

N-Channel Enhancement Mode MOSFET

TDM3578

DESCRIPTION

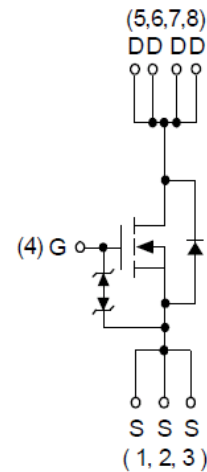
The TDM3578 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use as a load switch or in PWM applications.

GENERAL FEATURES

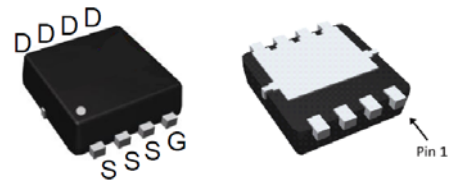
- $R_{DS(ON)} < 6.7m\Omega$ @ $V_{GS}=10V$
 $R_{DS(ON)} < 10.3m\Omega$ @ $V_{GS}=4.5V$
- High Power and current handling capability
- Lead free product is available
- Surface Mount Package

Application

- PWM applications
- Load switch
- Power management



N-Channel MOSFET



PPAK-3*3-8

ABSOLUTE MAXIMUM RATINGS($T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Diode Continuous Forward Current	I_S ($T_C=25^\circ\text{C}$)	20	A
Drain Current @ Continuous	I_D ($T_C=25^\circ\text{C}$)	61	A
	I_D ($T_C=100^\circ\text{C}$)	43	A
Drain Current @ Current-Pulsed	I_{DM} ($T_C=25^\circ\text{C}$)	244	A
Maximum Power Dissipation ($T_C=25^\circ\text{C}$)	$P_D(T_C=25^\circ\text{C})$	50	W
	$P_D(T_C=100^\circ\text{C})$	23.5	W
Drain Current @ Continuous(Note a)	I_D ($T_A=25^\circ\text{C}$)	14.2	A
	I_D ($T_A=70^\circ\text{C}$)	12	A
Drain Current @ Current-Pulsed (Note b)	I_{DM} ($T_A=25^\circ\text{C}$)	57	A
Maximum Power Dissipation(Note a)	$P_D(T_A=25^\circ\text{C})$	2.5	W
	$P_D(T_A=70^\circ\text{C})$	1.8	W
Maximum Operating Junction Temperature	T_J	175	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 To 175	$^\circ\text{C}$
Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	4.5	$^\circ\text{C}/\text{W}$
Thermal Resistance,Junction-to-Ambient (Note a)	$R_{\theta JA}$	60	$^\circ\text{C}/\text{W}$

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

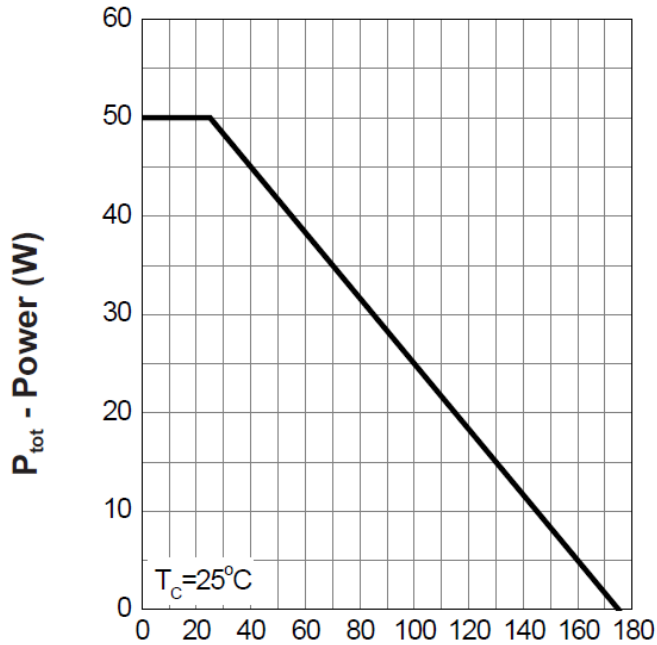
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	40	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =32V,V _{GS} =0V	-	-	1	μ A
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V,V _{DS} =0V	-	-	± 10	μ A
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =250μA	1.4	1.7	2.5	V
Drain-Source On-State Resistance(Note d)	R _{DS(ON)}	V _{GS} =10V, I _D =20A	-	5.6	6.7	mΩ
		V _{GS} =4.5V, I _D =15A	-	7.9	10.3	mΩ
DYNAMIC CHARACTERISTICS						
Gate Resistance	R _G	V _{GS} =0V,V _{DS} =0V,F=1MHz	-	1.5	-	Ω
Input Capacitance	C _{iss}	V _{DS} =20V,V _{GS} =0V, F=1.0MHz	-	911	1185	PF
Output Capacitance	C _{oss}		-	222	-	PF
Reverse Transfer Capacitance	C _{rss}		-	30	-	PF
Turn-on Delay Time	t _{d(on)}	V _{DS} =20V, R _L =20Ω, V _{GEN} =10V,R _G =6Ω I _{DS} =1A	-	11.3	21-	nS
Turn-on Rise Time	t _r		-	8.2	15	nS
Turn-Off Delay Time	t _{d(off)}		-	22.6	41	nS
Turn-Off Fall Time	t _f		-	15.4	28	nS
Gate Charge Characteristics(Note e)						
Total Gate Charge	Q _g	V _{DS} =20V,I _D =20A,V _{GS} =10V	-	15	21	nC
Total Gate Charge	Q _g	V _{DS} =20V,I _D =20A,V _{GS} =4.5V	-	7.1	-	nC
Gate-Source Charge	Q _{gs}		-	3.2	-	nC
Gate-Drain Charge	Q _{gd}		-	1.9	-	nC
Diode Characteristics						
Body Diode Reverse Recovery Time	T _{rr}	I _{DS} =20A, dI/dt=100A/μs	-	18.3	-	nS
Body Diode Reverse Recovery Charge	Q _{rr}		-	6.4	-	nC
Diode Forward Voltage (Note d)	V _{SD}	V _{GS} =0V,I _S =20A	-	0.8	1.1	V

NOTES:

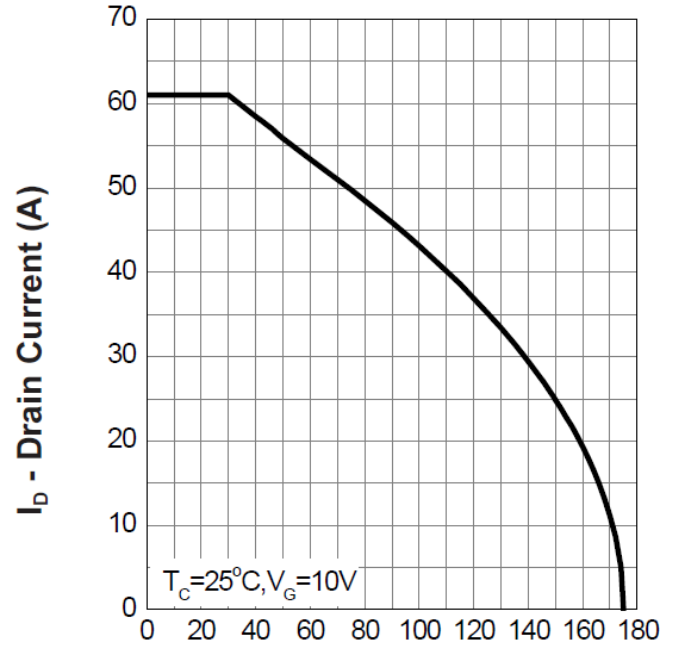
- Surface mounted on $1in^2$ pad area, steady state $t = 999s$.
- Pulse width limited by max. junction temperature..
- UIS tested and pulse width limited by maximum junction temperature 175°C (initial temperature $T_J=25^{\circ}\text{C}$).
- Pulse test ; pulse width $\leq 300ms$, duty cycle $\leq 2\%$.
- Guaranteed by design, not subject to production testing

Typical Operating Characteristics

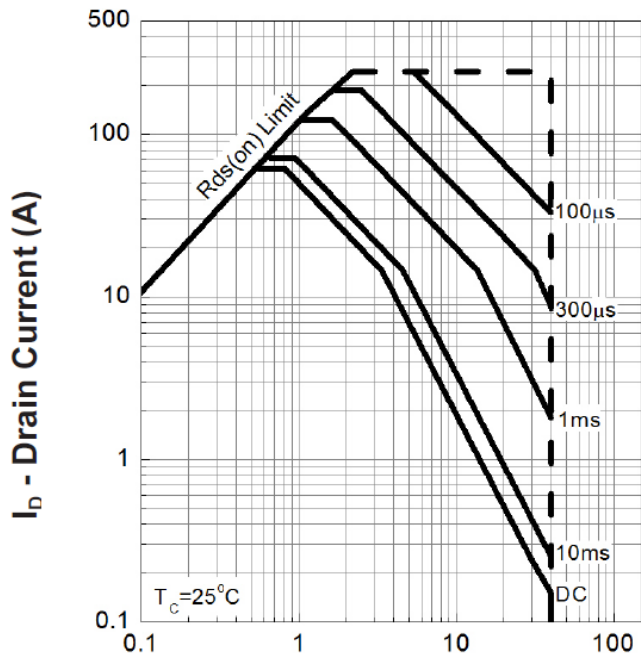
Power Dissipation



Drain Current

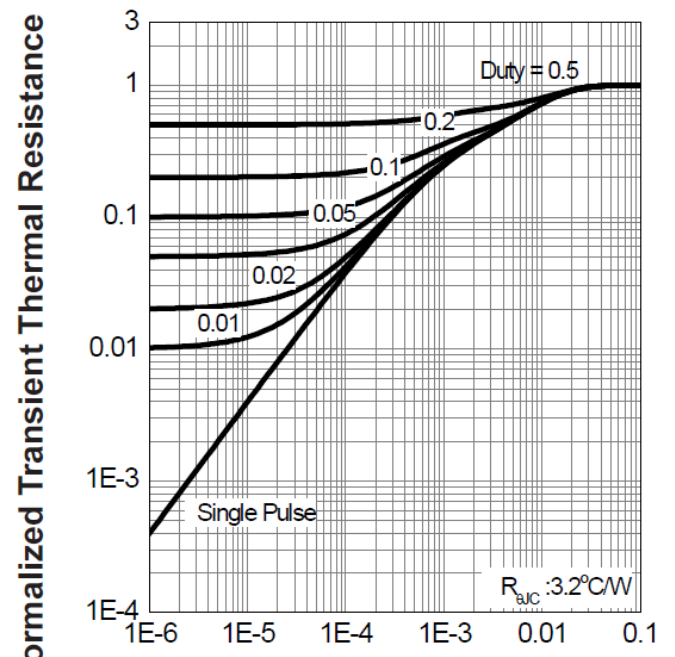


T_j - Junction Temperature (°C)
Safe Operation Area



V_{DS} - Drain - Source Voltage (V)

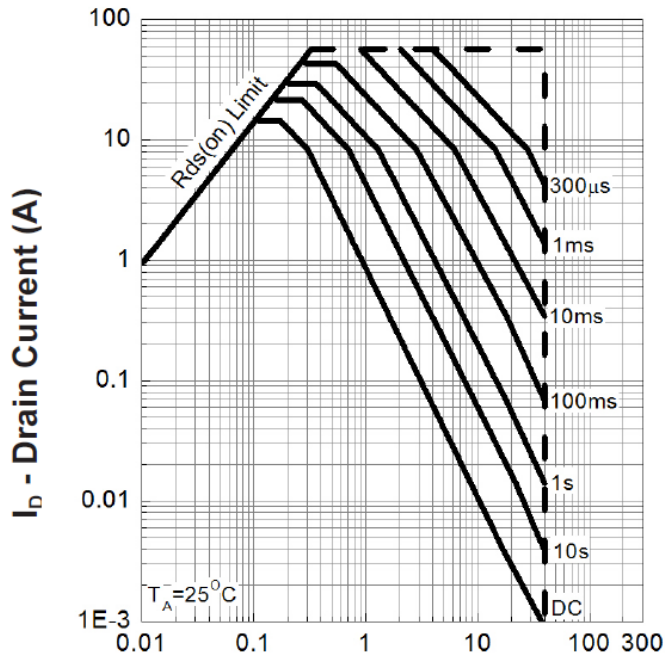
T_j - Junction Temperature (°C)
Thermal Transient Impedance



Square Wave Pulse Duration (sec)

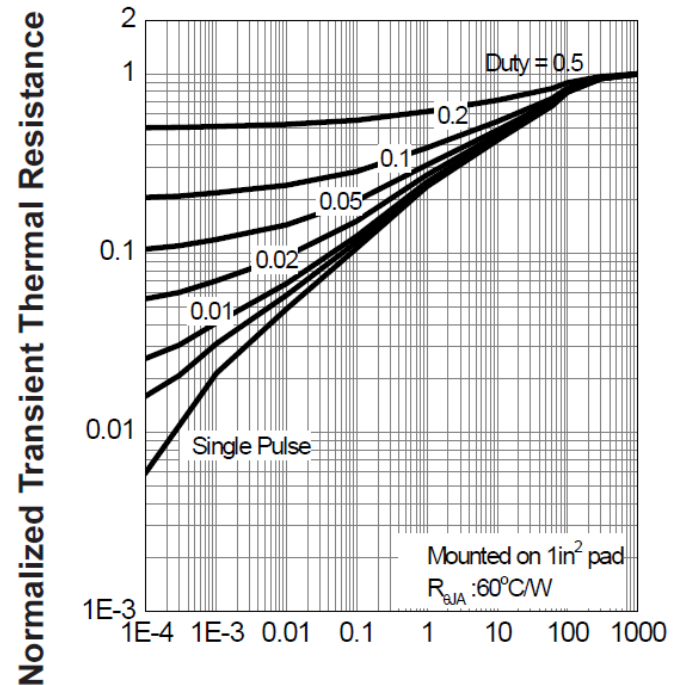
Typical Operating Characteristics(Cont.)

Safe Operation Area



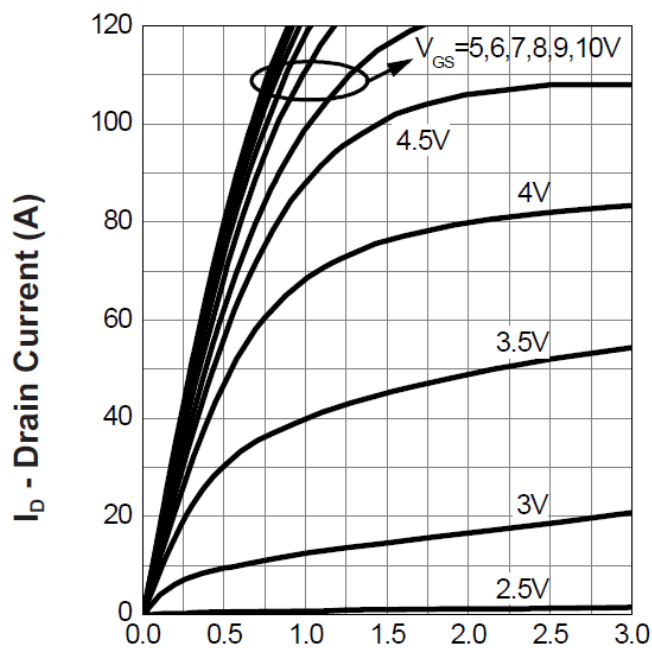
V_{DS} - Drain - Source Voltage (V)

Thermal Transient Impedance



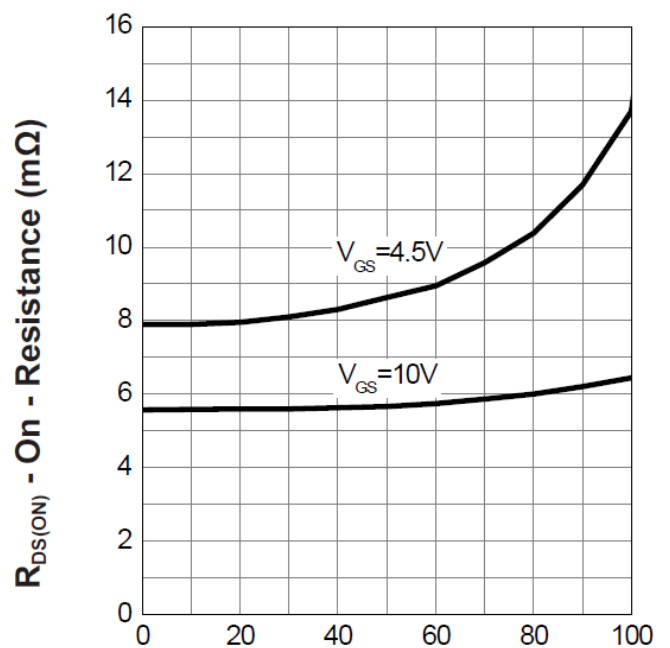
Square Wave Pulse Duration (sec)

Output Characteristics



V_{DS} - Drain - Source Voltage (V)

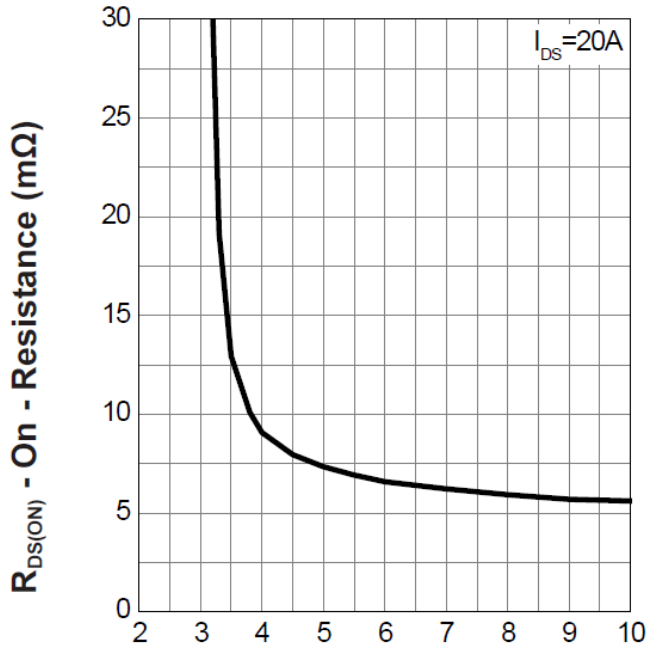
Drain-Source On Resistance



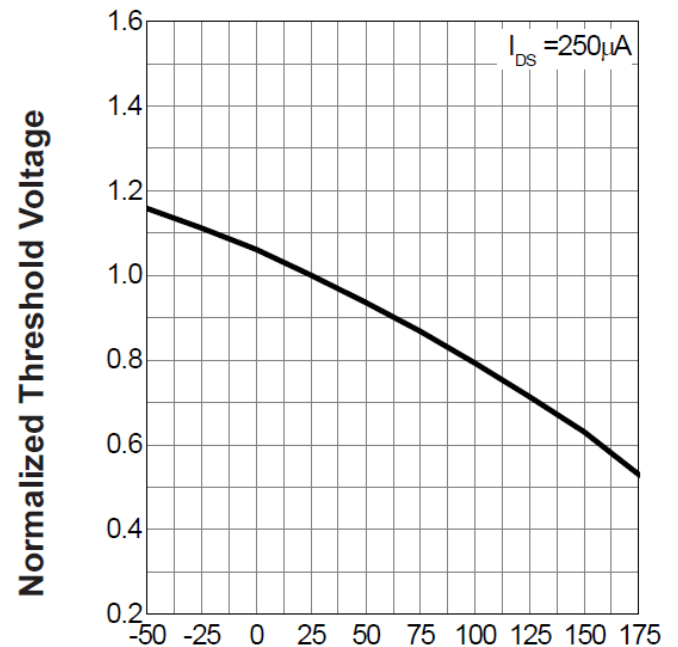
Id - Drain Current (A)

Typical Operating Characteristics (Cont.)

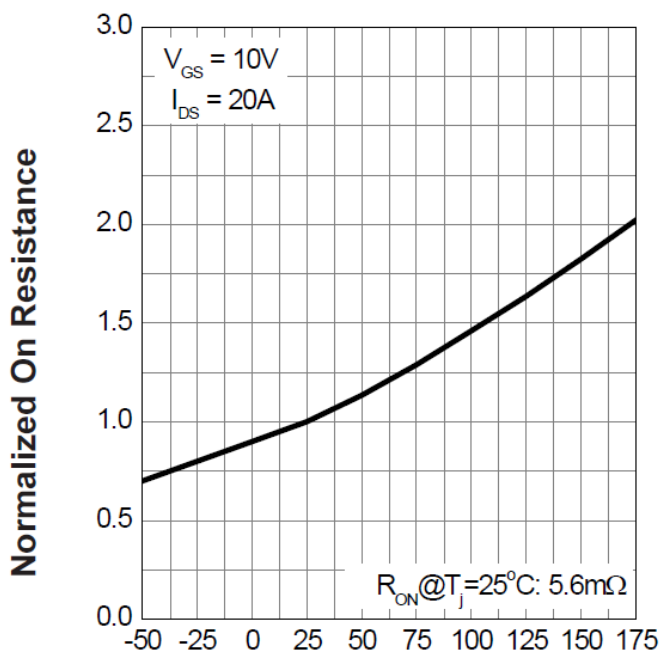
Gate-Source On Resistance

 V_{GS} - Gate - Source Voltage (V)

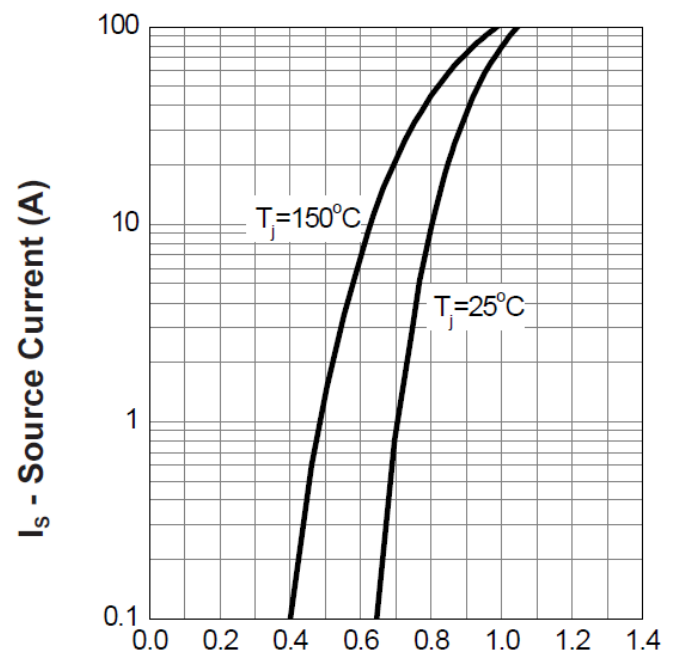
Gate Threshold Voltage

 T_J - Junction Temperature ($^{\circ}C$)

Drain-Source On Resistance

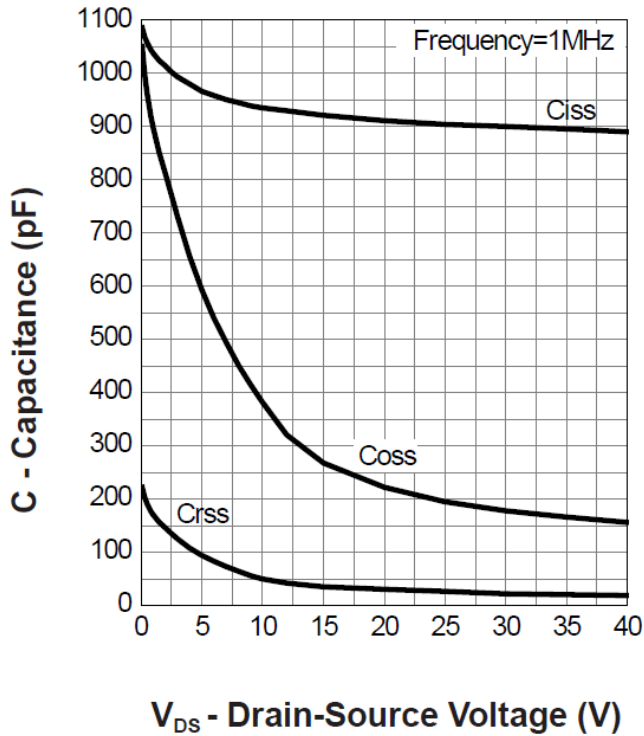
 T_J - Junction Temperature ($^{\circ}C$)

Source-Drain Diode Forward

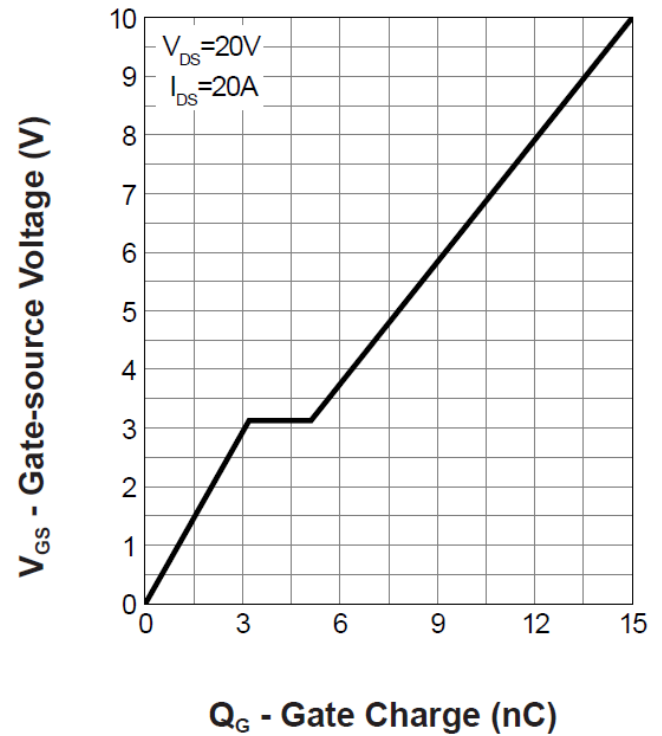
 V_{SD} - Source - Drain Voltage (V)

Typical Operating Characteristics (Cont.)

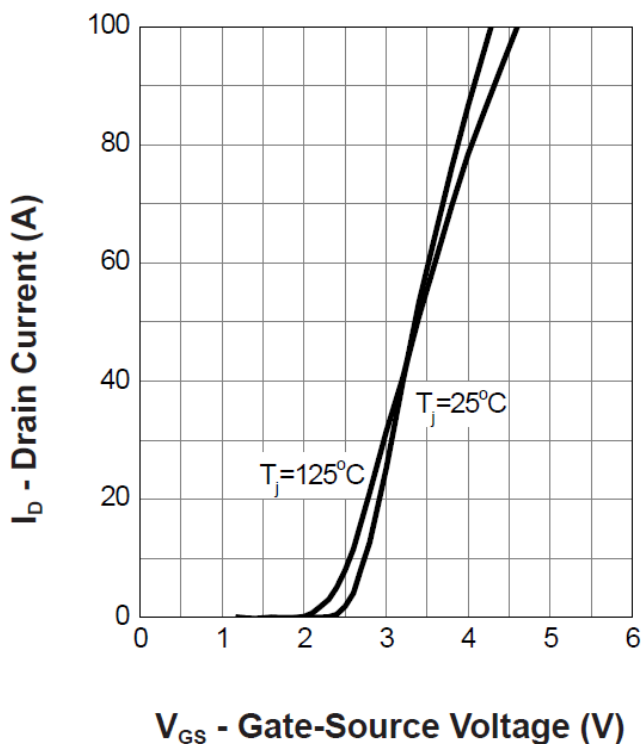
Capacitance



Gate Charge



Transfer Characteristics

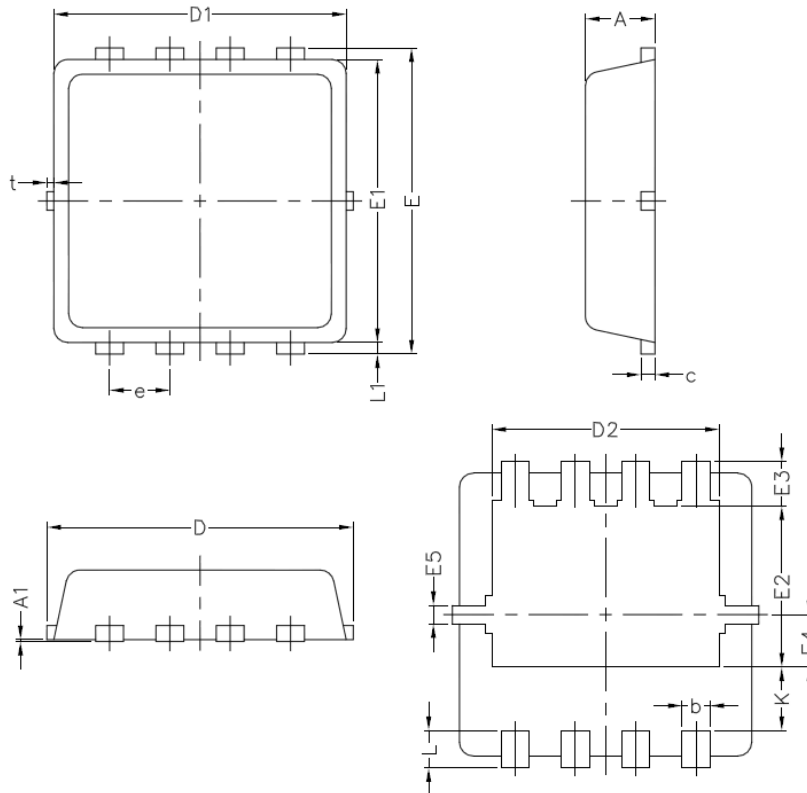


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Package Information

PPAK-3*3-8 Package



Symbol	PPAK-3*3-8(mm)		
	Min	Nom	Max
A	0.70	0.75	0.85
A1	/	/	0.05
b	0.20	0.30	0.40
c	0.10	0.152	0.25
D	3.15	3.3	3.45
D1	3.00	3.15	3.30
D2	2.25	2.45	2.65
E	3.15	3.30	3.45
E1	2.90	3.05	3.20
E2	1.54	1.74	1.94
E3	0.28	0.48	0.68
E4	0.37	0.57	0.77
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.49	0.69	0.89
L	0.30	0.40	0.50
L1	0.06	0.125	0.20
t	/	/	0.13

Design Notes