SamHop Microelectronics Corp.

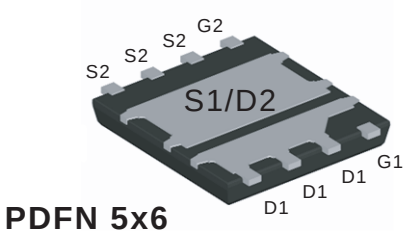
SP4400

Ver 1.0

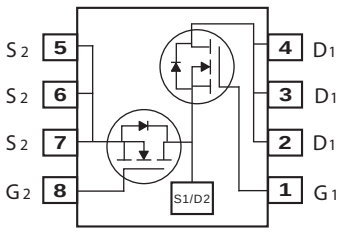
Dual N-Channel Enhancement Mode Field Effect Transistor

PRODUCT SUMMARY (DIE 1)		
V_{DSS}	I_D	$R_{DS(ON)}$ (mΩ) Max
40V	28A	23 @ VGS=10V
		34 @ VGS=4.5V

PRODUCT SUMMARY (DIE 2)		
V_{DSS}	I_D	$R_{DS(ON)}$ (mΩ) Max
40V	66A	10 @ VGS=10V
		15 @ VGS=4.5V



PDFN 5x6



ABSOLUTE MAXIMUM RATINGS (T_C=25°C unless otherwise noted)

Symbol	Parameter		Die 1	Die 2	Units
V_{DS}	Drain-Source Voltage		40		V
V_{GS}	Gate-Source Voltage		±20		V
I_D	Drain Current-Continuous [c]	T_C=25°C	28	66	A
		T_C=70°C	22.4	52.8	A
I_{DM}	-Pulsed [a c]		62	114	A
E_{AS}	Sigle Pulse Avalanche Energy [d]		49	121	mJ
P_D	Maximum Power Dissipation	T_C=25°C	31	78	W
		T_C=70°C	20	50	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range		-55 to 150		°C

THERMAL CHARACTERISTICS

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	4	1.6	°C/W

DIE 1 - ELECTRICAL CHARACTERISTICS (T_C=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	40			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=32V , V_{GS}=0V			1	uA
I_{GSS}	Gate-Body Leakage Current	V_{GS}= ±20V , V_{DS}=0V			±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} , I_D=250uA	1	1.8	3	V
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=10V , I_D=7A		18	23	m ohm
		V_{GS}=4.5V , I_D=6A		25	34	m ohm
g_{FS}	Forward Transconductance	V_{DS}=5V , I_D=7A		15		S
DYNAMIC CHARACTERISTICS [b]						
C_{ISS}	Input Capacitance	V_{DS}=20V,V_{GS}=0V f=1.0MHz		533		pF
C_{OSS}	Output Capacitance			87		pF
C_{RSS}	Reverse Transfer Capacitance			71		pF
SWITCHING CHARACTERISTICS [b]						
$t_{D(ON)}$	Turn-On Delay Time	V_{DD}=20V I_D=1A V_{GS}=10V R_{GEN}= 6 ohm		12		ns
t_r	Rise Time			13		ns
$t_{D(OFF)}$	Turn-Off Delay Time			18		ns
t_f	Fall Time			21		ns
Q_g	Total Gate Charge	V_{DS}=20V,I_D=7A,V_{GS}=10V		10		nC
		V_{DS}=20V,I_D=7A,V_{GS}=4.5V		5.5		nC
Q_{gs}	Gate-Source Charge	V_{DS}=20V,I_D=7A, V_{GS}=10V		1.2		nC
Q_{gd}	Gate-Drain Charge			3		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
V_{SD}	Diode Forward Voltage	V_{GS}=0V,I_S=1A		0.77	1.2	V

Notes

a.Pulse Test:Pulse Width ≤ 10us, Duty Cycle ≤ 1%.
b.Guaranteed by design, not subject to production testing.
c.Drain current limited by maximum junction temperature.
d.Starting T_J=25°C,L=0.5mH,V_{DD} = 20V.(See Figure13)
e.Mounted on FR4 Board of 1 inch^2 , 2oz.

DIE 2 - ELECTRICAL CHARACTERISTICS (T_C=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	40			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=32V , V_{GS}=0V			1	uA
I_{GSS}	Gate-Body Leakage Current	V_{GS}= ±20V , V_{DS}=0V			±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} , I_D=250uA	1	1.6	3	V
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=10V , I_D=16.5A		8	10	m ohm
		V_{GS}=4.5V , I_D=13.5A		11	15	m ohm
g_{FS}	Forward Transconductance	V_{DS}=5V , I_D=16.5A		22		S
DYNAMIC CHARACTERISTICS [b]						
C_{ISS}	Input Capacitance	V_{DS}=20V,V_{GS}=0V f=1.0MHz		1414		pF
C_{OSS}	Output Capacitance			170		pF
C_{RSS}	Reverse Transfer Capacitance			146		pF
SWITCHING CHARACTERISTICS [b]						
$t_{D(ON)}$	Turn-On Delay Time	V_{DD}=20V I_D=1A V_{GS}=10V R_{GEN}= 6 ohm		23		ns
t_r	Rise Time			27		ns
$t_{D(OFF)}$	Turn-Off Delay Time			68		ns
t_f	Fall Time			38		ns
Q_g	Total Gate Charge	V_{DS}=20V,I_D=16.5A,V_{GS}=10V		23		nC
		V_{DS}=20V,I_D=16.5A,V_{GS}=4.5V		12		nC
Q_{gs}	Gate-Source Charge	V_{DS}=20V,I_D=16.5A, V_{GS}=10V		2		nC
Q_{gd}	Gate-Drain Charge			6.2		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
V_{SD}	Diode Forward Voltage	V_{GS}=0V,I_S=3A		0.78	1.2	V

Notes

a.Pulse Test:Pulse Width ≤ 10us, Duty Cycle ≤ 1%.
b.Guaranteed by design, not subject to production testing.
c.Drain current limited by maximum junction temperature.
d.Starting T_J=25°C,L=0.5mH,V_{DD} = 20V.(See Figure13)
e.Mounted on FR4 Board of 1 inch^2 , 2oz.

Die 1

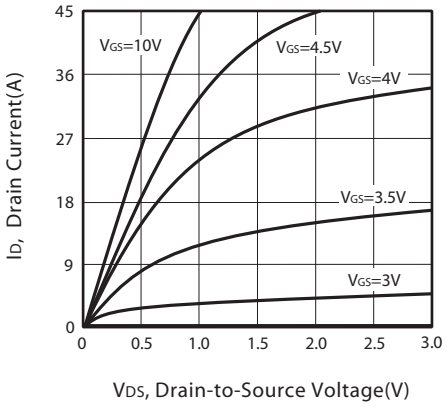


Figure 1. Output Characteristics

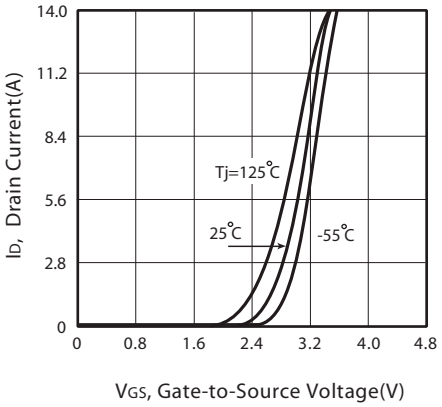


Figure 2. Transfer Characteristics

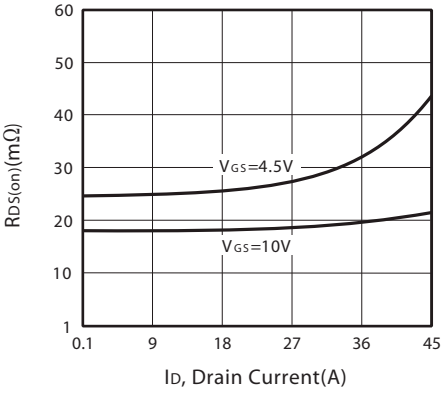


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

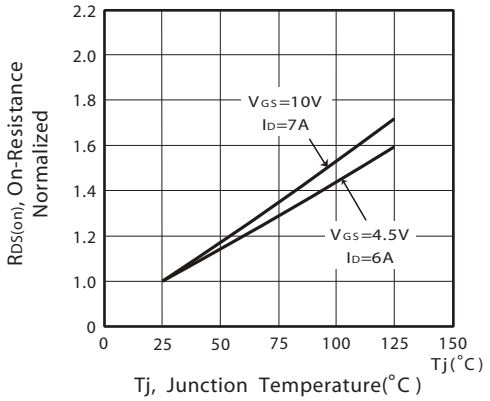


Figure 4. On-Resistance Variation with Drain Current and Temperature

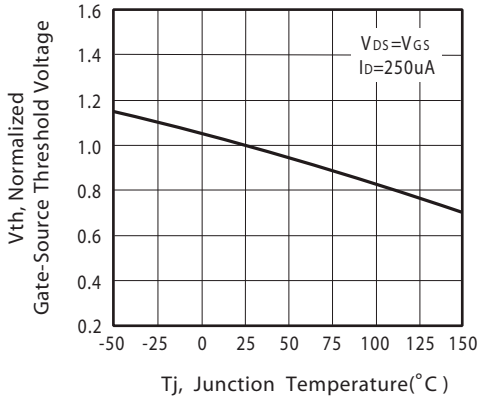


Figure 5. Gate Threshold Variation with Temperature

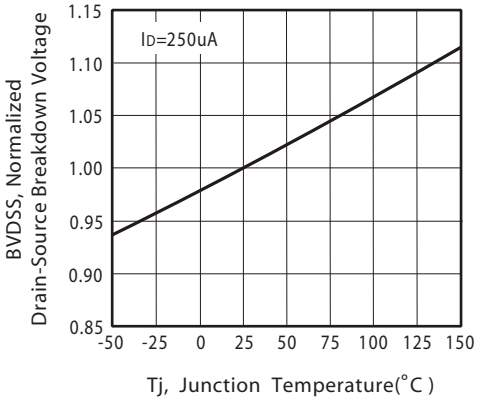


Figure 6. Breakdown Voltage Variation with Temperature

Die 1

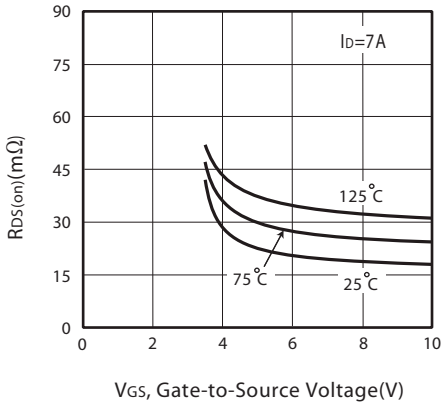


Figure 7. On-Resistance vs. Gate-Source Voltage

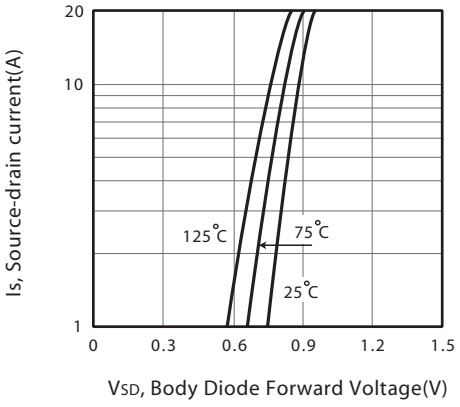


Figure 8. Body Diode Forward Voltage Variation with Source Current

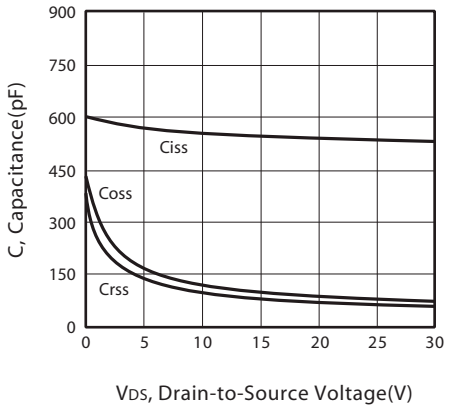


Figure 9. Capacitance

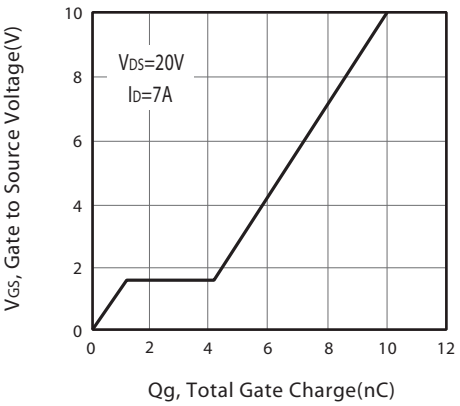


Figure 10. Gate Charge

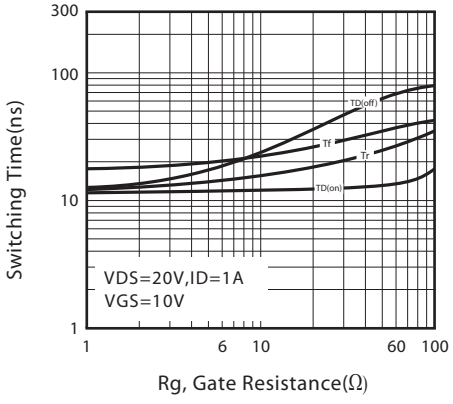


Figure 11. switching characteristics

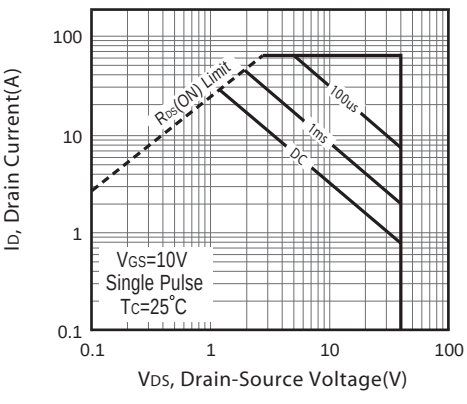
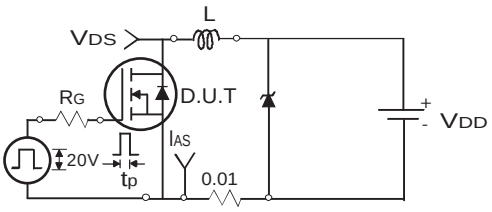


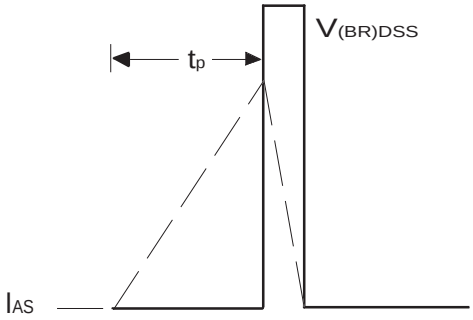
Figure 12. Maximum Safe Operating Area

Die 1



Uncamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

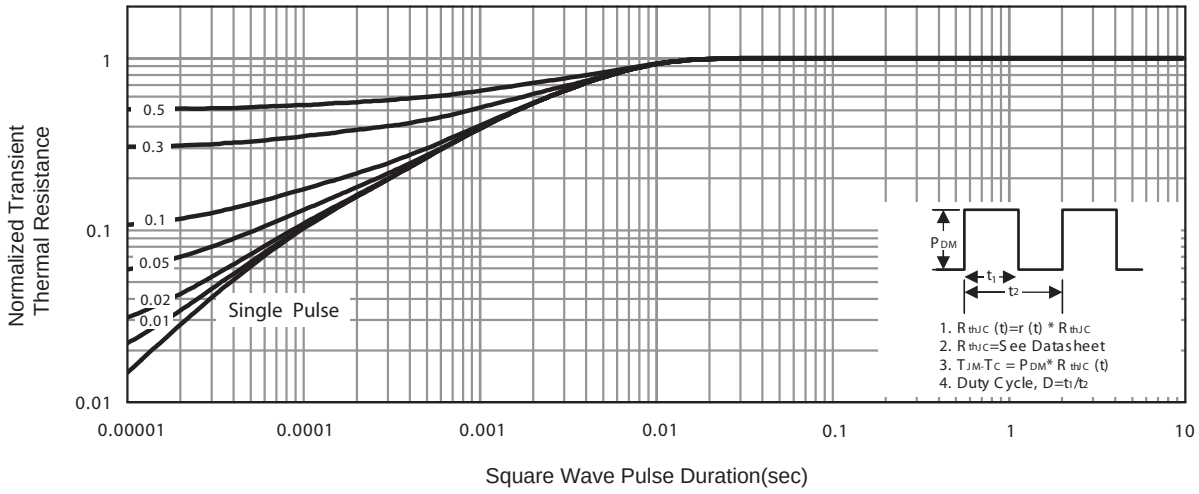


Figure 14. Normalized Thermal Transient Impedance Curve

Die 2

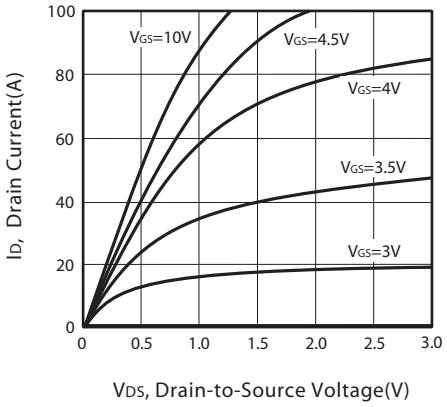


Figure 1. Output Characteristics

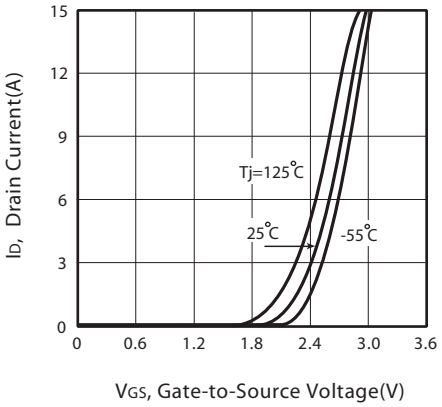


Figure 2. Transfer Characteristics

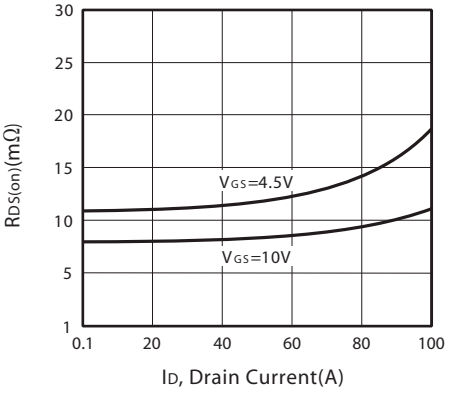


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

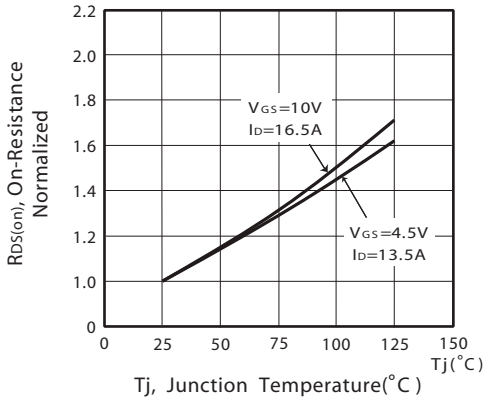


Figure 4. On-Resistance Variation with Drain Current and Temperature

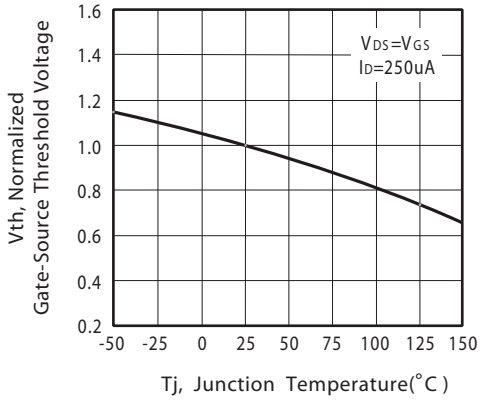


Figure 5. Gate Threshold Variation with Temperature

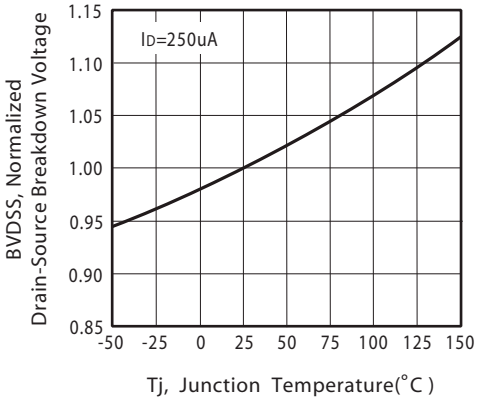


Figure 6. Breakdown Voltage Variation with Temperature

Die 2

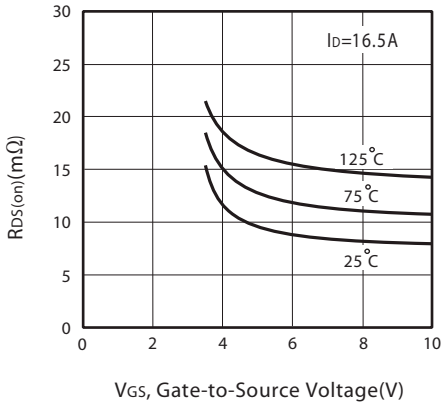


Figure 7. On-Resistance vs. Gate-Source Voltage

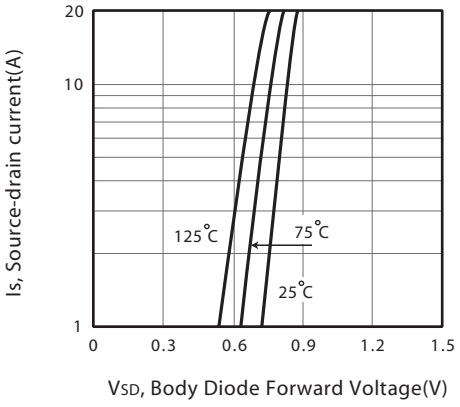


Figure 8. Body Diode Forward Voltage Variation with Source Current

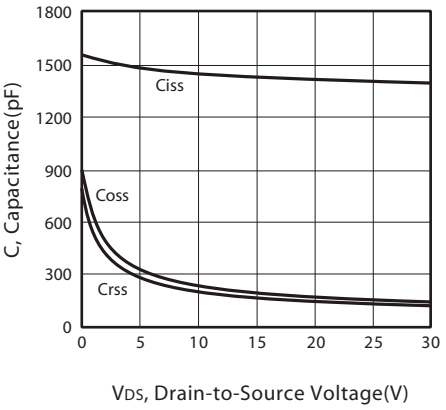


Figure 9. Capacitance

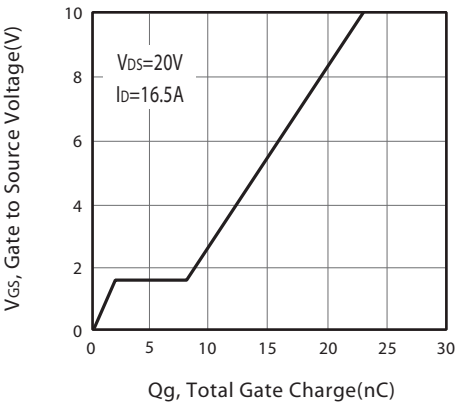


Figure 10. Gate Charge

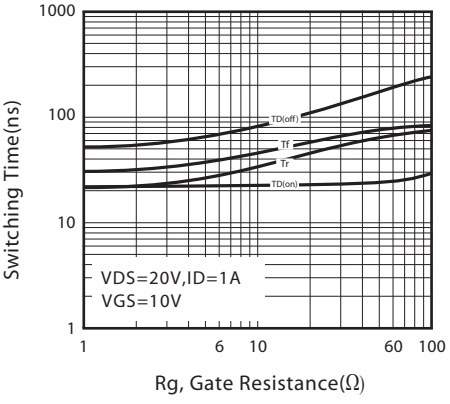


Figure 11. switching characteristics

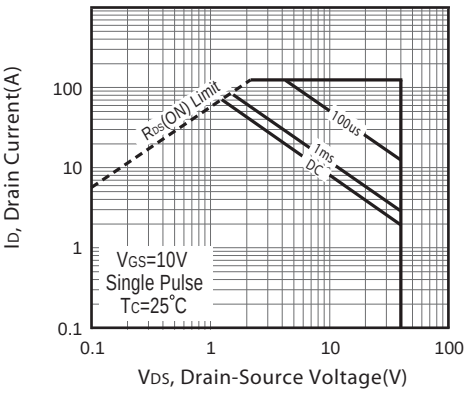
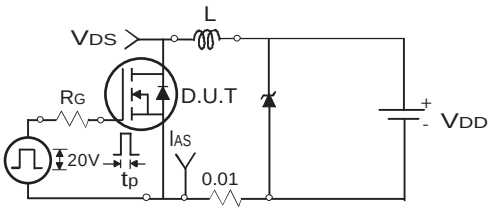


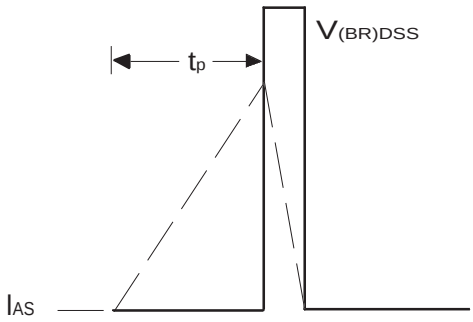
Figure 12. Maximum Safe Operating Area

Die 2



Uncamped Inductive Test Circuit

Figure 13a.



Unclamped Inductive Waveforms

Figure 13b.

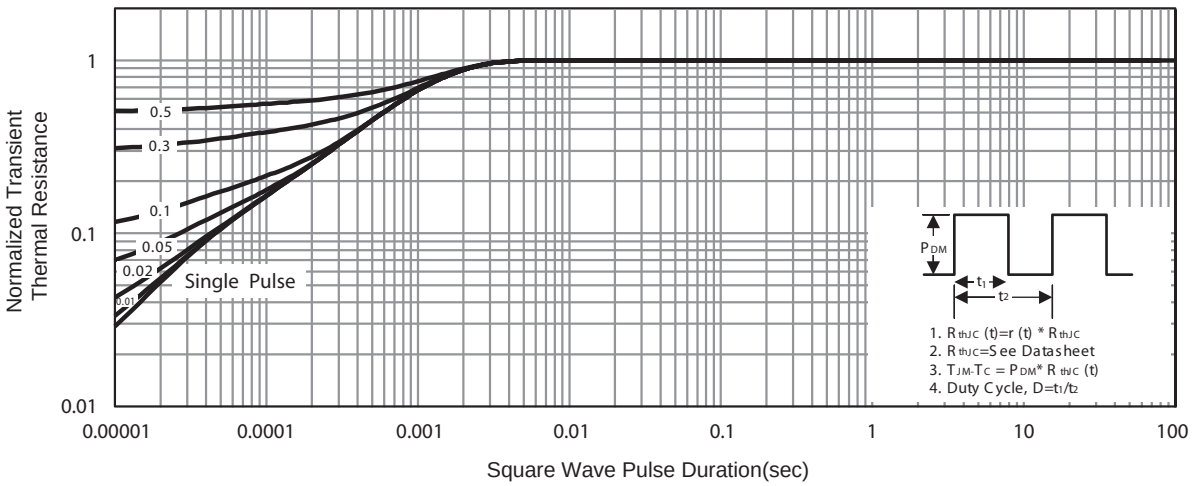
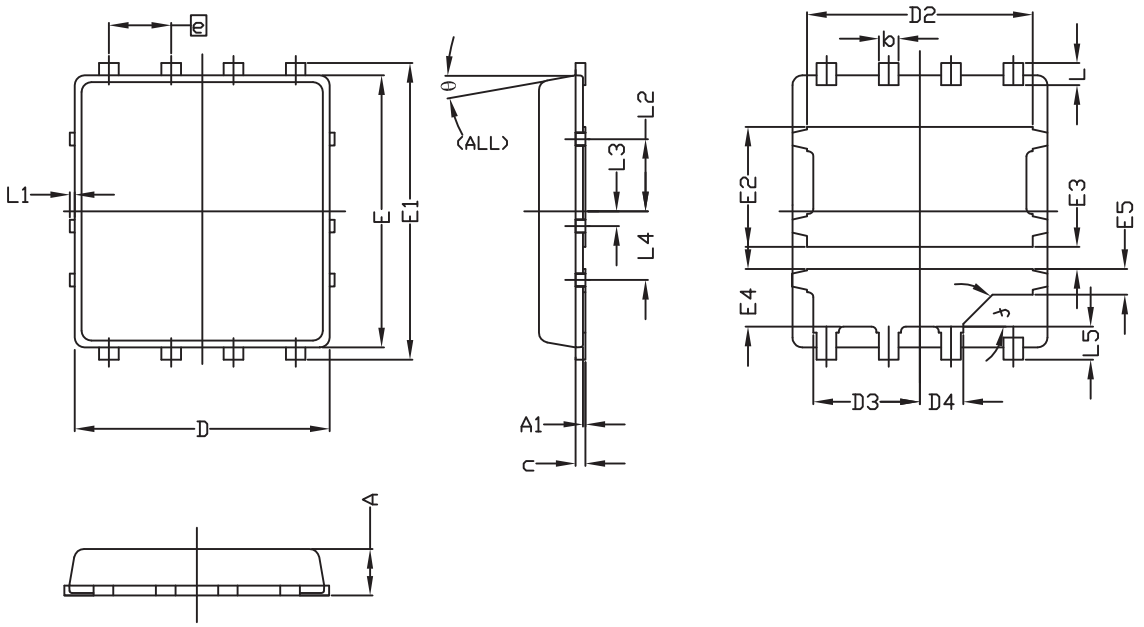


Figure 14. Normalized Thermal Transient Impedance Curve

PACKAGE OUTLINE DIMENSIONS

PDFN 5x6-8L



SYMBOLS	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.85	0.90	1.00	0.033	0.035	0.039
A1	0.00	——	0.05	0.000	——	0.002
b	0.35	0.40	0.45	0.014	0.016	0.018
c	0.15	0.20	0.25	0.006	0.008	0.010
D	5.20 BSC			0.205 BSC		
D2	4.50	4.60	4.70	0.177	0.181	0.185
D3	2.125	2.175	2.225	0.084	0.086	0.088
D4	0.835	0.885	0.935	0.033	0.035	0.037
E	5.55 BSC			0.219 BSC		
E1	6.05 BSC			0.238 BSC		
E2	2.40	2.45	2.50	0.094	0.096	0.098
E3	0.40	0.45	0.50	0.016	0.018	0.020
E4	1.125	1.175	1.225	0.044	0.046	0.048
E5	0.475	0.525	0.575	0.019	0.021	0.023
e	1.27 BSC			0.050 BSC		
L	0.35	0.45	0.55	0.014	0.018	0.022
L1	0.00	——	0.10	0.000	——	0.004
L2	1.375	1.475	1.575	0.054	0.058	0.062
L3	0.20	0.30	0.40	0.008	0.012	0.016
L4	1.30	1.40	1.50	0.051	0.055	0.059
L5	0.575	0.675	0.775	0.023	0.027	0.031
f	45°			45°		
θ	0°	——	10°	0°	——	10°

TOP MARKING DEFINITION

PDFN 5x6-8L