442-Rev. A, 27-Oct-08
DWG: 5977

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm per side. These dimensions are measured at the outmost extremes of the plastic body.
3. Thermal pad contour optional within dimension E, L1, D1, and E1.
4. Dimension b1 and c1 apply to base metal only.



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