## MOSFET - Power, N-Channel, UltraFET

55 V, 75 A, 7 m $\Omega$

## HUF75345G3, HUF75345P3, HUF75345S3S

## Description

These N -Channel power MOSFETs are manufactured using the innovative UltraFET process. This advanced process technology achieves the lowest possible on-resistance per silicon area, resulting in outstanding performance. This device is capable of withstanding high energy in the avalanche mode and the diode exhibits very low reverse recovery time and stored charge. It was designed for use in applications where power efficiency is important, such as switching regulators, switching converters, motor drivers, relay drivers, low-voltage bus switches, and power management in portable and battery-operated products.

## Features

- 75 A, 55 V
- Simulation Models
- Temperature Compensated PSPICE ${ }^{\text {TM }}$ and SABER ${ }^{\circledR}$ Models
- Thermal Impedance SPICE and SABER Models
- Peak Current vs Pulse Width Curve
- UIS Rating Curve
- These Devices are Pb -Free

ON Semiconductor ${ }^{\circledR}$
www.onsemi.com

| $\mathbf{V}_{\text {DSS }}$ | $\mathbf{R}_{\text {DS(ON) }}$ MAX | $\mathbf{I}_{\mathbf{D}}$ MAX |
| :---: | :---: | :---: |
| 55 V | $7 \mathrm{~m} \Omega$ | 75 A |



MARKING DIAGRAM


| $\$ Y$ | $=$ ON Semiconductor Logo |
| :--- | :--- |
| $\& Z$ | $=$ Assembly Plant Code |
| $\& 3$ | $=$ Data Code (Year \& Week) |
| $\& K$ | $=$ Lot |
| $75345 X$ | $=$ Specific Device Code |
|  | $X=G / P / S$ |

ORDERING INFORMATION
See detailed ordering and shipping information on page 2 of this data sheet.

PACKAGE MARKING AND ORDERING INFORMATION

| Part Number | Package | Brand |
| :---: | :---: | :---: |
| HUF75345G3 | TO-247-3 | 75345 G |
| HUF75345P3 | TO-220-3 | 75345 P |
| HUF75345S3ST | D2PAK-3 | 75345 S |

MOSFET MAXIMUM RATINGS $\left(T_{C}=25^{\circ} \mathrm{C}\right.$, Unless otherwise noted)

| Symbol |  | Parameter | Value | Unit |
| :---: | :---: | :---: | :---: | :---: |
| $\mathrm{V}_{\text {DSS }}$ | Drain to Source Voltage (Note 1) |  | 55 | V |
| $V_{\text {DGR }}$ | Drain to Gate Voltage ( $\mathrm{R}_{\mathrm{GS}}=20 \mathrm{k} \Omega$ ) (Note 1) |  | 55 | V |
| $\mathrm{V}_{\mathrm{GS}}$ | Gate to Source Voltage |  | $\pm 20$ | V |
| $\mathrm{I}_{\mathrm{D}}$ | Drain Current | - Continuous (Figure 2) | 75 | A |
| IDM | Drain Current | - Pulsed | Figure 4 |  |
| $\mathrm{E}_{\text {AS }}$ | Pulsed Avalanche Rating |  | Figure 6 |  |
| $\mathrm{P}_{\mathrm{D}}$ | Power Dissipation | ( $\mathrm{T}_{\mathrm{C}}=25^{\circ} \mathrm{C}$ ) | 325 | W |
|  |  | - Derate Above $25^{\circ} \mathrm{C}$ | 2.17 | W/ ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{T}_{\mathrm{J},} \mathrm{T}_{\text {STG }}$ | Operating and Storage Temperature |  | -55 to +175 | ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{T}_{\mathrm{L}}$ | Maximum Temperature for Soldering Leads at 0.063 in ( 1.6 mm ) from Case for 10 s |  | 300 | ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{T}_{\mathrm{pkg}}$ | Maximum Temperature for Soldering Leads Package Body for 10 s |  | 260 | ${ }^{\circ} \mathrm{C}$ |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. $\mathrm{T}_{J}=25^{\circ} \mathrm{C}$ to $150^{\circ} \mathrm{C}$

ELECTRICAL CHARACTERISTICS $\left(\mathrm{T}_{\mathrm{C}}=25^{\circ} \mathrm{C}\right.$ unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| OFF STATE CHARACTERISTICS |  |  |  |  |  |  |
| BV ${ }_{\text {DSS }}$ | Drain to Source Breakdown Voltage | $\mathrm{I}_{\mathrm{D}}=250 \mu \mathrm{~A}, \mathrm{~V}_{\mathrm{GS}}=0 \mathrm{~V}$ (Figure 11) | 55 |  |  | V |
| $\mathrm{I}_{\text {DSS }}$ | Zero Gate Voltage Drain Current | $\mathrm{V}_{\mathrm{DS}}=50 \mathrm{~V}, \mathrm{~V}_{\mathrm{GS}}=0 \mathrm{~V}$ |  |  | 1 | $\mu \mathrm{A}$ |
|  |  | $\mathrm{V}_{\mathrm{DS}}=45 \mathrm{~V}, \mathrm{~V}_{\mathrm{GS}}=0 \mathrm{~V}, \mathrm{~T}_{\mathrm{C}}=150^{\circ} \mathrm{C}$ |  |  | 250 |  |
| $\mathrm{I}_{\text {GSS }}$ | Gate to Source Leakage Current | $\mathrm{V}_{\mathrm{GS}}= \pm 20 \mathrm{~V}$ |  |  | $\pm 100$ | nA |

ON STATE CHARACTERISTICS

| $\mathrm{V}_{\mathrm{GS}(\mathrm{TH})}$ | Gate to Source Threshold Voltage | $\mathrm{V}_{\mathrm{GS}}=\mathrm{V}_{\mathrm{DS}}, \mathrm{I}_{\mathrm{D}}=250 \mu \mathrm{~A}$ (Figure 10) | 2 |  | 4.0 | V |
| :---: | :--- | :--- | :--- | :--- | :---: | :---: |
| $\mathrm{R}_{\mathrm{DS}(\mathrm{ON})}$ | Drain to Source On Resistance | $\mathrm{I}_{\mathrm{D}}=75 \mathrm{~A}, \mathrm{~V}_{\mathrm{GS}}=10 \mathrm{~V}$ (Figure 9) |  | 0.006 | 0.007 | $\Omega$ |

THERMAL CHARACTERISTICS

| $\mathrm{R}_{\theta \mathrm{JC}}$ | Thermal Resistance Junction to Case | (Figure 3) |  |  | 0.46 |
| :---: | :--- | :--- | :--- | :---: | :---: |
| $\mathrm{R}_{\theta \mathrm{JA}}$ | Thermal Resistance Junction to Ambient | TO-247 | ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |  |  |
|  | Thermal Resistance Junction to Ambient | TO-220, D2PAK |  |  | 30 |
| ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |  |  |  |  |  |

SWITCHING CHARACTERISTICS ( $\mathrm{V}_{\mathrm{GS}}=10 \mathrm{~V}$ )

| ton | Turn-On Time | $\begin{aligned} & \mathrm{V}_{\mathrm{DD}}=30 \mathrm{~V}, \mathrm{I}_{\mathrm{D}}=75 \mathrm{~A}, \\ & \mathrm{R}_{\mathrm{L}}=0.4 \Omega, \mathrm{~V}_{\mathrm{GS}}=10 \mathrm{~V}, \mathrm{R}_{\mathrm{GS}}=2.5 \Omega \end{aligned}$ |  | 195 | ns |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{t}_{\mathrm{d}(\mathrm{ON})}$ | Turn-On Delay Time |  | 14 |  | ns |
| $\mathrm{t}_{\mathrm{r}}$ | Rise Time |  | 118 |  | ns |
| $\mathrm{t}_{\mathrm{d} \text { (OFF) }}$ | Turn-Off Delay Time |  | 42 |  | ns |
| $\mathrm{t}_{\mathrm{f}}$ | Fall Time |  | 26 |  | ns |
| toff | Turn-Off Time |  |  | 98 | ns |

## GATE CHARGE CHARACTERISTICS

| $\mathrm{Q}_{\mathrm{g} \text { (tot) }}$ | Total Gate Charge | $\begin{aligned} & \hline \mathrm{V}_{\mathrm{GS}}=0 \mathrm{~V} \text { to } 20 \mathrm{~V}, \\ & \mathrm{~V}_{\mathrm{DD}}=30 \mathrm{~V}, \mathrm{I}_{\mathrm{D}}=75 \mathrm{~A}, \mathrm{R}_{\mathrm{L}}=0.4 \Omega, \\ & \mathrm{I}_{\mathrm{g}(\mathrm{REF})}=1.0 \mathrm{~mA} \text { (Figure 13) } \end{aligned}$ | 220 | 275 | nC |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{Q}_{\mathrm{g}(10)}$ | Gate Charge at 10 V | $\begin{aligned} & \hline V_{G S}=0 \mathrm{~V} \text { to } 10 \mathrm{~V}, \\ & \mathrm{~V}_{\mathrm{DD}}=30 \mathrm{~V}, \mathrm{I}_{\mathrm{D}}=75 \mathrm{~A}, \mathrm{R}_{\mathrm{L}}=0.4 \Omega, \\ & \mathrm{I}_{\mathrm{g}(\mathrm{REF})}=1.0 \mathrm{~mA} \text { (Figure 13) } \end{aligned}$ | 125 | 165 | nC |
| $\mathrm{Q}_{\mathrm{g}(\mathrm{th})}$ | Threshold Gate Charge | $\begin{aligned} & \mathrm{V}_{\mathrm{GS}}=0 \mathrm{~V} \text { to } 2 \mathrm{~V}, \\ & \mathrm{~V}_{\mathrm{DD}}=30 \mathrm{~V}, \mathrm{I}_{\mathrm{D}}=75 \mathrm{~A}, \mathrm{R}_{\mathrm{L}}=0.4 \Omega, \\ & \mathrm{I}_{\mathrm{g}(\mathrm{REF})}=1.0 \mathrm{~mA} \text { (Figure 13) } \end{aligned}$ | 6.8 | 10 | nC |
| $\mathrm{Q}_{\mathrm{gs}}$ | Gate to Source Gate Charge | $\begin{aligned} & \hline \mathrm{V}_{\mathrm{DD}}=30 \mathrm{~V}, \mathrm{I}_{\mathrm{D}}=75 \mathrm{~A}, \mathrm{R}_{\mathrm{L}}=0.4 \Omega, \\ & \mathrm{I}_{\mathrm{g}(\mathrm{REF})}=1.0 \mathrm{~mA} \text { (Figure 13) } \end{aligned}$ | 14 |  | nC |
| $Q_{\text {gd }}$ | Gate to Drain "Miller" Charge |  | 58 |  | nC |

CAPACITANCE CHARACTERISTICS

| $\mathrm{C}_{\text {iss }}$ | Input Capacitance | $\mathrm{V}_{\mathrm{DS}}=25 \mathrm{~V}, \mathrm{~V}_{\mathrm{GS}}=0 \mathrm{~V}, \mathrm{f}=1 \mathrm{Mhz}$ <br> (Figure 12) | 4000 | pF |
| :---: | :---: | :---: | :---: | :---: |
| $\mathrm{C}_{\text {oss }}$ | Output Capacitance |  | 1450 | pF |
| $\mathrm{C}_{\text {rss }}$ | Reverse Transfer Capacitance |  | 450 | pF |

SOURCE TO DRAIN DIODE CHARACTERISTICS

| $\mathrm{V}_{\mathrm{SD}}$ | Source to Drain Diode Voltage | $\mathrm{I}_{\mathrm{SD}}=75 \mathrm{~A}$ |  |  | 1.25 | V |
| :---: | :--- | :--- | :--- | :--- | :---: | :---: |
| $\mathrm{t}_{\mathrm{rr}}$ | Reverse Recovery Time | $\mathrm{I}_{\mathrm{SD}}=75 \mathrm{~A}, \mathrm{~d} \mathrm{I}_{\mathrm{SD}} / \mathrm{dt}=100 \mathrm{~A} / \mu \mathrm{s}$ |  |  | 55 | ns |
| $\mathrm{Q}_{\mathrm{RR}}$ | Reverse Recovered Charge | $\mathrm{I}_{\mathrm{SD}}=75 \mathrm{~A}, \mathrm{~d} \mathrm{I}_{\mathrm{SD}} / \mathrm{dt}=100 \mathrm{~A} / \mu \mathrm{s}$ |  |  | 80 | nC |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## HUF75345G3, HUF75345P3, HUF75345S3S

TYPICAL PERFORMANCE CURVES
$\mathrm{T}_{\mathrm{C}}=25^{\circ} \mathrm{C}$ unless otherwise noted


Figure 1. Normalized Power Dissipation vs. Case Temperature


Figure 2. Maximum Continuous Drain Current vs Case Temperature


Figure 3. Normalized Maximum Transient Thermal Impedance


Figure 4. Peak Current Capability

# HUF75345G3, HUF75345P3, HUF75345S3S 

TYPICAL CHARACTERISTICS (Continued)
$\mathrm{T}_{\mathrm{C}}=25^{\circ} \mathrm{C}$ unless otherwise noted

$\mathrm{V}_{\mathrm{DS}}$, DRAIN TO SOURCE VOLTAGE (V)
Figure 5. Forward Bias Safe Operating Area


Figure 7. Saturation Characteristics


Figure 9. Normalized Drain to Source On Resistance vs Junction Temperature

NOTE: Refer to ON Semiconductor Application Notes AN-7514 and AN-7515


Figure 6. Unclamped Inductive Switching Capability


Figure 8. Transfer Characteristics


Figure 10. Normalized Gate Threshold Voltage vs Junction Temperature

# HUF75345G3, HUF75345P3, HUF75345S3S 

TYPICAL CHARACTERISTICS (Continued)
$\mathrm{T}_{\mathrm{C}}=25^{\circ} \mathrm{C}$ unless otherwise noted


Figure 11. Normalized Drain to Source Breakdown vs. Junction Temperature


Figure 12. Capacitance vs. Drain to Source Voltage


Figure 13. Gate Charge Waveforms for Constant Gate Currents

## HUF75345G3, HUF75345P3, HUF75345S3S

TEST CIRCUITS WAVEFORMS


Figure 14. Unclamped Energy Test Circuit


Figure 16. Gate Charge Test Circuit


Figure 15. Unclamped Energy Waveforms


Figure 17. Gate Charge Waveforms


Figure 19. Resistive Switching Waveforms

## PSPICE Electrical Model

.SUBCKT HUF75345 213 ; rev 3 Feb 99
CA $1285.55 \mathrm{e}-9$
CB $15145.55 \mathrm{e}-9$
CIN 68 3.45e-9
DBODY 75 DBODYMOD
DBREAK 511 DBREAKMOD
DPLCAP 105 DPLCAPMOD
EBREAK 117171856.7
EDS 148581
EGS 138681
ESG 610681
EVTHRES 6211981
EVTEMP 20618221
IT 8171
LDRAIN 25 1e-9
LGATE 19 2.6e-9
LSOURCE 37 1.1e-9
KGATE LSOURCE LGATE 0.0085
MMED 16688 MMEDMOD
MSTRO 16688 MSTROMOD
MWEAK 162188 MWEAKMOD
RBREAK 1718 RBREAKMOD 1
RDRAIN 5016 RDRAINMOD 1e-4
RGATE 9200.36
RLDRAIN 2510
RLGATE 1926
RLSOURCE 3711
RSLC1 551 RSLCMOD 1e-6
RSLC2 5501 e 3
RSOURCE 87 RSOURCEMOD 3.15e-3
RVTHRES 228 RVTHRESMOD 1
RVTEMP 1819 RVTEMPMOD 1
S1A 612138 S1AMOD
S1B 1312138 S1BMOD
S2A 6151413 S2AMOD
S2B 13151413 S2BMOD
VBAT 2219 DC 1
$\operatorname{ESLC} 5150 \operatorname{VALUE}=\left\{(\mathrm{V}(5,51) / \operatorname{ABS}(\mathrm{V}(5,51)))^{*}(\operatorname{PWR}(\mathrm{~V}(5,51) /(1 \mathrm{e}-6 * 500), 3.5))\right\}$
.$M O D E L$ DBODYMOD D (IS $=6 \mathrm{e}-12 \mathrm{RS}=1.4 \mathrm{e}-3 \mathrm{IKF}=20 \mathrm{XTI}=5 \mathrm{TRS} 1=2.75 \mathrm{e}-3 \mathrm{TRS} 2=5.0 \mathrm{e}-6 \mathrm{CJO}=5.5 \mathrm{e}-9 \mathrm{TT}=$ $5.9 \mathrm{e}-8 \mathrm{M}=0.5 \mathrm{VJ}=0.75$ )
.MODEL DBREAKMOD D (RS = 2.8e-2 IKF $=30$ TRS1 $=-4.0 \mathrm{e}-3 \mathrm{TRS} 2=1.0 \mathrm{e}-6)$
.MODEL DPLCAPMOD D (CJO $=6.75 \mathrm{e}-9 \mathrm{IS}=1 \mathrm{e}-30 \mathrm{M}=0.88 \mathrm{VJ}=1.45 \mathrm{FC}=0.5)$

. $\operatorname{MODEL}$ MSTROMOD NMOS ( $\mathrm{VTO}=3.23 \mathrm{KP}=96 \mathrm{IS}=1 \mathrm{e}-30 \mathrm{~N}=10 \mathrm{TOX}=1 \mathrm{~L}=1 \mathrm{u} \mathrm{W}=1 \mathrm{u}$ Lambda = 0.06)
.MODEL MWEAKMOD NMOS ( $\mathrm{VTO}=2.35 \mathrm{KP}=0.02 \mathrm{IS}=1 \mathrm{e}-30 \mathrm{~N}=10 \mathrm{TOX}=1 \mathrm{~L}=1 \mathrm{u} \mathrm{W}=1 \mathrm{u} \mathrm{RG}=3.6$ )
.MODEL RBREAKMOD RES ( $\mathrm{TC} 1=8.0 \mathrm{e}-4 \mathrm{TC} 2=4.0 \mathrm{e}-6$ )
.MODEL RDRAINMOD RES $(\mathrm{TC} 1=1.5 \mathrm{e}-1 \mathrm{TC} 2=6.5 \mathrm{e}-4)$

## HUF75345G3, HUF75345P3, HUF75345S3S

.MODEL RSLCMOD RES (TC1 $=1.0 \mathrm{e}-4 \mathrm{TC} 2=1.05 \mathrm{e}-6)$
.MODEL RSOURCEMOD RES (TC1 $=1.0 \mathrm{e}-3 \mathrm{TC} 2=0$ )
.MODEL RVTHRESMOD RES (TC1 $=-1.5 \mathrm{e}-3 \mathrm{TC} 2=-2.6 \mathrm{e}-5)$
.MODEL RVTEMPMOD RES (TC1 $=-2.75 \mathrm{e}-3 \mathrm{TC} 2=1.45 \mathrm{e}-6$ )
.MODEL S1AMOD VSWITCH $($ RON $=1 \mathrm{e}-5 \mathrm{ROFF}=0.1 \mathrm{VON}=-9.00 \mathrm{VOFF}=-4.00)$
.MODEL S1BMOD VSWITCH (RON $=1 \mathrm{e}-5 \mathrm{ROFF}=0.1 \mathrm{VON}=-4.00 \mathrm{VOFF}=-9.00)$
.MODEL S2AMOD VSWITCH (RON $=1 \mathrm{e}-5 \mathrm{ROFF}=0.1 \mathrm{VON}=0.00 \mathrm{VOFF}=0.50)$
.MODEL S2BMOD VSWITCH $(\mathrm{RON}=1 \mathrm{e}-5 \mathrm{ROFF}=0.1 \mathrm{VON}=0.50 \mathrm{VOFF}=0.00)$
.ENDS
NOTE: For further discussion of the PSPICE model, consult A New PSPICE Sub-Circuit for the Power MOSFET Featuring Global Temperature Options; IEEE Power Electronics Specialist Conference Records, 1991, written by William J. Hepp and C. Frank Wheatley.


Figure 20. PSPICE Electrical Model

## SABER Electrical Model

REV 3 February 1999
template huf75345 n2, n1, n3
electrical n2, n1, n3
\{
var i iscl
d.. model dbodymod $=($ is $=6 \mathrm{e}-12, \mathrm{xti}=5, \mathrm{cjo}=5.5 \mathrm{e}-9, \mathrm{tt}=5.9 \mathrm{e}-8, \mathrm{~m}=0.5, \mathrm{vj}=0.75)$
d.. model dbreakmod $=()$
d.. model dplcapmod $=(\operatorname{cjo}=6.75 \mathrm{e}-9$, is $=1 \mathrm{e}-30, \mathrm{~m}=0.88, \mathrm{vj}=1.45, \mathrm{fc}=0.5)$
m. . model mmedmod $=\left(\right.$ type $=\_\mathrm{n}$, vto $=2.93, \mathrm{kp}=13.75$, is $=1 \mathrm{e}-30$, tox $=1$ )
m.. model mstrongmod $=\left(\right.$ type $=\_\mathrm{n}$, vto $=3.23, \mathrm{kp}=96$, is $=1 \mathrm{e}-30$, tox $=1$,
lambda $=0.06$ )
m.. model mweakmod $=\left(\right.$ type $=\_\mathrm{n}, \mathrm{vto}=2.35, \mathrm{kp}=0.02$, is $=1 \mathrm{e}-30$, tox $\left.=1\right)$
sw_vcsp..model s1amod $=($ ron $=1 \mathrm{e}-5$, roff $=0.1$, von $=-9$, voff $=-4)$
sw_vcsp..model s1bmod $=($ ron $=1 \mathrm{e}-5$, roff $=0.1$, von $=-4$, voff $=-9)$
sw_vcsp..model s2amod $=($ ron $=1 \mathrm{e}-5$, roff $=0.1$, von $=0, \operatorname{voff}=0.5)$
sw_vcsp..model s2bmod $=($ ron $=1 \mathrm{e}-5$, roff $=0.1$, von $=0.5$, voff $=0)$
c.ca $\mathrm{n} 12 \mathrm{n} 8=5.55 \mathrm{e}-9$
c.cb n15 n14 $=5.55 \mathrm{e}-9$
c.cin $\mathrm{n} 6 \mathrm{n} 8=3.45 \mathrm{e}-9$
d.dbody n7 n71 = model=dbodymod
d.dbreak n72 n11 = model=dbreakmod
d.dplcap n10 n5 = model=dplcapmod
i.it n8 n17 = 1
1.ldrain n2 n5 $=1 \mathrm{e}-9$
l.lgate n1 n9 $=2.6 \mathrm{e}-9$
1.1source n3 n7 = 1.1e-9
k.k1 i(l.lgate) $\mathrm{i}(1.1$ source $)=1($ l.lgate $), 1$ (1.lsource $), 0.0085$
m.mmed n16 n6 n8 n8 = model=mmedmod, $\mathrm{l}=1 \mathrm{u}, \mathrm{w}=1 \mathrm{u}$
m.mstrong n16 n6 n8 n8 = model=mstrongmod, $\mathrm{l}=1 \mathrm{u}, \mathrm{w}=1 \mathrm{u}$
m.mweak n16 n21 n8 n8 = model=mweakmod, $\mathrm{l}=1 \mathrm{u}, \mathrm{w}=1 \mathrm{u}$
res.rbreak n17 n18 $=1$, tc1 $=8 \mathrm{e}-4$, tc2 $=4 \mathrm{e}-6$
res.rdbody n71 n5 $=1.4 \mathrm{e}-3$, tc $1=2.75 \mathrm{e}-3$, tc $2=5 \mathrm{e}-6$
res.rdbreak n72 n5 $=2.8 \mathrm{e}-2$, tc1 $=-4 \mathrm{e}-3$, tc2 $=1 \mathrm{e}-6$
res.rdrain n50 n16 $=1 \mathrm{e}-4$, tc1 $=1.5 \mathrm{e}-1, \mathrm{tc} 2=6.5 \mathrm{e}-4$
res.rgate $\mathrm{n} 9 \mathrm{n} 20=0.36$
res.rldrain n2 n5 $=10$
res.rlgate $\mathrm{n} 1 \mathrm{n} 9=26$
res.rlsource n3 n7 = 11
res.rslc1 n5 n $51=1 \mathrm{e}-6$, tc $1=1 \mathrm{e}-4$, tc2 $=1.05 \mathrm{e}-6$
res.rslc $2 \mathrm{n} 5 \mathrm{n} 50=1 \mathrm{e} 3$
res.rsource $\mathrm{n} 8 \mathrm{n} 7=3.15 \mathrm{e}-3$, tc $1=1 \mathrm{e}-3$, tc2 $=0$
res.rvtemp n18 n19 = 1, tc1 $=-2.75 \mathrm{e}-3$, tc $2=1.45 \mathrm{e}-6$
res.rvthres $\mathrm{n} 22 \mathrm{n} 8=1$, tc1 $=-1.5 \mathrm{e}-3$, tc2 $=-2.6 \mathrm{e}-5$
spe.ebreak n11 n7n17n18 $=56.7$
spe.eds n14 n8 n5 n8 = 1
spe.egs n13 n8 n6 n8 = 1
spe.esg n6 n10 n6 n8 = 1
spe.evtemp n20 n6 n18 n22 = 1
spe.evthres n6 n21 n19 n8 = 1

## HUF75345G3, HUF75345P3, HUF75345S3S

sw_vcsp.s1a n6 n12 n13 n8 = model=s1amod
sw_vcsp.s1b n13 n12 n13 n8 = model=s1bmod
sw_vcsp.s2a n6 n15 n14 n13 = model=s2amod
sw_vcsp.s2b n13 n15 n14 n13 = model=s2bmod
v.vbat n22 n19 = dc $=1$
equations \{
i (n51->n50) + = iscl
iscl: $\mathrm{v}(\mathrm{n} 51, \mathrm{n} 50)=\left((\mathrm{v}(\mathrm{n} 5, \mathrm{n} 51) /(1 \mathrm{e}-9+\mathrm{abs}(\mathrm{v}(\mathrm{n} 5, \mathrm{n} 51))))^{*}\left(\left(\operatorname{abs}\left(\mathrm{v}(\mathrm{n} 5, \mathrm{n} 51)^{*} 1 \mathrm{e} 6 / 500\right)\right)^{* *} 3.5\right)\right)$
\}
\}


Figure 21. SABER Electrical Model

## SPICE Thermal Model

REV 5 February 1999
HUF75345
CTHERM1 th 6 6.3e-3
CTHERM2 65 1.5e-2
CTHERM3 54 2.0e-2
CTHERM4 43 3.0e-2
CTHERM5 32 8.0e-2
CTHERM6 2 tl $1.5 \mathrm{e}-1$
RTHERM1 th $65.0 \mathrm{e}-3$
RTHERM2 65 1.8e-2
RTHERM3 54 5.0e-2
RTHERM4 43 8.5e-2
RTHERM5 $321.0 \mathrm{e}-1$
RTHERM6 2 tl 1.1e-1

## SABER Thermal Model

SABER thermal model HUF75345

```
template thermal_model th tl
thermal_c th, tl
{
ctherm.ctherm1 th 6=6.3e-3
ctherm.ctherm2 65=1.5e-2
ctherm.ctherm354=2.0e-2
ctherm.ctherm443=3.0e-2
ctherm.ctherm5 32=8.0e-2
ctherm.ctherm6 2 tl=1.5e-1
rtherm.rtherm1 th 6 = 5.0e-3
rtherm.rtherm2 65=1.8e-2
rtherm.rtherm354=5.0e-2
rtherm.rtherm443=8.5e-2
rtherm.rtherm5 32=1.0e-1
rtherm.rtherm6 2 tl=1.1e-1
}
```



Figure 22. Thermal Model


Scale 1:1

TO-220-3LD
CASE 340AT
ISSUE A

SUPPLIER "A" PACKAGE SHAPE

DATE 03 OCT 2017

NOTES:

A) REFERENCE JEDEC, TO-220, VARIATION AB
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS COMMON TO ALL PACKAGE SUPPLIERS EXCEPT WHERE NOTED [ ].
D) LOCATION OF MOLDED FEATURE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
E DOES NOT COMPLY JEDEC STANDARD VALUE.
F) "A1" DIMENSIONS AS BELOW:

SINGLE GAUGE $=0.51-0.61$
DUAL GAUGE $=1.10-1.45$
G PRESENCE IS SUPPLIER DEPENDENT
H) SUPPLIER DEPENDENT MOLD LOCKING HOLES IN HEATSINK.

| DOCUMENT NUMBER: | 98AON13818G | Electronic versions are uncontrolled except when accessed directly from the Document Repository. <br> Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |  |
| ---: | :--- | :--- | :--- |
| DESCRIPTION: | TO-220-3LD | PAGE 1 OF 1 |  |

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rights of others.

## TO-247-3LD SHORT LEAD CASE 340CK ISSUE A

DATE 31 JAN 2019


NOTES: UNLESS OTHERWISE SPECIFIED.
A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. DRAWING CONFORMS TO ASME Y14.5-2009.
D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

## GENERIC MARKING DIAGRAM*

|  | AYWWZZ <br> XXXXXXX <br> XXXXXXX <br> - |
| :--- | :--- |
|  |  |
| XXXX | $=$ Specific Device Code |
| A | $=$ Assembly Location |
| $Y$ | $=$ Year |
| WW | $=$ Work Week |
| ZZ | $=$ Assembly Lot Code |

*This information is generic. Please refer to device data sheet for actual part marking. $\mathrm{Pb}-\mathrm{Free}$ indicator, " G " or microdot " r ", may or may not be present. Some products may not follow the Generic Marking.

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| :--- | :--- | :--- |

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## D²PAK-3 (TO-263, 3-LEAD) <br> CASE 418AJ <br> ISSUE F


notes

1. Dimensinaing and tdlerancing per ASME Y14.5M, 2009.
2. contraliing dimensinn inches
3. CHAMFER DPTIINAL.
4. DIMENSIONS D AND E DO NDT INCLUDE MDLD FLASH. MILD FLASH SHALL NDT EXCEED 0.005 PER SIDE. these dimensians are measured at the dutermast EXTREMES aF THE PLASTIC BZDY AT DATUM H.
5. THERMAL PAD CONTIUR IS OPTIONAL WITHIN DIMENSIDNS E, L1, D1, AND E1.
6. IPTIONAL MILD FEATURE.
7. © , © ... םPTIONAL CINSTRUCTIIN FEATURE CALL DUTS.

| DIM | INCHES |  | MILLIMETERS |  |
| :---: | :---: | :---: | :---: | :---: |
|  | MIN. | MAX. | MIN. | MAX. |
| A | 0.160 | 0.190 | 4.06 | 4.83 |
| A1 | 0.000 | 0.010 | 0.00 | 0.25 |
| b | 0.020 | 0.039 | 0.51 | 0.99 |
| c | 0.012 | 0.029 | 0.30 | 0.74 |
| c2 | 0.045 | 0.065 | 1.14 | 1.65 |
| D | 0.330 | 0.380 | 8.38 | 9.65 |
| D1 | 0.260 | --- | 6.60 | --- |
| E | 0.380 | 0.420 | 9.65 | 10.67 |
| E1 | 0.245 | --- | 6.22 | --- |
| e | 0.100 BSC |  | 2.54 BSC |  |
| H | 0.575 | 0.625 | 14.60 | 15.88 |
| L | 0.070 | 0.110 | 1.78 | 2.79 |
| L1 | --- | 0.066 | --- | 1.68 |
| L2 | --- | 0.070 | --- | 1.78 |
| L3 | 0.010 BSC |  | 0.25 BSC |  |
| M | $0^{\circ}$ | $8^{\circ}$ | $0^{\circ}$ | $8^{\circ}$ |




DETAIL C
TIP LEADFRRM
ROTATED $90^{\circ} \mathrm{CW}$


VIEW A-A



VIEW A-A

DATE 11 MAR 2021

DPTIDNAL CDNSTRUCTIDNS
GENERIC MARKING DIAGRAMS*


IC


Standard


Rectifier


SSG


XXXXXX = Specific Device Code
A = Assembly Location

WL = Wafer Lot
Y = Year
WW = Work Week
W = Week Code (SSG)
M = Month Code (SSG)
$\mathrm{G}=\mathrm{Pb}-$ Free Package
AKA = Polarity Indicator
*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, " $G$ " or microdot " $\quad$ ", may or may not be present. Some products may not follow the Generic Marking.

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| :--- | :--- | :--- |

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