

N-Channel 40-V (D-S), 175 °C MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	r _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ)
40	0.0065 at V _{GS} = 10 V	20	53.6 nC
	0.008 at V _{GS} = 4.5 V	20	

FEATURES

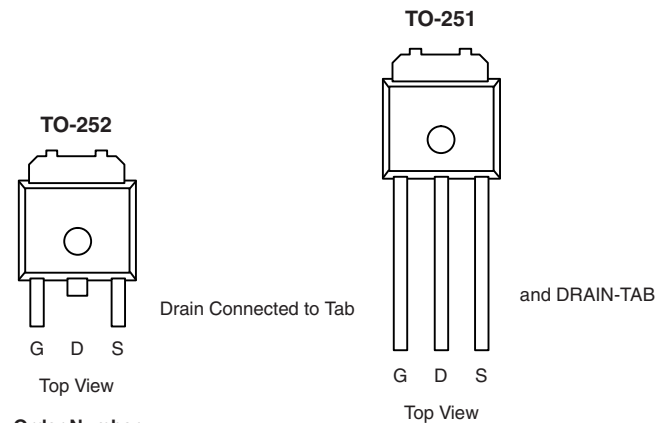
- TrenchFET® Power MOSFET
- 100 % R_g & UIS Tested



RoHS
COMPLIANT

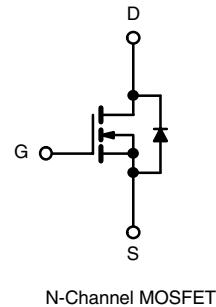
APPLICATIONS

- LCD TV Inverter
- Secondary Synchronous Rectification



Order Number:
SUD50N04-06P-E3 (Lead (Pb)-free)

Order Number:
SUU50N04-06P-E3 (Lead (Pb)-free)



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}	± 16	
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	I _D	20 ^c	A
	T _C = 100 °C		20 ^c	
	T _A = 25 °C		15.9 ^b	
	T _A = 100 °C		11 ^b	
Pulsed Drain Current		I _{DM}	60	
Continuous Source-Drain Diode Current	T _C = 25 °C	I _S	20 ^c	A
	T _A = 25 °C		2.5 ^b	
Single Pulse Avalanche Current	L = 0.1 mH	I _{AS}	30	mJ
Avalanche Energy		E _{AS}	45	
Maximum Power Dissipation	T _C = 25 °C	P _D	79	W
	T _C = 100 °C		39.5	
	T _A = 25 °C		3.3 ^b	
	T _A = 100 °C		1.6 ^b	
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	Steady State	R _{thJA}	37	4.5	°C/W
Maximum Junction-to-Case	Steady State	R _{thJC}	1.5	1.9	

Notes:

a. Based on T_C = 25 °C.

b. Surface Mounted on 1" x 1" FR4 board.

c. Package limited.

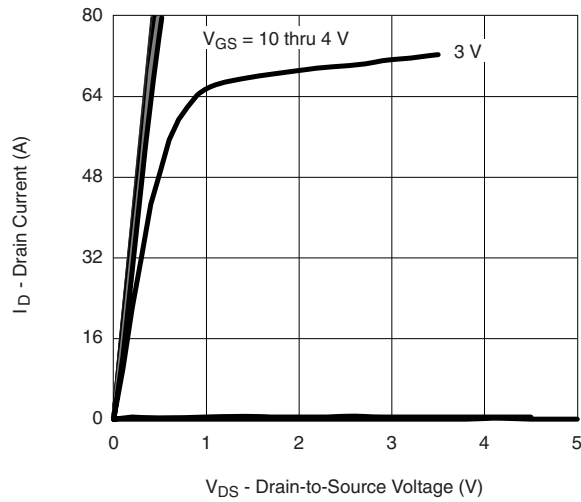
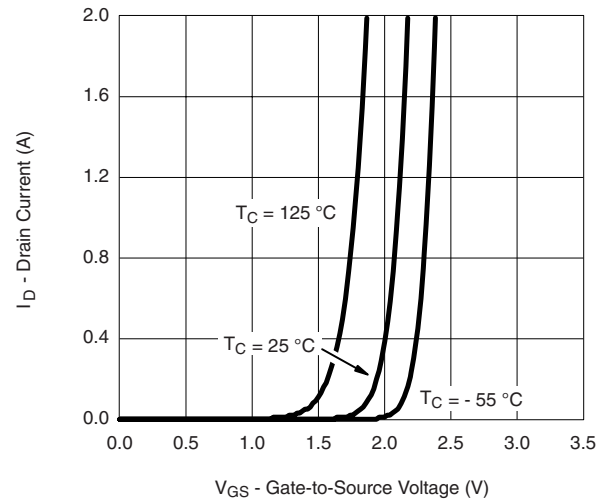
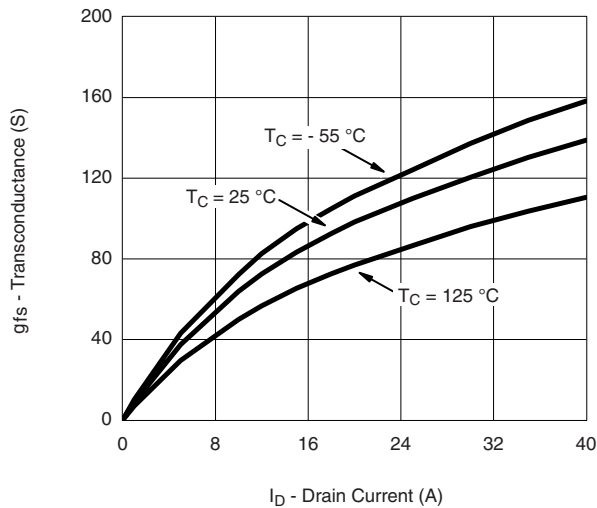
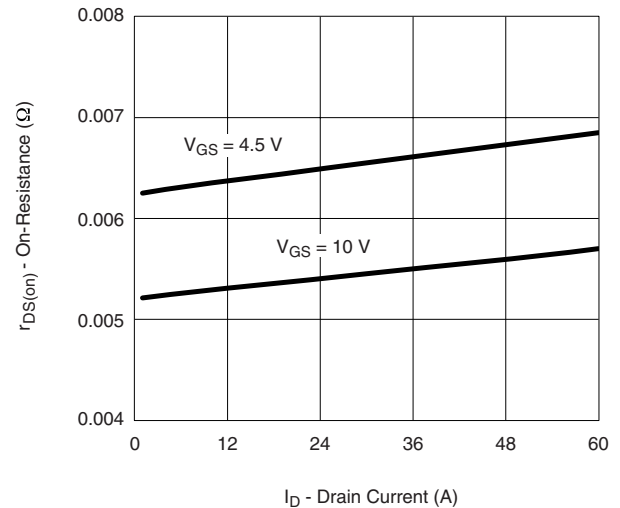
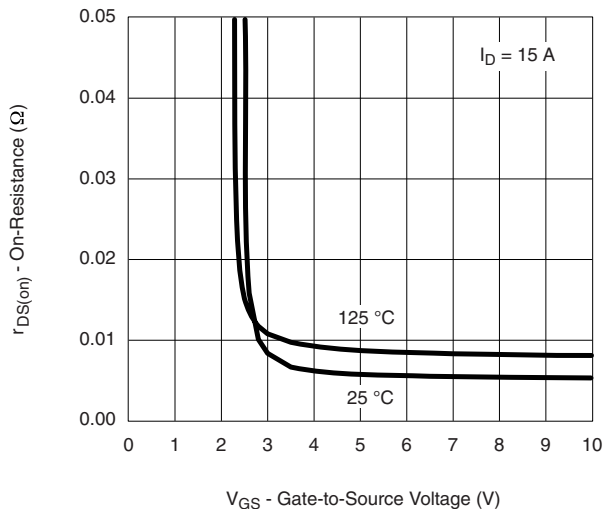
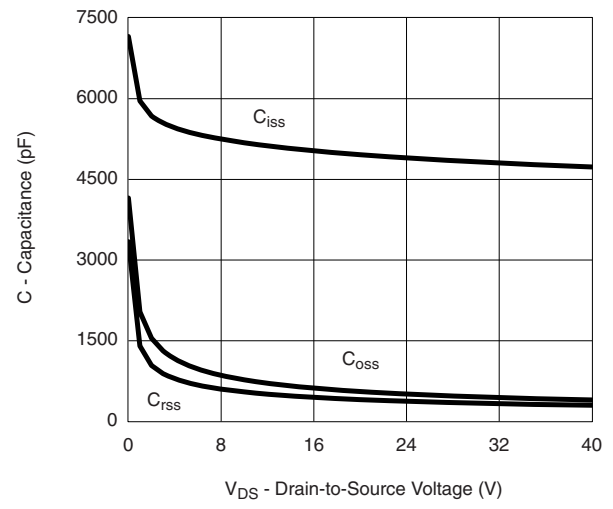
SPECIFICATIONS T _J = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	40			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		35		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 6.0		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	0.8		2.2	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 16 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 = 100 °C			20	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	30			A
Drain-Source On-State Resistance ^a	r _{DS(on)}	V _{GS} = 10 V, I _D = 15 A		0.0053	0.0065	Ω
		V _{GS} = 4.5 V, I _D = 10 A		0.0063	0.008	
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 15 A		83		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 20 V, V _{GS} = 0 V, f = 1 MHz		5080		pF
Output Capacitance	C _{oss}			555		
Reverse Transfer Capacitance	C _{rss}			402		
Total Gate Charge	Q _g	V _{DS} = 20 V, V _{GS} = 10 V, I _D = 30 A		110	165	nC
Gate-Source Charge	Q _{gs}	V _{DS} = 20 V, V _{GS} = 4.5 V, I _D = 30 A		53.6	80	
Gate-Drain Charge	Q _{gd}			8.8		
Gate Resistance	R _g	f = 1 MHz		1.2	1.8	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 20 V, R _L = 0.66 Ω I _D ≅ 30 A, V _{GEN} = 4.5 V, R _g = 1 Ω		24	36	ns
Rise Time	t _r			142	215	
Turn-Off Delay Time	t _{d(off)}			142	215	
Fall Time	t _f			92	140	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 20 V, R _L = 0.66 Ω I _D ≅ 30 A, V _{GEN} = 10 V, R _g = 1 Ω		8	16	
Rise Time	t _r			19	30	
Turn-Off Delay Time	t _{d(off)}			50	75	
Fall Time	t _f			11	18	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			20	A
Pulse Diode Forward Current ^a	I _{SM}				50	
Body Diode Voltage	V _{SD}	I _S = 10 A		0.76	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 20 A, di/dt = 100 A/μs, T _J = 25 °C		36	55	ns
Body Diode Reverse Recovery Charge	Q _{rr}			40	60	nC
Reverse Recovery Fall Time	t _a			20		ns
Reverse Recovery Rise Time	t _b			16		

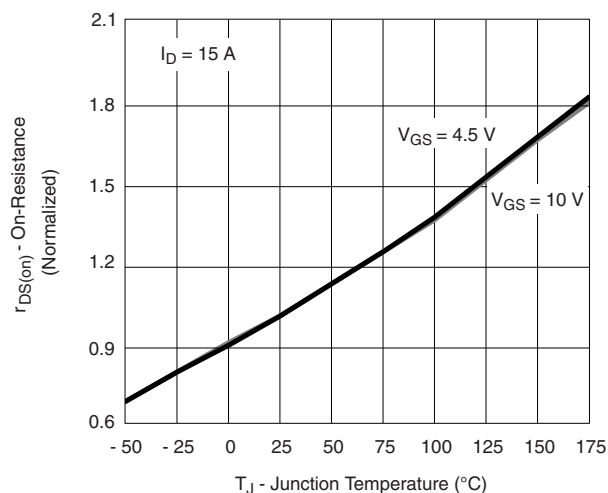
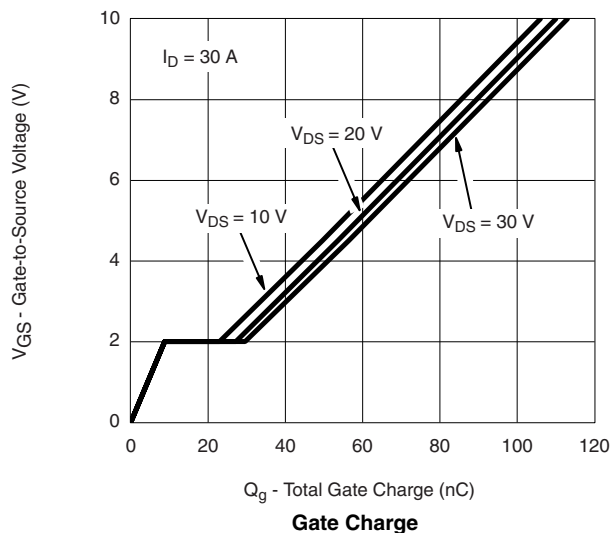
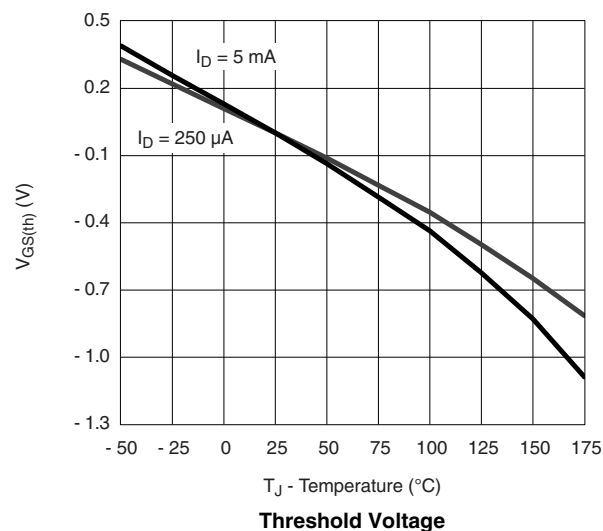
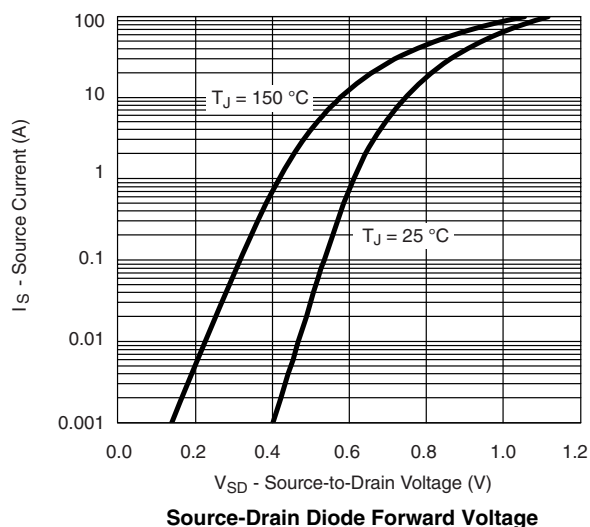
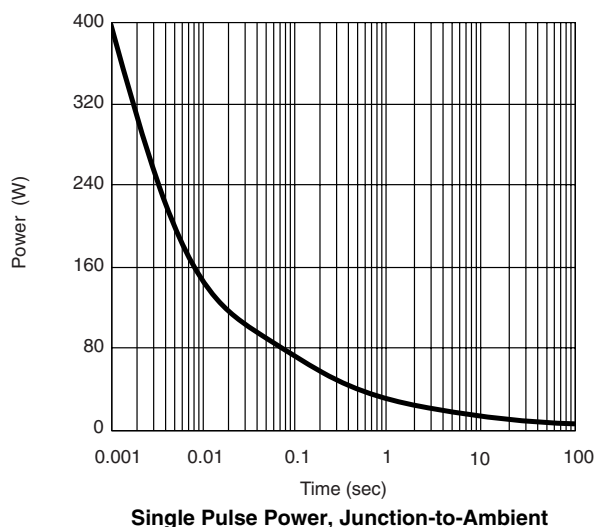
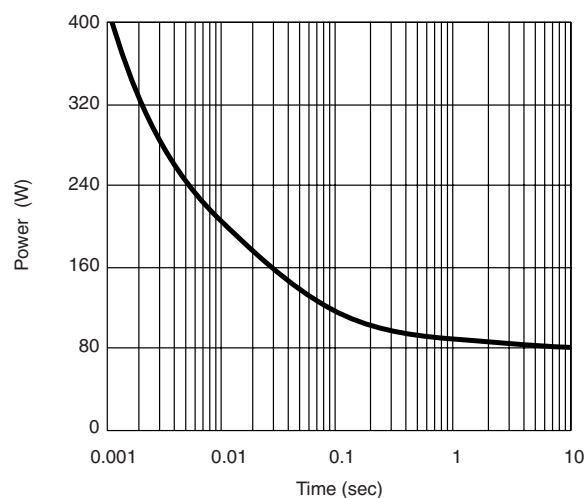
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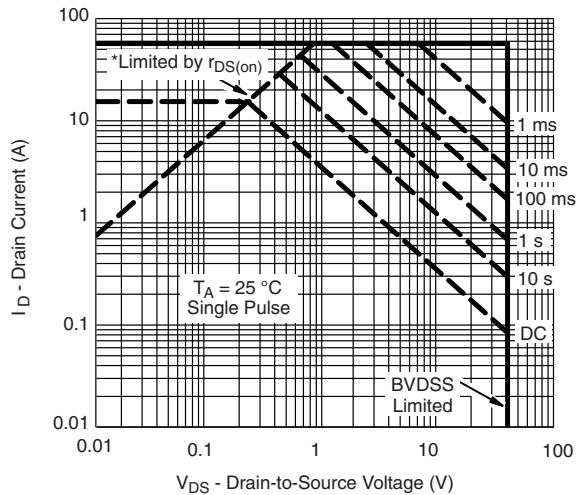
a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

b. Guaranteed by design, not subject to production testing.

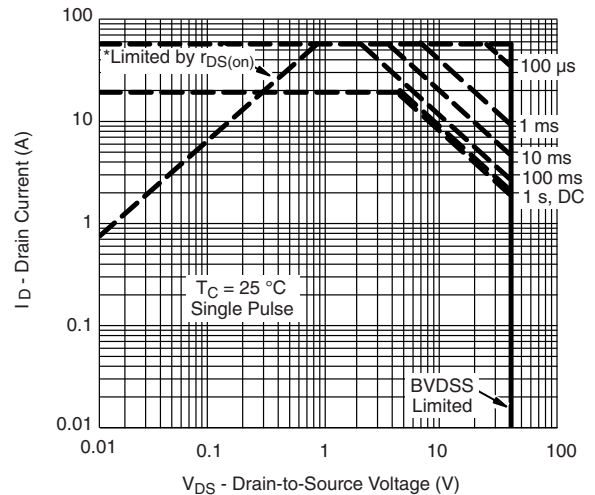
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Output Characteristics

Transfer Characteristics

Transconductance

On-Resistance vs. Drain Current

On-Resistance vs. Gate-to-Source Voltage

Capacitance

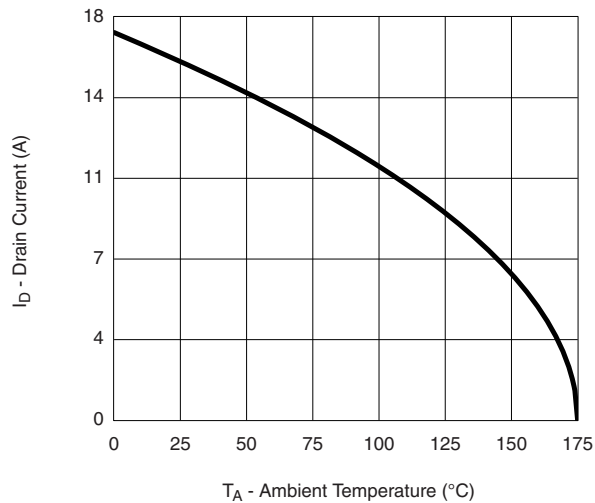
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted**On-Resistance vs. Junction Temperature****Threshold Voltage****Single Pulse Power, Junction-to-Ambient****Single Pulse Power, Junction-to-Case**

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


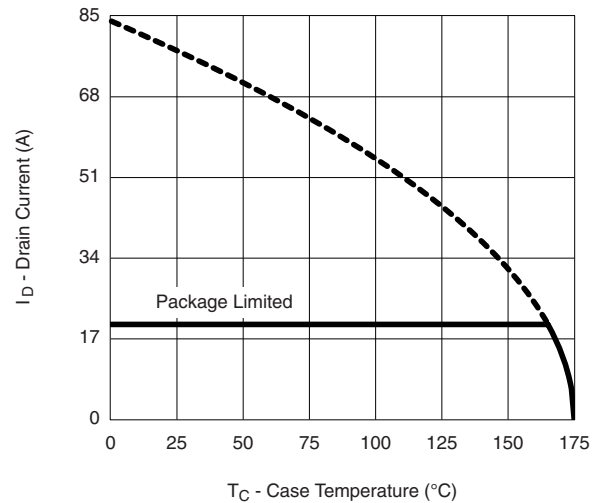
V_{DS} - Drain-to-Source Voltage (V)
 $*V_{GS} > \text{minimum } V_{GS} \text{ at which } r_{DS(on)} \text{ is specified}$
Safe Operating Area, Junction-to-Ambient



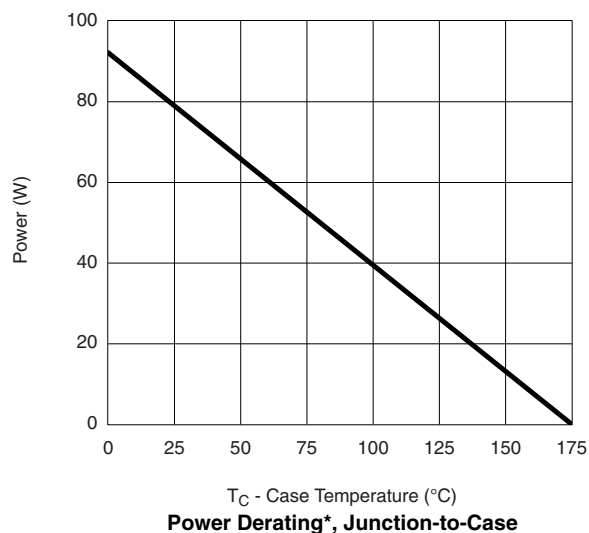
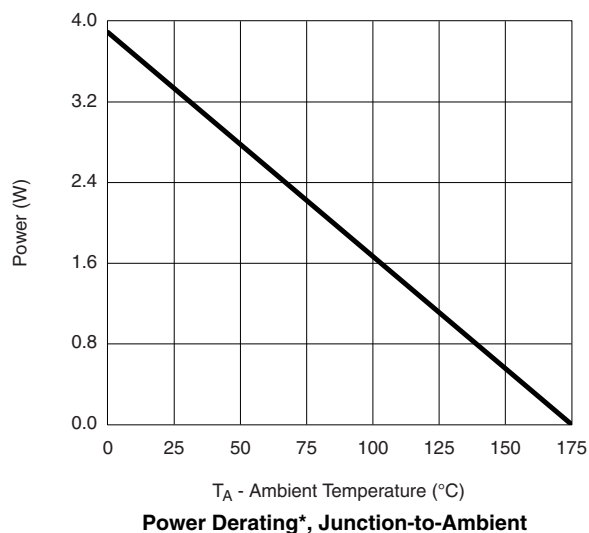
V_{DS} - Drain-to-Source Voltage (V)
 $*V_{GS} > \text{minimum } V_{GS} \text{ at which } r_{DS(on)} \text{ is specified}$
Safe Operating Area, Junction-to-Case



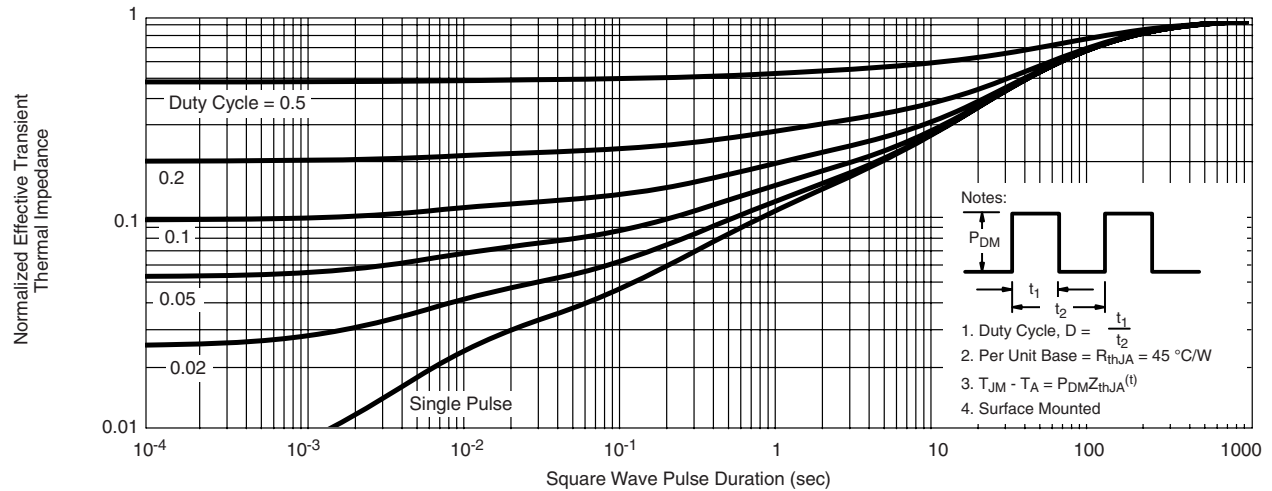
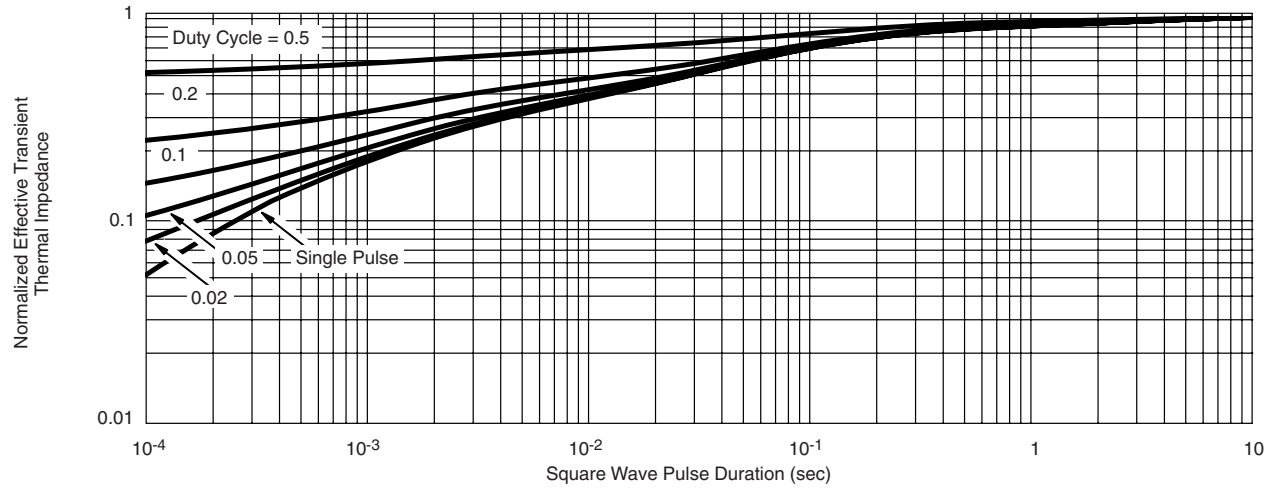
T_A - Ambient Temperature ($^\circ\text{C}$)
Current Derating*, Junction-to-Ambient



T_C - Case Temperature ($^\circ\text{C}$)
Current Derating*, Junction-to-Case

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.

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted**Normalized Thermal Transient Impedance, Junction-to-Ambient****Normalized Thermal Transient Impedance, Junction-to-Case**

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