

# FCU2250N80Z Datasheet



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DiGi Electronics Part Number	FCU2250N80Z-DG
Manufacturer	<a href="#">onsemi</a>
Manufacturer Product Number	FCU2250N80Z
Description	MOSFET N-CH 800V 2.6A IPAK
Detailed Description	N-Channel 800 V 2.6A (Tc) 39W (Tc) Through Hole I-PAK



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## Purchase and inquiry

Manufacturer Product Number:

FCU2250N80Z

Series:

SuperFET® II

FET Type:

N-Channel

Drain to Source Voltage (Vdss):

800 V

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

10V

Vgs(th) (Max) @ Id:

4.5V @ 260µA

Vgs (Max):

±20V

FET Feature:

-

Operating Temperature:

-55°C ~ 150°C (Tj)

Supplier Device Package:

I-PAK

Base Product Number:

FCU2250

Manufacturer:

onsemi

Product Status:

Obsolete

Technology:

MOSFET (Metal Oxide)

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

2.6A (Tc)

Rds On (Max) @ Id, Vgs:

2.250hm @ 1.3A, 10V

Gate Charge (Qg) (Max) @ Vgs:

14 nC @ 10 V

Input Capacitance (Ciss) (Max) @ Vds:

585 pF @ 100 V

Power Dissipation (Max):

39W (Tc)

Mounting Type:

Through Hole

Package / Case:

TO-251-3 Short Leads, IPak, TO-251AA

## Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0095

Moisture Sensitivity Level (MSL):

Not Applicable

ECCN:

EAR99





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January 2015

## FCU2250N80Z

### N-Channel SuperFET<sup>®</sup> II MOSFET

800 V, 2.6 A, 2.25  $\Omega$ 

#### Features

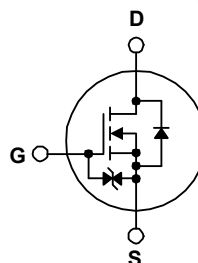
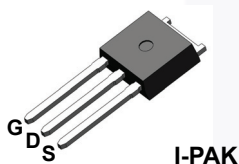
- $R_{DS(on)} = 1.87 \Omega$  (Typ.)
- Ultra Low Gate Charge (Typ.  $Q_g = 11$  nC)
- Low  $E_{oss}$  (Typ. 1.1  $\mu$ J @ 400V)
- Low Effective Output Capacitance (Typ.  $C_{oss(eff.)} = 51$  pF)
- 100% Avalanche Tested
- RoHS Compliant
- ESD Improved Capability

#### Applications

- AC - DC Power Supply
- LED Lighting

#### Description

SuperFET<sup>®</sup> II MOSFET is Fairchild 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 is very suitable for the switching power applications such as Audio, Laptop adapter, Lighting, ATX power and industrial power applications.



#### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FCU2250N80Z	Unit
$V_{DSS}$	Drain to Source Voltage	800	V
$V_{GSS}$	Gate to Source Voltage	- DC	$\pm 20$
		- AC (f > 1 Hz)	$\pm 30$
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	2.6
		- Continuous ( $T_C = 100^\circ\text{C}$ )	1.7
$I_{DM}$	Drain Current - Pulsed (Note 1)	6.5	A
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	21.6	mJ
$I_{AR}$	Avalanche Current (Note 1)	0.52	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	0.39	mJ
dv/dt	MOSFET dv/dt	100	V/ns
	Peak Diode Recovery dv/dt (Note 3)	20	
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	- Derate Above $25^\circ\text{C}$	39
			0.31
$T_J, T_{STG}$	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	$^\circ\text{C}$

#### Thermal Characteristics

Symbol	Parameter	FCU2250N80Z	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	3.2	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	100	

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FCU2250N80Z	FCU225080Z	IPAK	Tube	N/A	N/A	75 units

## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	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 $25^\circ\text{C}$	-	0.85	-	$V/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$	-	-	25	$\mu\text{A}$
		$V_{DS} = 640\text{ V}, V_{GS} = 0\text{ V}, T_C = 125^\circ\text{C}$	-	-	250	$\mu\text{A}$
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	-	-	$\pm 10$	$\mu\text{A}$

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 0.26\text{ mA}$	2.5	-	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 1.3\text{ A}$	-	1.87	2.25	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 20\text{ V}, I_D = 1.3\text{ A}$	-	2.28	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	440	585	pF
$C_{oss}$	Output Capacitance		-	16	22	pF
$C_{riss}$	Reverse Transfer Capacitance		-	0.75	-	pF
$C_{oss}$	Output Capacitance	$V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	8.4	-	pF
$C_{oss(eff.)}$	Effective Output Capacitance	$V_{DS} = 0\text{ V to } 480\text{ V}, V_{GS} = 0\text{ V}$	-	51	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 640\text{ V}, I_D = 2.6\text{ A}, V_{GS} = 10\text{ V}$ (Note 4)	-	11	14	nC
$Q_{gs}$	Gate to Source Gate Charge		-	2.2	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	4.3	-	nC
ESR	Equivalent Series Resistance	$f = 1\text{ MHz}$	-	2.8	-	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 400\text{ V}, I_D = 2.6\text{ A}, V_{GS} = 10\text{ V}, R_g = 4.7\text{ }\Omega$ (Note 4)	-	11	32	ns
$t_r$	Turn-On Rise Time		-	6.7	23	ns
$t_{d(off)}$	Turn-Off Delay Time		-	26	62	ns
$t_f$	Turn-Off Fall Time		-	8.7	27	ns

### Drain-Source Diode Characteristics

$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	2.6	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	6.5	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_{SD} = 2.6\text{ A}$	-	-	1.2	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_{SD} = 2.6\text{ A}, di_F/dt = 100\text{ A}/\mu\text{s}$	-	260	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	2.2	-	$\mu\text{C}$

#### Notes:

1. Repetitive rating: pulse width limited by maximum junction temperature.
2.  $I_{AS} = 0.52\text{ A}, R_G = 25\text{ }\Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 2.6\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

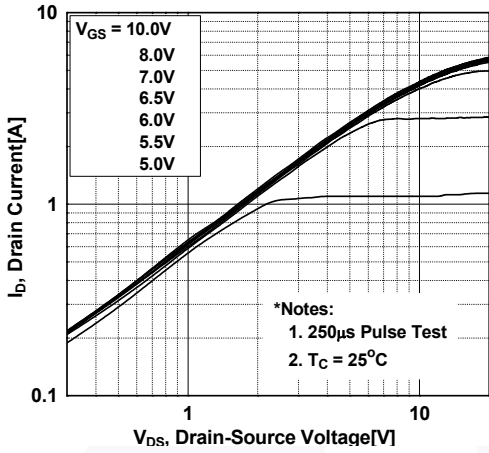


Figure 2. Transfer Characteristics

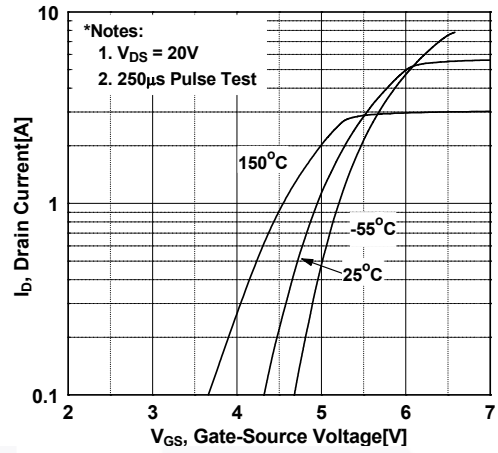


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

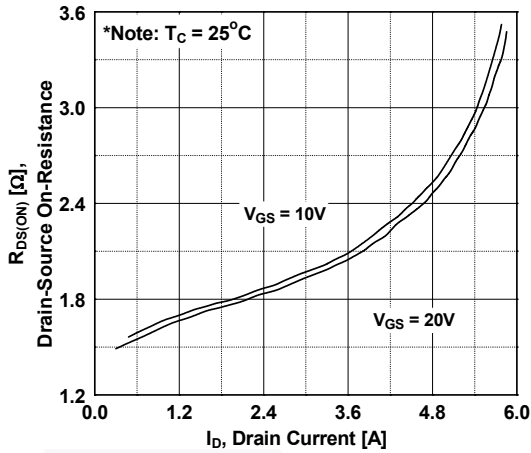


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

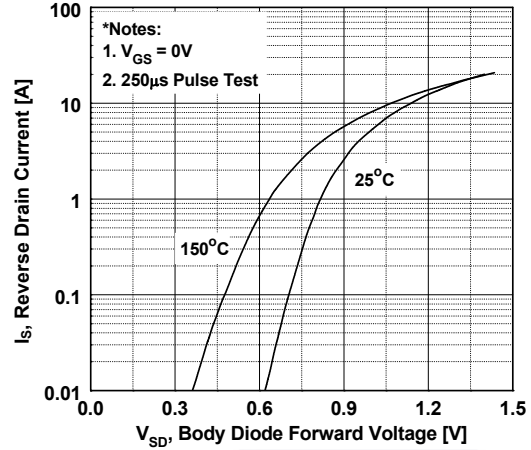


Figure 5. Capacitance Characteristics

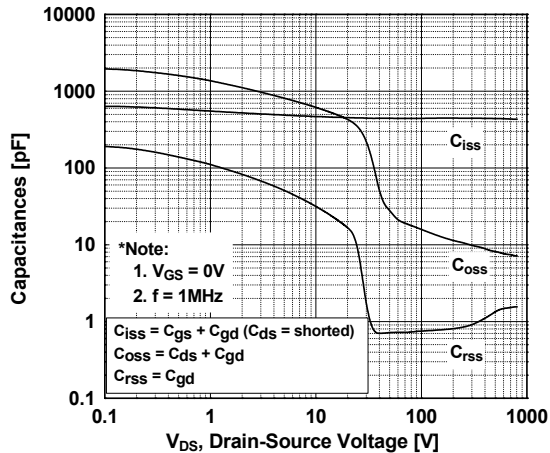
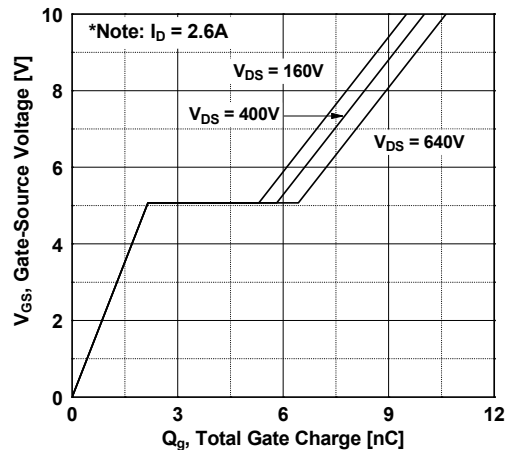


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

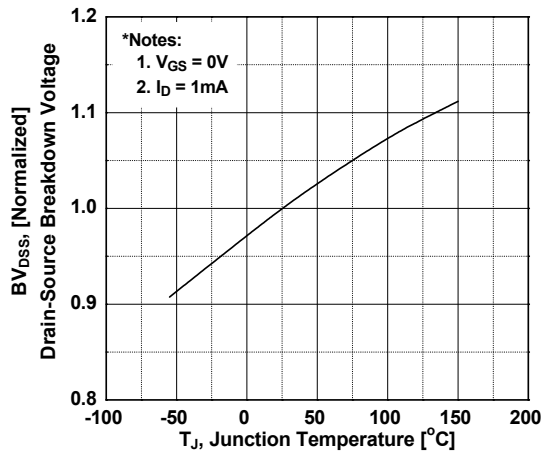


Figure 8. On-Resistance Variation vs. Temperature

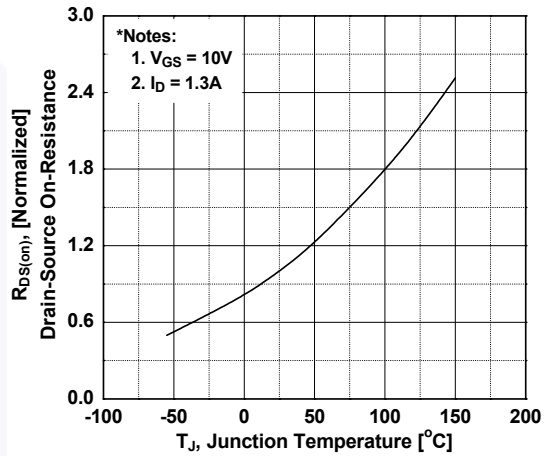


Figure 9. Maximum Safe Operating Area

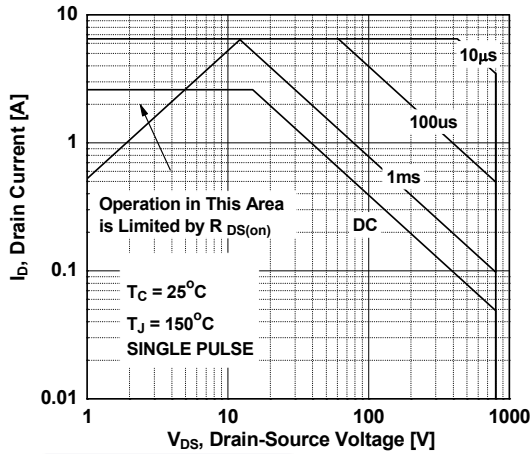


Figure 10. Maximum Drain Current vs. Case Temperature

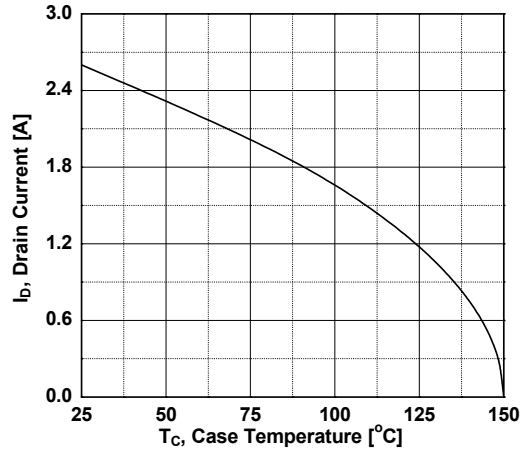
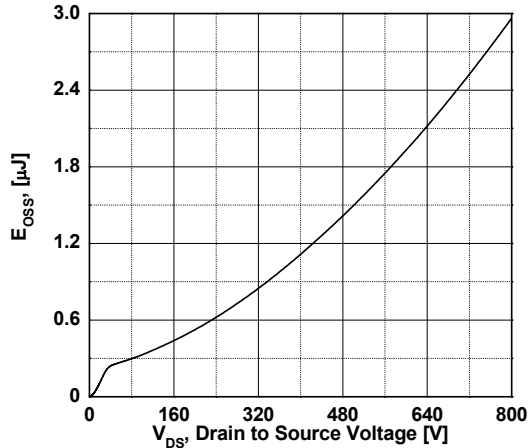
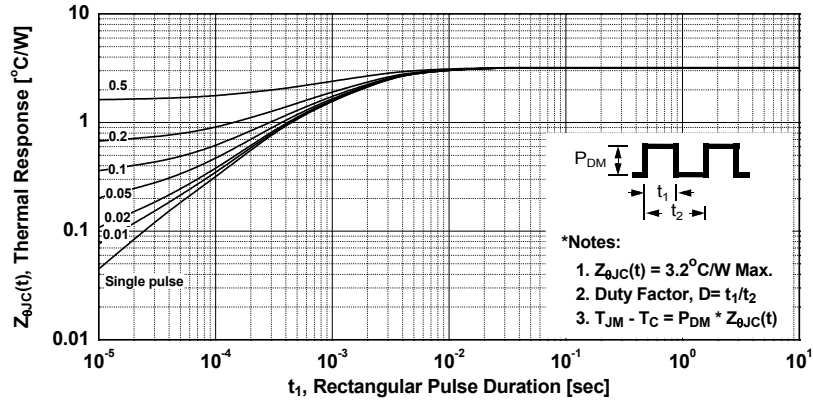


Figure 11. E\_oss vs. Drain to Source Voltage



Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve





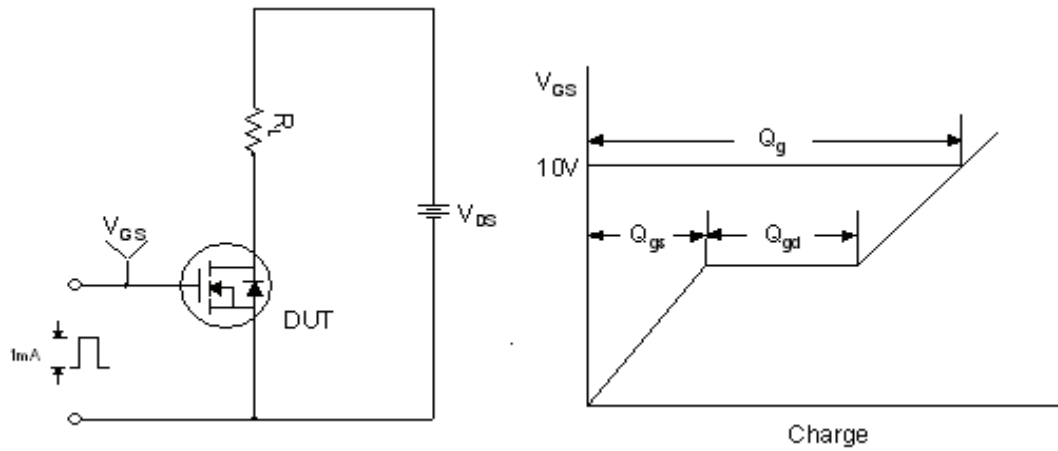


Figure 13. Gate Charge Test Circuit & Waveform

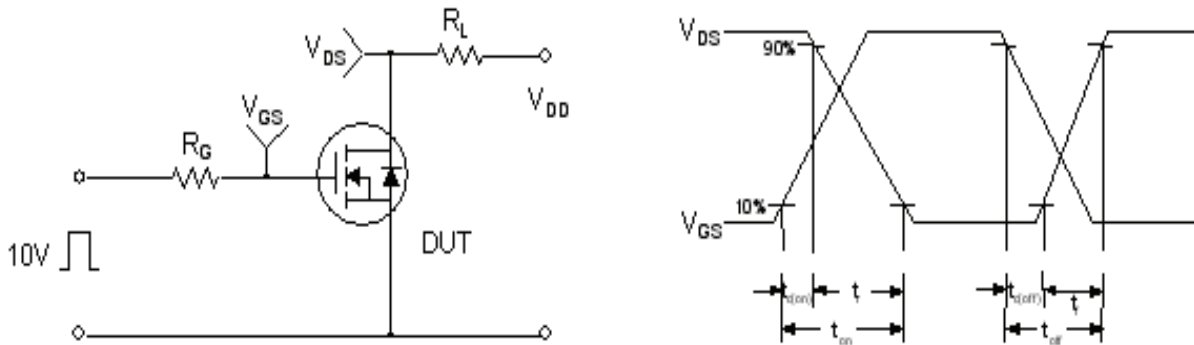


Figure 14. Resistive Switching Test Circuit & Waveforms

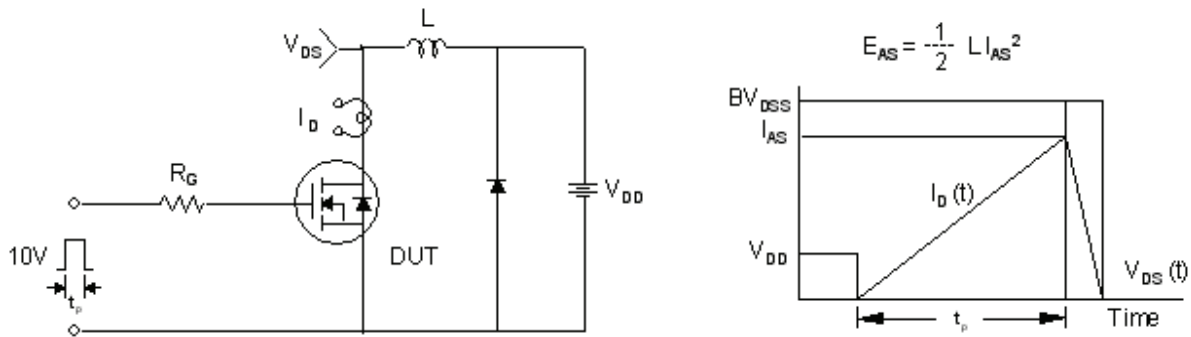


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

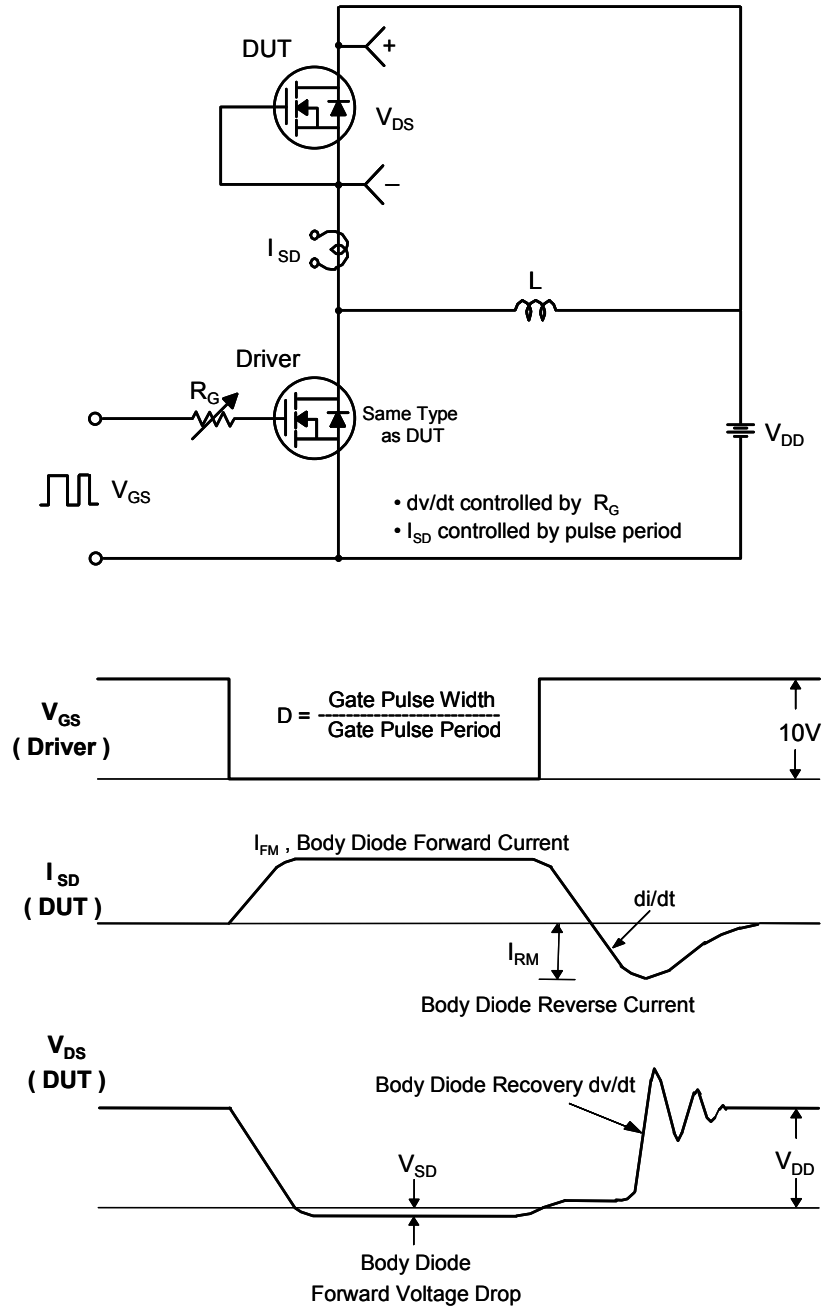
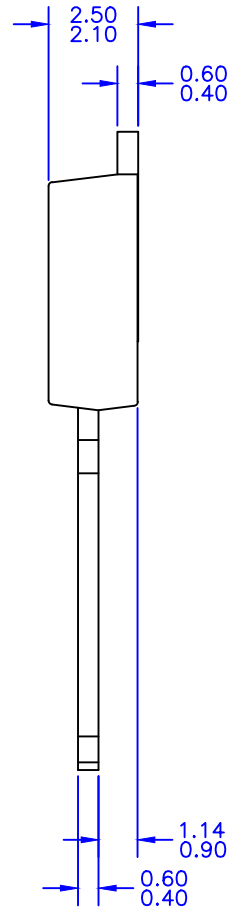
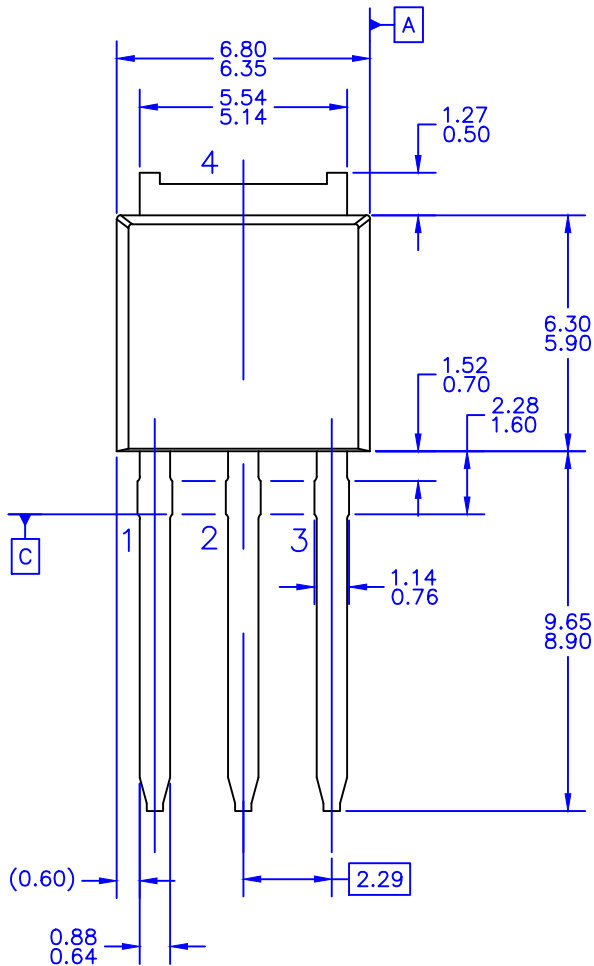
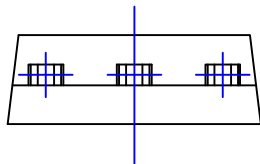


Figure 16. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms




$\text{⌀} 0.25 \text{ (M)}$   $\text{A (M)}$   $\text{C}$   
 3 PLCS



NOTES: UNLESS OTHERWISE SPECIFIED

- A) ALL DIMENSIONS ARE IN MILLIMETERS.
- B) THIS PACKAGE CONFORMS TO JEDEC, TO-251, ISSUE C, VARIATION AA, DATED SEP 1988.
- C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
- D) DRAWING NUMBER AND REVISION: MKT-TO251A03REV2



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