

MOSFET – N-Channel, SUPERFET®

800 V, 8 A, 850 mΩ

FCP850N80Z

Description

SuperFET II MOSFET is onsemi's brand-new high voltage super-junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance. This technology is tailored to minimize conduction loss, provide superior switching performance, dv/dt rate and higher avalanche energy. In addition, internal gate-source ESD diode allows to withstand over 2 kV HBM surge stress. Consequently, SuperFET II MOSFET is very suitable for the switching power applications such as Audio, Laptop adapter, Lighting, ATX power and industrial power applications.

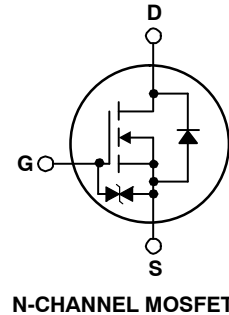
Features

- Typ. $R_{DS(on)} = 710 \text{ m}\Omega$ (Typ)
- Ultra Low Gate Charge (Typ. $Q_g = 22 \text{ nC}$)
- Low E_{oss} (Typ. $2.3 \mu\text{J @ } 400 \text{ V}$)
- Low Effective Output Capacitance (Typ. $C_{oss(eff.)} = 106 \text{ pF}$)
- 100% Avalanche Tested
- This Device is Pb-Free, Halide Free and RoHS Compliant
- ESD Improved Capability

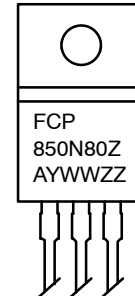
Applications

- AC-DC Power Supply
- LED Lighting

V_{DSS}	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
800 V	850 mΩ @ 10 V	8 A



MARKING DIAGRAM



FCP850N80Z	= Specific Device Code
A	= Assembly Location
YWW	= Date Code (Year & Week)
ZZ	= Assembly Lot

ORDERING INFORMATION

Device	Package	Shipping
FCP850N80Z	TO-220 (Pb-Free)	800 / Tube

FCP850N80Z

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

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		800	V
V_{GSS}	Gate to Source Voltage	– DC	± 20	V
		– AC ($f > 1\text{ Hz}$)	± 30	A
I_D	Drain Current	– Continuous ($T_C = 25\text{ }^{\circ}\text{C}$)	8.0	A
		– Continuous ($T_C = 100\text{ }^{\circ}\text{C}$)	5.1	
I_{DM}	Drain Current	Pulsed (Note 1)	18	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		114	mJ
I_{AR}	Avalanche Current (Note 1)		1.2	A
E_{AR}	Repetitive Avalanche Energy (Note 1)		1.36	mJ
dv/dt	MOSFET dv / dt		100	V/ns
	Peak Diode Recovery dv/dt (Note 3)		20	
P_D	Power Dissipation	($T_C = 25\text{ }^{\circ}\text{C}$)	136	W
		– Derate Above $25\text{ }^{\circ}\text{C}$	1.09	
T_J, T_{STG}	Operating and Storage Temperature Range		$-55\text{ to }+150$	$^{\circ}\text{C}$
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Second		300	$^{\circ}\text{C}$

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. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. $I_{AS} = 1.2\text{ A}$, $V_{DD} = 50\text{ V}$, $R_G = 25\text{ }\Omega$, starting $T_J = 25\text{ }^{\circ}\text{C}$
3. $I_{SD} \leq 8\text{ A}$, $di/dt \leq 200\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25\text{ }^{\circ}\text{C}$.

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.92	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	$^{\circ}\text{C}/\text{W}$



FCP850N80Z

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

BV_{DSS}	Drain to Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}, T_J = 25^\circ\text{C}$	800	–	–	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 1\text{ mA}$, Referenced to 25°C	–	0.8	–	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$	–	–	25	μA
		$V_{DS} = 640\text{ V}, V_{GS} = 0\text{ V}, T_C = 125^\circ\text{C}$	–	–	250	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	–	–	± 10	μA

ON CHARACTERISTICS

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 0.6\text{ mA}$	2.5	–	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 3\text{ A}$	–	710	850	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 20\text{ V}, I_D = 3\text{ A}$	–	3.5	–	S

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	–	990	1315	pF
C_{oss}	Output Capacitance		–	28	37	pF
C_{rss}	Reverse Transfer Capacitance		–	0.74	–	pF
C_{oss}	Output Capacitance	$V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	–	15	–	pF
$C_{oss (eff)}$	Effective Output Capacitance	$V_{DS} = 0\text{ V to } 480\text{ V}, V_{GS} = 0\text{ V}$	–	106	–	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 640\text{ V}, I_D = 6\text{ A}, V_{GS} = 10\text{ V}$ (Note 4)	–	22	29	nC
Q_{gs}	Gate to Source Gate Charge		–	5	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	8.6	–	nC
ESR	Equivalent Series Resistance	$f = 1\text{ MHz}$	–	2.4	–	Ω

SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 400\text{ V}, I_D = 6\text{ A}, V_{GS} = 10\text{ V}, R_g = 4.7\text{ }\Omega$ (Note 4)	–	16	42	ns
t_r	Turn-On Rise Time		–	10	30	ns
$t_{d(off)}$	Turn-Off Delay Time		–	40	90	ns
t_f	Turn-Off Fall Time		–	4.5	19	ns

DRAIN-SOURCE DIODE CHARACTERISTICS

I_S	Maximum Continuous Drain to Source Diode Forward Current		–	–	8	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		–	–	18	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_{SD} = 6\text{ A}$	–	–	1.2	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_{SD} = 6\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$	–	318	–	ns
Q_{rr}	Reverse Recovery Charge		–	4.5	–	μC

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.

4. Essentially Independent of Operating Temperature Typical Characteristics



TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

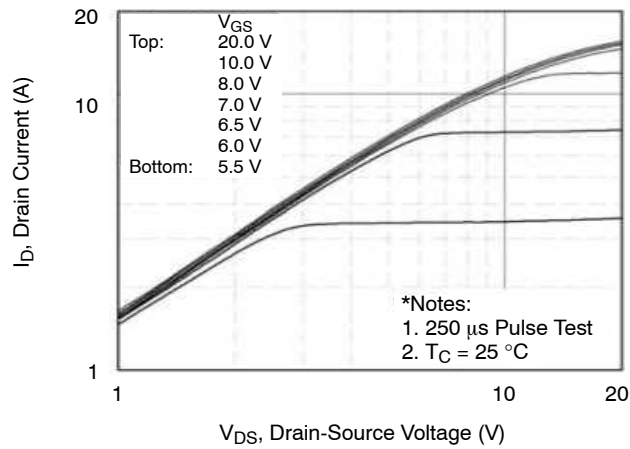


Figure 1. On-Region Characteristics

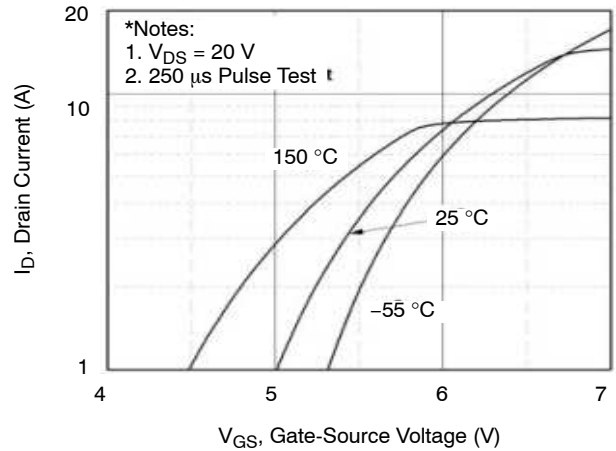


Figure 2. Transfer Characteristics

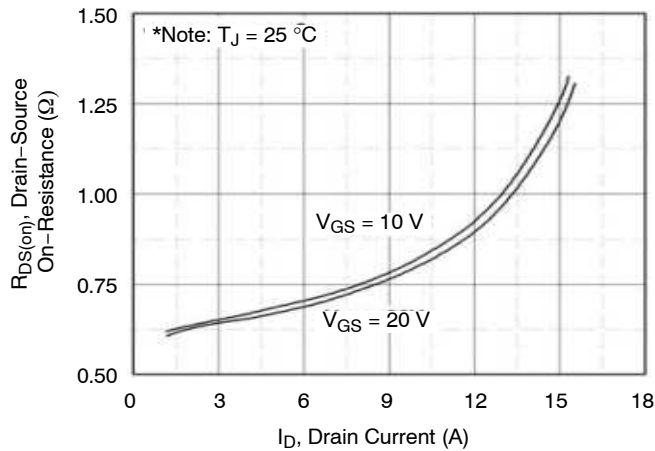


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

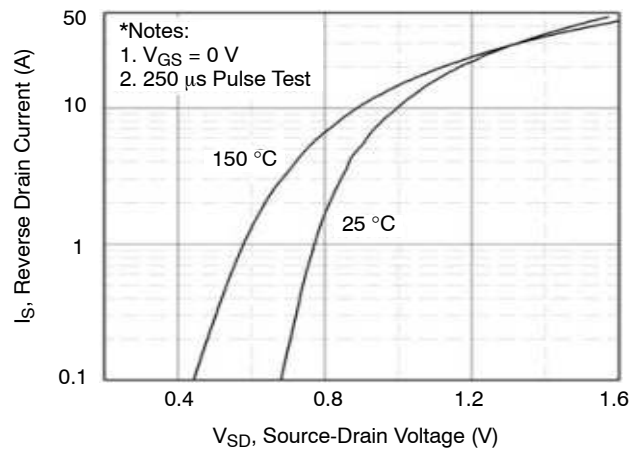


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

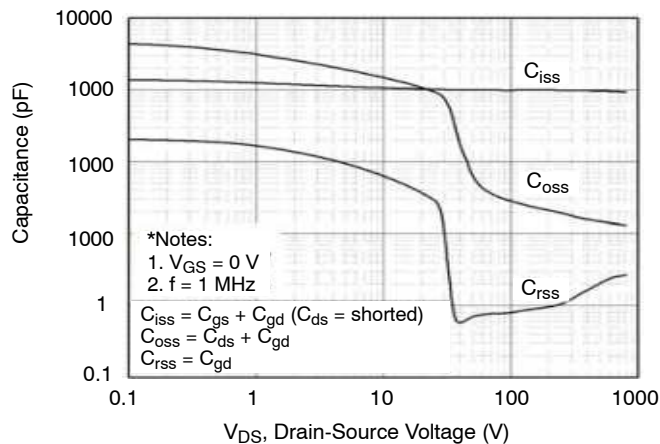


Figure 5. Capacitance Characteristics

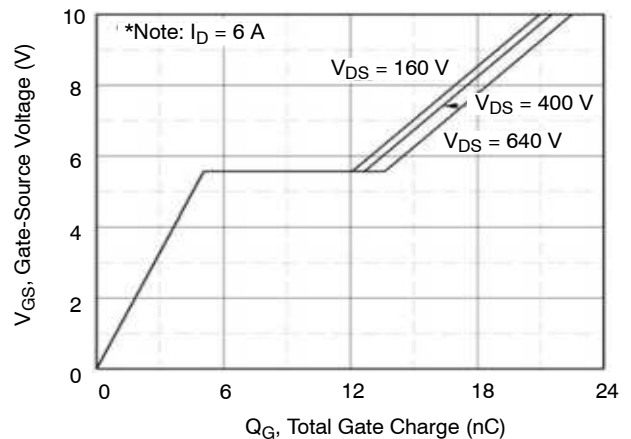
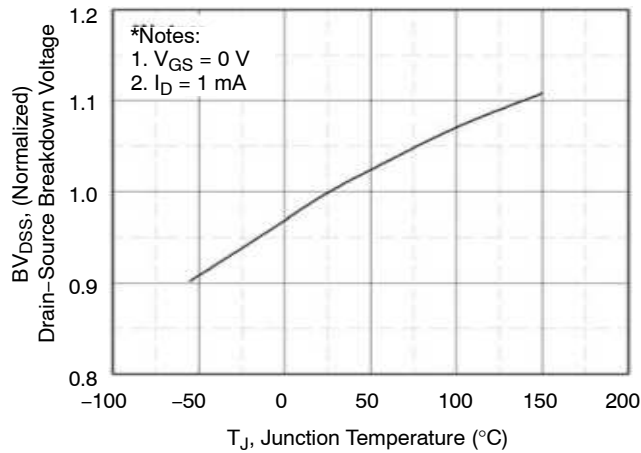
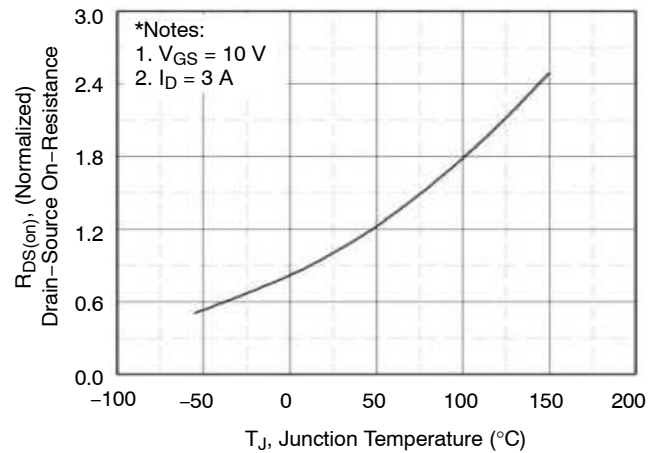
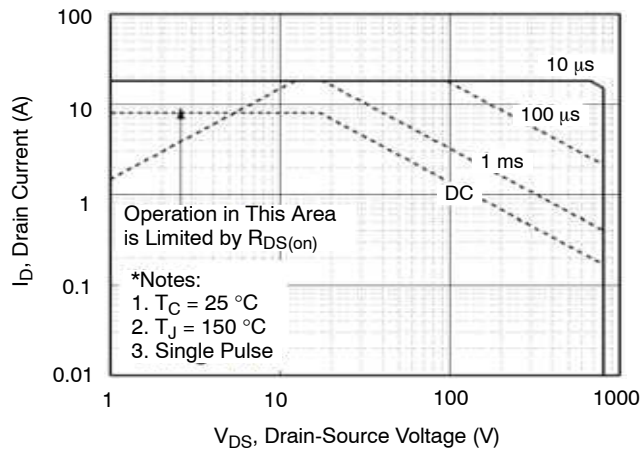
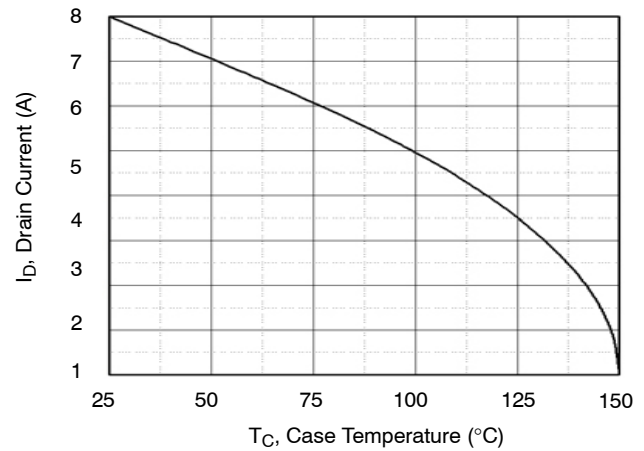
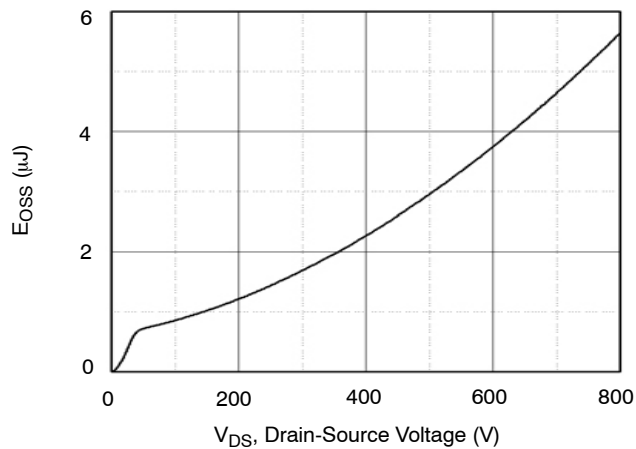


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)



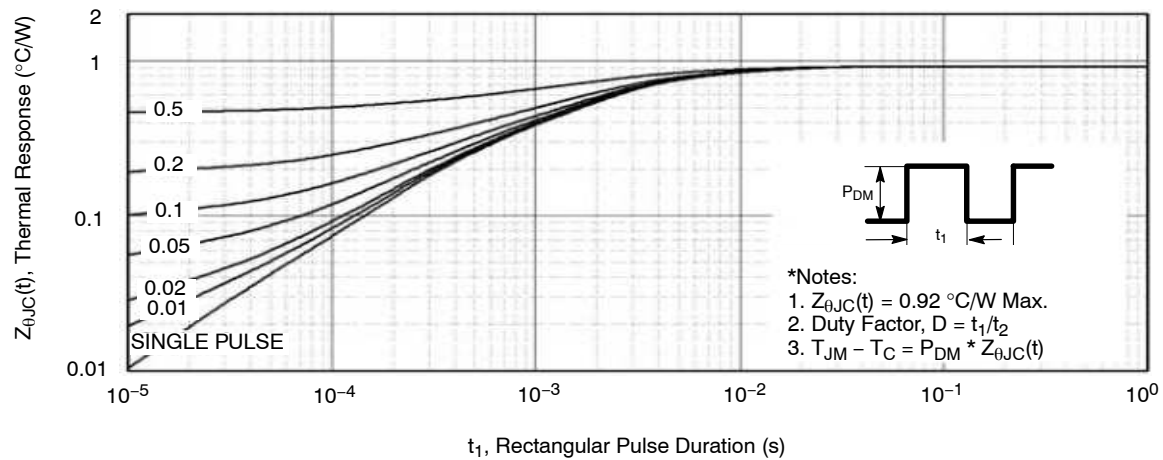


Figure 12. Transient Thermal Response Curve

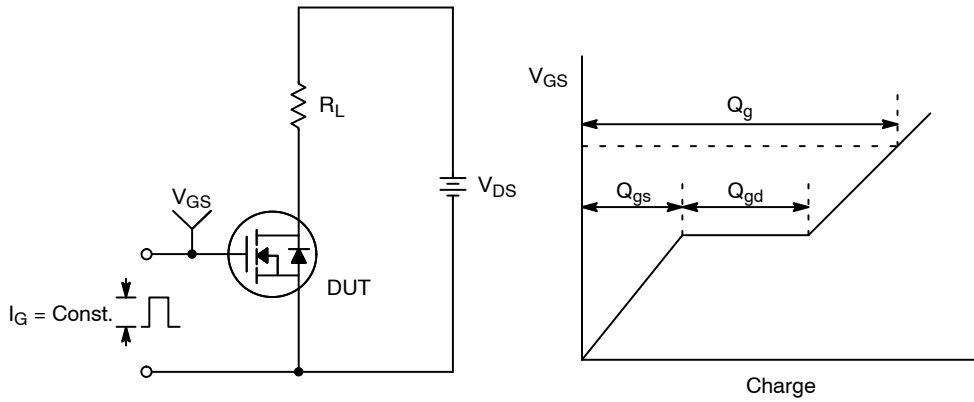


Figure 13. Gate Charge Test Circuit & Waveform

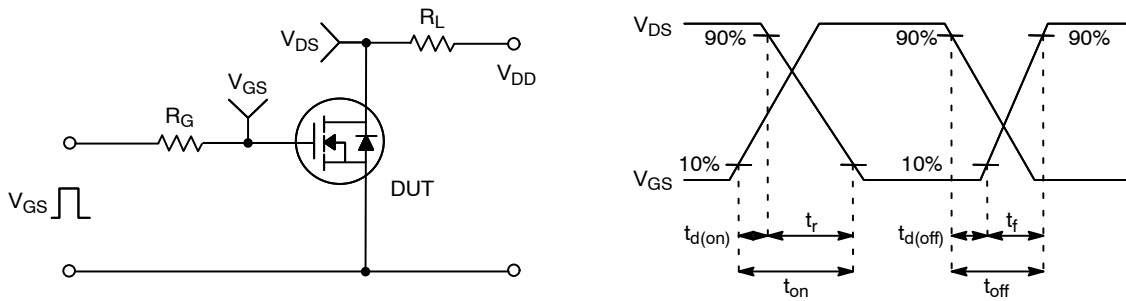


Figure 14. Resistive Switching Test Circuit & Waveforms

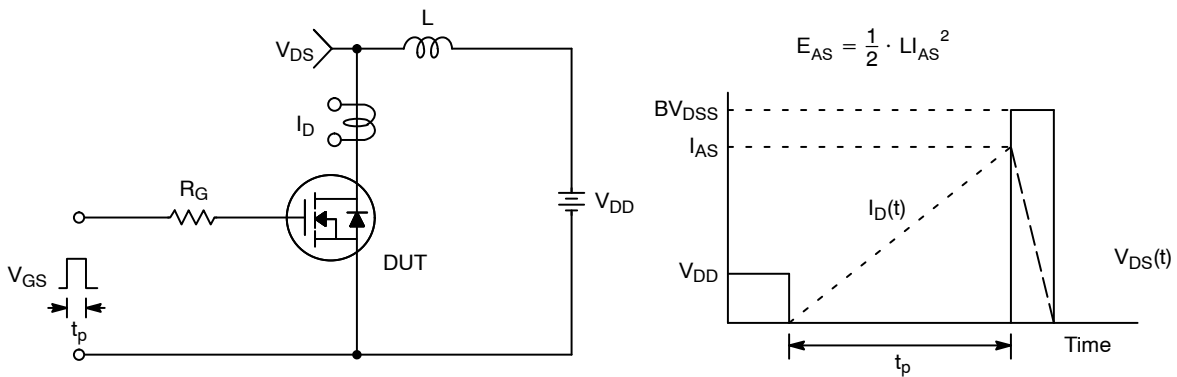


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

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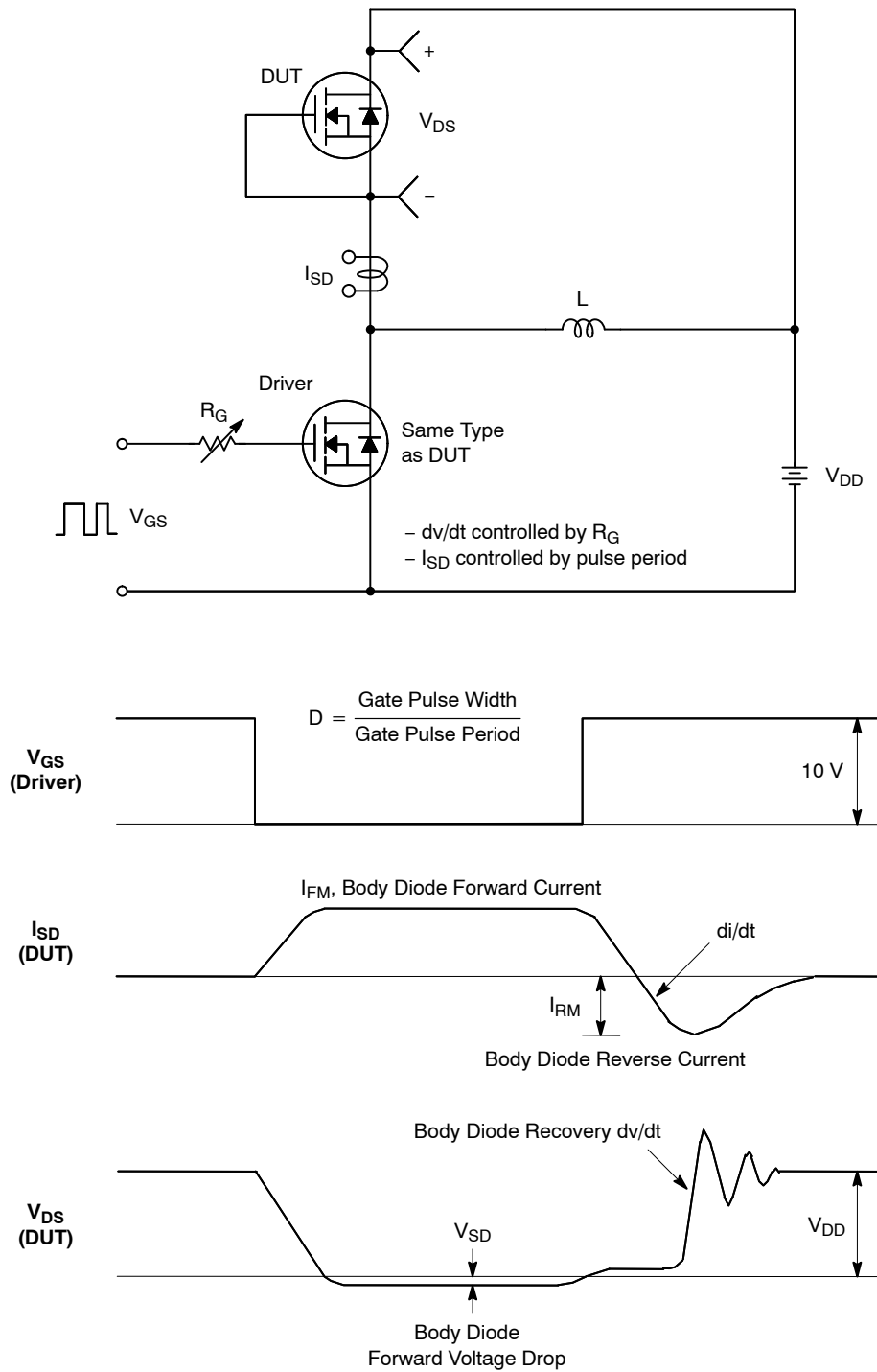


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms

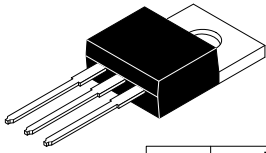
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REVISION HISTORY

Revision	Description of Changes	Date
2	Converted the Data Sheet to onsemi format.	12/10/2025

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.





TO-220-3LD
CASE 340AT
ISSUE B

DATE 08 AUG 2022

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	4.00	--	4.70
A1	SEE NOTE "F"		
A2	2.10	--	2.85
b	0.55	--	1.00
b2	1.10	--	1.62
b4	1.42	--	1.62
c	0.36	--	0.60
D	13.90	--	16.30
D1	8.13	--	9.40
D2	11.50	--	14.30
D3	15.42	--	16.51
E	9.65	--	10.67
E1	7.59	--	8.65
e	2.40	--	2.67
H1	6.06	--	6.69
L	12.70	--	14.04
L1	2.70	--	4.10
P	3.50	--	4.00
Q	2.50	--	3.40
z	2.13 REF		
z1	2.06 REF		
θ	3°	--	5°

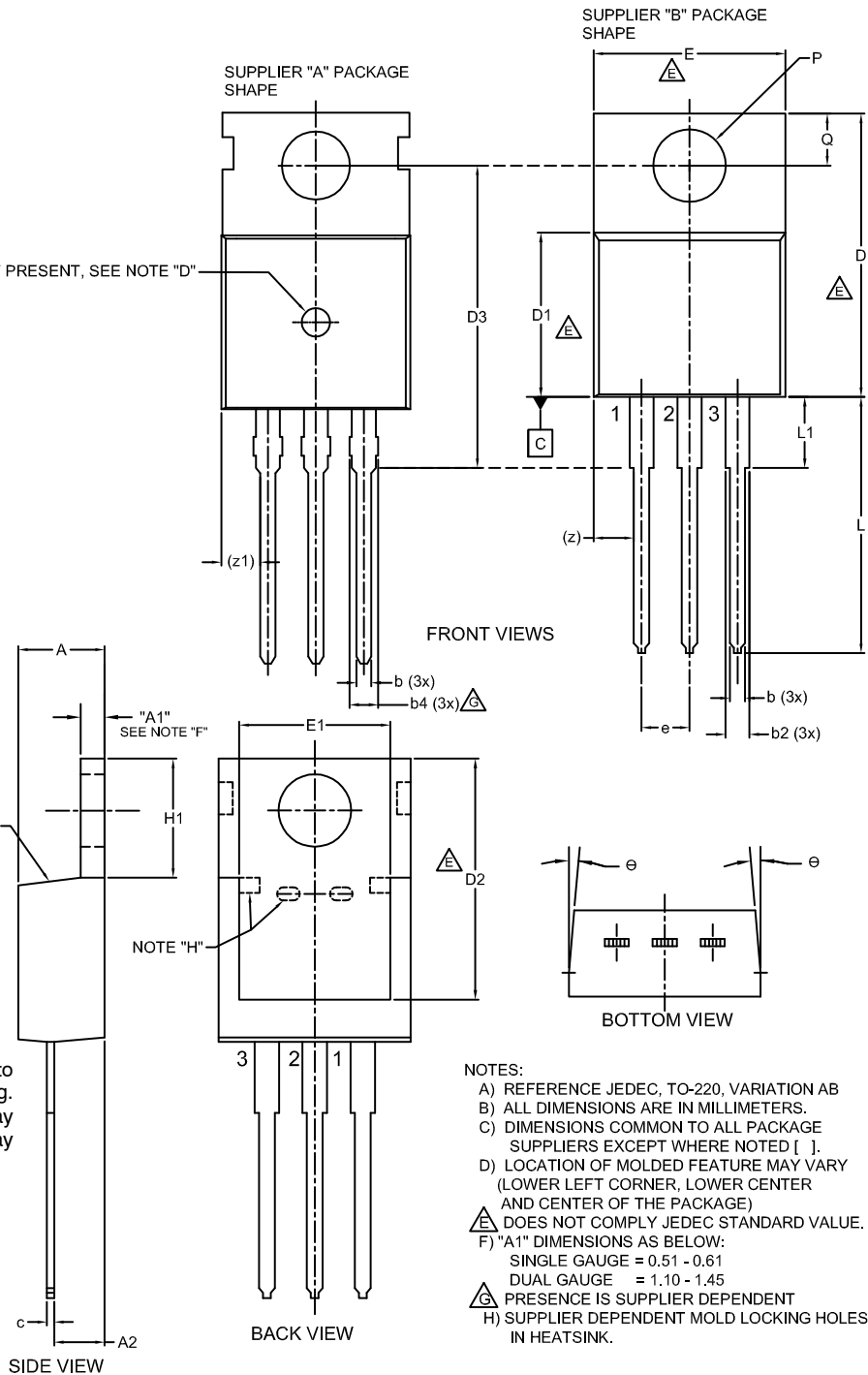
IF PRESENT, SEE NOTE "D"

GENERIC
MARKING DIAGRAM*



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. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



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
- PRESENCE IS SUPPLIER DEPENDENT
- H) SUPPLIER DEPENDENT MOLD LOCKING HOLES IN HEATSINK.

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