



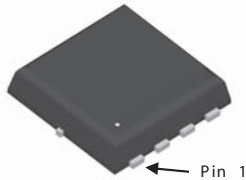
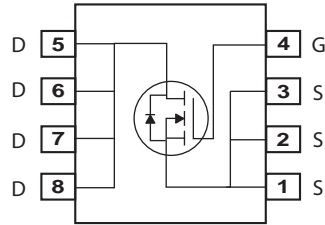
## N-Channel Logic Level Enhancement Mode Field Effect Transistor

### PRODUCT SUMMARY

V <sub>DS</sub>	I <sub>D</sub>	R <sub>DS(ON)</sub> (mΩ) Max
60V	32A	17 @ V <sub>GS</sub> =10V
		24 @ V <sub>GS</sub> =4.5V

### FEATURES

- Super high dense cell design for low R<sub>DS(ON)</sub>.
- Rugged and reliable.
- Surface Mount Package.

**TSON 3.3 x 3.3**

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

Symbol	Parameter		Limit	Units
V <sub>DS</sub>	Drain-Source Voltage		60	V
V <sub>GS</sub>	Gate-Source Voltage		±20	V
I <sub>D</sub>	Drain Current-Continuous <sup>c</sup>	T <sub>A</sub> =25°C	8	A
		T <sub>A</sub> =70°C	6.4	A
		T <sub>C</sub> =25°C	32	A
		T <sub>C</sub> =70°C	25.6	A
I <sub>DM</sub>	-Pulsed <sup>a c</sup>		83	A
E <sub>AS</sub>	Single Pulse Avalanche Energy <sup>d</sup>		81	mJ
P <sub>D</sub>	Maximum Power Dissipation	T <sub>A</sub> =25°C	1.67	W
		T <sub>A</sub> =70°C	1.07	W
		T <sub>C</sub> =25°C	30	W
		T <sub>C</sub> =70°C	19	W
T <sub>J</sub> , T <sub>STG</sub>	Operating Junction and Storage Temperature Range		-55 to 150	°C

### THERMAL CHARACTERISTICS

R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient	75	°C/W
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	4.2	°C/W

## ELECTRICAL CHARACTERISTICS (T<sub>A</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	60			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =48V , 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	2	3	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =10V , I <sub>D</sub> =8A		14	17	m ohm
		V <sub>GS</sub> =4.5V , I <sub>D</sub> =6.7A		18	24	m ohm
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =10V , I <sub>D</sub> =8A		26		S
DYNAMIC CHARACTERISTICS <sup>b</sup>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V f=1.0MHz		1542		pF
C <sub>oss</sub>	Output Capacitance			110		pF
C <sub>rSS</sub>	Reverse Transfer Capacitance			85		pF
SWITCHING CHARACTERISTICS <sup>b</sup>						
t <sub>D(ON)</sub>	Turn-On Delay Time	V <sub>DD</sub> =30V I <sub>D</sub> =1A V <sub>GS</sub> =10V R <sub>GEN</sub> = 6 ohm		28		ns
t <sub>r</sub>	Rise Time			23		ns
t <sub>D(OFF)</sub>	Turn-Off Delay Time			42		ns
t <sub>f</sub>	Fall Time			13		ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =30V, I <sub>D</sub> =8A, V <sub>GS</sub> =10V		17		nC
		V <sub>DS</sub> =30V, I <sub>D</sub> =8A, V <sub>GS</sub> =4.5V		8.6		nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =30V, I <sub>D</sub> =8A, V <sub>GS</sub> =10V		2.3		nC
Q <sub>gd</sub>	Gate-Drain Charge			4.4		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =7A		0.78	1.3	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> = 30V. (See Figure13)
- Mounted on FR4 Board of 1 inch<sup>2</sup>, 2oz.

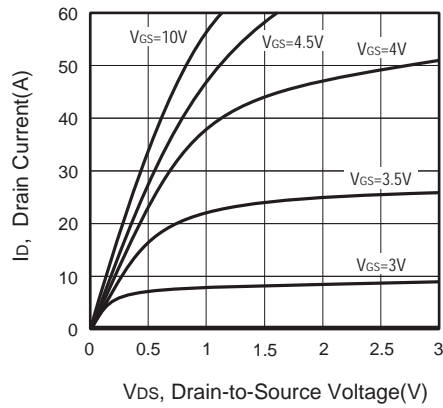


Figure 1. Output Characteristics

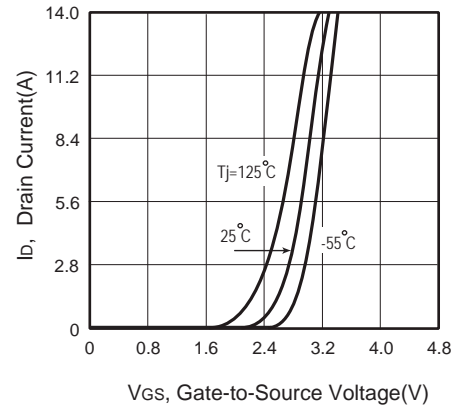


Figure 2. Transfer Characteristics

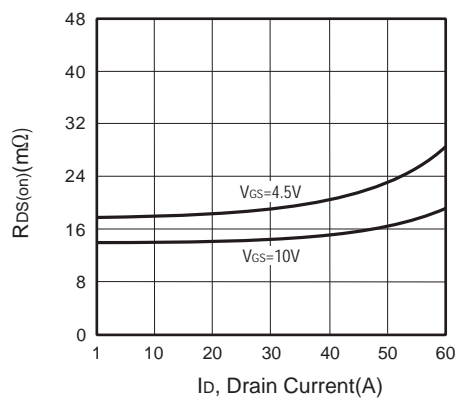


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

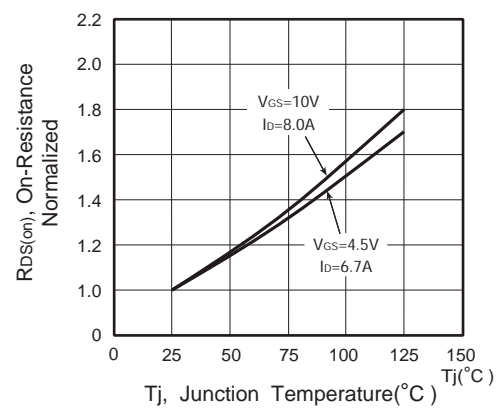


Figure 4. On-Resistance Variation with Drain Current and Temperature

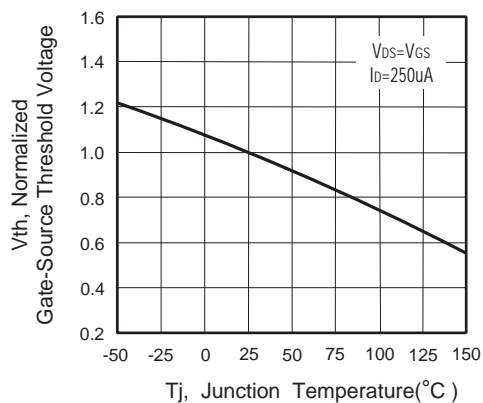


Figure 5. Gate Threshold Variation with Temperature

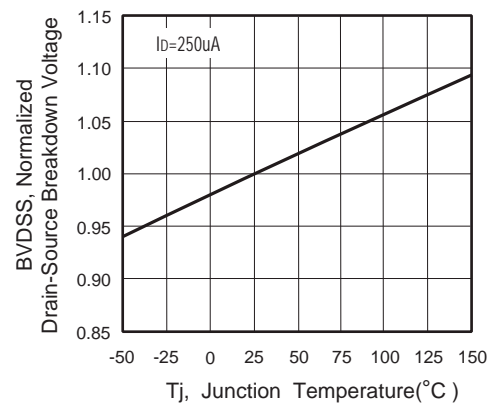


Figure 6. Breakdown Voltage Variation with Temperature

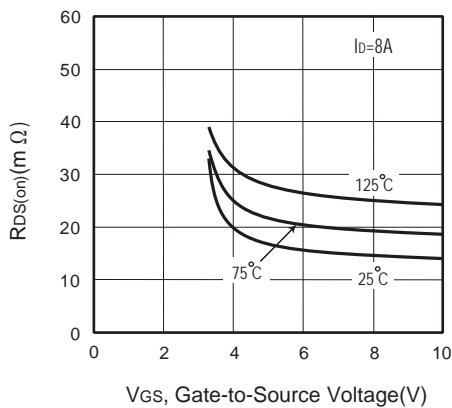


Figure 7. On-Resistance vs. Gate-Source Voltage

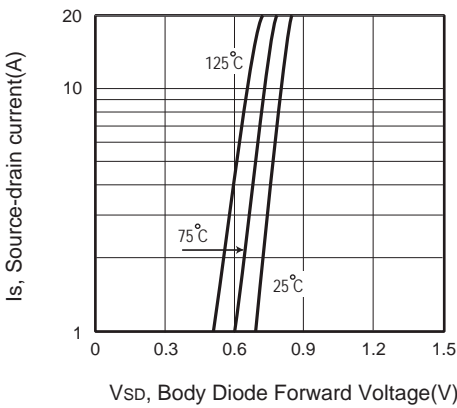


Figure 8. Body Diode Forward Voltage Variation with Source Current

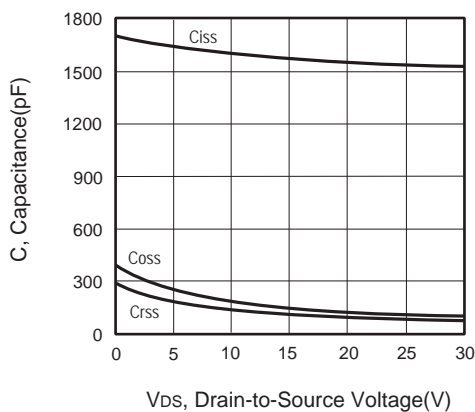


Figure 9. Capacitance

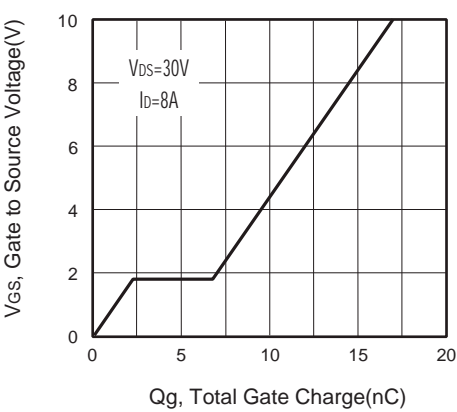


Figure 10. Gate Charge

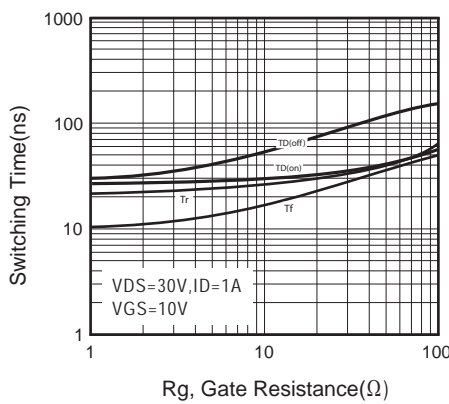


Figure 11. switching characteristics

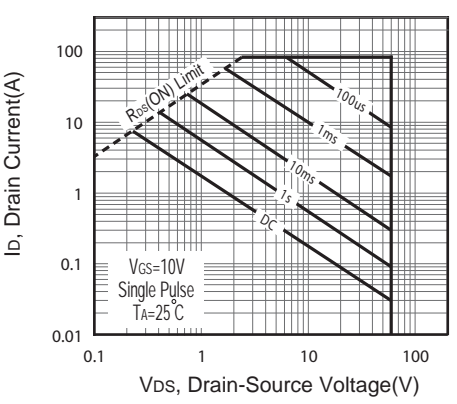
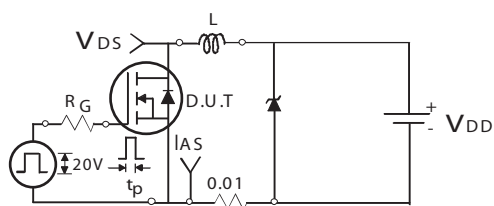
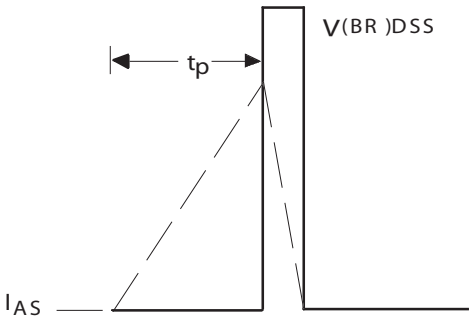


Figure 12. Maximum Safe Operating Area



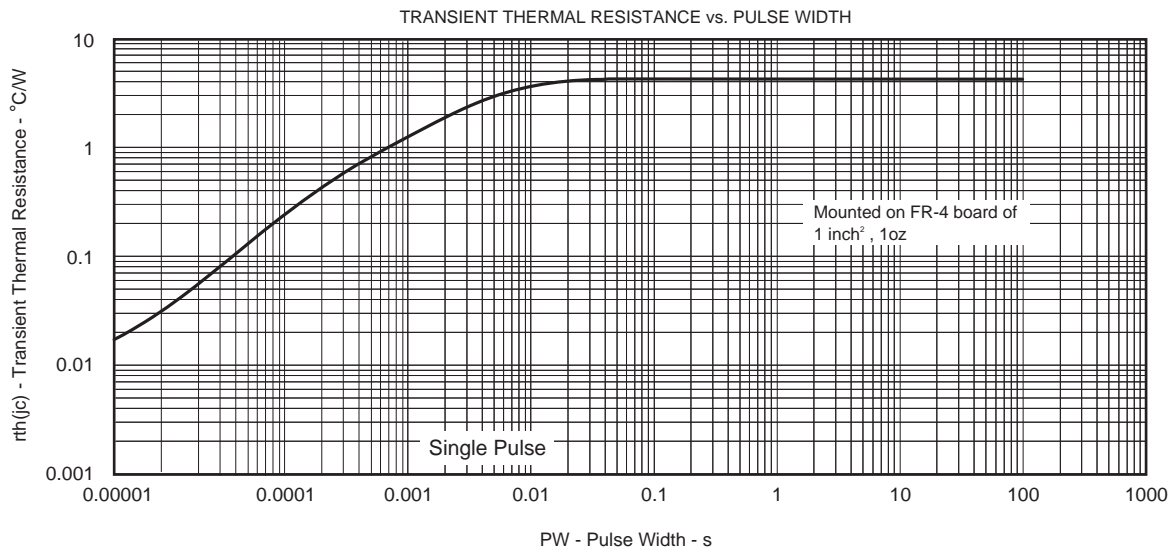
Unclamped Inductive Test Circuit

Figure 13a.



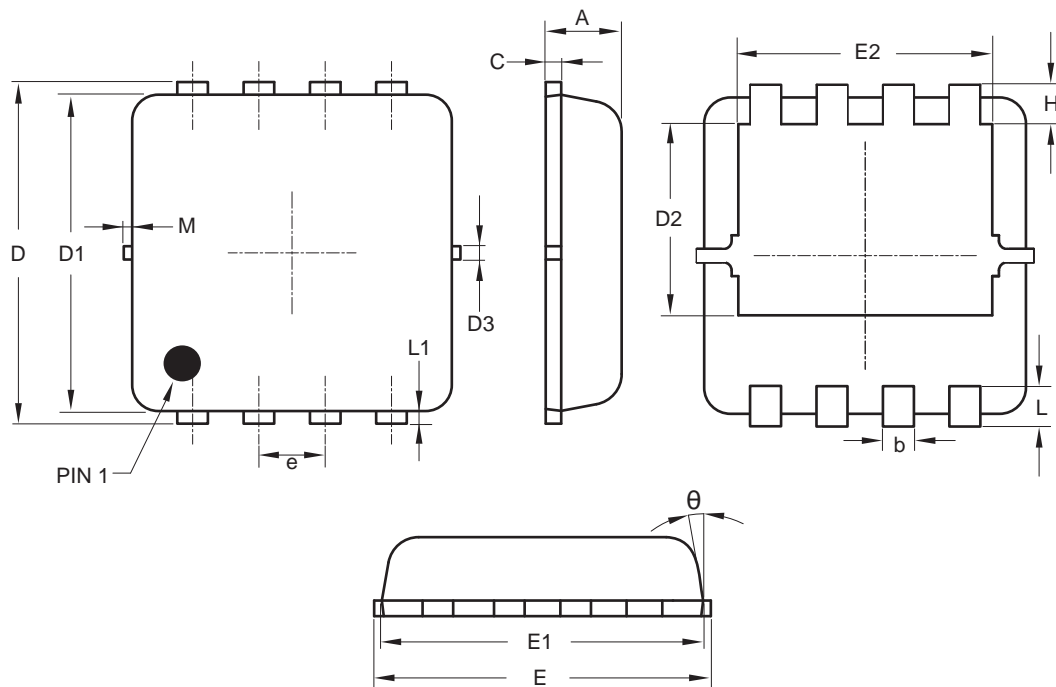
Unclamped Inductive Waveforms

Figure 13b.



## PACKAGE OUTLINE DIMENSIONS

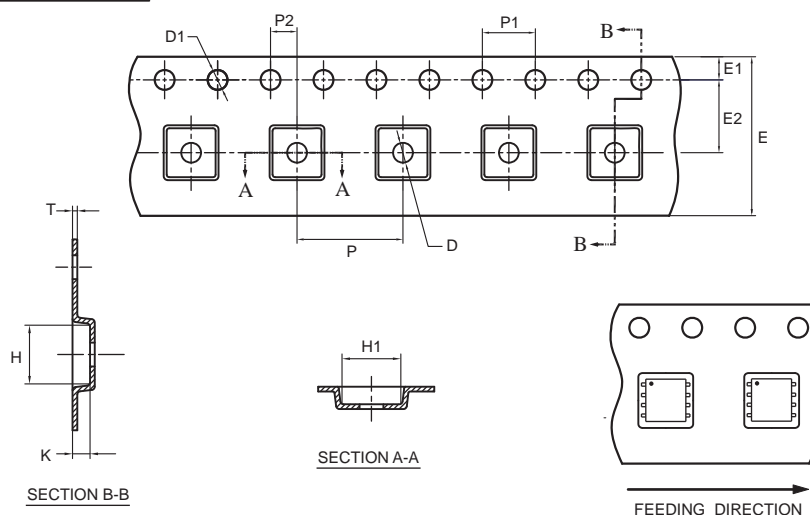
## TSOP 3.3 x 3.3



SYMBOLS	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
b	0.25	0.30	0.35
C	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.78	1.88	1.98
D3	—	0.13	—
E	3.20	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65 BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	—	0.13	—
M	—	—	0.15
θ	—	10°	12°

## TSON 3.3 x 3.3 Tape

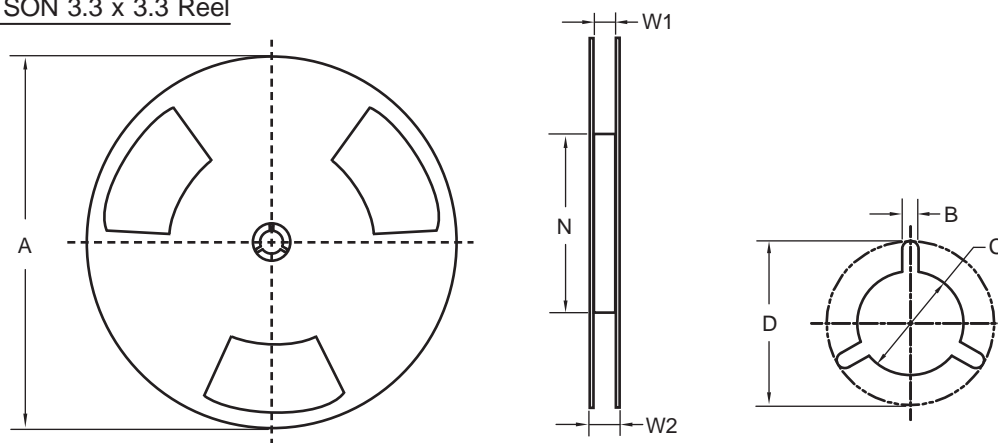
## TSON 3.3 x 3.3 Tape and Reel Data



unit:mm

PACKAGE	D	D1	E	E1	E2	H	H1	K	P	P1	P2	T
TSON 3.3 x 3.3	$\phi 1.50$ (MIN)	$\phi 1.50$ +0.10 -0.00	12.0 +0.30 -0.10	1.75 $\pm 0.10$	5.50 $\pm 0.05$	3.70 $\pm 0.10$	3.70 $\pm 0.10$	1.10 $\pm 0.10$	8.0 $\pm 0.10$	4.0 $\pm 0.10$	2.0 $\pm 0.05$	0.3 $\pm 0.05$

## TSON 3.3 x 3.3 Reel



UNIT:mm

TAPE SIZE	REEL SIZE	A	B	C	D	N	W1	W2
12 mm	13 "	330 $\pm$ 1.0	1.5 $\begin{smallmatrix} +0.5 \\ -0.2 \end{smallmatrix}$	$\phi 13.0$ $\begin{smallmatrix} +0.5 \\ -0.2 \end{smallmatrix}$	20.2(ref.)	178 $\begin{smallmatrix} +0.0 \\ -2.0 \end{smallmatrix}$	12.4 $\begin{smallmatrix} +2.0 \\ -0.0 \end{smallmatrix}$	18.4(ref.)

## TOP MARKING DEFINITION

