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FDMS7606

Dual N-Channel PowerTrench® MOSFET

Q1: 30 V, 12 A, 12.0 mΩ Q2: 30 V, 22 A, 11.6 mΩ

Features

Q1: N-Channel

- Max $r_{DS(on)} = 12.0 \text{ mΩ}$ at $V_{GS} = 10 \text{ V}$, $I_D = 11.5 \text{ A}$
- Max $r_{DS(on)} = 16.4 \text{ mΩ}$ at $V_{GS} = 4.5 \text{ V}$, $I_D = 10 \text{ A}$

Q2: N-Channel

- Max $r_{DS(on)} = 11.6 \text{ mΩ}$ at $V_{GS} = 10 \text{ V}$, $I_D = 12 \text{ A}$
- Max $r_{DS(on)} = 17.2 \text{ mΩ}$ at $V_{GS} = 4.5 \text{ V}$, $I_D = 9.5 \text{ A}$
- RoHS Compliant

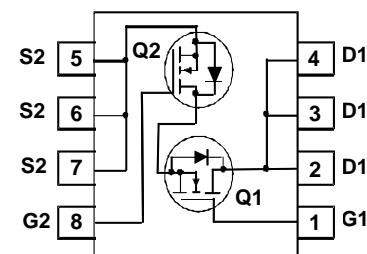
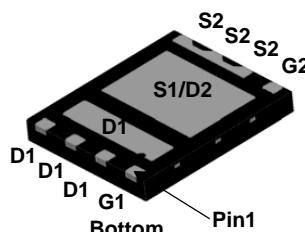


General Description

This device includes two specialized N-Channel MOSFETs in a dual MLP package. The switch node has been internally connected to enable easy placement and routing of synchronous buck converters. The control MOSFET (Q1) and synchronous MOSFET (Q2) have been designed to provide optimal power efficiency.

Applications

- Computing
- Communications
- General Purpose Point of Load
- Notebook Charger



Power 56

MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Q1	Q2	Units
V_{DS}	Drain to Source Voltage	30	30	V
V_{GS}	Gate to Source Voltage	(Note 3)	± 20	V
I_D	Drain Current -Continuous	$T_C = 25^\circ\text{C}$	12	A
	-Continuous	$T_A = 25^\circ\text{C}$	11.5^{1a}	
	-Pulsed	50	60	
E_{AS}	Single Pulse Avalanche Energy	(Note 4)	25	mJ
P_D	Power Dissipation for Single Operation	$T_A = 25^\circ\text{C}$	2.2^{1a}	W
	Power Dissipation for Single Operation	$T_A = 25^\circ\text{C}$	1.0^{1c}	
T_J , T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150		°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	57^{1a}	50^{1b}	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	125^{1c}	120^{1d}	
$R_{\theta JC}$	Thermal Resistance, Junction to Case	4.6	4.7	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS7606	FDMS7606	Power 56	13 "	12 mm	3000 units

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	Q1 Q2	30 30			V
$\frac{\Delta \text{BV}_{\text{DSS}}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}, \text{referenced to } 25^\circ\text{C}$	Q1 Q2		16 20		$\text{mV/}^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24 \text{ V}, V_{GS} = 0 \text{ V}$	Q1 Q2			1 1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = 20 \text{ V}, V_{DS} = 0 \text{ V}$ $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	Q1 Q2			100 ± 100	nA

On Characteristics

$V_{GS(\text{th})}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	Q1 Q2	1.0 1.0	2.1 1.9	3.0 3.0	V
$\frac{\Delta V_{GS(\text{th})}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}, \text{referenced to } 25^\circ\text{C}$	Q1 Q2		-6 -5.5		$\text{mV/}^\circ\text{C}$
$r_{DS(\text{on})}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 11.5 \text{ A}$ $V_{GS} = 4.5 \text{ V}, I_D = 10 \text{ A}$ $V_{GS} = 10 \text{ V}, I_D = 11.5 \text{ A}, T_J = 125^\circ\text{C}$	Q1		9.2 12.6 11.8	12.0 16.4 14.7	$\text{m}\Omega$
		$V_{GS} = 10 \text{ V}, I_D = 12 \text{ A}$ $V_{GS} = 4.5 \text{ V}, I_D = 9.5 \text{ A}$ $V_{GS} = 10 \text{ V}, I_D = 12 \text{ A}, T_J = 125^\circ\text{C}$	Q2		9.7 12.8 12.3	11.6 17.2 15.4	
g_{FS}	Forward Transconductance	$V_{DD} = 5 \text{ V}, I_D = 11.5 \text{ A}$ $V_{DD} = 5 \text{ V}, I_D = 12 \text{ A}$	Q1 Q2		53 47		s

Dynamic Characteristics

C_{iss}	Input Capacitance	Q1: $V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHZ}$	Q1 Q2		1050 947	1400 1260	pF
C_{oss}	Output Capacitance	Q2: $V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHZ}$	Q1 Q2		295 191	395 255	pF
C_{rss}	Reverse Transfer Capacitance		Q1 Q2		32 131	50 200	pF
R_g	Gate Resistance		Q1 Q2	0.2 0.2	1.6 1.0	4.0 2.5	Ω

Switching Characteristics

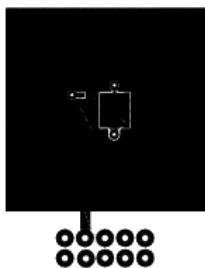
$t_{d(\text{on})}$	Turn-On Delay Time	Q1 $V_{DD} = 15 \text{ V}, I_D = 11.5 \text{ A}, R_{\text{GEN}} = 6 \Omega$	Q1 Q2		7 6	14 12	ns
t_r	Rise Time	Q2 $V_{DD} = 15 \text{ V}, I_D = 12 \text{ A}, R_{\text{GEN}} = 6 \Omega$	Q1 Q2		3 3	10 10	ns
$t_{d(\text{off})}$	Turn-Off Delay Time	Q2 $V_{DD} = 15 \text{ V}, I_D = 12 \text{ A}, R_{\text{GEN}} = 6 \Omega$	Q1 Q2		18 19	33 34	ns
t_f	Fall Time	Q2 $V_{DD} = 15 \text{ V}, I_D = 12 \text{ A}, R_{\text{GEN}} = 6 \Omega$	Q1 Q2		3 3	10 10	ns
$Q_{g(\text{TOT})}$	Total Gate Charge	$V_{GS} = 0\text{V} \text{ to } 10 \text{ V}$	Q1		16 19	22 27	nC
$Q_{g(\text{TOT})}$	Total Gate Charge	$V_{GS} = 0\text{V} \text{ to } 5 \text{ V}$	Q1 Q2		8 10	11 15	nC
Q_{gs}	Gate to Source Charge	$Q2$ $V_{DD} = 15 \text{ V}, I_D = 12 \text{ A}$	Q1 Q2		3.2 2.6		nC
Q_{gd}	Gate to Drain "Miller" Charge		Q1 Q2		2.0 4.2		nC

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units	
Drain-Source Diode Characteristics								
V_{SD}	Source-Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 2 \text{ A}$ $V_{GS} = 0 \text{ V}, I_S = 11.5 \text{ A}$ $V_{GS} = 0 \text{ V}, I_S = 2 \text{ A}$ $V_{GS} = 0 \text{ V}, I_S = 12 \text{ A}$	(Note 2) (Note 2) (Note 2) (Note 2)	Q1 Q1 Q2 Q2		0.76 0.87 0.75 0.85	1.2 1.2 1.2 1.2	V
t_{rr}	Reverse Recovery Time	$I_F = 11.5 \text{ A}, dI/dt = 100 \text{ A/s}$	Q1 Q2		22 18	35 33	ns	
Q_{rr}	Reverse Recovery Charge	$I_F = 12 \text{ A}, dI/dt = 100 \text{ A/s}$	Q2 Q2		7 6	13 12	nC	

Notes:

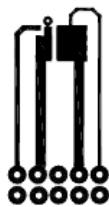
1. R_{QJA} is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. R_{QJC} is guaranteed by design while R_{QCA} is determined by the user's board design.



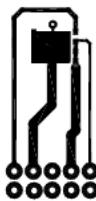
a. 57 °C/W when mounted on a 1 in² pad of 2 oz copper



b. 50 °C/W when mounted on a 1 in² pad of 2 oz copper



c. 125 °C/W when mounted on a minimum pad of 2 oz copper



d. 120 °C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.

3. As an N-ch device, the negative V_{GS} rating is for low duty cycle pulse occurrence only. No continuous rating is implied

4. Q1: E_{AS} of 25 mJ is based on starting $T_J = 25^\circ\text{C}$, $L = 0.3 \text{ mH}$, $I_{AS} = 13 \text{ A}$, $V_{DD} = 27 \text{ V}$, $V_{GS} = 10 \text{ V}$.

Q2: E_{AS} of 33 mJ is based on starting $T_J = 25^\circ\text{C}$, $L = 0.3 \text{ mH}$, $I_{AS} = 15 \text{ A}$, $V_{DD} = 27 \text{ V}$, $V_{GS} = 10 \text{ V}$.

Typical Characteristics (Q1 N-Channel)

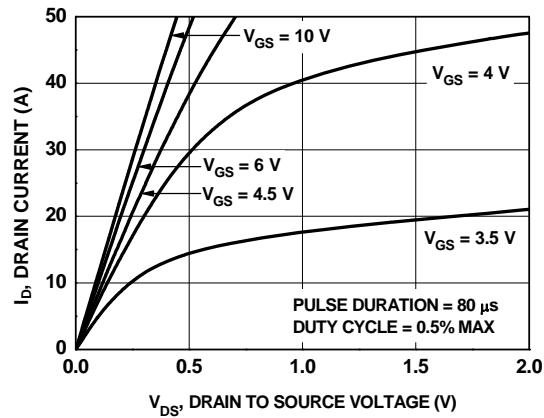


Figure 1. On Region Characteristics

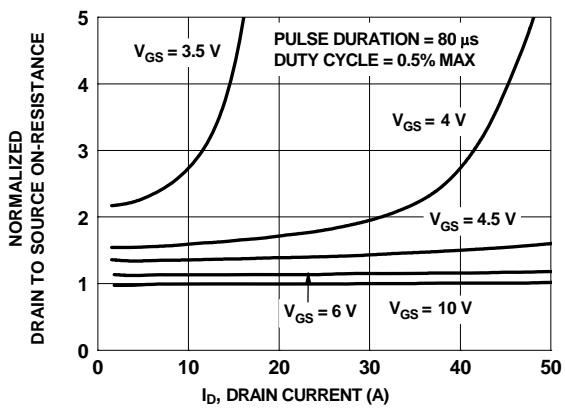


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

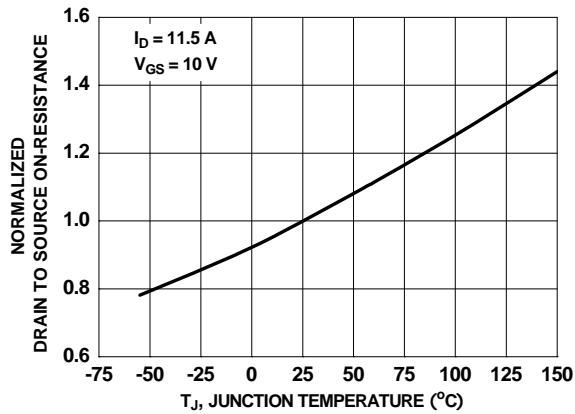


Figure 3. Normalized On Resistance vs Junction Temperature

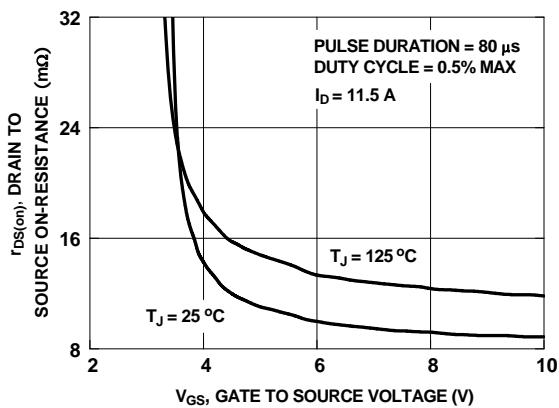


Figure 4. On-Resistance vs Gate to Source Voltage

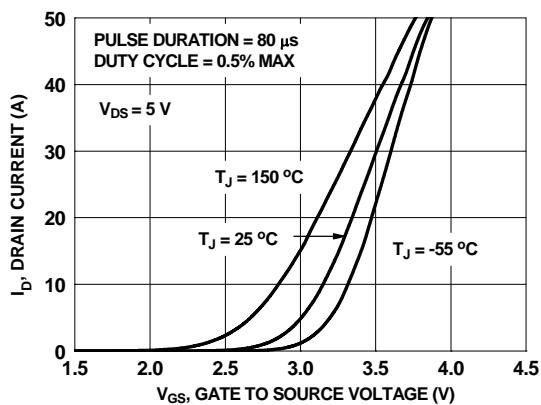


Figure 5. Transfer Characteristics

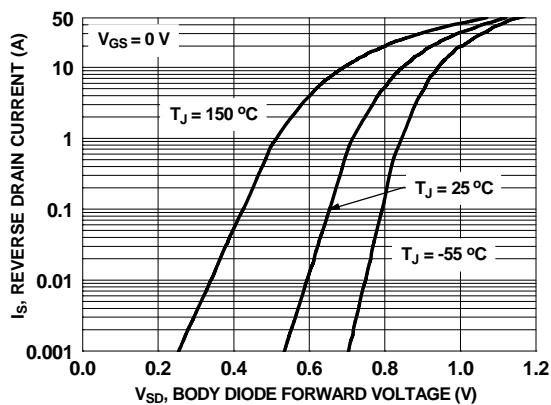


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (Q1 N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

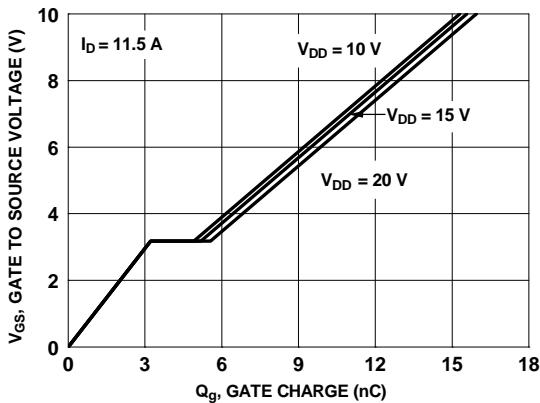


Figure 7. Gate Charge Characteristics

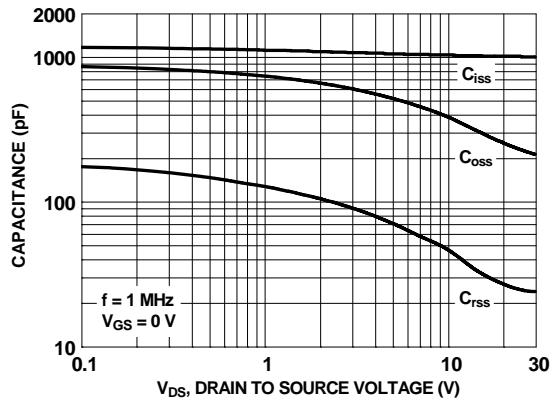


Figure 8. Capacitance vs Drain to Source Voltage

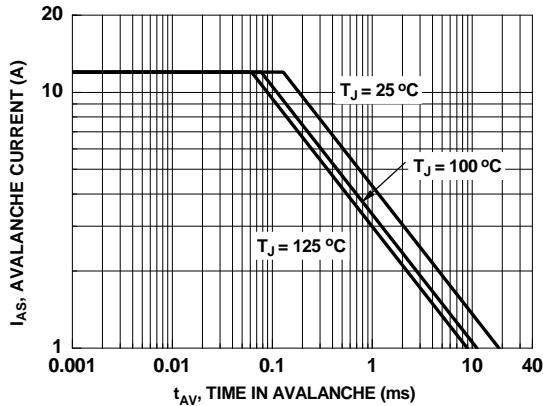


Figure 9. Unclamped Inductive Switching Capability

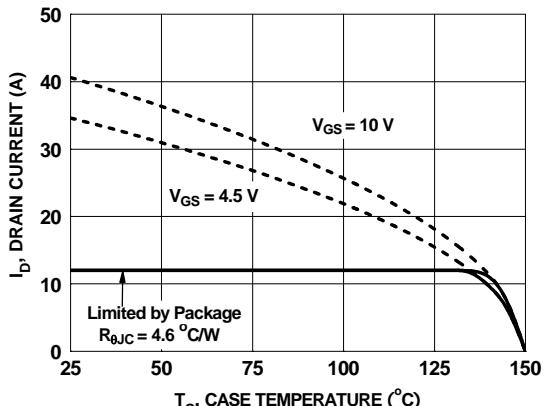


Figure 10. Maximum Continuous Drain Current vs Case Temperature

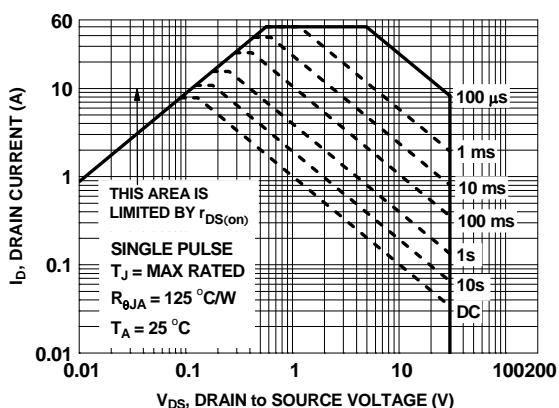


Figure 11. Forward Bias Safe Operating Area

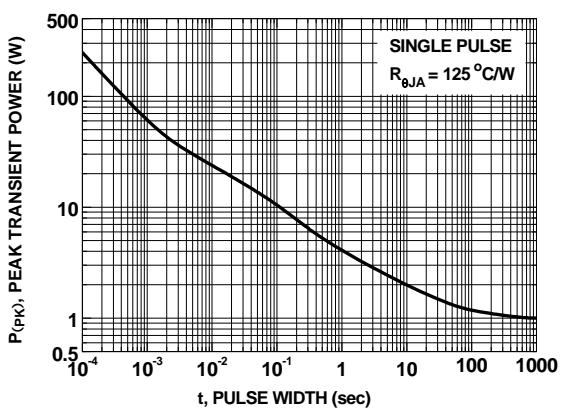


Figure 12. Single Pulse Maximum Power Dissipation

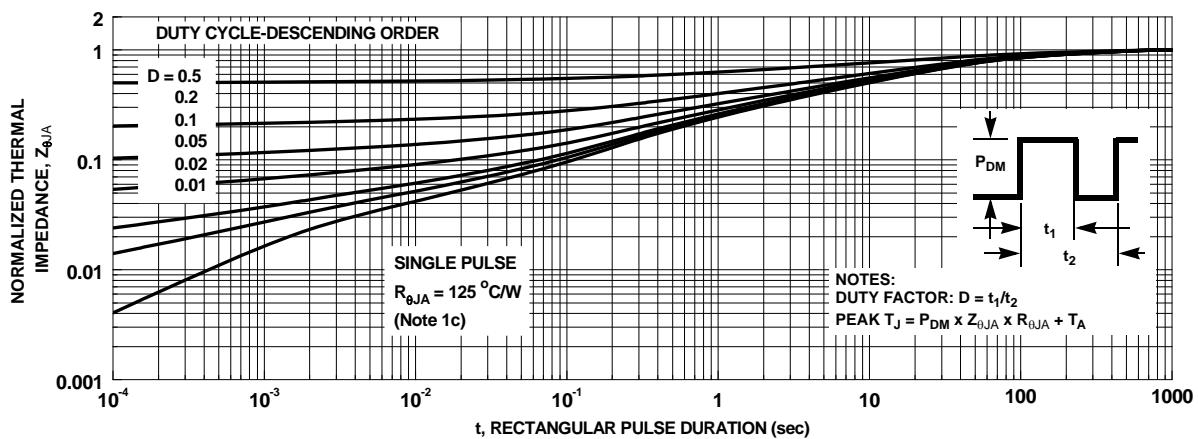
Typical Characteristics (Q1 N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

Figure 13. Junction-to-Ambient Transient Thermal Response Curve

Typical Characteristics (Q2 N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

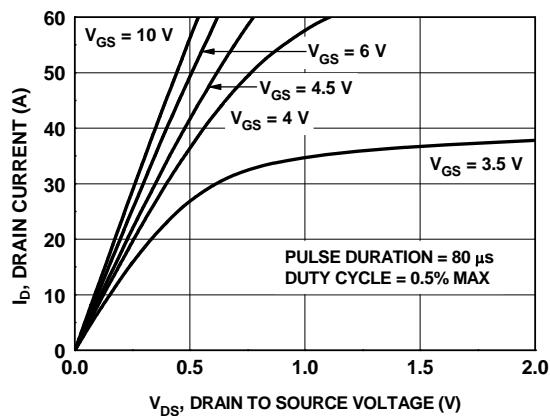


Figure 14. On-Region Characteristics

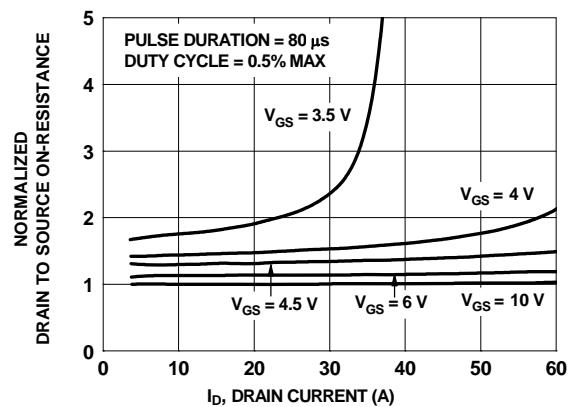


Figure 15. Normalized on-Resistance vs Drain Current and Gate Voltage

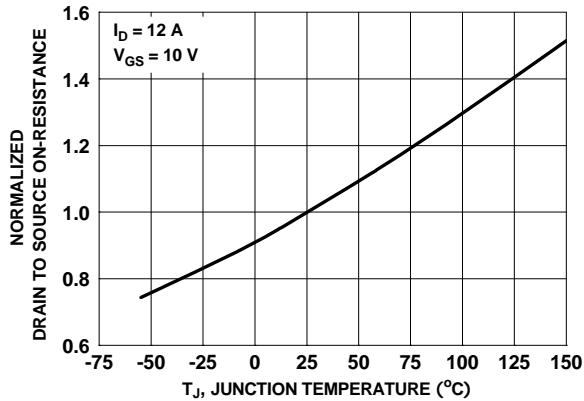


Figure 16. Normalized On-Resistance vs Junction Temperature

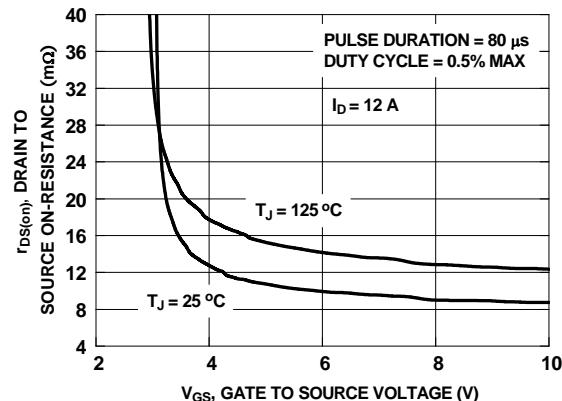


Figure 17. On-Resistance vs Gate to Source Voltage

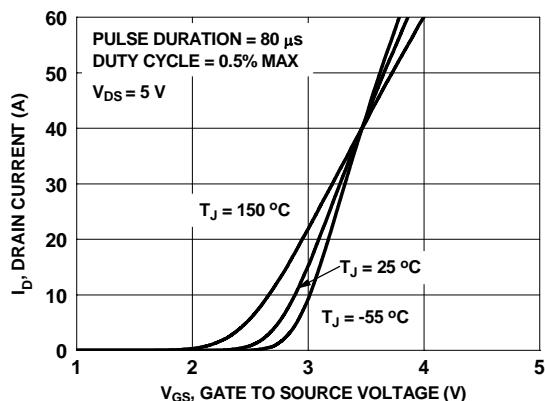


Figure 18. Transfer Characteristics

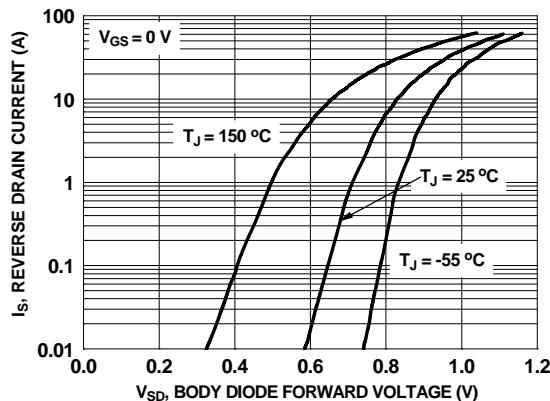


Figure 19. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (Q2 N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

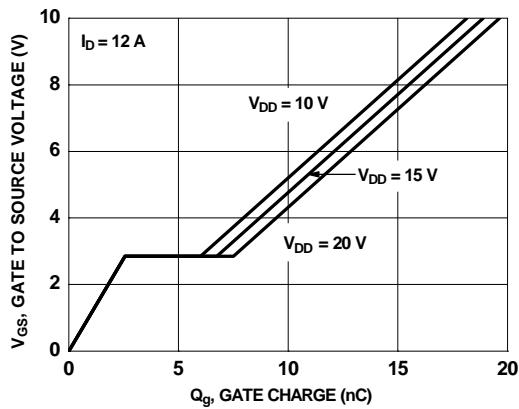


Figure 20. Gate Charge Characteristics

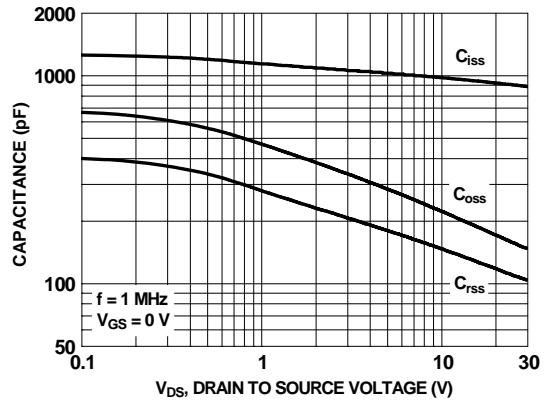


Figure 21. Capacitance vs Drain to Source Voltage

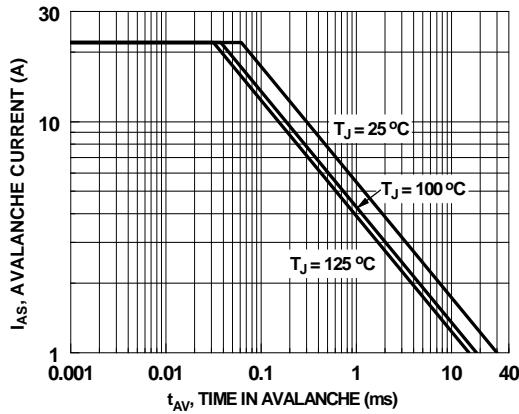


Figure 22. Unclamped Inductive Switching Capability

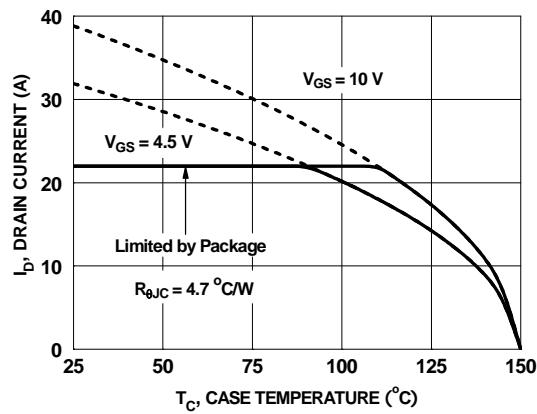


Figure 23. Maximum Continuous Drain Current vs Case Temperature

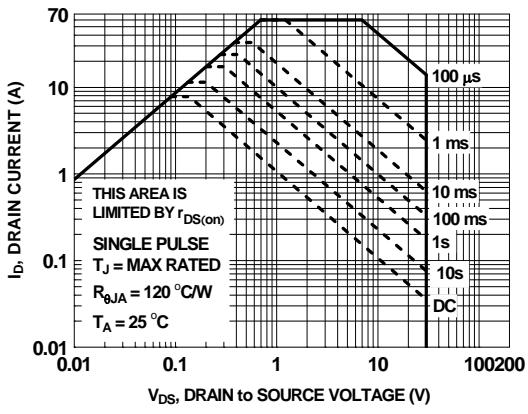


Figure 24. Forward Bias Safe Operating Area

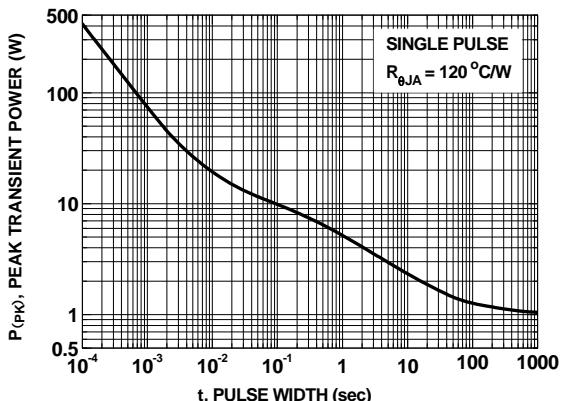


Figure 25. Single Pulse Maximum Power Dissipation

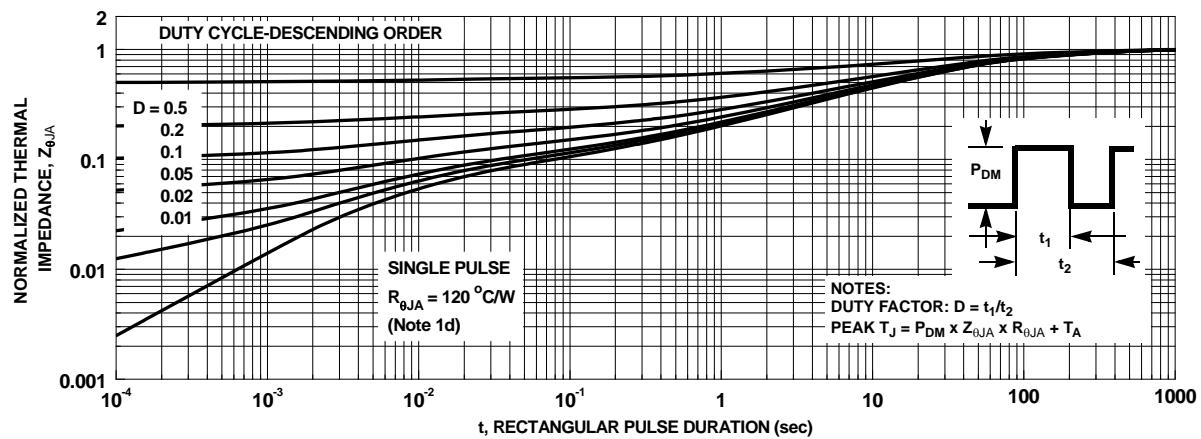
Typical Characteristics (Q2 N-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

Figure 26. Junction-to-Ambient Transient Thermal Response Curve

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