

N-Channel Enhancement Mode MOSFET

TDM3646

**DESCRIPTION**

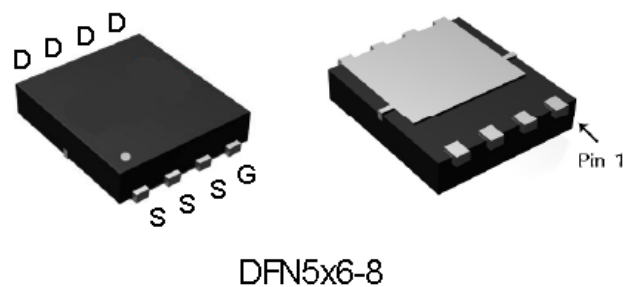
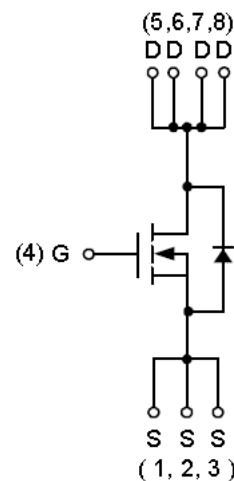
The TDM3646 uses advanced trench technology to provide excellent RDS(ON) and low gate charge. This device is suitable for use as a load switch or in PWM applications.

**GENERAL FEATURES**

- RDS(ON) < 7mΩ @ VGS=4.5V  
RDS(ON) < 5.6mΩ @ VGS=10V
- High Power and current handling capability
- Surface Mount Package
- Lead Free and Green Devices available(RoHS Compliant)

**Application**

- PWM applications
- Load switch
- Power management
- Motor Control



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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	60	V
Gate-Source Voltage	V <sub>GS</sub>	±20	V
Diode Continuous Forward Current	I <sub>S</sub> (T <sub>C</sub> =25°C)	40	A
Drain Current @ Continuous(Note 1)	I <sub>D</sub> (T <sub>C</sub> =25°C)	80	A
	I <sub>D</sub> (T <sub>C</sub> =100°C)	59	A
Drain Current @ Current-Pulsed (Note 2)	I <sub>DM</sub> (T <sub>C</sub> =25°C)	300	A
Maximum Power Dissipation	P <sub>D</sub> (T <sub>C</sub> =25°C)	96	W
	P <sub>D</sub> (T <sub>C</sub> =100°C)	38	W
Drain Current @ Continuous(Note 1)	I <sub>D</sub> (T <sub>A</sub> =25°C)	13	A
	I <sub>D</sub> (T <sub>A</sub> =70°C)	11	A
Maximum Power Dissipation	P <sub>D</sub> (T <sub>A</sub> =25°C)	2	W
	P <sub>D</sub> (T <sub>A</sub> =70°C)	1.3	W
Maximum Operating Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature Range	T <sub>STG</sub>	-55 To 150	°C

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**TDM3646**
**THERMAL CHARACTERISTICS**

Thermal Resistance, Junction-to-Ambient (Note 2)	R <sub>θJA</sub> (t <sub>s</sub> ≤10s)	20	°C/W
	R <sub>θJA</sub> (Steady State)	60	°C/W
Thermal Resistance, Junction-to-Case	R <sub>θJC</sub> (Steady State)	1.3	°C/W

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C unless otherwise noted)**

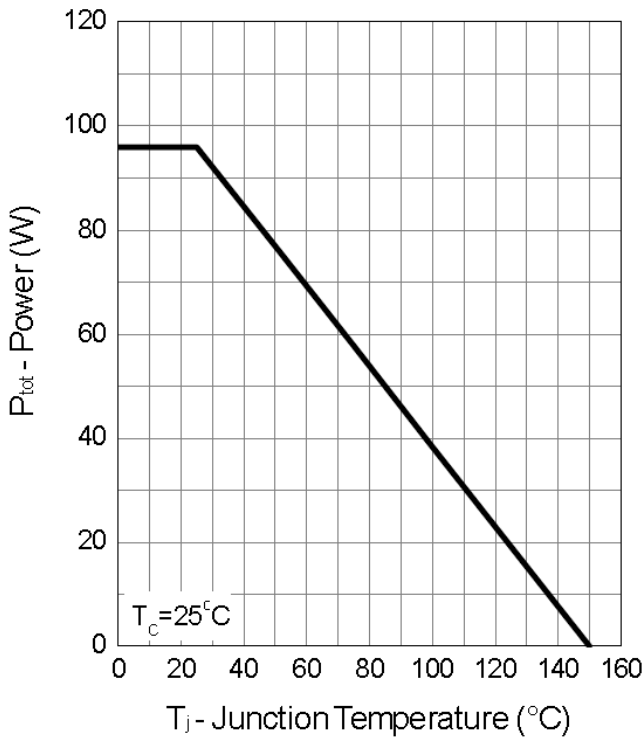
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	60	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =48V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
<b>ON CHARACTERISTICS (Note 3)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1	2	3	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =25A	-	5.6	7	mΩ
		V <sub>GS</sub> =10V, I <sub>D</sub> =25A	-	4.9	5.6	mΩ
<b>DYNAMIC CHARACTERISTICS (Note 4)</b>						
Gate Resistance	R <sub>G</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, F=1.0MHz	-	1.0	-	Ω
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, F=1.0MHz	-	4347	6100	PF
Output Capacitance	C <sub>oss</sub>		-	428	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	220	-	PF
<b>SWITCHING CHARACTERISTICS (Note 4)</b>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DS</sub> =30V, R <sub>L</sub> =30Ω, V <sub>GEN</sub> =10V, R <sub>G</sub> =6Ω I <sub>D</sub> =1A	-	25	45	nS
Turn-on Rise Time	t <sub>r</sub>		-	12	22	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	90	162	nS
Turn-Off Fall Time	t <sub>f</sub>		-	38	69	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =30V, I <sub>D</sub> =30A, V <sub>GS</sub> =10V	-	83	117	nC
Gate-Source Charge	Q <sub>gs</sub>		-	17	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	15	-	nC
Body Diode Reverse Recovery Time	T <sub>rr</sub>	I <sub>F</sub> =30A, di/dt=100A/μs	-	33	-	nS
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>		-	41	-	nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =20A	-	0.8	1.3	V

**NOTES:**

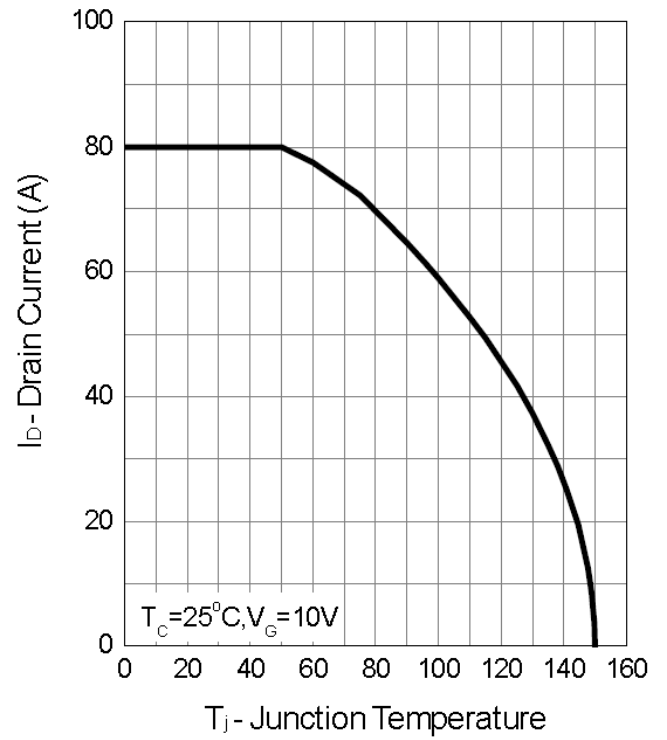
1. Current limited by bonding wire
2. Pulse width limited by max. Junction temperature.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production testing

Typical Operating Characteristics

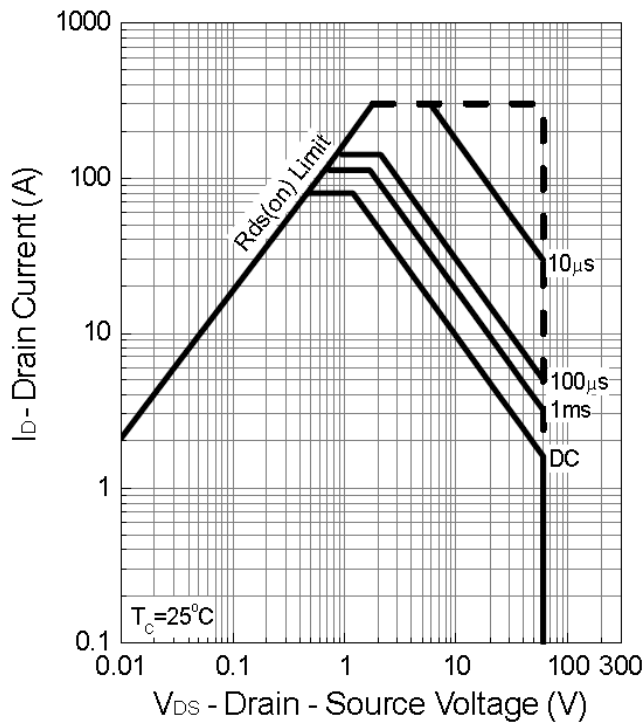
Power Dissipation



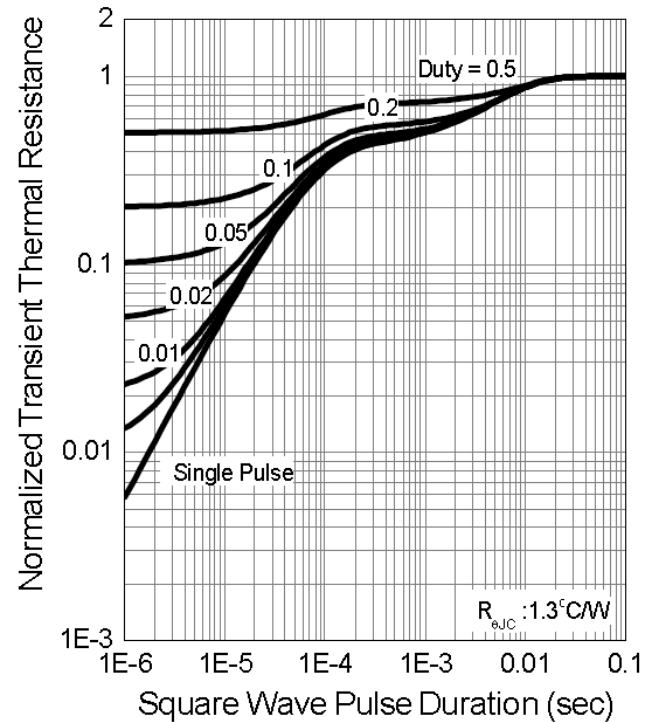
Drain Current



Safe Operation Area

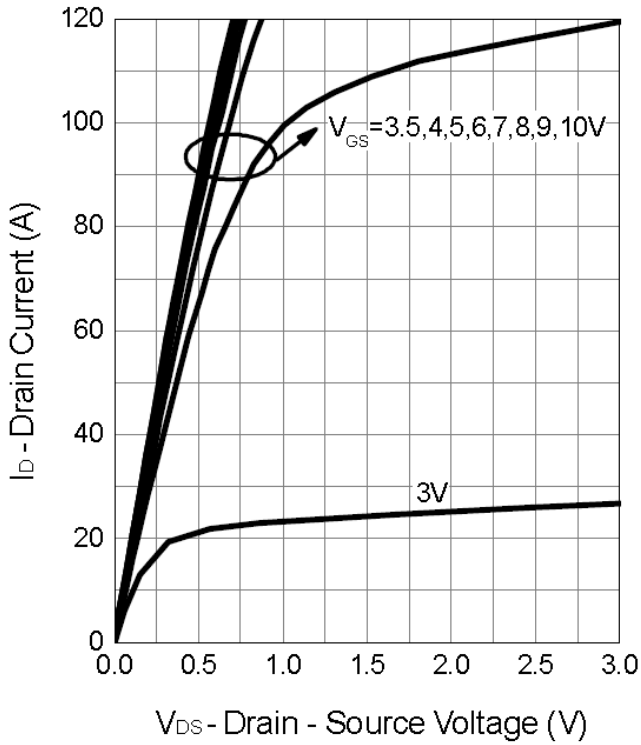


Thermal Transient Impedance

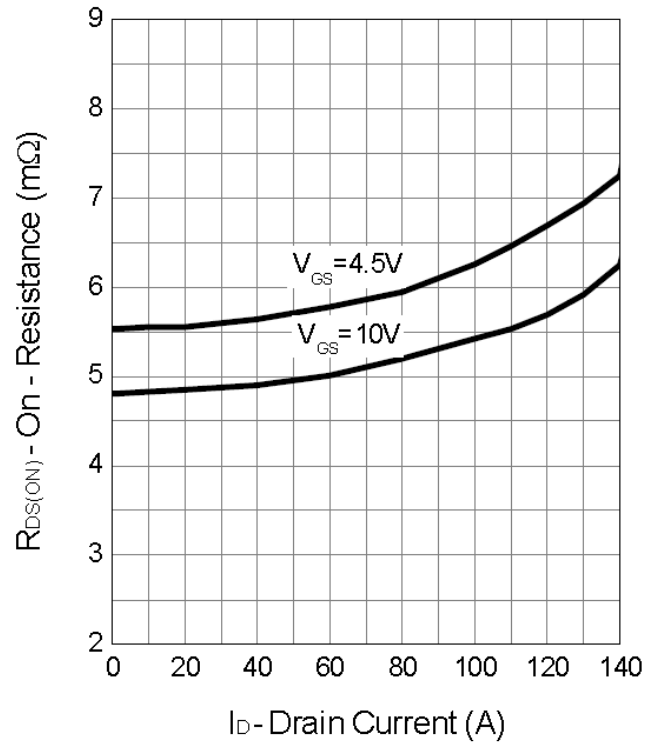


Typical Operating Characteristics(Cont.)

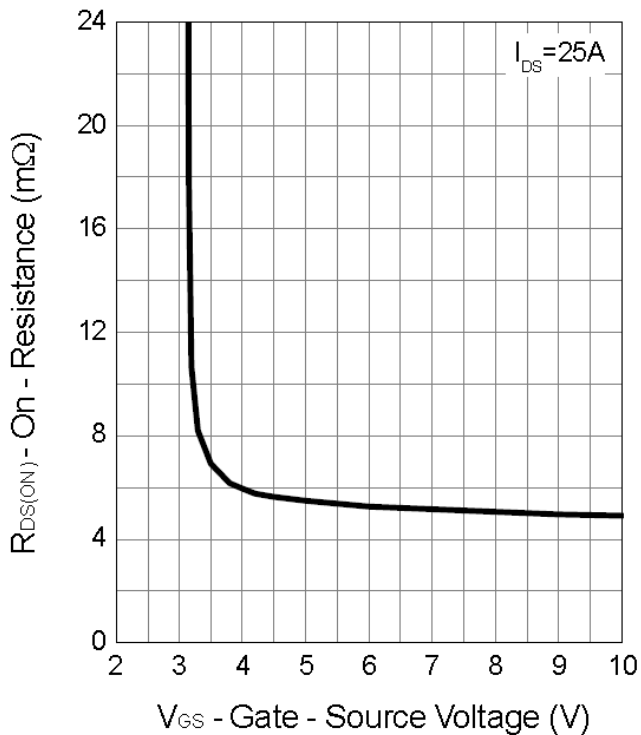
Output Characteristics



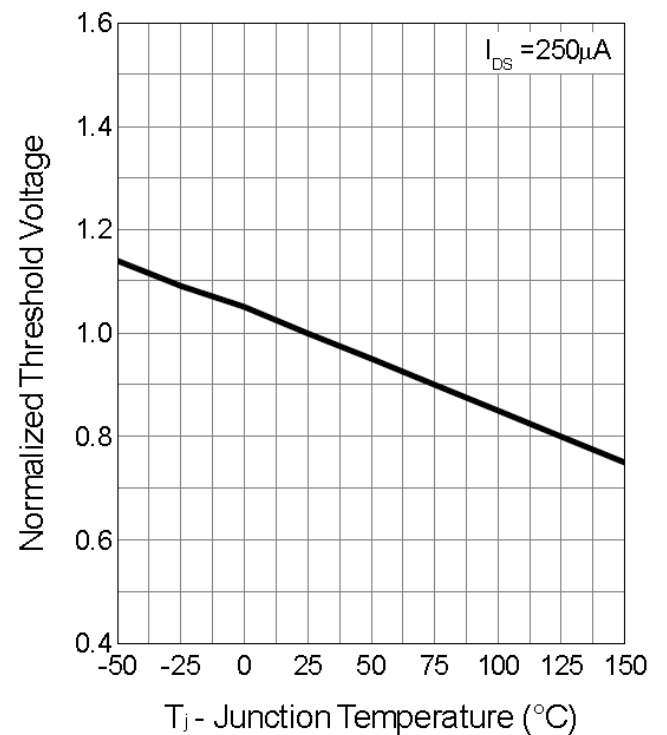
Drain-Source On Resistance



Gate-Source On Resistance

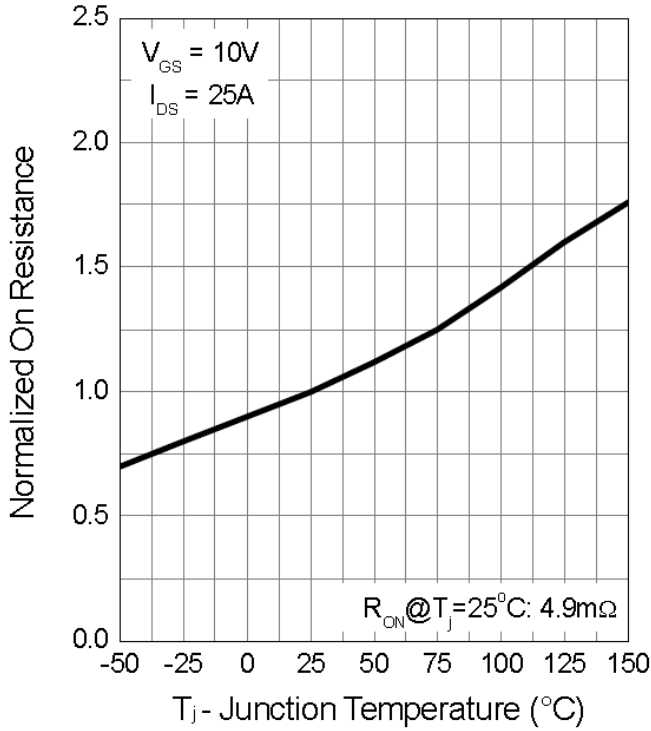


Gate Threshold Voltage

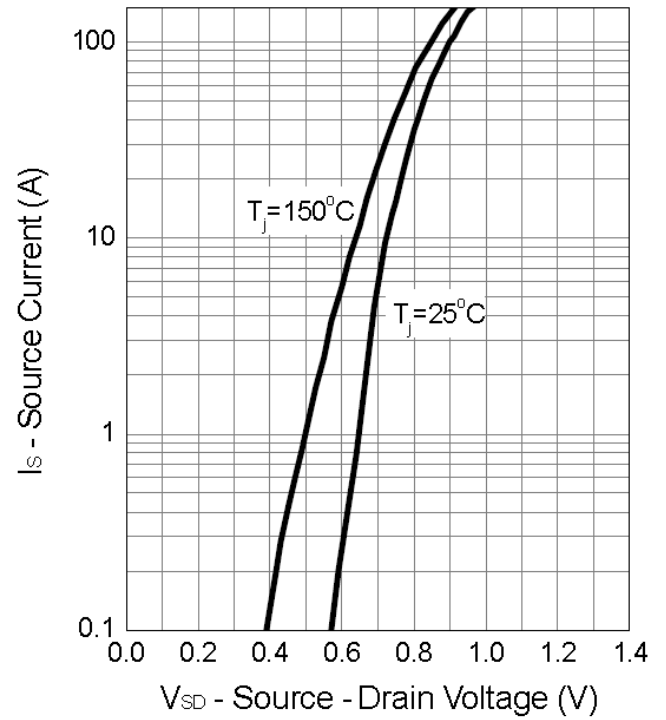


Typical Operating Characteristics (Cont.)

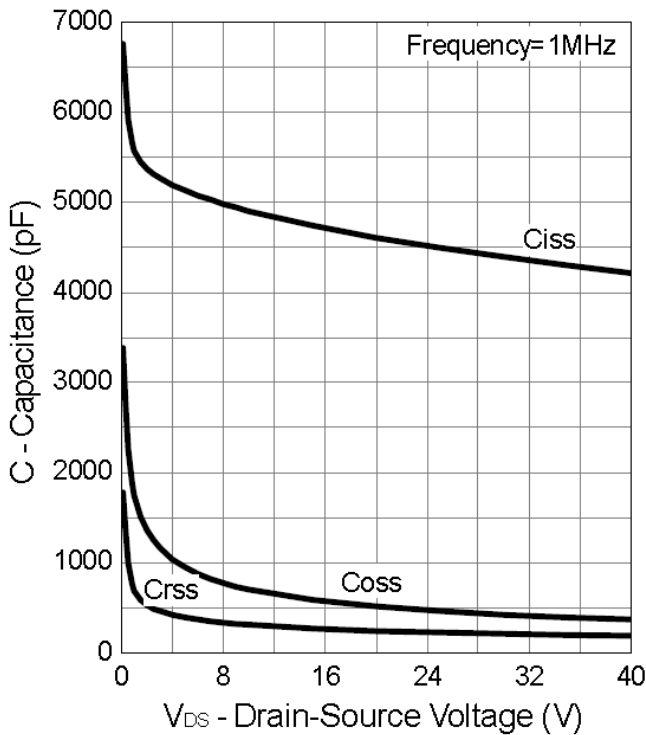
Drain-Source On Resistance



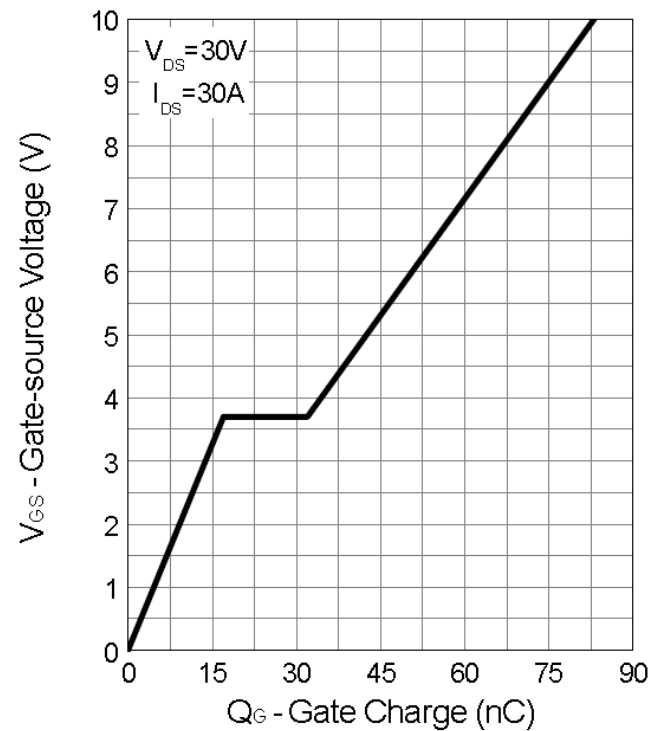
Source-Drain Diode Forward



Capacitance

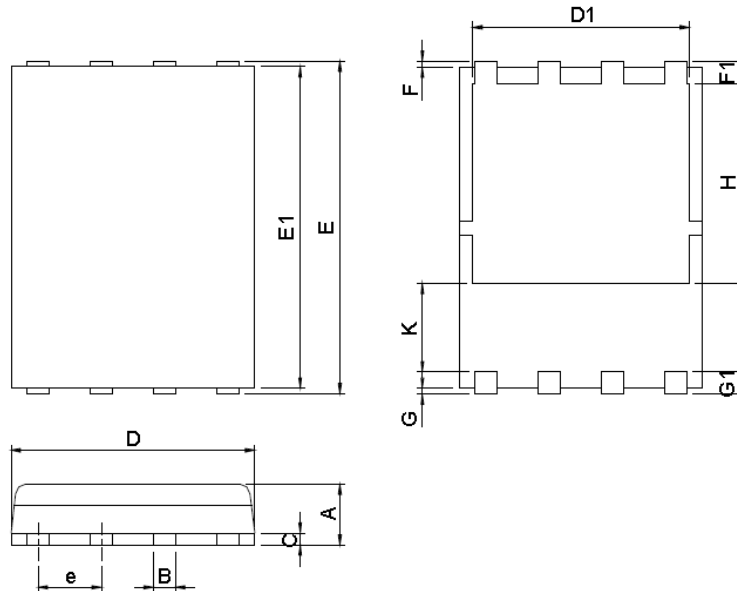


Gate Charge



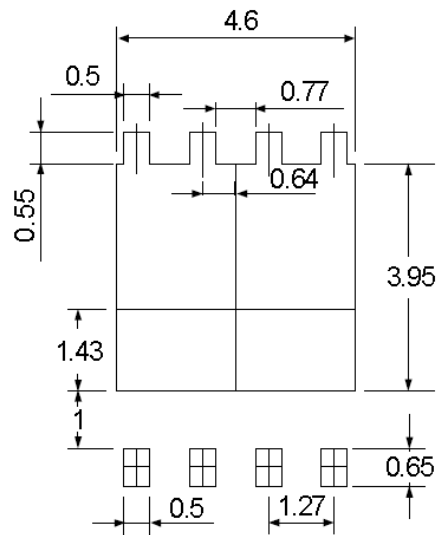
Package Information

DFN5\*6-8 Package



DIMENSIONS	DFN5x6-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.90	1.20	0.035	0.047
B	0.3	0.51	0.012	0.020
C	0.19	0.25	0.007	0.010
D	4.80	5.30	0.189	0.209
D1	4.00	4.40	0.157	0.173
E	5.90	6.20	0.232	0.244
E1	5.50	5.80	0.217	0.228
e	1.27 BSC		0.050 BSC	
F	0.05	0.30	0.002	0.012
F1	0.35	0.75	0.014	0.030
G	0.05	0.30	0.002	0.012
G1	0.35	0.75	0.014	0.030
H	3.34	3.9	0.131	0.154
K	0.762	-	0.03	-

RECOMMENDED LAND PATTERN



UNIT: mm

Note : 1.Dimension D, D1,D2 and E1 do not include mold flash or protrusions.  
Mold flash or protrusions shall not exceed 10 mil.

Design Notes