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FDMC8097AC

Dual N & P-Channel PowerTrench® MOSFET
N-Channel: 150 V, 2.4 A, 155 mΩ P-Channel: -150 V, -0.9 A, 1200 mΩ

Features

Q1: N-Channel

- Max $r_{DS(on)}$ = 155 mΩ at $V_{GS} = 10$ V, $I_D = 2.4$ A
- Max $r_{DS(on)}$ = 212 mΩ at $V_{GS} = 6$ V, $I_D = 2$ A

Q2: P-Channel

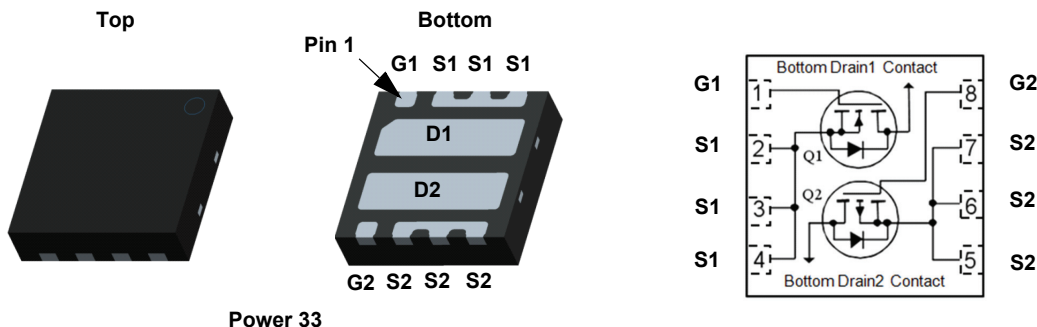
- Max $r_{DS(on)}$ = 1200 mΩ at $V_{GS} = -10$ V, $I_D = -0.9$ A
- Max $r_{DS(on)}$ = 1400 mΩ at $V_{GS} = -6$ V, $I_D = -0.8$ A
- Optimised for active clamp forward converters
- RoHS Compliant

General Description

These dual N and P-Channel enhancement mode PowerTrench MOSFETs are produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize on-state resistance and yet maintain superior switching performance. Shrinking the area needed for implementation of active clamp topology; enabling best in class power density.

Applications

- DC-DC Converter
- Active Clamp



Power 33

MOSFET Maximum Ratings $T_A = 25$ °C unless otherwise noted.

Symbol	Parameter	Q1	Q2	Units	
V_{DS}	Drain to Source Voltage	150	-150	V	
V_{GS}	Gate to Source Voltage	±20	±25	V	
I_D	Drain Current -Continuous	$T_C = 25$ °C (Note 5)	6.3	-2.0	A
	-Continuous	$T_C = 100$ °C (Note 5)	3.9	-1.2	
	-Continuous	$T_A = 25$ °C	2.4 ^{1a}	-0.9 ^{1b}	
	-Pulsed	(Note 4)	33	-8.8	
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	24	6	mJ
P_D	Power Dissipation for Single Operation	$T_A = 25$ °C	1.9 ^{1a}	1.9 ^{1b}	W
	Power Dissipation for Single Operation	$T_A = 25$ °C	0.8 ^{1c}	0.8 ^{1d}	
	Power Dissipation for Single Operation	$T_C = 25$ °C	14	10	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150		°C	

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	65 ^{1a}	65 ^{1b}	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	155 ^{1c}	155 ^{1d}	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	8.9	12.5	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC8097AC	FDMC8097AC	Power 33	13 "	12 mm	3000 units

Electrical Characteristics $T_J = 25\text{ }^\circ\text{C}$ 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	$I_D = 250\text{ }\mu\text{A}, V_{GS} = 0\text{ V}$ $I_D = -250\text{ }\mu\text{A}, V_{GS} = 0\text{ V}$	Q1 Q2	150 -150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$ $I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$	Q1 Q2		98 122		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 120\text{ V}, V_{GS} = 0\text{ V}$ $V_{DS} = -120\text{ V}, V_{GS} = 0\text{ V}$	Q1 Q2			1 -1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$ $V_{GS} = \pm 25\text{ V}, V_{DS} = 0\text{ V}$	Q1 Q2			± 100 ± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$ $V_{GS} = V_{DS}, I_D = -250\text{ }\mu\text{A}$	Q1 Q2	2.0 -2.0	3.1 -3.0	4.0 -4.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$ $I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$	Q1 Q2		-9 -6		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 2.4\text{ A}$ $V_{GS} = 6\text{ V}, I_D = 2\text{ A}$ $V_{GS} = 10\text{ V}, I_D = 2.4\text{ A}, T_J = 125\text{ }^\circ\text{C}$	Q1		124 155 245	155 212 306	m Ω
		$V_{GS} = -10\text{ V}, I_D = -0.9\text{ A}$ $V_{GS} = -6\text{ V}, I_D = -0.8\text{ A}$ $V_{GS} = -10\text{ V}, I_D = -0.9\text{ A}, T_J = 125\text{ }^\circ\text{C}$	Q2		930 1030 1682	1200 1400 2171	
g_{FS}	Forward Transconductance	$V_{DD} = 10\text{ V}, I_D = 2.4\text{ A}$ $V_{DD} = -10\text{ V}, I_D = -0.9\text{ A}$	Q1 Q2		6.4 0.75		S

Dynamic Characteristics

C_{iss}	Input Capacitance	Q1 $V_{DS} = 75\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Q1		279	395	pF
			Q2		162	230	
C_{oss}	Output Capacitance	Q2	Q1		26	40	pF
			Q2		13	25	
C_{riss}	Reverse Transfer Capacitance	$V_{DS} = -75\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Q1		1.4	5	pF
			Q2		0.6	5	
R_g	Gate Resistance		Q1	0.1	0.6	1.5	Ω
			Q2	0.1	3.3	8.3	

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	Q1 $V_{DD} = 75\text{ V}, I_D = 2.4\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$	Q1		5.4	11	ns	
			Q2		5.2	11		
t_r	Rise Time	Q2	Q1		1.3	10	ns	
			Q2		1.6	10		
$t_{d(off)}$	Turn-Off Delay Time	Q2 $V_{DD} = -75\text{ V}, I_D = -0.9\text{ A},$ $V_{GS} = -10\text{ V}, R_{GEN} = 6\text{ }\Omega$	Q1		9.1	18	ns	
			Q2		7.4	15		
t_f	Fall Time	Q2	Q1		2.2	10	ns	
			Q2		6.3	13		
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }10\text{ V}$ $V_{GS} = 0\text{ V to }-10\text{ V}$	Q1 $V_{DD} = 75\text{ V},$ $I_D = 2.4\text{ A}$	Q1		4.4	6.2	nC
				Q2		2.8	4.0	
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }6\text{ V}$ $V_{GS} = 0\text{ V to }-6\text{ V}$	Q2 $V_{DD} = -75\text{ V},$ $I_D = -0.9\text{ A}$	Q1		2.9	4.1	nC
				Q2		1.8	2.6	
Q_{gs}	Gate to Source Charge		Q2 $V_{DD} = -75\text{ V},$ $I_D = -0.9\text{ A}$	Q1		1.3	nC	
				Q2		0.8		
Q_{gd}	Gate to Drain "Miller" Charge		Q2 $V_{DD} = -75\text{ V},$ $I_D = -0.9\text{ A}$	Q1		1.0	nC	
				Q2		0.7		

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

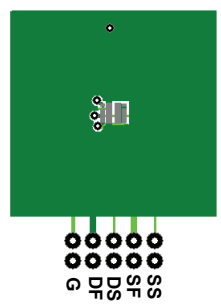
Symbol	Parameter	Test Conditions	Type	Min.	Typ.	Max.	Units
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Drain-Source Diode Characteristics

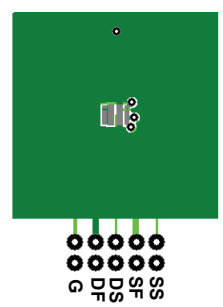
V_{SD}	Source-Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 2.4\text{ A}$ (Note 2)	Q1		0.8	1.3	V
		$V_{GS} = 0\text{ V}, I_S = -0.9\text{ A}$ (Note 2)	Q2		-0.9	-1.3	
t_{rr}	Reverse Recovery Time	Q1 $I_F = 2.4\text{ A}, di/dt = 100\text{ A/s}$	Q1		50	80	ns
			Q2		44	71	
Q_{rr}	Reverse Recovery Charge	Q2 $I_F = -0.9\text{ A}, di/dt = 100\text{ A/s}$	Q1		43	69	nC
			Q2		68	109	

Notes:

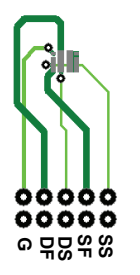
1. $R_{\theta JA}$ is determined with the device mounted on a 1in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



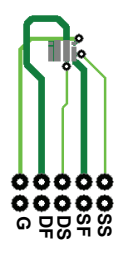
a. 65 °C/W when mounted on a 1 in² pad of 2 oz copper



b. 65 °C/W when mounted on a 1 in² pad of 2 oz copper



c. 155 °C/W when mounted on a minimum pad of 2 oz copper



d. 155 °C/W when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.
- Q1: E_{AS} of 24 mJ is based on starting $T_J = 25^\circ\text{C}$, $L = 3\text{ mH}$, $I_{AS} = 4\text{ A}$, $V_{DD} = 150\text{ V}$, $V_{GS} = 10\text{ V}$. 100% test at $L = 0.1\text{ mH}$, $I_{AS} = 14\text{ A}$.
Q2: E_{AS} of 6 mJ is based on starting $T_J = 25^\circ\text{C}$, $L = 3\text{ mH}$, $I_{AS} = -2\text{ A}$, $V_{DD} = -150\text{ V}$, $V_{GS} = -10\text{ V}$. 100% test at $L = 0.1\text{ mH}$, $I_{AS} = -8\text{ A}$.
- Q1: Pulsed I_d please refer to Fig 11 SOA graph for more details.
Q2: Pulsed I_d please refer to Fig 24 SOA graph for more details.
- Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

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

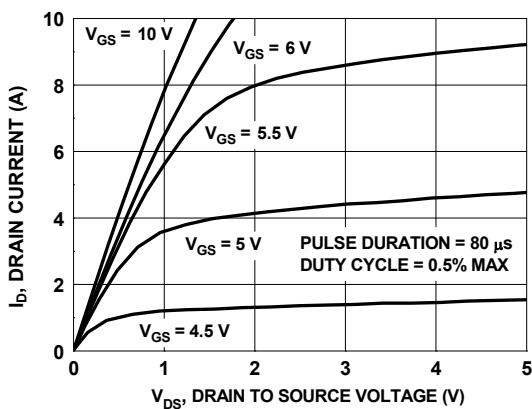


Figure 1. On Region Characteristics

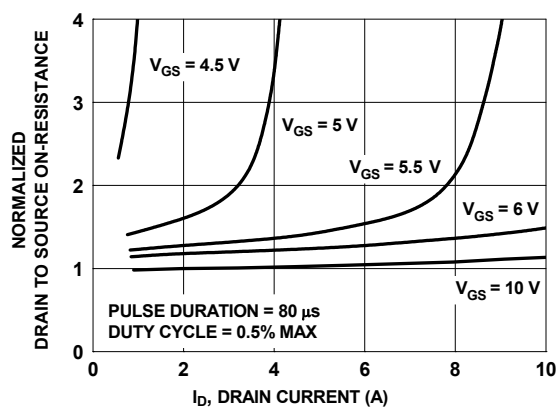


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

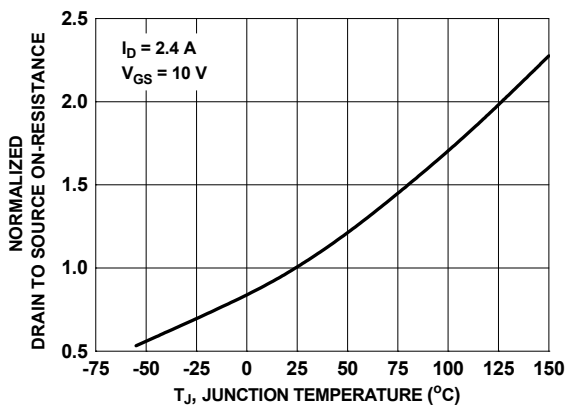


Figure 3. Normalized On Resistance vs. Junction Temperature

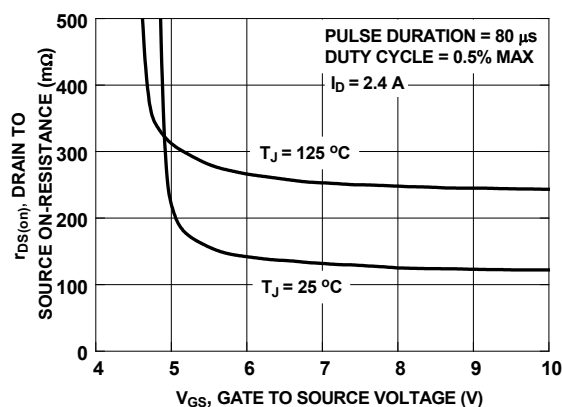


Figure 4. On-Resistance vs. Gate to Source Voltage

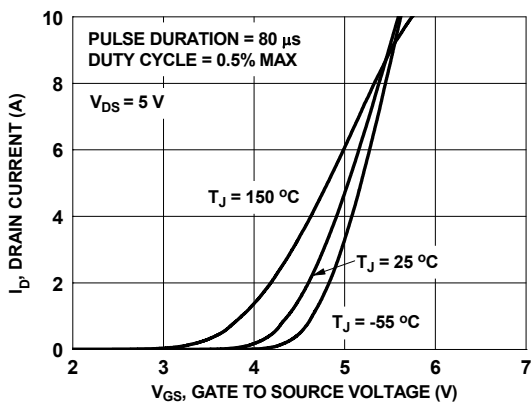


Figure 5. Transfer Characteristics

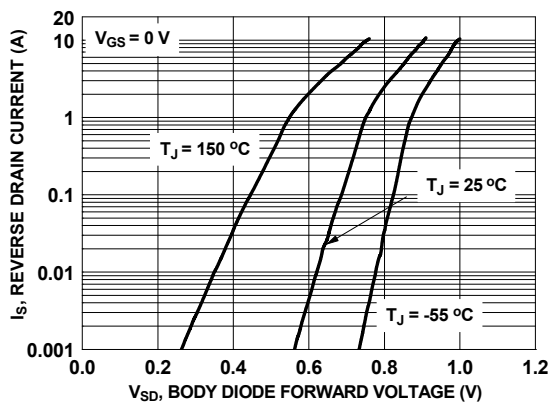


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

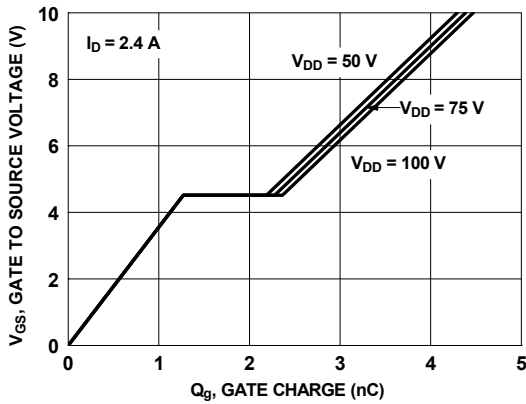


Figure 7. Gate Charge Characteristics

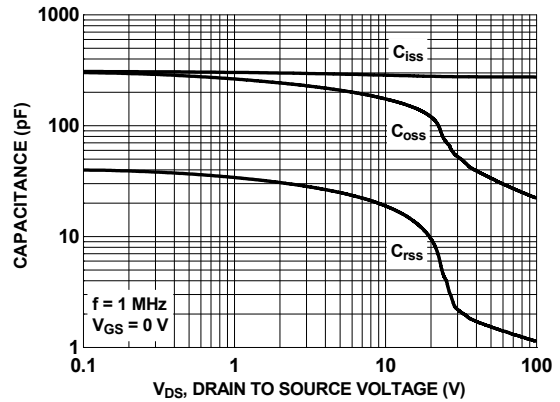


Figure 8. Capacitance vs. Drain to Source Voltage

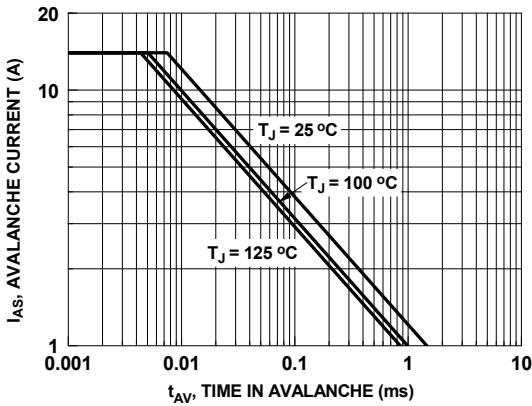


Figure 9. Unclamped Inductive Switching Capability

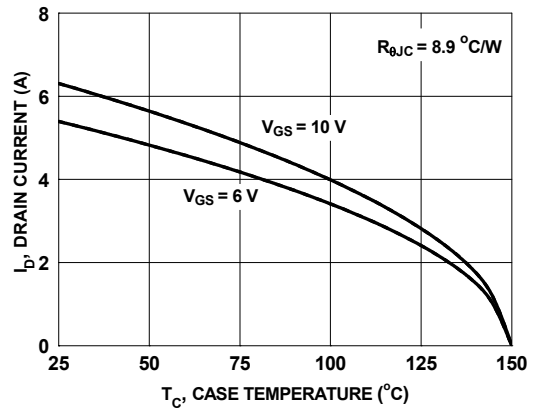


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

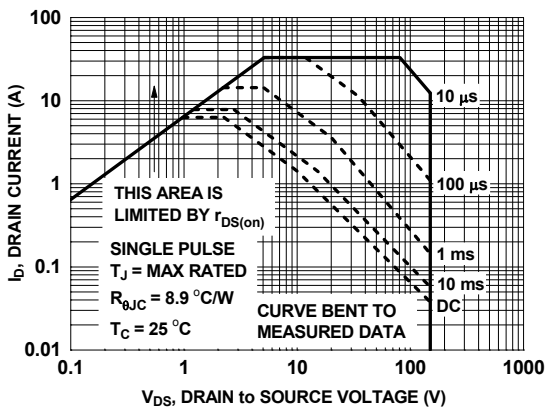


Figure 11. Forward Bias Safe Operating Area

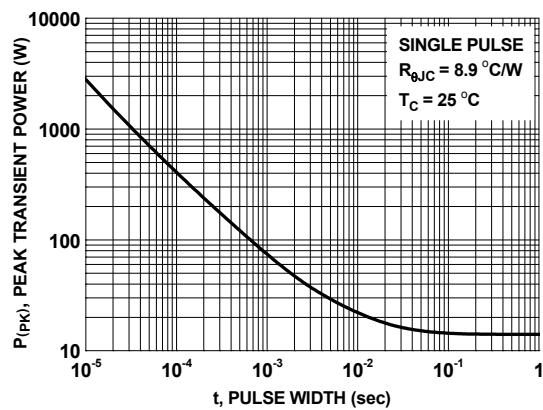


Figure 12. Single Pulse Maximum Power Dissipation

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

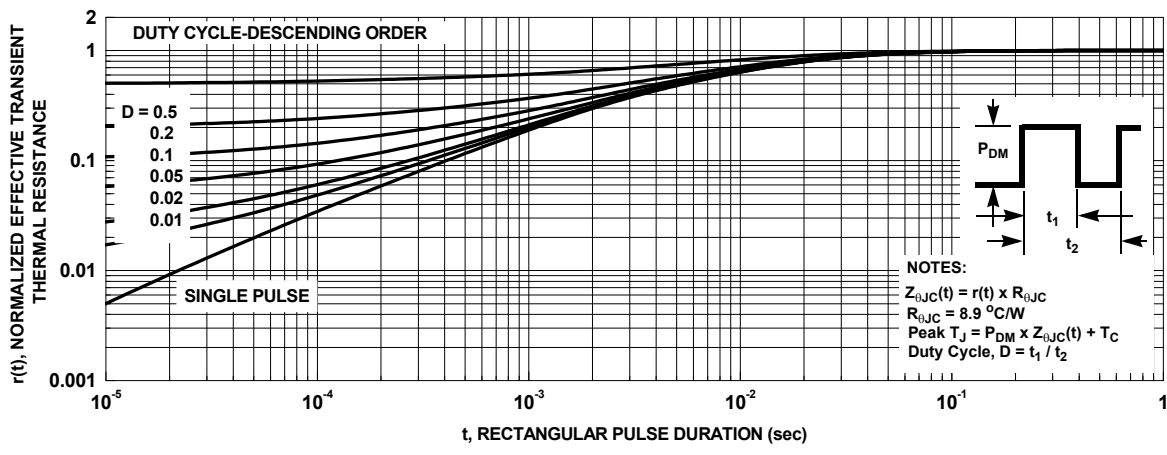


Figure 13. Junction-to-Case Transient Thermal Response Curve

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

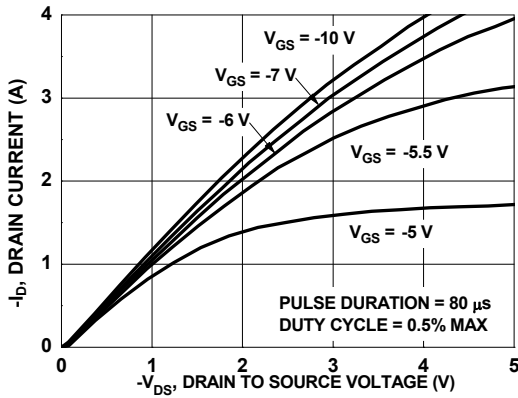


Figure 14. On-Region Characteristics

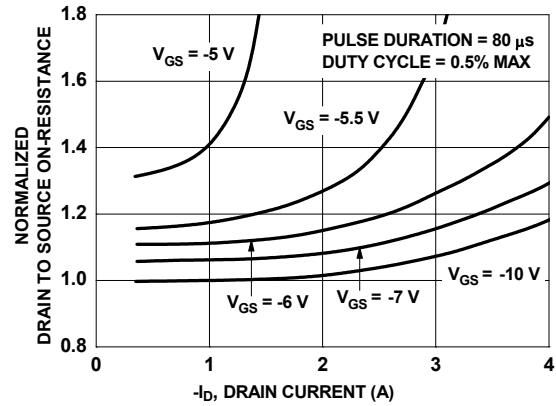


Figure 15. Normalized on-Resistance vs. Drain Current and Gate Voltage

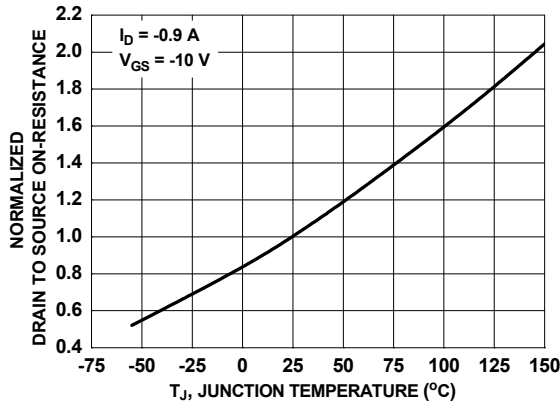


Figure 16. Normalized On-Resistance vs. Junction Temperature

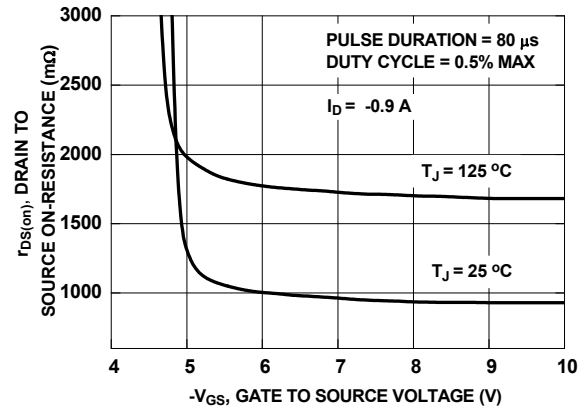


Figure 17. On-Resistance vs. Gate to Source Voltage

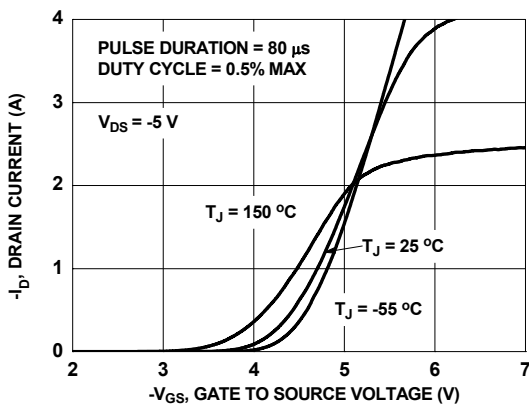


Figure 18. Transfer Characteristics

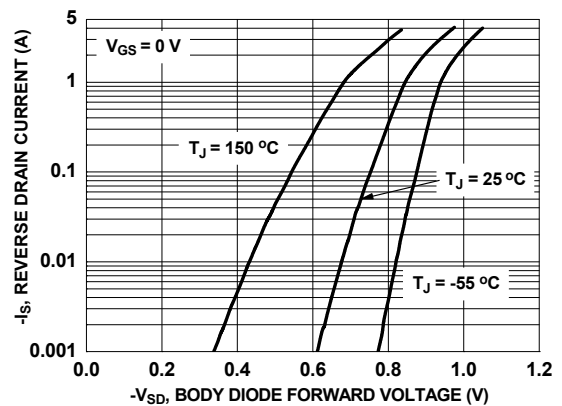


Figure 19. Source to Drain Diode Forward Voltage vs. Source Current

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

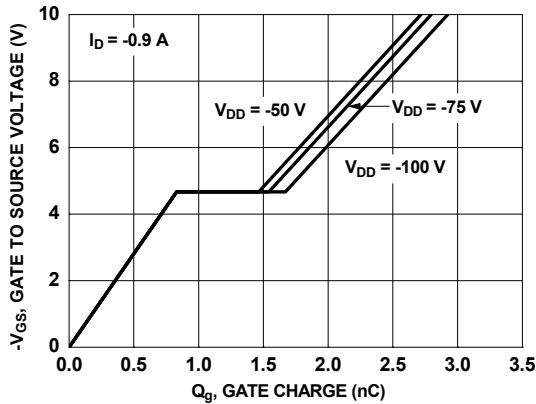


Figure 20. Gate Charge Characteristics

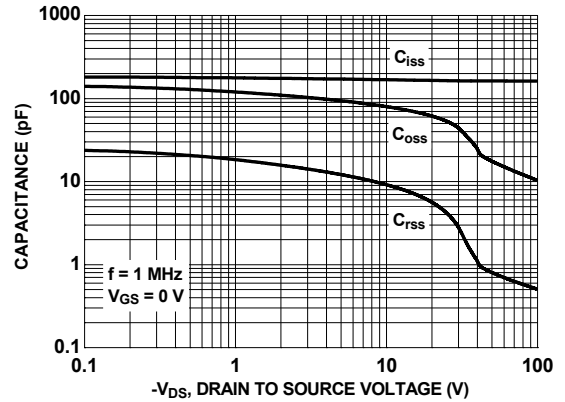


Figure 21. Capacitance vs. Drain to Source Voltage

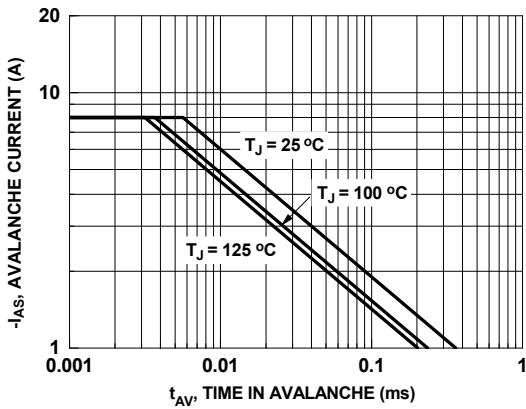


Figure 22. Unclamped Inductive Switching Capability

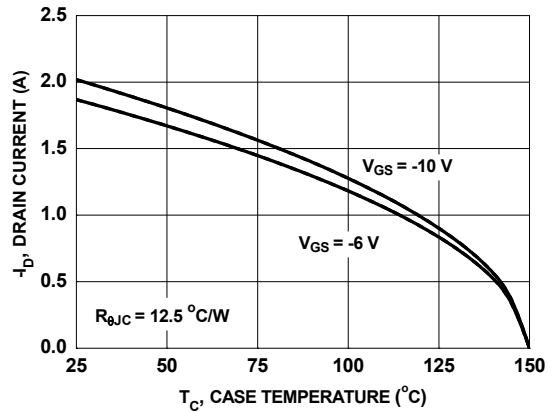


Figure 23. Maximum Continuous Drain Current vs. Case Temperature

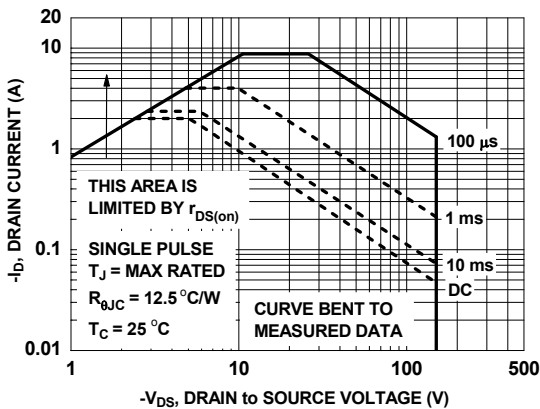


Figure 24. Forward Bias Safe Operating Area

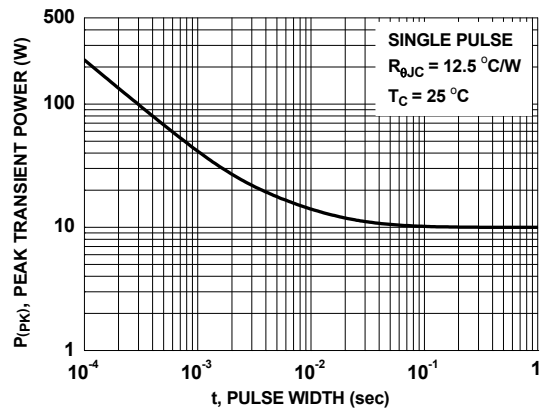


Figure 25. Single Pulse Maximum Power Dissipation

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

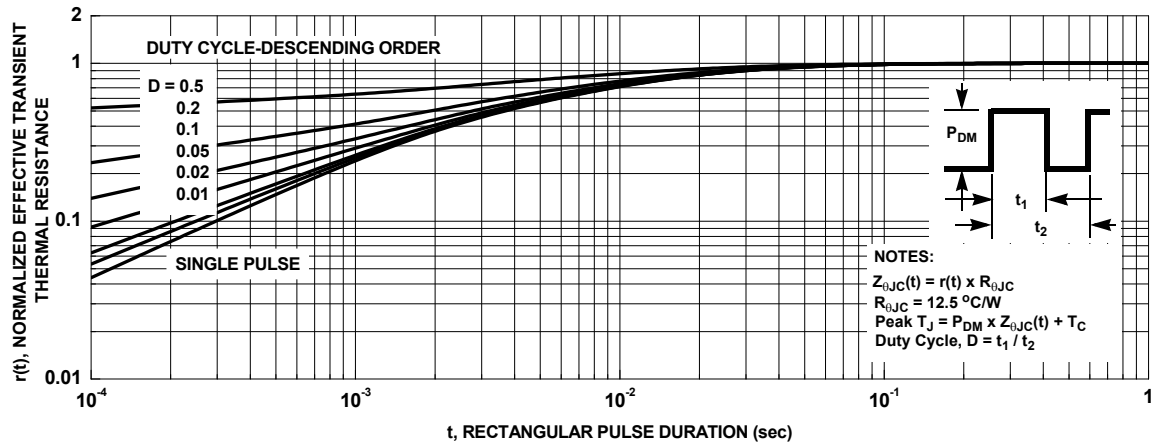
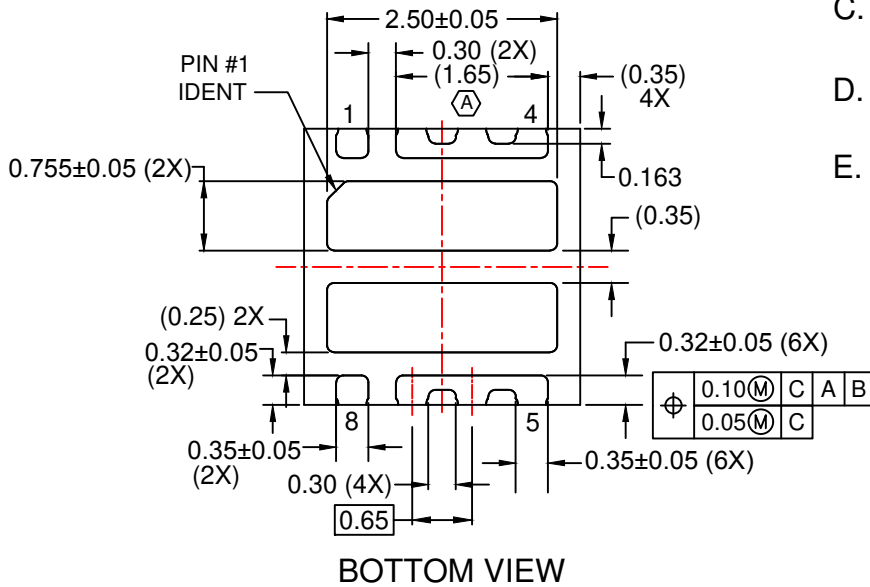
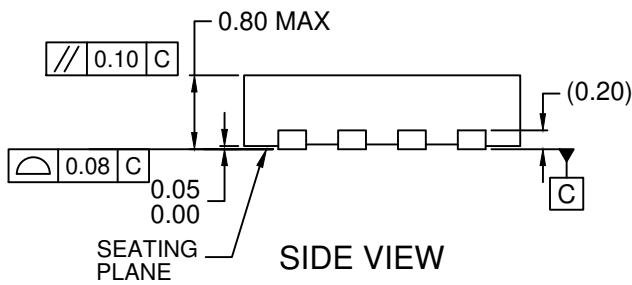
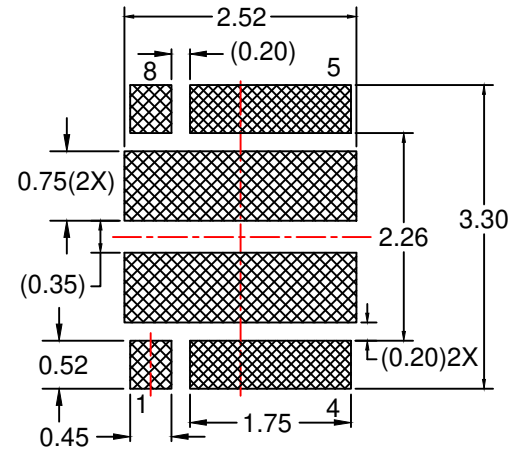
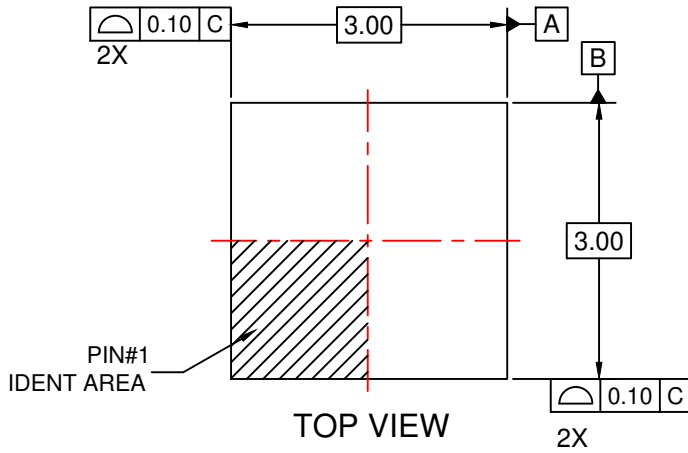


Figure 26. Junction-to-Case Transient Thermal Response Curve



RECOMMENDED LAND PATTERN

NOTES:

- A. DOES NOT FULLY CONFORM TO JEDEC REGISTRATION, MO-229.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
- D. LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN ONLY
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