

N-Channel 40 V (D-S) MOSFET

PRODUCT SUMMARY

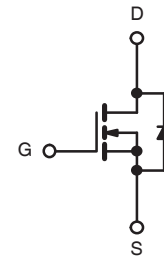
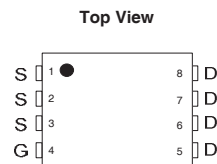
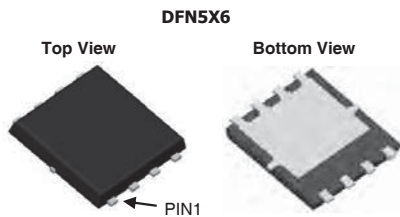
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^{a, e}	Q_g (Typ.)
40	0.0082 at $V_{GS} = 10$ V	48	66 nC
	0.012 at $V_{GS} = 4.5$ V	36	

FEATURES

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

APPLICATIONS

- Notebook PC Core
- VRM/POL


RoHS
 COMPLIANT


N-Channel MOSFET

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	
Continuous Drain Current ($T_J = 175^\circ\text{C}$)	I_D	$T_C = 25^\circ\text{C}$	48 ^{a, e}
		$T_C = 70^\circ\text{C}$	38 ^e
		$T_A = 25^\circ\text{C}$	15 ^{b, c}
		$T_A = 70^\circ\text{C}$	10 ^{b, c}
Pulsed Drain Current	I_{DM}	160	
Avalanche Current Pulse	I_{AS}	18	
Single Pulse Avalanche Energy	E_{AS}	40	mJ
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$	50 ^{a, e}
		$T_A = 25^\circ\text{C}$	2.1 ^{b, c}
Maximum Power Dissipation	P_D	$T_C = 25^\circ\text{C}$	150 ^a
		$T_C = 70^\circ\text{C}$	105
		$T_A = 25^\circ\text{C}$	2.9 ^{b, c}
		$T_A = 70^\circ\text{C}$	1.7 ^{b, c}
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 175	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, d}	R_{thJA}	50	65	$^\circ\text{C/W}$
Maximum Junction-to-Case	R_{thJC}	0.9	1.1	

Notes:

 a. Based on $T_C = 25^\circ\text{C}$.

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 50 A.

SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

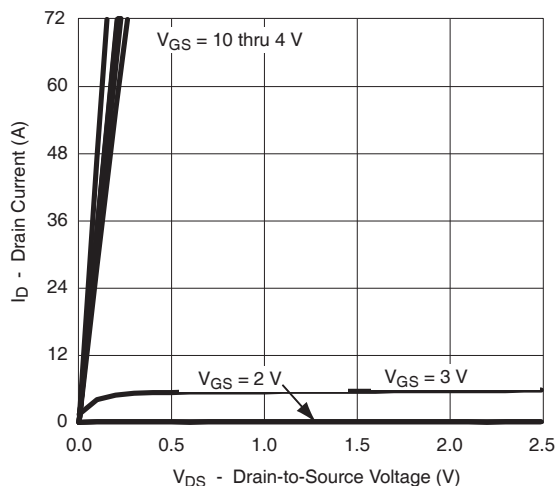
Parameter	Symbol	Test Conditions	Min .	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	40			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		35		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 5.5		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1.2		2.5	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} = 40 V, V _{GS} = 0 V			1	μA
		V _{DS} = 40 V, V _{GS} = 0 V, T _J = 55 °C			10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	48			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D =5 A		0.0082	0.0099	Ω
		V _{GS} = 4.5 V, I _D =5 A		0.012	0.014	
Forward Transconductance ^a	g _{fs}	V _{DS} = 4.5 V, I _D =5 A		110		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 12.5 V, V _{GS} = 0 V, f = 1 MHz		1180		pF
Output Capacitance	C _{oss}			970		
Reverse Transfer Capacitance	C _{rss}			660		
Total Gate Charge	Q _g	V _{DS} = 15 V, V _{GS} = 10 V, I _D = 5 A		69		nC
		V _{DS} = 15 V, V _{GS} = 4.5 V, I _D = 5 A		58		
Q _{gs}			30			
Q _{gd}			20			
Gate Resistance	R _g	f = 1 MHz		1.5		Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 15 V, R _L = 0.555 Ω I _D ≅ 20 A, V _{GEN} = 10 V, R _g = 1 Ω		20		ns
Rise Time	t _r			15		
Turn-Off Delay Time	t _{d(off)}			70		
Fall Time	t _f			11		
Turn-On Delay Time	t _{d(on)}	V _{DD} = 15 V, R _L = 0.625 Ω I _D ≅ 18 A, V _{GEN} = 4.5 V, R _g = 1 Ω		56		
Rise Time	t _r			180		
Turn-Off Delay Time	t _{d(off)}			56		
Fall Time	t _f			11		
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			46	A
Pulse Diode Forward Current ^a	I _{SM}				152	
Body Diode Voltage	V _{SD}	I _S = 20 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 20 A, di/dt = 100 A/μs, T _J = 25 °C		53		ns
Body Diode Reverse Recovery Charge	Q _{rr}			71		nC
Reverse Recovery Fall Time	t _a			28		ns
Reverse Recovery Rise Time	t _b			26		

Notes:

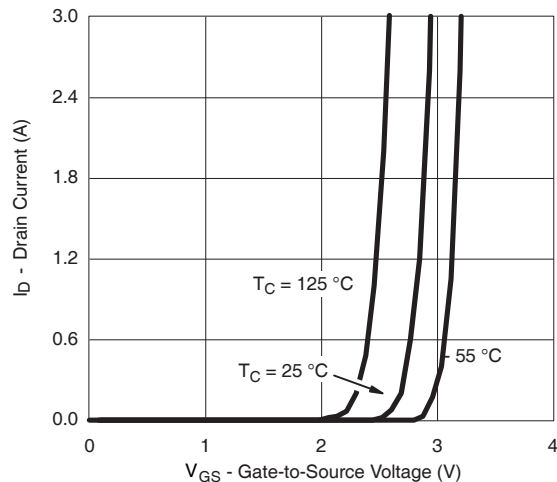
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

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.

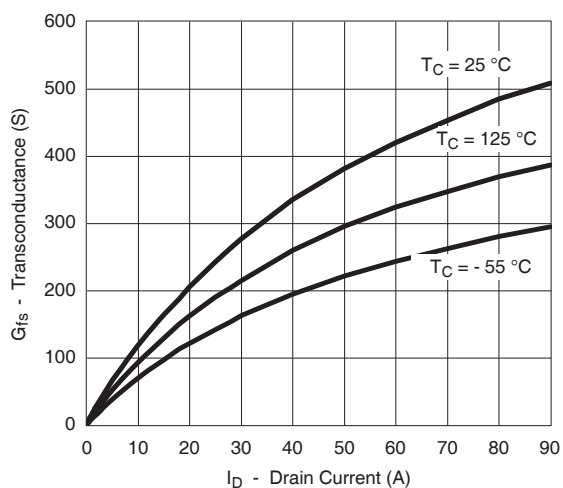
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



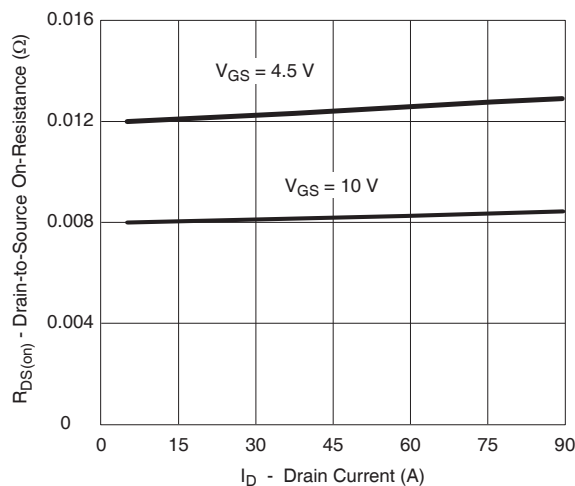
Output Characteristics



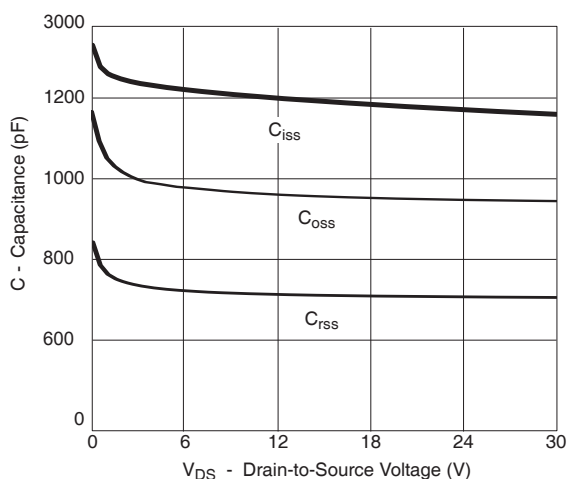
Transfer Characteristics



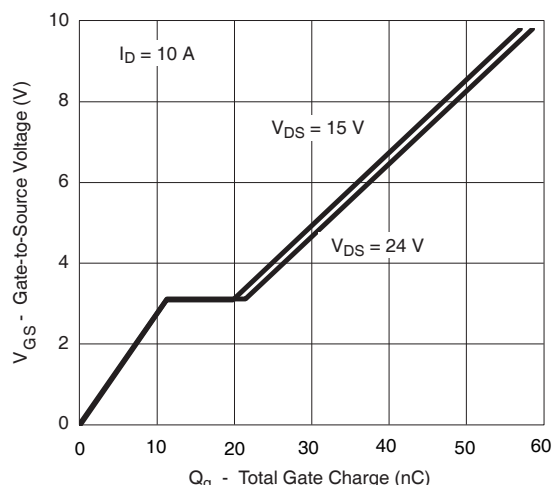
Transconductance



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

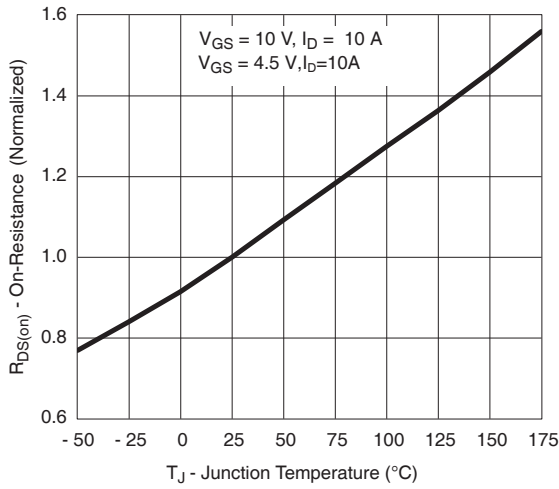


Capacitance

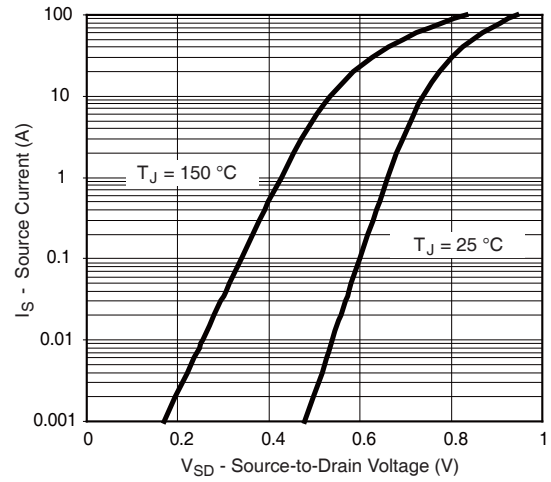


Gate Charge

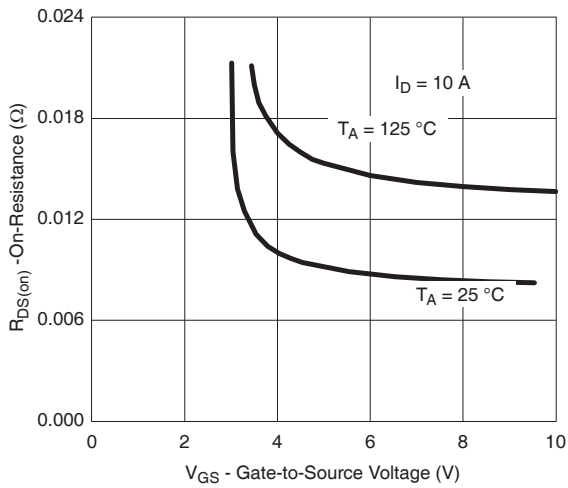
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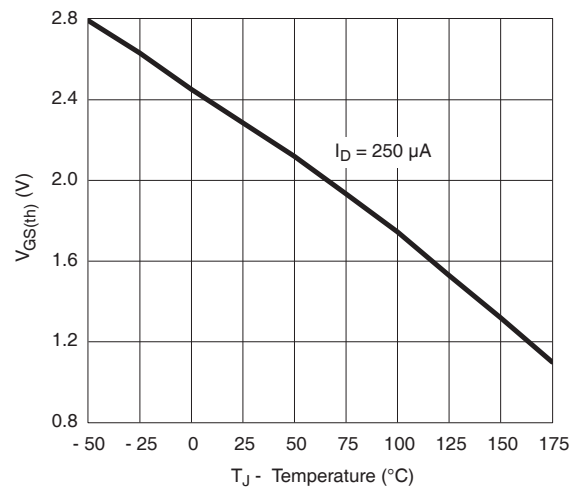
On-Resistance vs. Junction Temperature



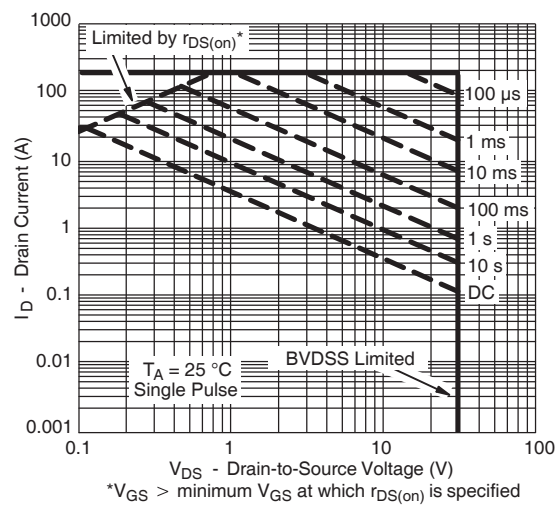
Forward Diode Voltage vs. Temperature



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



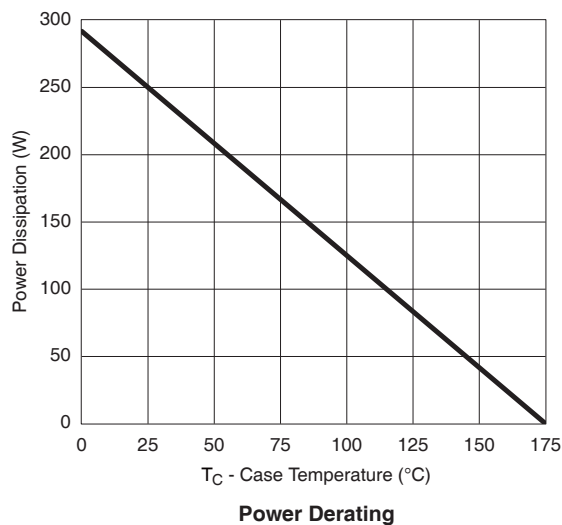
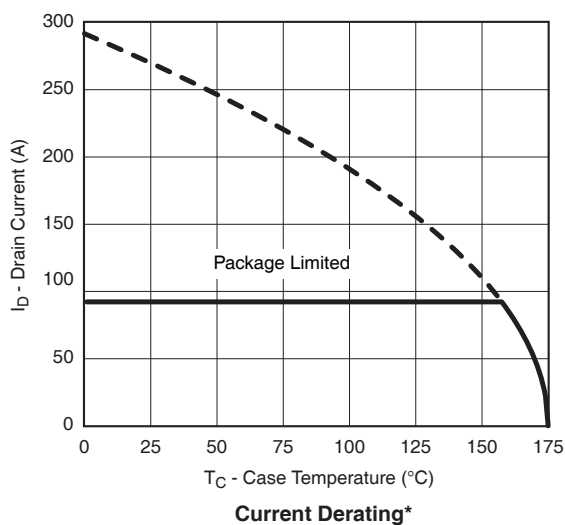
Threshold Voltage



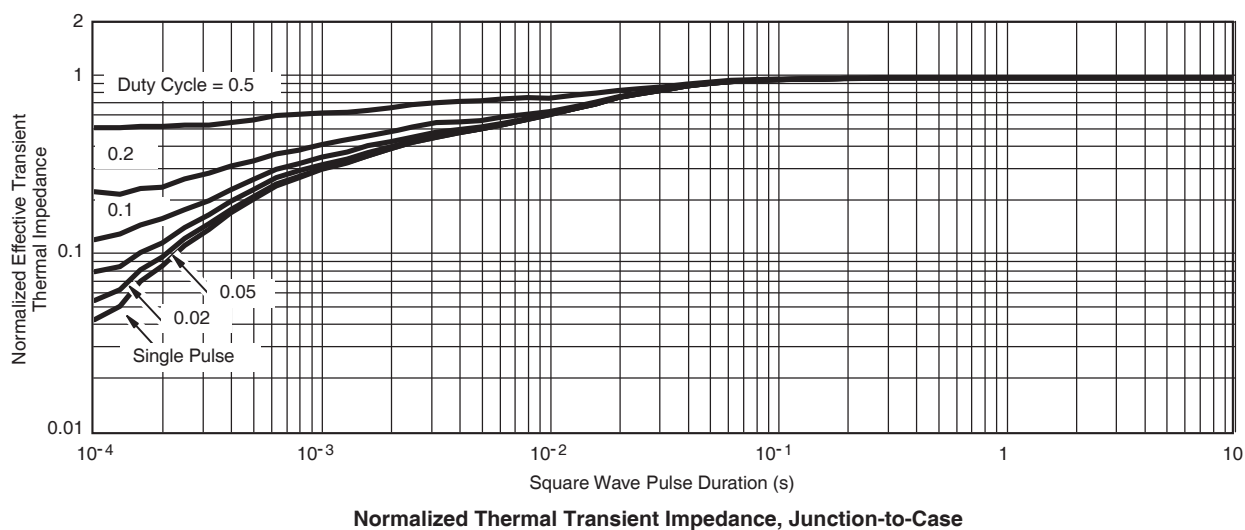
* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



* 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.



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