

MOSFET – N-Channel, POWER TRENCH[®]

150 V, 29 A, 54 mΩ

FDP2572

Features

- $R_{DS(on)} = 45 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 9 \text{ A}$
- $Q_{G(tot)} = 26 \text{ nC}$ (Typ.) @ $V_{GS} = 10 \text{ V}$
- Low Miller Charge
- Low Q_{rr} Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- This Device is Pb-Free and Halide Free

Applications

- Consumer Appliances
- Synchronous Rectification
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies
- Micro Solar Inverter

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

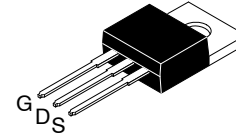
Symbol	Parameter	Value	Unit
V_{DS}	Drain to Source Voltage	150	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current	Continuous ($T_C = 25^\circ\text{C}$, $V_{GS} = 10 \text{ V}$)	29 A
		Continuous ($T_C = 100^\circ\text{C}$, $V_{GS} = 10 \text{ V}$)	20 A
		Continuous ($T_{amb} = 25^\circ\text{C}$, $V_{GS} = 10 \text{ V}$, $R_{\theta JA} = 43^\circ\text{C/W}$)	4 A
		Pulsed	Figure 4 A
E_{AS}	Single Pulse Avalanche Energy (Note 1)	36	mJ
P_D	Power Dissipation	135	W
	Derate above 25°C	0.9	W/ $^\circ\text{C}$
T_J , T_{STG}	Operating and Storage Temperature	-55 to 175	$^\circ\text{C}$

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.

THERMAL CHARACTERISTICS

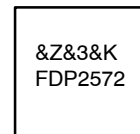
Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	1.11	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max. (Note 2)	62.5	$^\circ\text{C/W}$

V_{DS}	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
150 V	54 mΩ @ 10 V	29 A

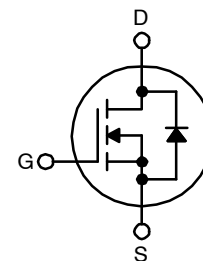


TO-220-3LD
CASE 340AT

MARKING DIAGRAM



&Z = Assembly Plant Code
 &3 = 3-Digit Date Code
 &K = 2-Digits Lot Run Traceability Code
 FDP2572 = Specific Device Code



N-Channel

ORDERING INFORMATION

Device	Package	Shipping
FDP2572	TO-220-3LD	800 Units / Tube

FDP2572

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

B _{VDS}	Drain to Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA	150	–	–	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{GS} = 0 V, V _{DS} = 120 V	–	–	1	μA
		V _{GS} = 0 V, V _{DS} = 120 V, T _C = 150°C	–	–	250	
I _{GSS}	Gate to Source Leakage Current	V _{GS} = ±20 V	–	–	±100	nA

ON CHARACTERISTICS

V _{GS(TH)}	Gate to Source Threshold Voltage	V _{GS} = V _{DS} , I _D = 250 μA	2	–	4	V
R _{DS(on)}	Drain to Source On Resistance	V _{GS} = 10 V, I _D = 9 A	–	0.045	0.054	Ω
		V _{GS} = 6 V, I _D = 4 A	–	0.050	0.075	
		V _{GS} = 10 V, I _D = 9 A, T _C = 175°C	–	0.126	0.146	

DYNAMIC CHARACTERISTICS

C _{ISS}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz	–	1770	–	pF
C _{OSS}	Output Capacitance		–	183	–	pF
C _{RSS}	Reverse Transfer Capacitance		–	40	–	pF
Q _{g(TOT)}	Total Gate Charge at 10 V	V _{DD} = 75 V, I _D = 9 A, I _g = 1.0 mA, V _{GS} = 0 V to 10 V	–	26	34	nC
Q _{g(TH)}	Threshold Gate Charge	V _{DD} = 75 V, I _D = 9 A, I _g = 1.0 mA, V _{GS} = 0 V to 2 V	–	3.3	4.3	nC
Q _{gs}	Gate to Source Gate Charge	V _{DD} = 75 V, I _D = 9 A, I _g = 1.0 mA	–	8	–	nC
Q _{gs2}	Gate Charge Threshold to Plateau		–	5	–	nC
Q _{gd}	Gate to Drain “Miller” Charge		–	6	–	nC

RESISTIVE SWITCHING CHARACTERISTICS (V_{GS} = 10 V)

t _{ON}	Turn-On Time	V _{DD} = 75 V, I _D = 9 A, V _{GS} = 10 V, R _{GS} = 11.0 Ω	–	–	36	ns
t _{d(ON)}	Turn-On Delay Time		–	11	–	ns
t _r	Rise Time		–	14	–	ns
t _{d(OFF)}	Turn-Off Delay Time		–	31	–	ns
t _f	Fall Time		–	14	–	ns
t _{OFF}	Turn-Off Time		–	–	66	ns

DRAIN-SOURCE DIODE CHARACTERISTICS

V _{SD}	Source to Drain Diode Voltage	I _{SD} = 9 A	–	–	1.25	V
		I _{SD} = 4 A	–	–	1.0	V
t _{rr}	Reverse Recovery Time	I _{SD} = 9 A, dI _{SD} /dt = 100 A/μs	–	–	74	ns
Q _{RR}	Reverse Recovered Charge	I _{SD} = 9 A, dI _{SD} /dt = 100 A/μs	–	–	169	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.

- Starting T_J = 25°C, L = 0.2 mH, I_{AS} = 19 A.
- Pulse Width = 100 μs

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

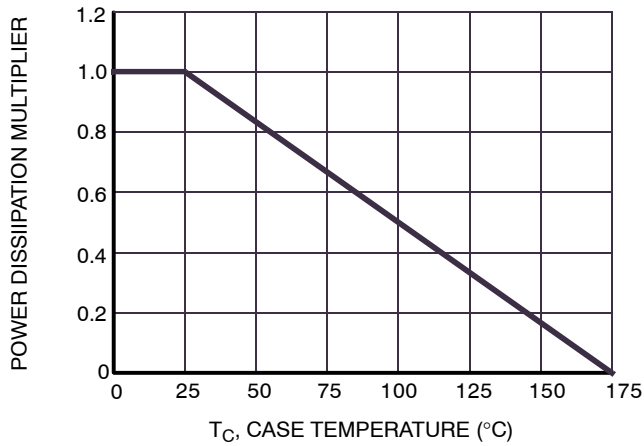


Figure 1. Normalized Power Dissipation vs. Ambient Temperature

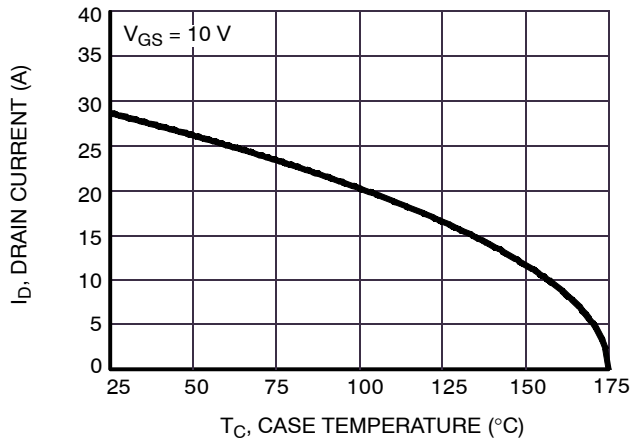


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

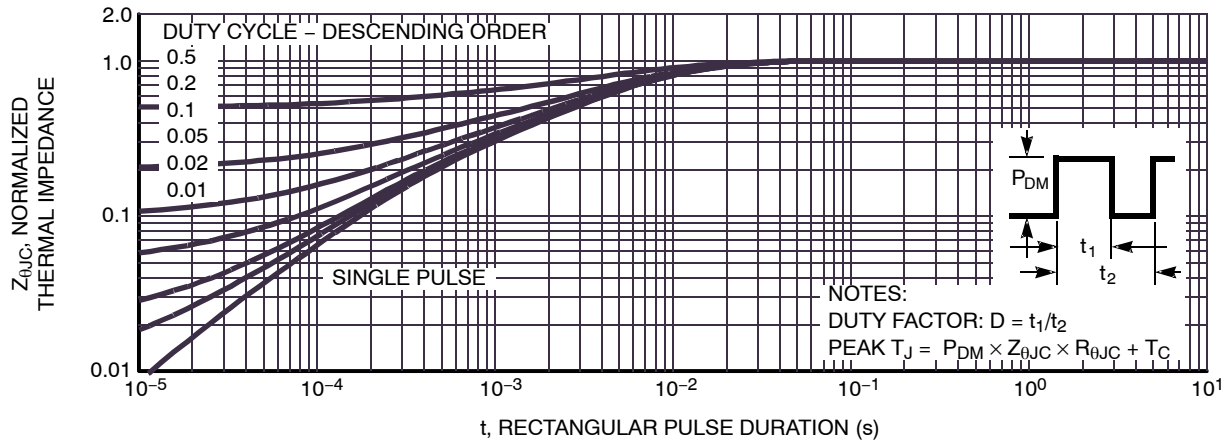


Figure 3. Normalized Maximum Transient Thermal Impedance

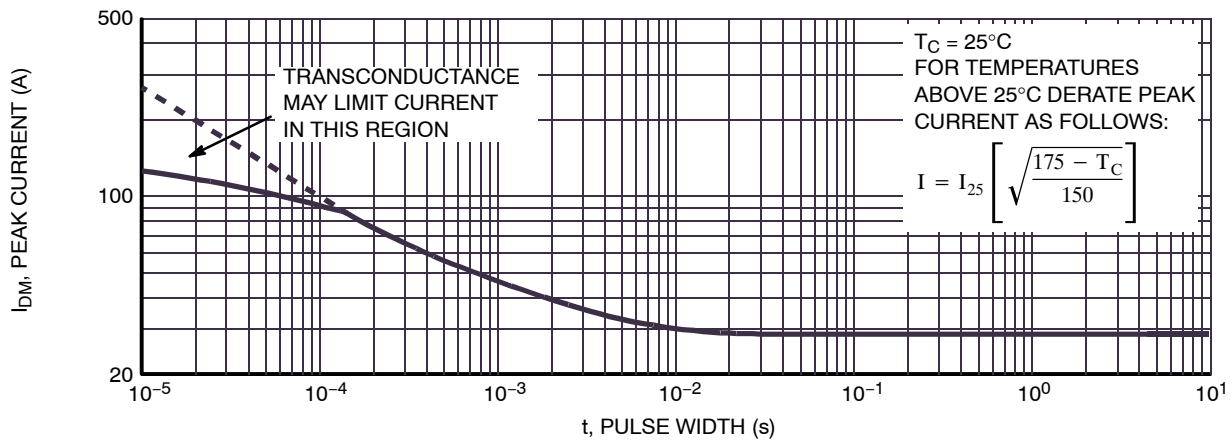


Figure 4. Peak Current Capability

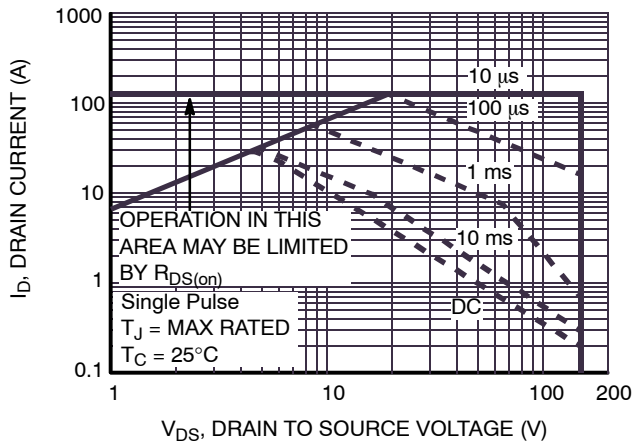
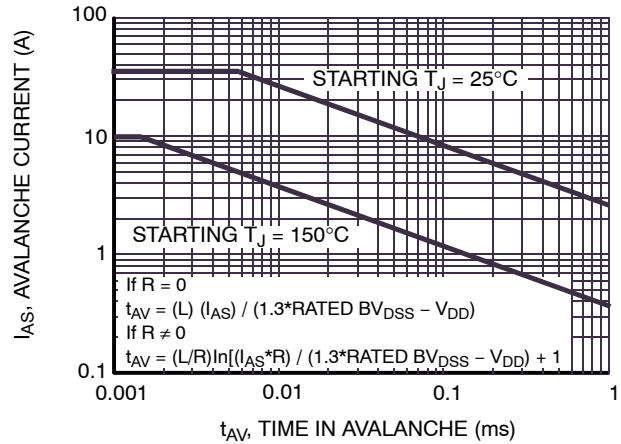
TYPICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted) (continued)

Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to onsemi Application Notes [AN7514](#) and [AN7515](#)

Figure 6. Unclamped Inductive Switching Capability

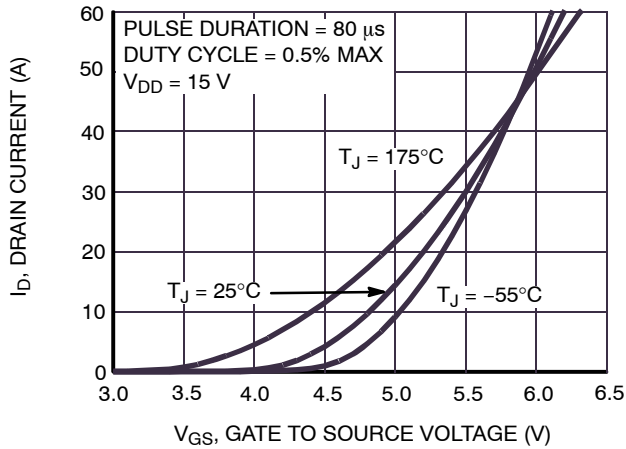


Figure 7. Transfer Characteristics

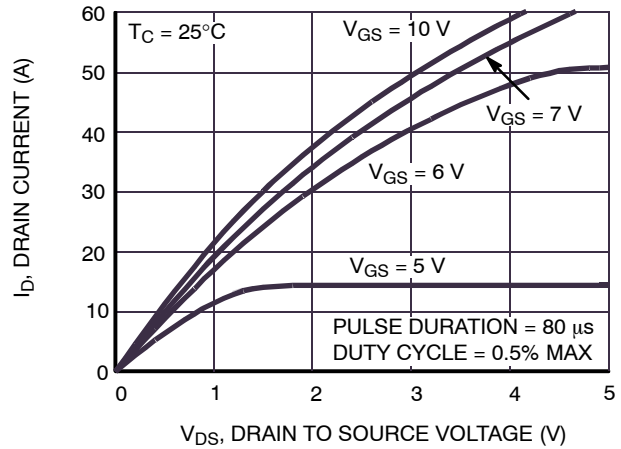


Figure 8. Saturation Characteristics

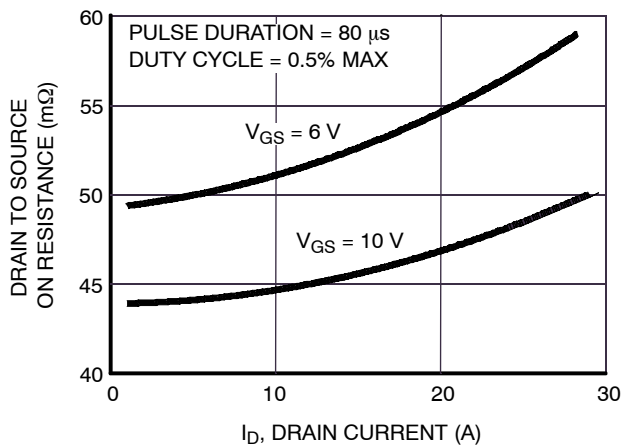


Figure 9. Drain to Source On Resistance vs. Drain Current

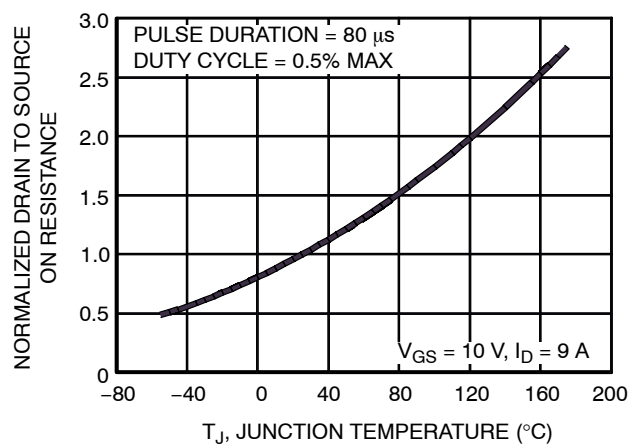


Figure 10. Normalized Drain to Source On Resistance vs. Junction Temperature

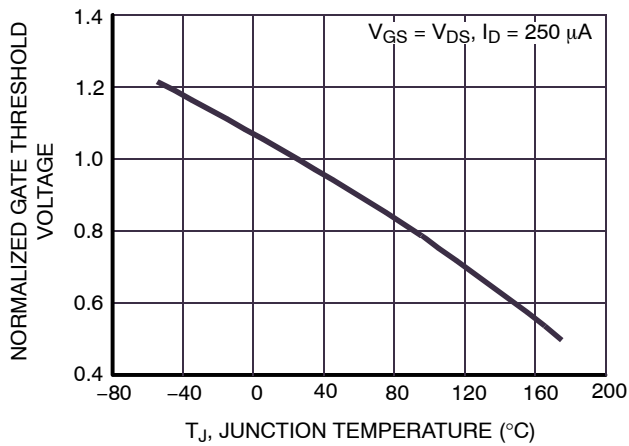
TYPICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted) (continued)

Figure 11. Normalized Gate Threshold Voltage vs. Junction Temperature

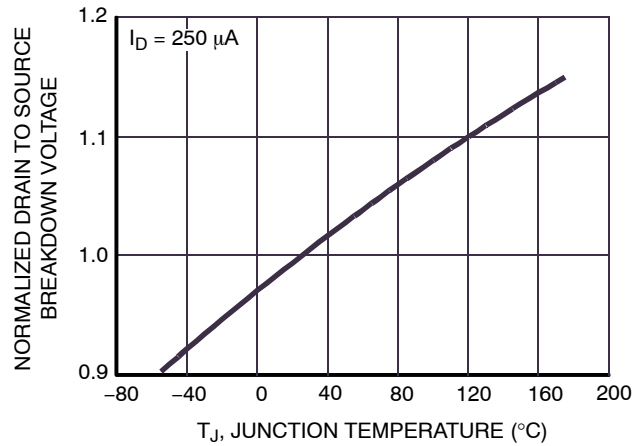


Figure 12. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

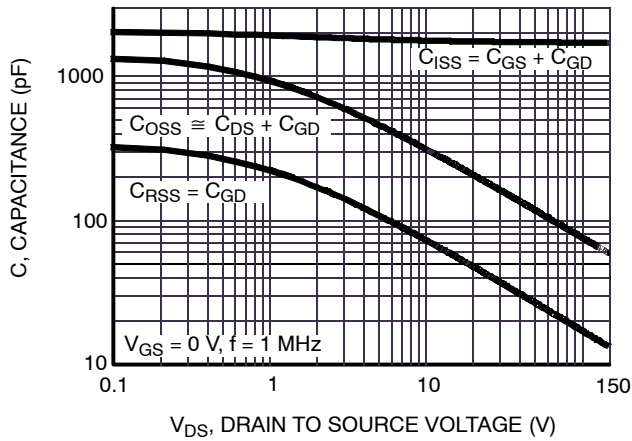


Figure 13. Capacitance vs. Drain to Source Voltage

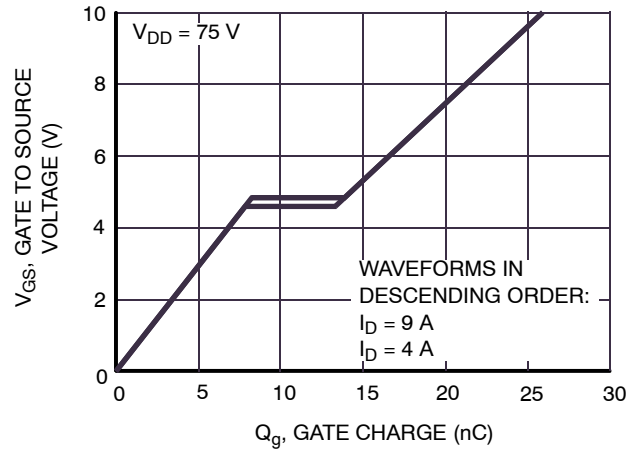


Figure 14. Gate Charge Waveforms for Constant Gate Currents

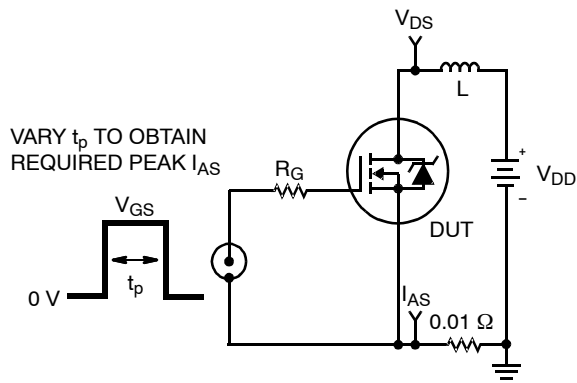


Figure 15. Unclamped Energy Test Circuit

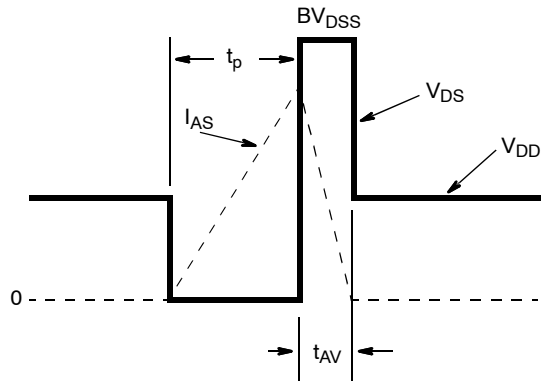


Figure 16. Unclamped Energy Waveforms

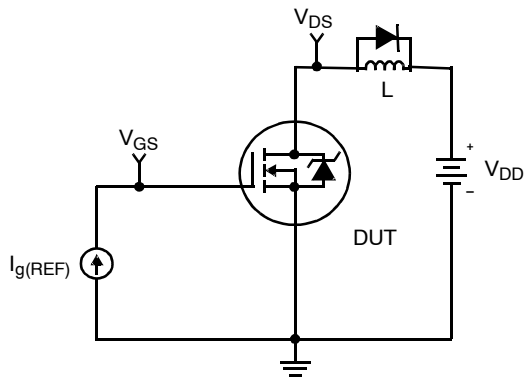


Figure 17. Gate Charge Test Circuit

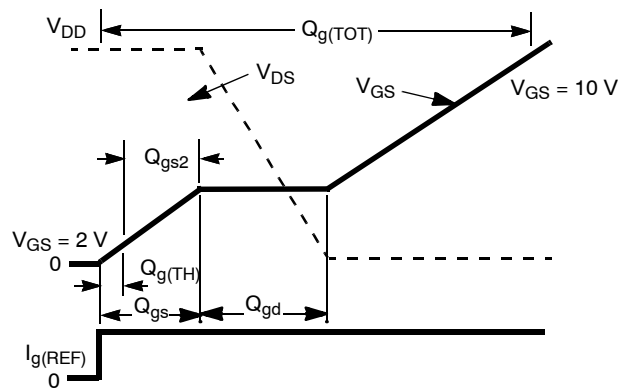


Figure 18. Gate Charge Waveforms

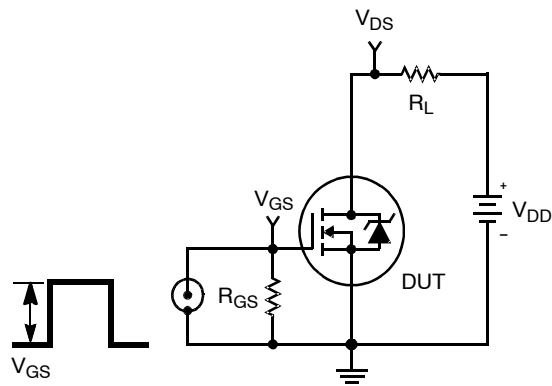


Figure 19. Switching Time Test Circuit

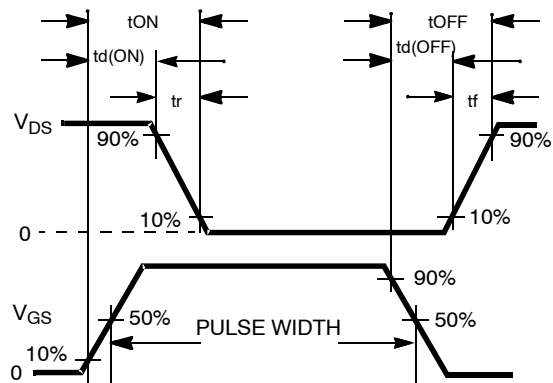


Figure 20. Switching Time Waveforms

FDP2572

PSPICE Electrical Model

```
.SUBCKT FDP2572 2 1 3 ; rev April 2002
CA 12 8 5.5e-10
Cb 15 14 7.4e-10
Cin 6 8 1.7e-9
```

```
Dbody 7 5 DbodyMOD
Dbreak 5 11 DbreakMOD
Dplcap 10 5 DplcapMOD
```

```
Ebreak 11 7 17 18 160
Eds 14 8 5 8 1
Egs 13 8 6 8 1
Esg 6 10 6 8 1
Evthres 6 21 19 8 1
Etemp 20 6 18 22 1
```

```
It 8 17 1
```

```
Lgate 1 9 9.56e-9
Ldrain 2 5 1.0e-9
Lsource 3 7 7.71e-9
```

```
RLgate 1 9 95.6
RLdrain 2 5 10
RLsource 3 7 77.1
```

```
Mmed 16 6 8 8 MmedMOD
Mstro 16 6 8 8 MstroMOD
Mweak 16 21 8 8 MweakMOD
```

```
Rbreak 17 18 RbreakMOD 1
Rdrain 50 16 RdrainMOD 35e-3
Rgate 9 20 1.6
RSLC1 5 51 RSLCMOD 1.0e-6
RSLC2 5 50 1.0e3
Rsource 8 7 RsourceMOD 3.0e-3
Rvthres 22 8 RvthresMOD 1
Rvtemp 18 19 RvtempMOD 1
S1a 6 12 13 8 S1AMOD
S1b 13 12 13 8 S1BMOD
S2a 6 15 14 13 S2AMOD
S2b 13 15 14 13 S2BMOD
```

```
Vbat 22 19 DC 1
```

```
ESLC 51 50 VALUE={ (V(5,51)/ABS(V(5,51))) * (PWR(V(5,51)/(1e-6*52),3)) }
```

```
.MODEL DbodyMOD D (IS=6.0E-11 N=1.14 RS=3.9e-3 TRS1=3.5e-3 TRS2=3.0e-6
+ CJO=1.1e-9 M=0.63 TT=6.2e-8 XTI=4.5)
```

```
.MODEL DbreakMOD D (RS=10 TRS1=5.0e-3 TRS2=-5.0e-6)
```

```
.MODEL DplcapMOD D (CJO=3.5e-10 IS=1.0e-30 N=10 M=0.65)
```

```
.MODEL MmedMOD NMOS (VTO=3.55 KP=3 IS=1e-40 N=10 TOX=1 L=1u W=1u RG=1.6)
```

```
.MODEL MstroMOD NMOS (VTO=4.0 KP=25 IS=1e-30 N=10 TOX=1 L=1u W=1u)
```

```
.MODEL MweakMOD NMOS (VTO=2.95 KP=0.05 IS=1e-30 N=10 TOX=1 L=1u W=1u RG=16 RS=0.1)
```

```
.MODEL RbreakMOD RES (TC1=1.15e-3 TC2=-9.5e-7)
```

```
.MODEL RdrainMOD RES (TC1=9.0e-3 TC2=2.5e-5)
```

```
.MODEL RSLCMOD RES (TC1=3.0e-3 TC2=2.5e-6)
```

```
.MODEL RsourceMOD RES (TC1=4.0e-3 TC2=1.0e-6)
```

```
.MODEL RvthresMOD RES (TC1=-4.1e-3 TC2=-1.0e-5)
```

```
.MODEL RvtempMOD RES (TC1=-4.0e-3 TC2=1.0e-6)
```

```
.MODEL S1AMOD VSWITCH (RON=1e-5 ROFF=0.1 VON=-5.0 VOFF=-3.5)
```

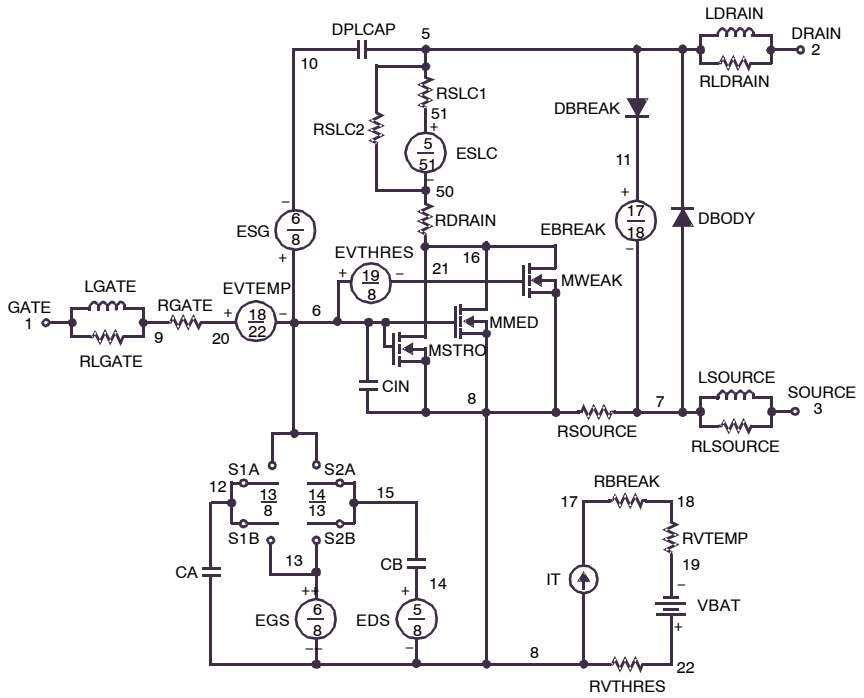
```
.MODEL S1BMOD VSWITCH (RON=1e-5 ROFF=0.1 VON=-3.5 VOFF=-5.0)
```

```
.MODEL S2AMOD VSWITCH (RON=1e-5 ROFF=0.1 VON=-0.5 VOFF=0.3)
```

```
.MODEL S2BMOD VSWITCH (RON=1e-5 ROFF=0.1 VON=0.3 VOFF=-0.5)
```

```
.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.



```
REV April 2002
ttemplate FDB2572 n2,n1,n3
electrical n2,n1,n3
```



SABER Electrical Model

```

REV 26 April 2002
FDB2572
CTHERM1 TH 6 3.8e-3
CTHERM2 6 5 4.0e-3
CTHERM3 5 4 4.2e-3
CTHERM4 4 3 4.3e-3
CTHERM5 3 2 8.5e-3
CTHERM6 2 TL 3.0e-2
RTHERM1 TH 6 5.5e-4
RTHERM2 6 5 5.0e-3
RTHERM3 5 4 4.5e-2
RTHERM4 4 3 10.5e-2
RTHERM5 3 2 3.7e-1
RTHERM6 2 TL 3.8e-1

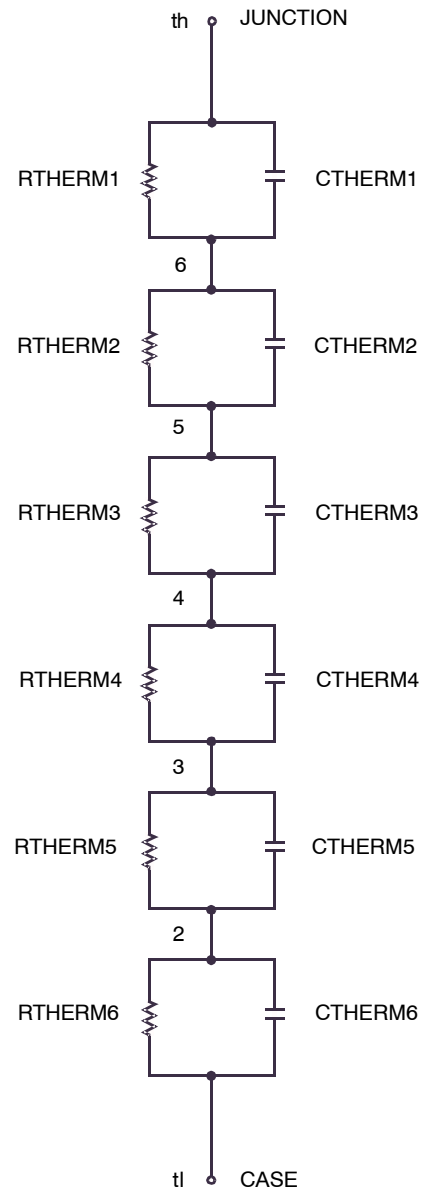
```

SABER Thermal Model

```

SABER thermal model FDB2572
template thermal_model th tl
thermal_c th, tl
{
  ctherm.ctherm1 th 6 =3.8e-3
  ctherm.ctherm2 6 5 =4.0e-3
  ctherm.ctherm3 5 4 =4.2e-3
  ctherm.ctherm4 4 3 =4.3e-3
  ctherm.ctherm5 3 2 =8.5e-3
  ctherm.ctherm6 2 tl =3.0e-2
  rtherm.rtherm1 th 6 =5.5e-4
  rtherm.rtherm2 6 5 =5.0e-3
  rtherm.rtherm3 5 4 =4.5e-2
  rtherm.rtherm4 4 3 =10.5e-2
  rtherm.rtherm5 3 2 =3.7e-1
  rtherm.rtherm6 2 tl =3.8e-1
}

```





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

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