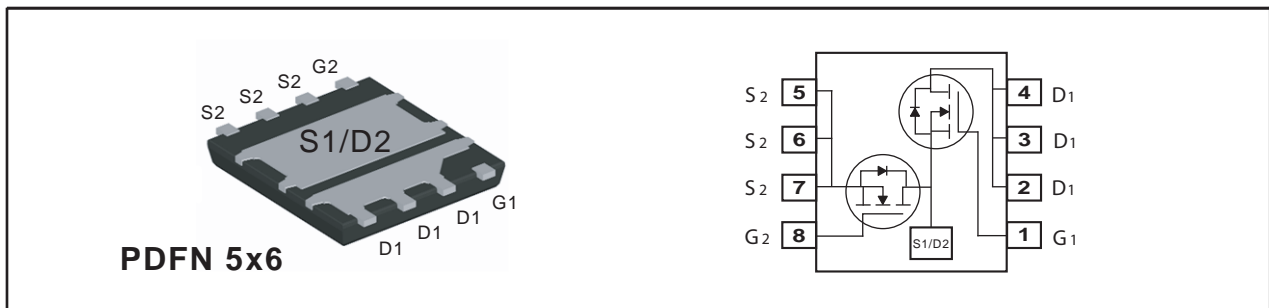


**Dual N-Channel Enhancement Mode Field Effect Transistor****PRODUCT SUMMARY (DIE 1)**

V <sub>DSS</sub>	I <sub>D</sub>	R <sub>DS(ON)</sub> (mΩ) Max
40V	28A	23 @ V <sub>GS</sub> =10V
		34 @ V <sub>GS</sub> =4.5V

**PRODUCT SUMMARY (DIE 2)**

V <sub>DSS</sub>	I <sub>D</sub>	R <sub>DS(ON)</sub> (mΩ) Max
40V	66A	10 @ V <sub>GS</sub> =10V
		15 @ V <sub>GS</sub> =4.5V

**ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub>=25°C unless otherwise noted)**

Symbol	Parameter		Die 1	Die 2	Units
V <sub>DS</sub>	Drain-Source Voltage		40		V
V <sub>GS</sub>	Gate-Source Voltage		±20		V
I <sub>D</sub>	Drain Current-Continuous <sup>c</sup>	T <sub>C</sub> =25°C	28	66	A
		T <sub>C</sub> =70°C	22.4	52.8	A
I <sub>DM</sub>	-Pulsed <sup>a c</sup>		62	114	A
E <sub>AS</sub>	Sigle Pulse Avalanche Energy <sup>d</sup>		49	121	mJ
P <sub>D</sub>	Maximum Power Dissipation	T <sub>C</sub> =25°C	31	78	W
		T <sub>C</sub> =70°C	20	50	W
T <sub>J</sub> , T <sub>STG</sub>	Operating Junction and Storage Temperature Range		-55 to 150		°C

**THERMAL CHARACTERISTICS**

R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	4	1.6	°C/W
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# SP4400

Ver 1.0

## DIE 1 - ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V , I <sub>D</sub> =250uA	40			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =32V , V <sub>GS</sub> =0V			1	uA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> = ±20V , V <sub>DS</sub> =0V			±100	nA
ON CHARACTERISTICS						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	1	1.8	3	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =10V , I <sub>D</sub> =7A		18	23	m ohm
		V <sub>GS</sub> =4.5V , I <sub>D</sub> =6A		25	34	m ohm
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V , I <sub>D</sub> =7A		15		S
DYNAMIC CHARACTERISTICS <sup>b</sup>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =20V,V <sub>GS</sub> =0V f=1.0MHz		533		pF
C <sub>oss</sub>	Output Capacitance			87		pF
C <sub>rSS</sub>	Reverse Transfer Capacitance			71		pF
SWITCHING CHARACTERISTICS <sup>b</sup>						
t <sub>D(ON)</sub>	Turn-On Delay Time	V <sub>DD</sub> =20V I <sub>D</sub> =1A V <sub>GS</sub> =10V R <sub>GEN</sub> = 6 ohm		12		ns
t <sub>r</sub>	Rise Time			13		ns
t <sub>D(OFF)</sub>	Turn-Off Delay Time			18		ns
t <sub>f</sub>	Fall Time			21		ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =20V,I <sub>D</sub> =7A,V <sub>GS</sub> =10V		10		nC
		V <sub>DS</sub> =20V,I <sub>D</sub> =7A,V <sub>GS</sub> =4.5V		5.5		nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =20V,I <sub>D</sub> =7A, V <sub>GS</sub> =10V		1.2		nC
Q <sub>gd</sub>	Gate-Drain Charge			3		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V,I <sub>S</sub> =1A		0.77	1.2	V

### Notes

- Pulse Test: Pulse Width ≤ 10us, Duty Cycle ≤ 1%.
- Guaranteed by design, not subject to production testing.
- Drain current limited by maximum junction temperature.
- Starting T<sub>J</sub>=25°C, L=0.5mH, V<sub>DD</sub> = 20V. (See Figure13)
- Mounted on FR4 Board of 1 inch<sup>2</sup> , 2oz.

Mar, 19, 2015

# SP4400

Ver 1.0

## DIE 2 - ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V , I <sub>D</sub> =250uA	40			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =32V , V <sub>GS</sub> =0V			1	uA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> = ±20V , V <sub>DS</sub> =0V			±100	nA
ON CHARACTERISTICS						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	1	1.6	3	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =10V , I <sub>D</sub> =16.5A		8	10	m ohm
		V <sub>GS</sub> =4.5V , I <sub>D</sub> =13.5A		11	15	m ohm
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V , I <sub>D</sub> =16.5A		22		S
DYNAMIC CHARACTERISTICS <sup>b</sup>						
C <sub>ISS</sub>	Input Capacitance	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V f=1.0MHz		1414		pF
C <sub>OSS</sub>	Output Capacitance			170		pF
C <sub>RSS</sub>	Reverse Transfer Capacitance			146		pF
SWITCHING CHARACTERISTICS <sup>b</sup>						
t <sub>D(ON)</sub>	Turn-On Delay Time	V <sub>DD</sub> =20V I <sub>D</sub> =1A V <sub>GS</sub> =10V R <sub>GEN</sub> = 6 ohm		23		ns
t <sub>r</sub>	Rise Time			27		ns
t <sub>D(OFF)</sub>	Turn-Off Delay Time			68		ns
t <sub>f</sub>	Fall Time			38		ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =20V, I <sub>D</sub> =16.5A, V <sub>GS</sub> =10V		23		nC
		V <sub>DS</sub> =20V, I <sub>D</sub> =16.5A, V <sub>GS</sub> =4.5V		12		nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =20V, I <sub>D</sub> =16.5A,		2		nC
Q <sub>gd</sub>	Gate-Drain Charge	V <sub>GS</sub> =10V		6.2		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =3A		0.78	1.2	V

### Notes

- Pulse Test: Pulse Width ≤ 10us, Duty Cycle ≤ 1%.
- Guaranteed by design, not subject to production testing.
- Drain current limited by maximum junction temperature.
- Starting T<sub>J</sub>=25°C, L=0.5mH, V<sub>DD</sub> = 20V. (See Figure13)
- Mounted on FR4 Board of 1 inch<sup>2</sup>, 2oz.

Mar, 19, 2015

Die 1

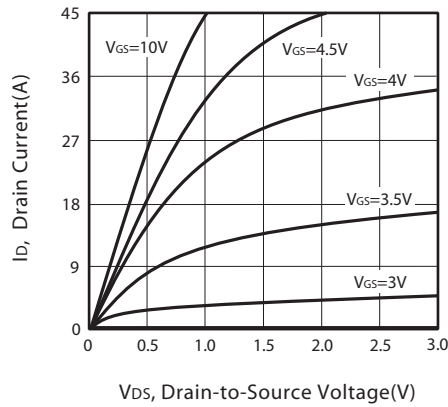


Figure 1. Output Characteristics

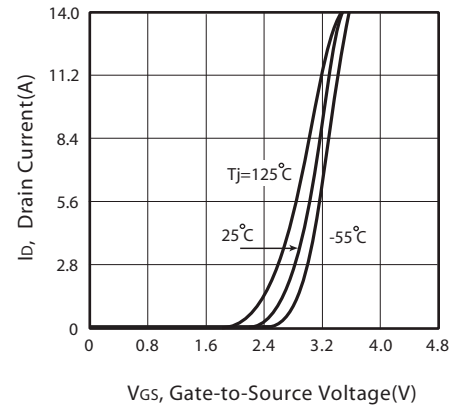


Figure 2. Transfer Characteristics

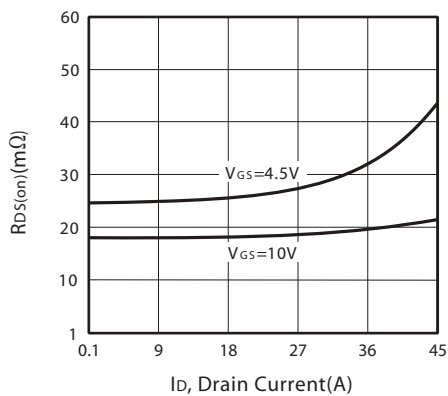


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

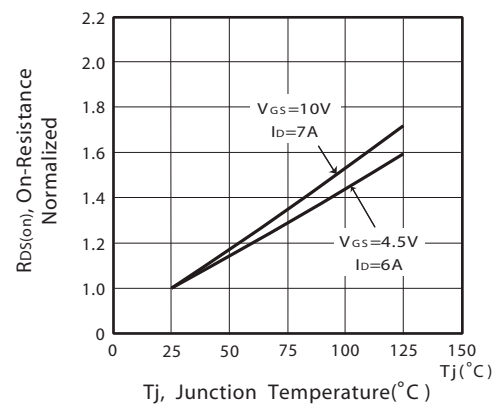


Figure 4. On-Resistance Variation with Drain Current and Temperature

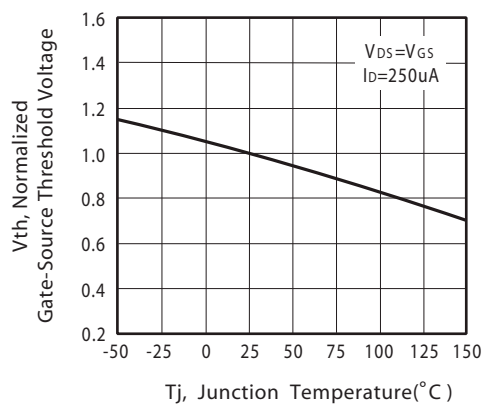


Figure 5. Gate Threshold Variation with Temperature

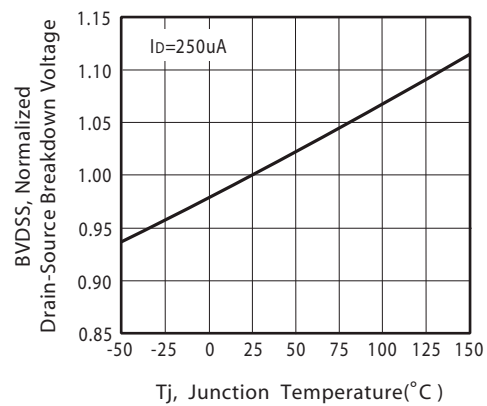


Figure 6. Breakdown Voltage Variation with Temperature

Die 1

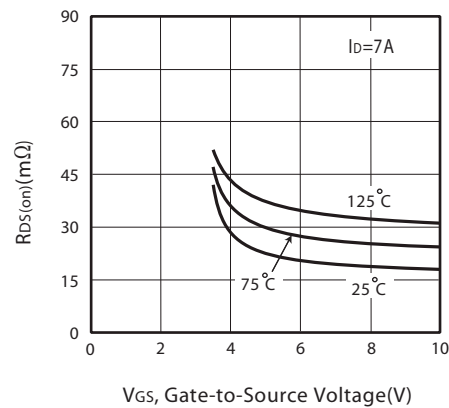


Figure 7. On-Resistance vs. Gate-Source Voltage

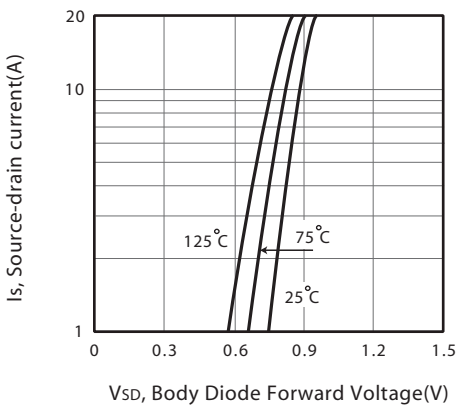


Figure 8. Body Diode Forward Voltage Variation with Source Current

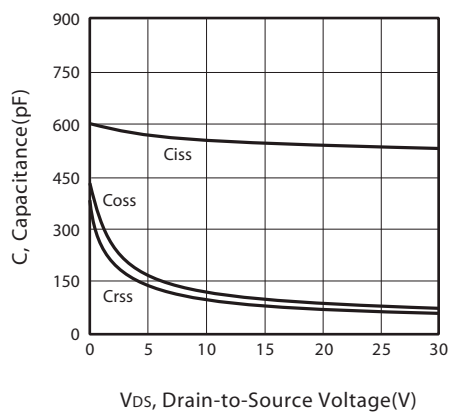


Figure 9. Capacitance

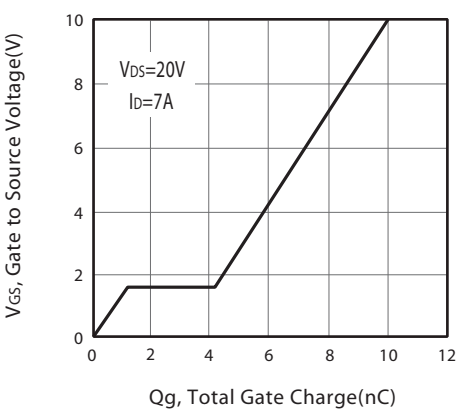


Figure 10. Gate Charge

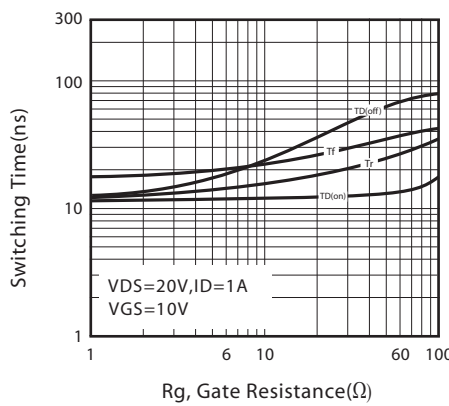


Figure 11. switching characteristics

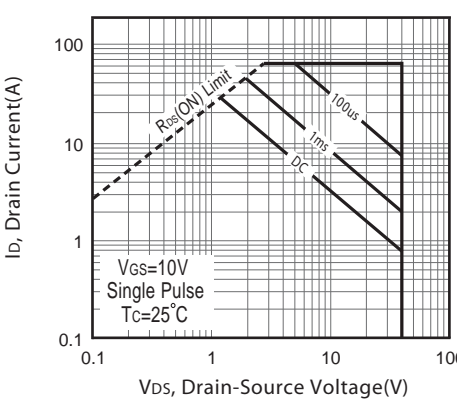
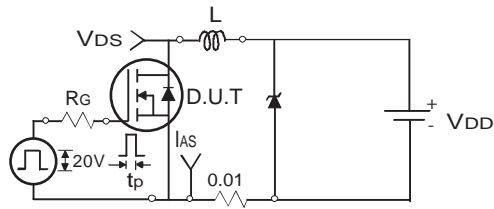


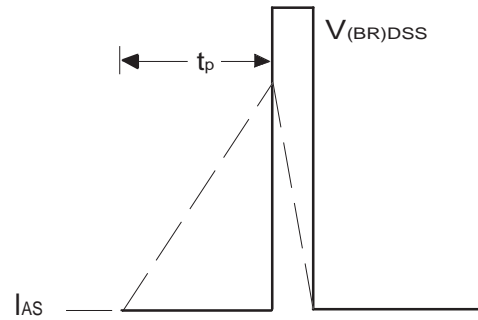
Figure 12. Maximum Safe Operating Area

Die 1



Uncamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

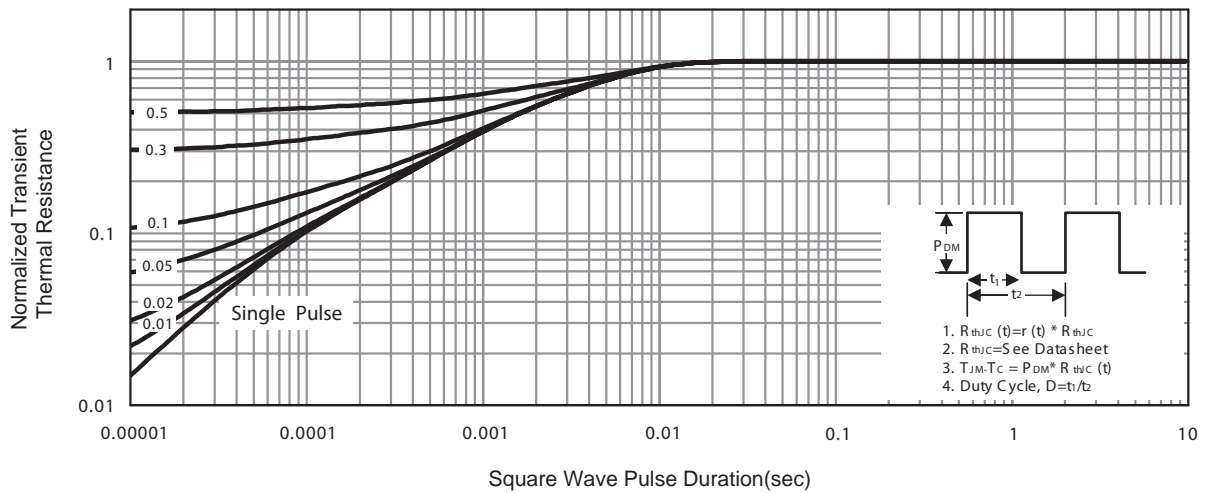


Figure 14. Normalized Thermal Transient Impedance Curve

## Die 2

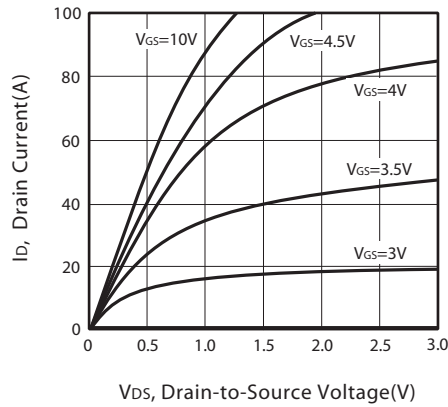


Figure 1. Output Characteristics

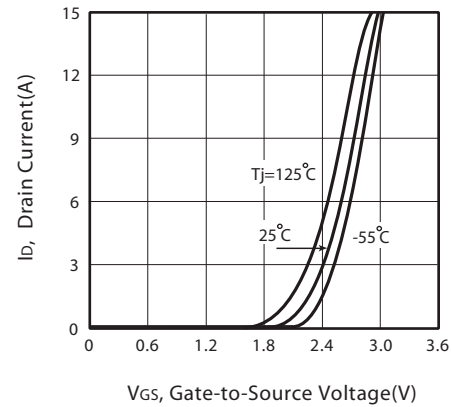


Figure 2. Transfer Characteristics

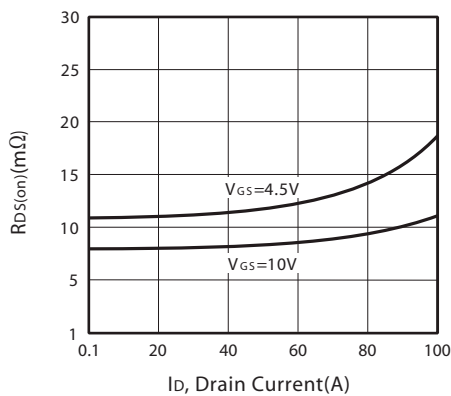


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

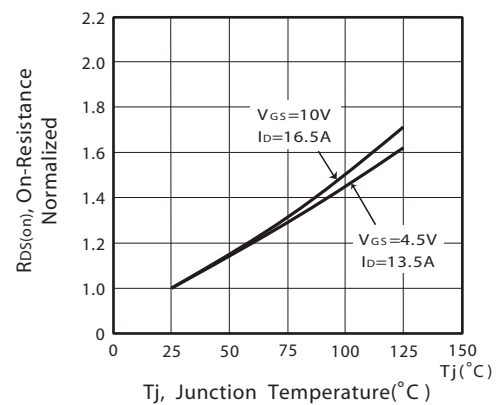


Figure 4. On-Resistance Variation with Drain Current and Temperature

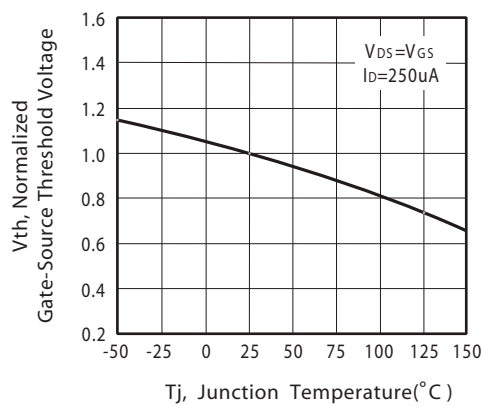


Figure 5. Gate Threshold Variation with Temperature

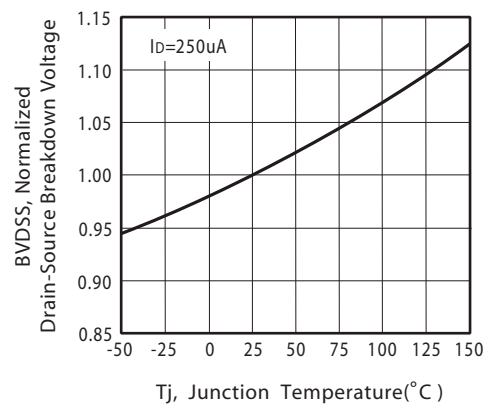


Figure 6. Breakdown Voltage Variation with Temperature

Die 2

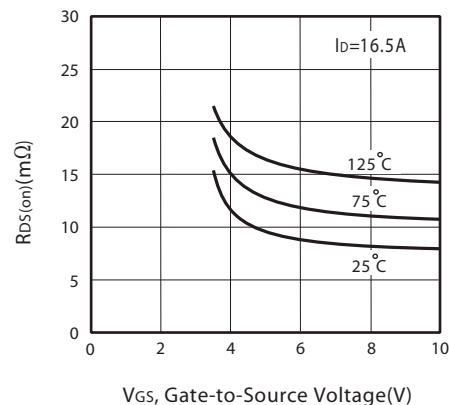


Figure 7. On-Resistance vs. Gate-Source Voltage

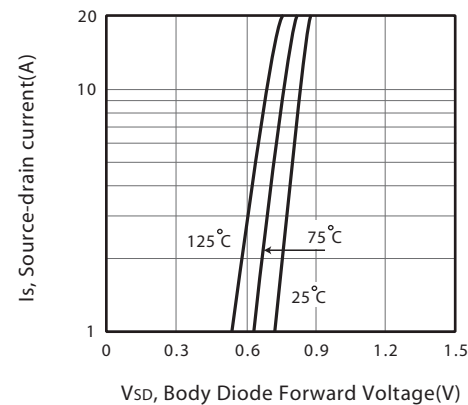


Figure 8. Body Diode Forward Voltage Variation with Source Current

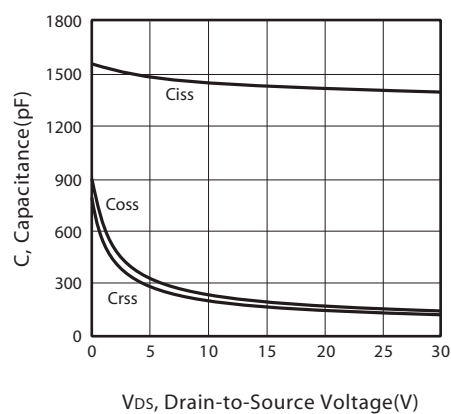


Figure 9. Capacitance

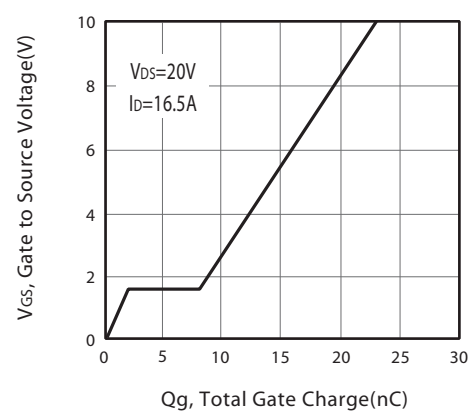


Figure 10. Gate Charge

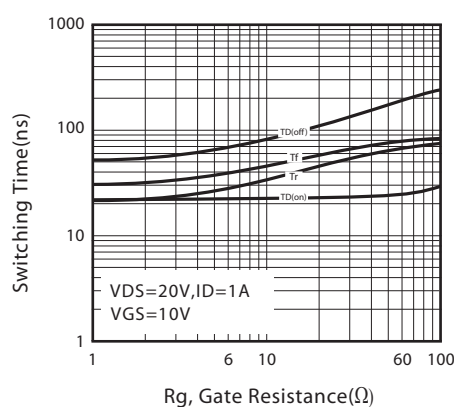


Figure 11. switching characteristics

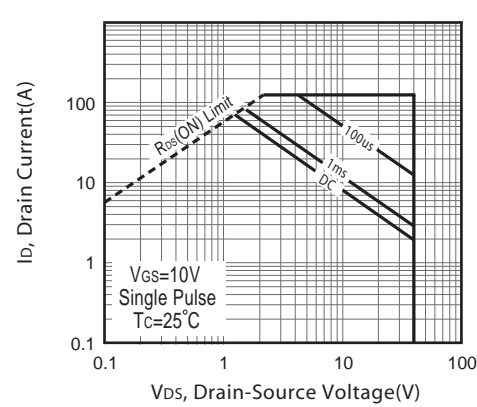
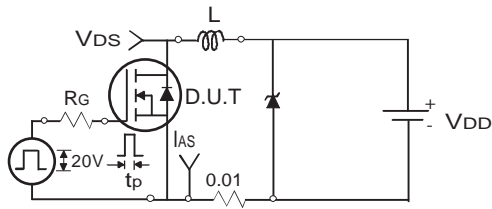


Figure 12. Maximum Safe Operating Area

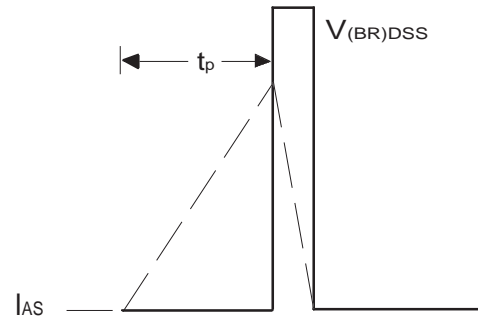


Die 2



Uncamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

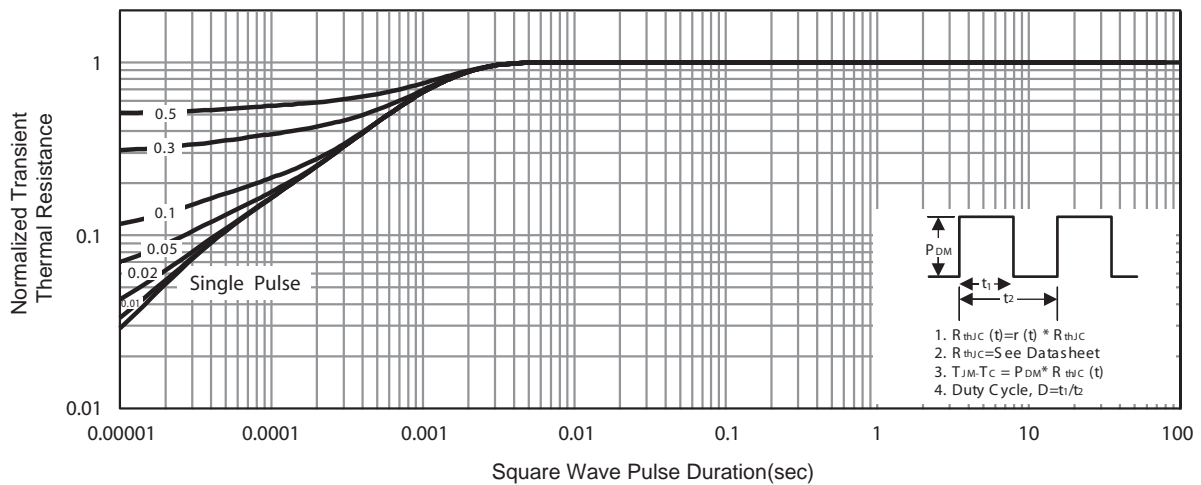
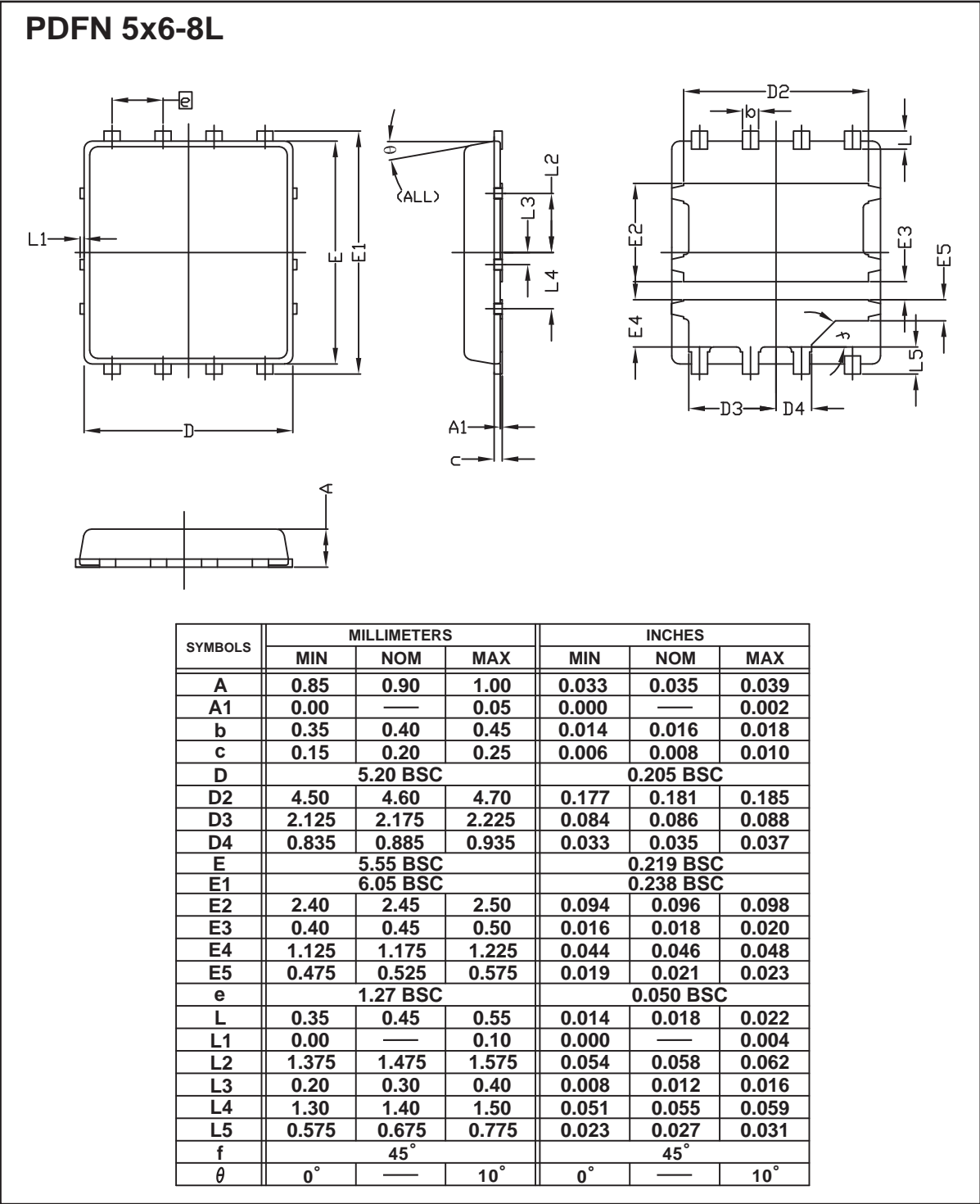


Figure 14. Normalized Thermal Transient Impedance Curve

PACKAGE OUTLINE DIMENSIONS



## TOP MARKING DEFINITION

### PDFN 5x6-8L

