Din-Tek SEMICONDUCTOR

DTQ3406

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N-Channel 40 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a, e]	Q_g (Typ.)
40	0.0058 at V_{GS} = 10 V	50	35 nC
	0.0068 at V_{GS} = 4.5 V	25	

FEATURES

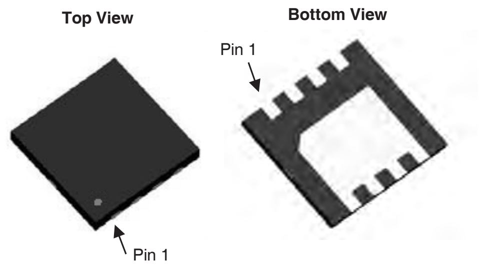
- DT-Trench Power MOSFET
- 100 % R_g and UIS Tested

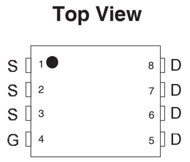
RoHS COMPLIANT

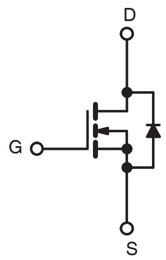
APPLICATIONS

- Notebook PC Core
- VRM/POL

DFN 3x3 EP







N-Channel MOSFET

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

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 175 °C)	T_C = 25 °C	I_D	50[a, e]	A
	T_C = 70 °C		42[e]	
	T_A = 25 °C		18[b, c]	
	T_A = 70 °C		11[b, c]	
Pulsed Drain Current		I_{DM}	200	
Avalanche Current Pulse	L = 0.1 mH	I_{AS}	48	
Single Pulse Avalanche Energy		E_{AS}	121	mJ
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	50[a, e]	A
	T_A = 25 °C		21[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	80	W
	T_C = 70 °C		52	
	T_A = 25 °C		5.9[b, c]	
	T_A = 70 °C		3.8[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 175	°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient[b, d]	t ≤ 10 s	R_{thJA}	50	55	°C/W
Maximum Junction-to-Case	Steady State	R_{thJC}	21	26	

Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 10 s.
d. Maximum under steady state conditions is 90 °C/W.
e. Calculated based on maximum junction temperature. Package limitation current is 10 A.

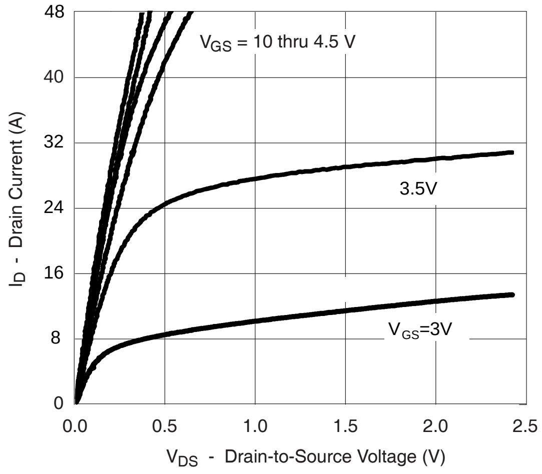
SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min .	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	40			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		35		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250 µA	1		3	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 32 V, V_{GS} = 0 V			1	µA
		V_{DS} = 32 V, V_{GS} = 0 V, T_J = 55 °C			10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 10 V	50			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		0.0058	0.007	Ω
		V_{GS} = 4.5 V, I_D = 15 A		0.0068	0.0082	
Forward Transconductance[a]	g_{fs}	V_{DS} = 32V, I_D = 10 A		80		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 32 V, V_{GS} = 0 V, f = 1 MHz		3340		pF
Output Capacitance	C_{oss}			369		
Reverse Transfer Capacitance	C_{rss}			50		
Total Gate Charge	Q_g	V_{DS} = 32 V, V_{GS} = 10 V, I_D = 20 A		35		nC
		V_{DS} = 32 V, V_{GS} = 4.5 V, I_D = 15 A		15		
Gate-Source Charge	Q_{gs}			7		
Gate-Drain Charge	Q_{gd}			4		
Gate Resistance	R_g	f = 1 MHz		1.5	2.3	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 32 V, R_L = 0.555 Ω $I_D \cong$ 20 A, V_{GEN} = 10 V, R_g = 1 Ω		16	22	ns
Rise Time	t_r			11	19	
Turn-Off Delay Time	$t_{d(off)}$			32	45	
Fall Time	t_f			8	15	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 32 V, R_L = 0.625 Ω $I_D \cong$ 15 A, V_{GEN} = 4.5 V, R_g = 1 Ω		38	53	
Rise Time	t_r			60	70	
Turn-Off Delay Time	$t_{d(off)}$			25	45	
Fall Time	t_f			8	12	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			50	A
Pulse Diode Forward Current[a]	I_{SM}				200	
Body Diode Voltage	V_{SD}	I_S = 12 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 10 A, di/dt = 100 A/µs, T_J = 25 °C		50	72	ns
Body Diode Reverse Recovery Charge	Q_{rr}			65	99	nC
Reverse Recovery Fall Time	t_a			24		ns
Reverse Recovery Rise Time	t_b			20		

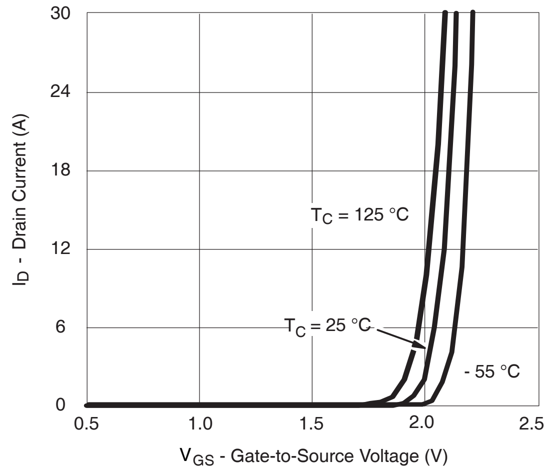
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

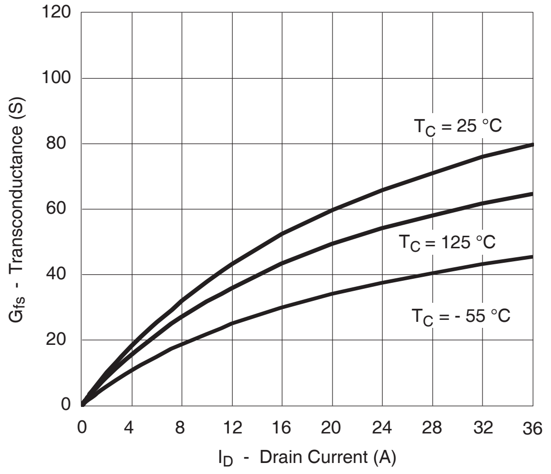
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



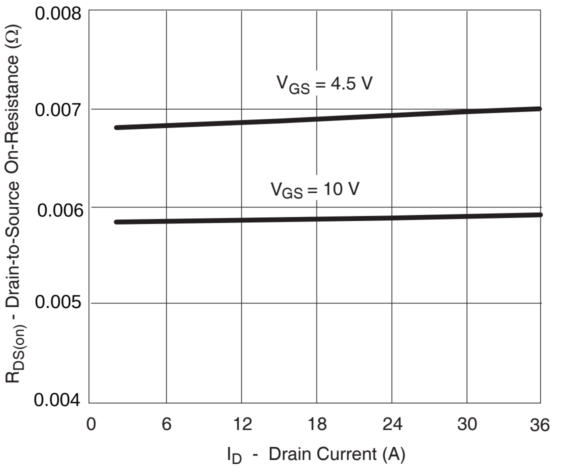
Output Characteristics



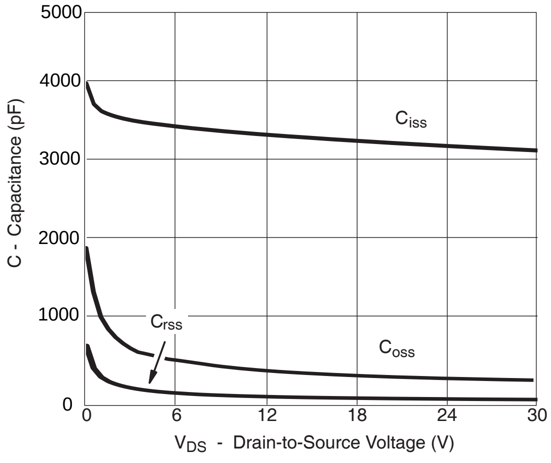
Transfer Characteristics



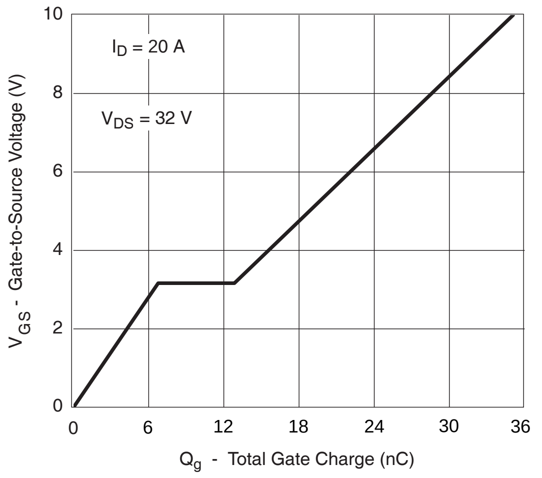
Transconductance



$R_{DS(on)}$ vs. Drain Current

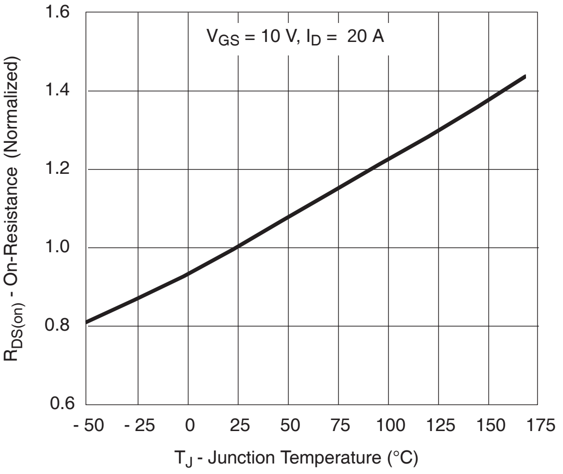


Capacitance

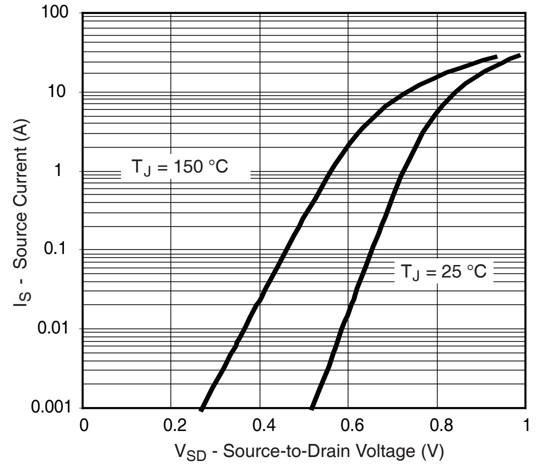


Gate Charge

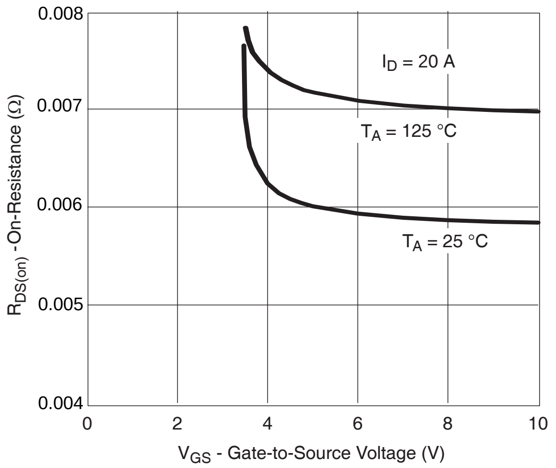
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



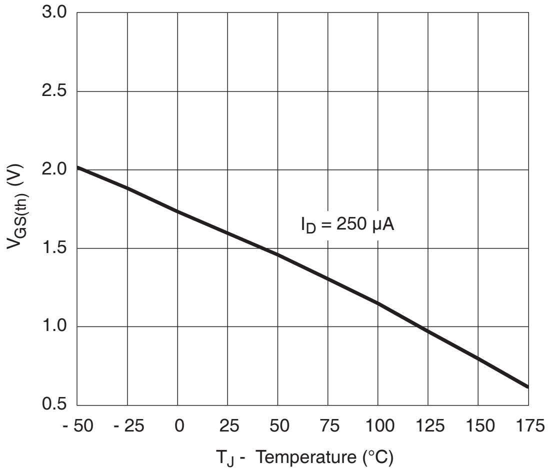
On-Resistance vs. Junction Temperature



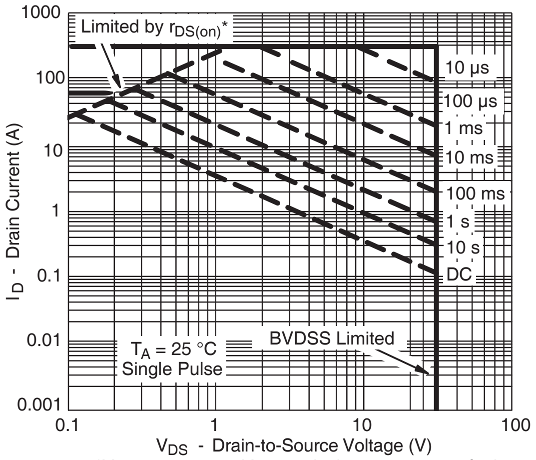
Forward Diode Voltage vs. Temperature



$R_{DS(on)}$ vs. V_{GS} vs. Temperature



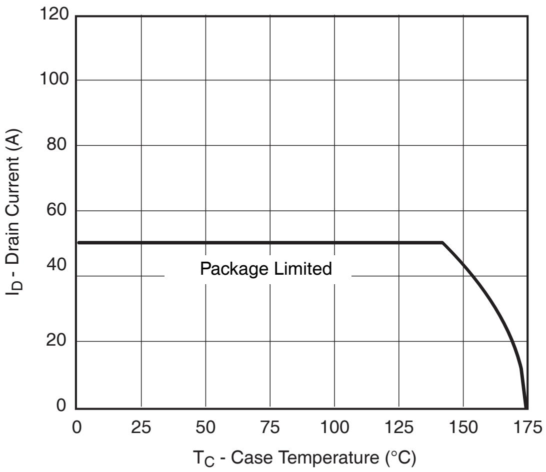
Threshold Voltage



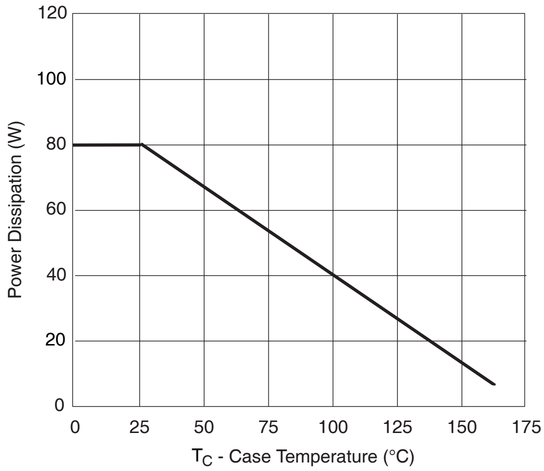
*V_{GS} > minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

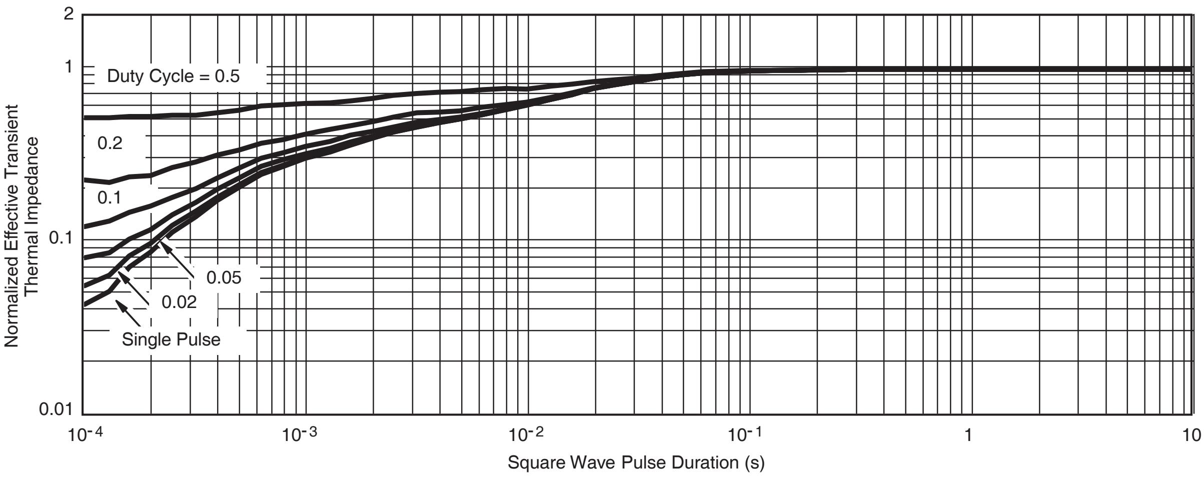


Current Derating*

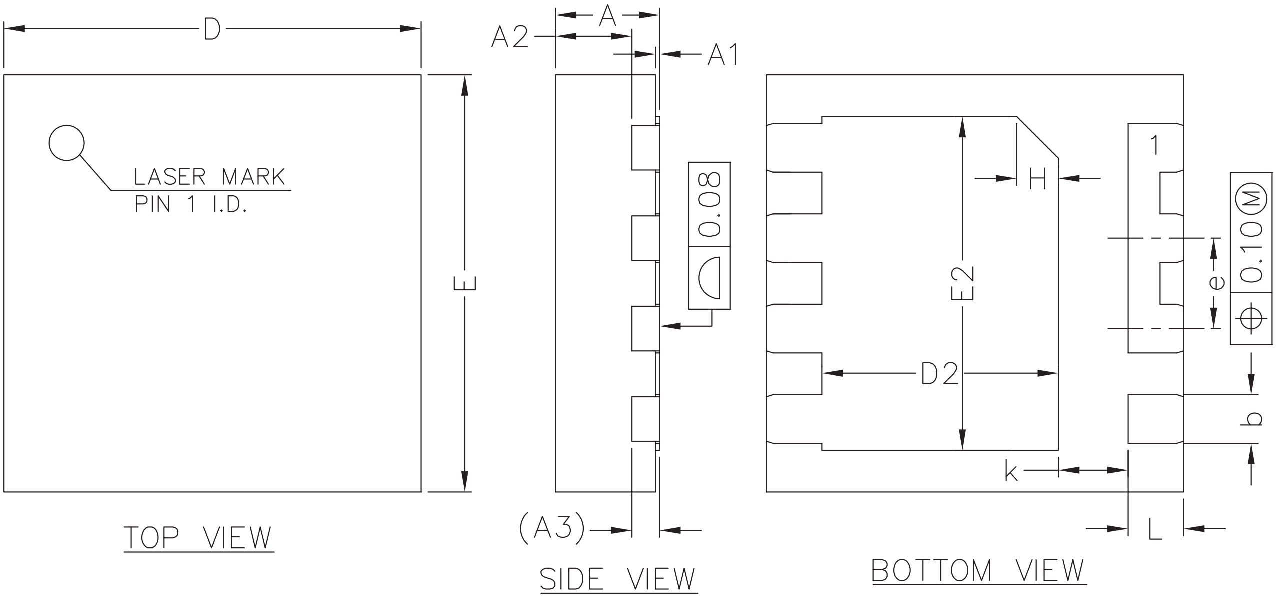


Power Derating

* The power dissipation P_D is based on $T_{J(max)}$ = 175 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



Normalized Thermal Transient Impedance, Junction-to-Case



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2	0.50	0.55	0.60
A3	0.20REF		
b	0.30	0.35	0.40
D	2.90	3.00	3.10
E	2.90	3.00	3.10
D2	1.60	1.70	1.80
E2	2.30	2.40	2.50
e	0.55	0.65	0.75
K	0.40	0.50	0.60
L	0.35	0.40	0.45

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