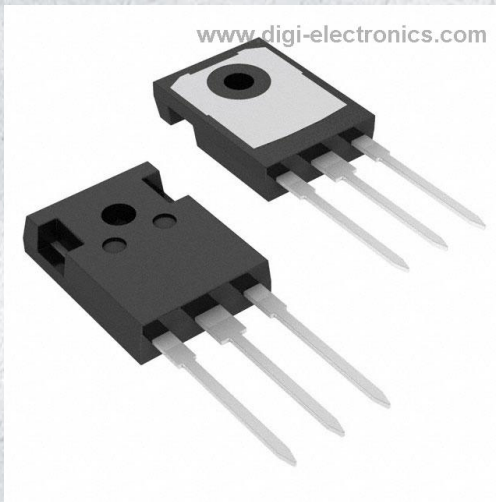


FCH099N60E Datasheet



<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	FCH099N60E-DG
Manufacturer	onsemi
Manufacturer Product Number	FCH099N60E
Description	MOSFET N-CH 600V 37A TO247-3
Detailed Description	N-Channel 600 V 37A (Tc) 357W (Tc) Through Hole TO-247-3



Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

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Purchase and inquiry

Manufacturer Product Number:

FCH099N60E

Series:

SuperFET® II

FET Type:

N-Channel

Drain to Source Voltage (Vdss):

600 V

Drive Voltage (Max Rds On, Min Rds On):

10V

Vgs(th) (Max) @ Id:

3.5V @ 250µA

Vgs (Max):

±20V

FET Feature:

-

Operating Temperature:

-55°C ~ 150°C (Tj)

Supplier Device Package:

TO-247-3

Base Product Number:

FCH099

Manufacturer:

onsemi

Product Status:

Obsolete

Technology:

MOSFET (Metal Oxide)

Current - Continuous Drain (Id) @ 25°C:

37A (Tc)

Rds On (Max) @ Id, Vgs:

99mOhm @ 18.5A, 10V

Gate Charge (Qg) (Max) @ Vgs:

114 nC @ 10 V

Input Capacitance (Ciss) (Max) @ Vds:

3465 pF @ 380 V

Power Dissipation (Max):

357W (Tc)

Mounting Type:

Through Hole

Package / Case:

TO-247-3

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0095

Moisture Sensitivity Level (MSL):

Not Applicable

ECCN:

EAR99

MOSFET – N-Channel, SUPERFET[®] II, Easy-Drive

600 V, 37 A, 99 mΩ

FCH099N60E

Description

SUPERFET II MOSFET is ON Semiconductor'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. Consequently, SUPERFET II MOSFET easy-drive series offers slightly slower rise and fall times compared to the SUPERFET II MOSFET series. Noted by the "E" part number suffix, this family helps manage EMI issues and allows for easier design implementation. For faster switching in applications where switching losses must be at an absolute minimum, please consider the SUPERFET II MOSFET series.

Features

- Typ. $R_{DS(on)} = 87 \text{ m}\Omega$
- 650 V @ $T_J = 150^\circ\text{C}$
- Ultra Low Gate Charge (Typ. $Q_g = 88 \text{ nC}$)
- Low Effective Output Capacitance (Typ. $C_{oss(eff.)} = 309 \text{ pF}$)
- 100% Avalanche Tested
- These Devices are Pb-Free and are RoHS Compliant

Applications

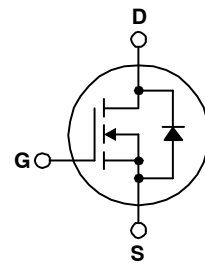
- Telecom / Server Power Supplies
- Industrial Power Supplies



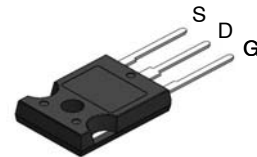
ON Semiconductor[®]

www.onsemi.com

V_{DS}	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
600 V	99 mΩ @ 10 V	37 A

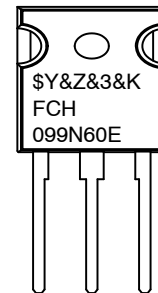


N-CHANNEL MOSFET



TO-247-3LD
CASE 340CK

MARKING DIAGRAM



\$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
FCH099N60E	= Specific Device Code

ORDERING INFORMATION

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

FCH099N60E**ABSOLUTE MAXIMUM RATINGS** ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	FCH099N60E	Unit
V_{DSS}	Drain to Source Voltage	600	V
V_{GSS}	Gate to Source Voltage	- DC	± 20
		- AC ($f > 1$ Hz)	± 30
I_D	Drain Current:	- Continuous ($T_C = 25^\circ\text{C}$)	37
		- Continuous ($T_C = 100^\circ\text{C}$)	24
I_{DM}	Drain Current:	- Pulsed (Note 1)	111
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	809	mJ
I_{AR}	Avalanche Current (Note 1)	6.8	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	3.57	mJ
dv/dt	MOSFET dv/dt	100	V/ns
	Peak Diode Recovery dv/dt (Note 3)	20	
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	357
		- Derate Above 25°C	2.85
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to + 150	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	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. $I_{AS} = 6.8$ A, $R_G = 25 \Omega$, Starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 18.5$ A, $di/dt \leq 200$ A/ μs , $V_{DD} \leq 380$ V, Starting $T_J = 25^\circ\text{C}$.

PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Marking	Package	Packing Method	Reel Size	Tape Width	Quantity
FCH099N60E	FCH099N60E	TO-247	Tube	N/A	N/A	30 Units

THERMAL CHARACTERISTICS

Symbol	Parameter	FCH099N60E	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.35	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	

FCH099N60E**ELECTRICAL CHARACTERISTICS** ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
OFF CHARACTERISTICS						
BV _{DSS}	Drain to Source Breakdown Voltage	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}, T_J = 25^\circ\text{C}$	600	–	–	V
		$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}, T_J = 150^\circ\text{C}$	650	–	–	
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 10\text{ mA}$, Referenced to 25°C	–	0.7	–	V/ $^\circ\text{C}$
I _{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$	–	–	1	μA
		$V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}, T_C = 125^\circ\text{C}$	–	2.1	–	
I _{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	–	–	± 100	nA

ON CHARACTERISTICS

V _{GS(th)}	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	2.5	–	3.5	V
R _{DS(on)}	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 18.5\text{ A}$	–	87	99	m Ω
g _{FS}	Forward Transconductance	$V_{DS} = 20\text{ V}, I_D = 18.5\text{ A}$	–	31.4	–	S

DYNAMIC CHARACTERISTICS

C _{iss}	Input Capacitance	$V_{DS} = 380\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	–	2604	3465	pF
C _{oss}	Output Capacitance		–	75	100	
C _{rss}	Reverse Transfer Capacitance		–	13.9	20	
C _{oss(eff.)}	Effective Output Capacitance	$V_{DS} = 0\text{ V to } 480\text{ V}, V_{GS} = 0\text{ V}$	–	309	–	pF
Q _{g(tot)}	Total Gate Charge at 10 V	$V_{DS} = 380\text{ V}, I_D = 18.5\text{ A}, V_{GS} = 10\text{ V}$ (Note 4)	–	88	114	nC
Q _{gs}	Gate to Source Gate Charge		–	12	–	
Q _{gd}	Gate to Drain "Miller" Charge		–	38	–	
ESR	Equivalent Series Resistance	$f = 1\text{ MHz}$	–	0.6	–	Ω

SWITCHING CHARACTERISTICS

t _{d(on)}	Turn-On Delay Time	$V_{DD} = 380\text{ V}, I_D = 18.5\text{ A},$ $V_{GS} = 10\text{ V}, R_g = 4.7\ \Omega$ (Note 4)	–	24	58	ns
t _r	Turn-On Rise Time		–	23	56	
t _{d(off)}	Turn-Off Delay Time		–	92	194	
t _f	Turn-Off Fall Time		–	22	54	

DRAIN-SOURCE DIODE CHARACTERISTICS

I _S	Maximum Continuous Source to Drain Diode Forward Current	–	–	37	A	
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current	–	–	111	A	
V _{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_{SD} = 18.5\text{ A}$	–	–	1.2	V
t _{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_{SD} = 18.5\text{ A},$ $di_F/dt = 100\text{ A}/\mu\text{s}$	–	387	–	ns
Q _{rr}	Reverse Recovery Charge		–	7.3	–	

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.

FCH099N60E

TYPICAL CHARACTERISTICS

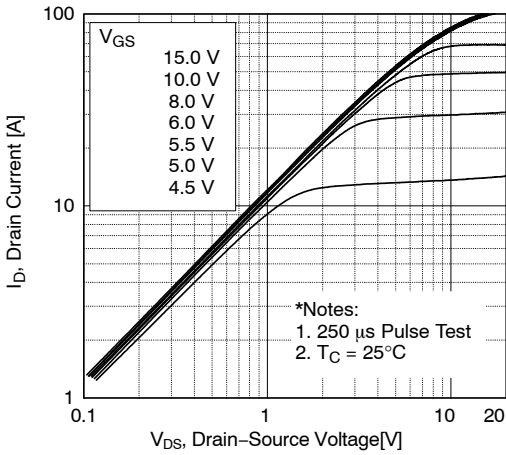


Figure 1. On-Region Characteristics

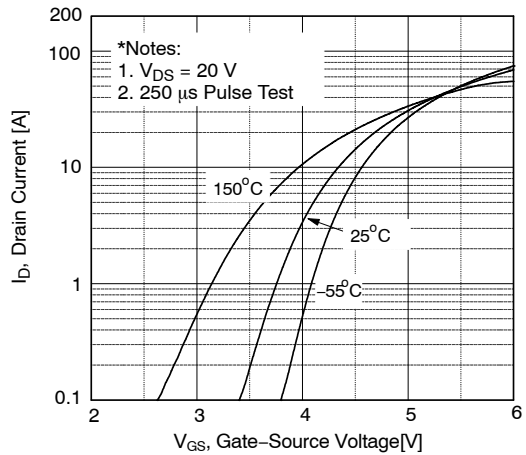


Figure 2. Transfer Characteristics

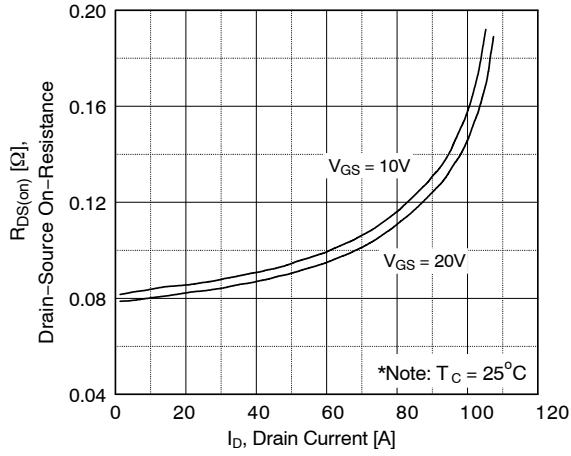


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

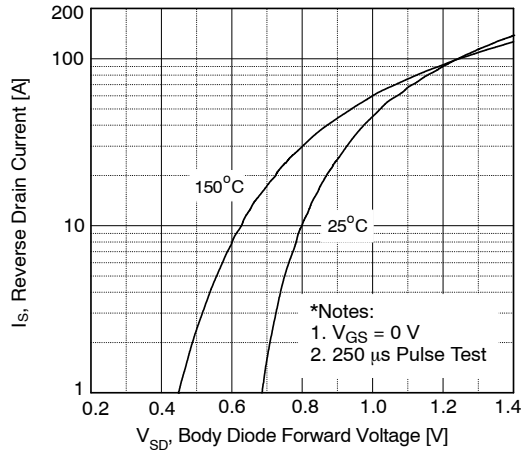


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

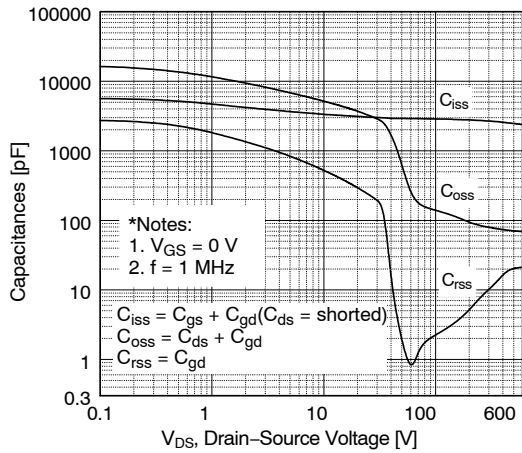


Figure 5. Capacitance Characteristics

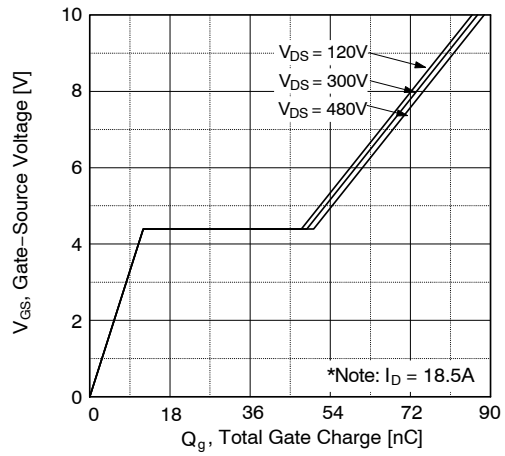


Figure 6. Gate Charge Characteristics

FCH099N60E

TYPICAL CHARACTERISTICS

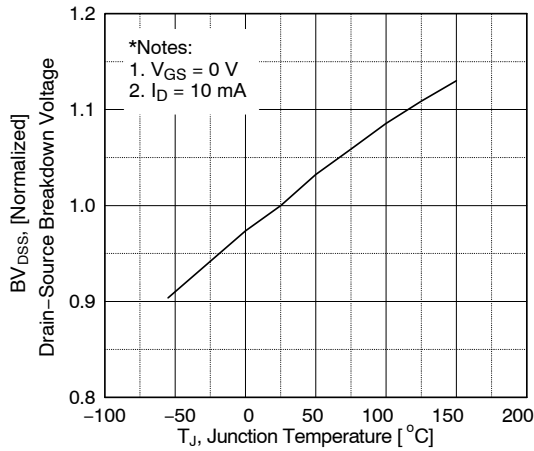


Figure 7. Breakdown Voltage Variation vs. Temperature

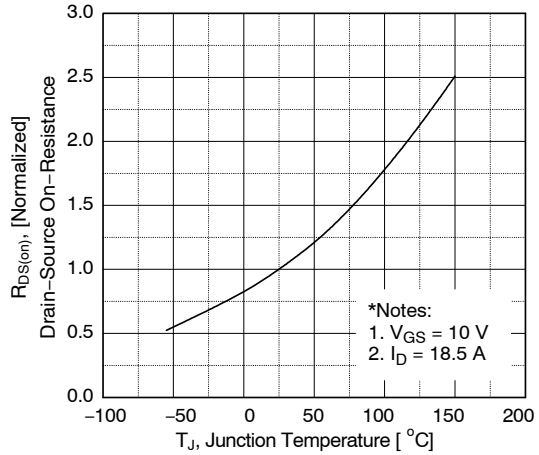


Figure 8. On-Resistance Variation vs. Temperature

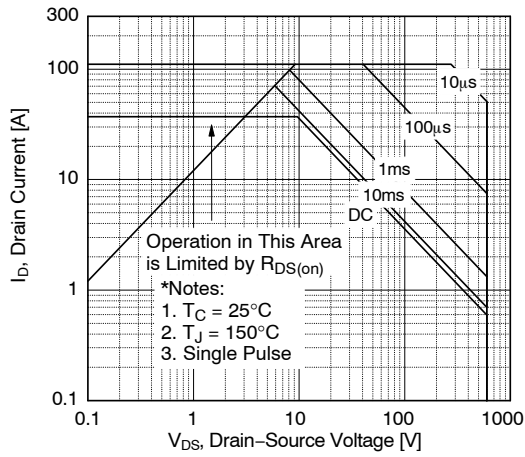


Figure 9. Maximum Safe Operating Area

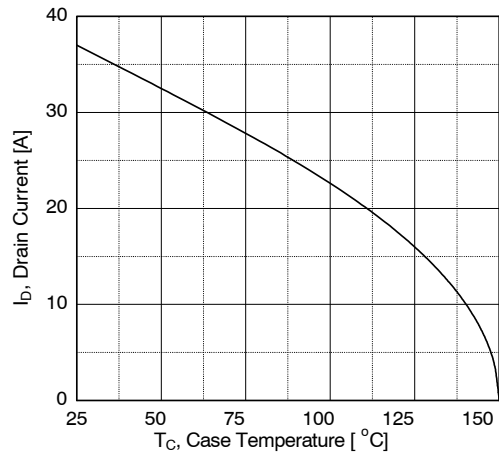


Figure 10. Maximum Drain Current vs. Case Temperature

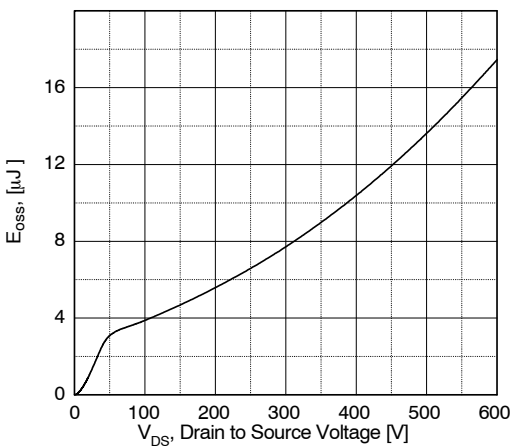


Figure 11. E_{oss} vs. Drain to Source Voltage

FCH099N60E

TYPICAL CHARACTERISTICS

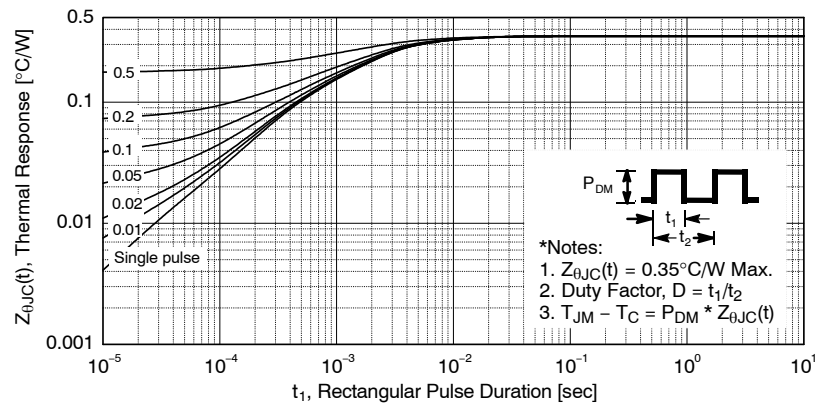


Figure 12. Transient Thermal Response Curve

FCH099N60E

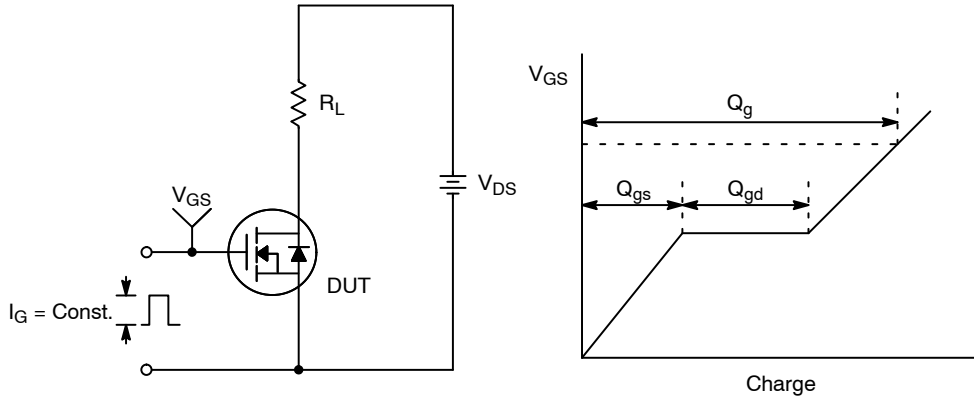


Figure 13. Gate Charge Test Circuit & Waveform

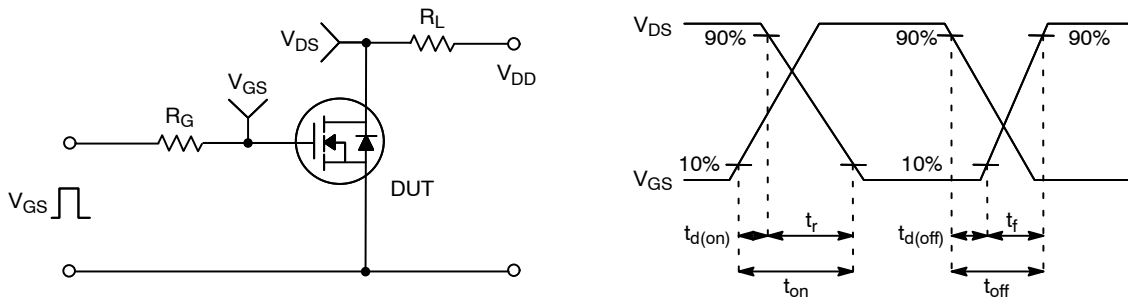


Figure 14. Resistive Switching Test Circuit & Waveforms

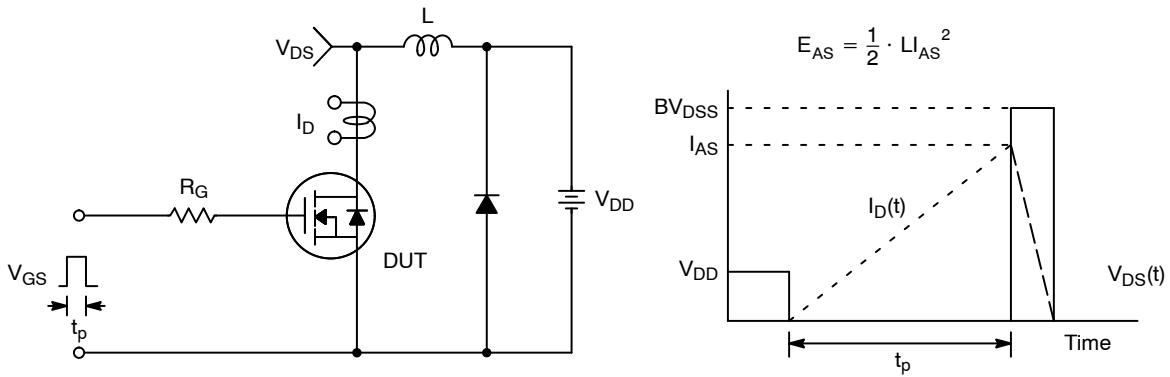


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

FCH099N60E

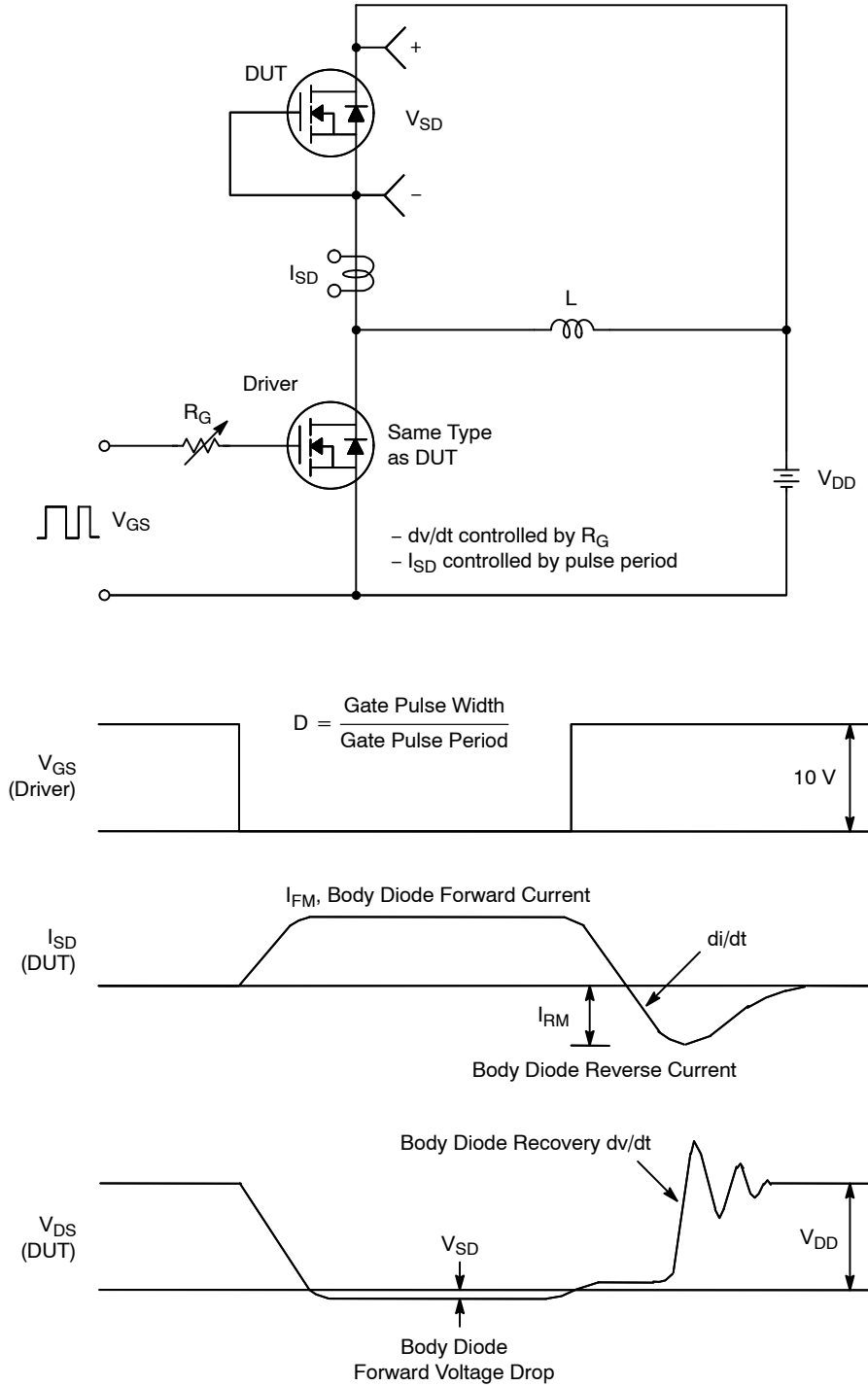
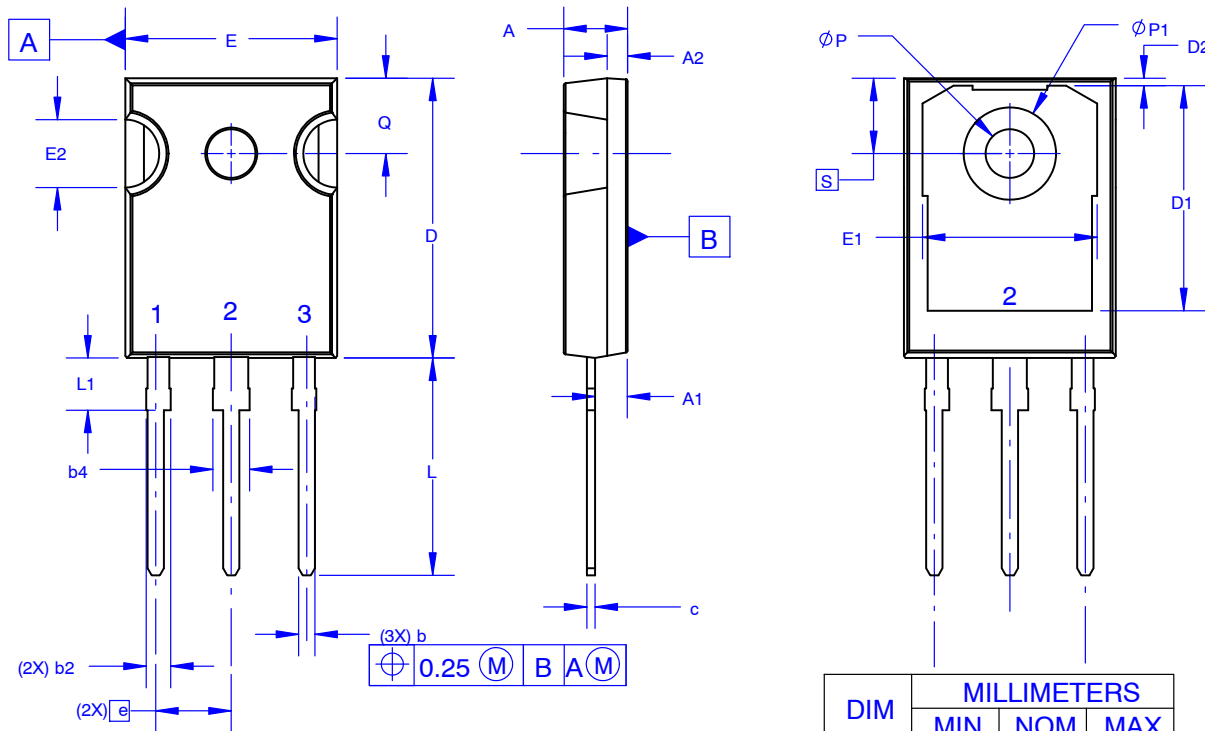


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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

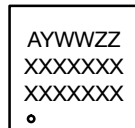
DATE 31 JAN 2019



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*



- 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.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.58	4.70	4.82
A1	2.20	2.40	2.60
A2	1.40	1.50	1.60
b	1.17	1.26	1.35
b2	1.53	1.65	1.77
b4	2.42	2.54	2.66
c	0.51	0.61	0.71
D	20.32	20.57	20.82
D1	13.08	~	~
D2	0.51	0.93	1.35
E	15.37	15.62	15.87
E1	12.81	~	~
E2	4.96	5.08	5.20
e	~	5.56	~
L	15.75	16.00	16.25
L1	3.69	3.81	3.93
φP	3.51	3.58	3.65
φP1	6.60	6.80	7.00
Q	5.34	5.46	5.58
S	5.34	5.46	5.58

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DESCRIPTION:	TO-247-3LD SHORT LEAD	PAGE 1 OF 1

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