



ON Semiconductor®

FQB27N25TM-F085/FQI27N25TU-F085

N-Channel MOSFET

250 V, 25.5 A, 131 mΩ

Features

- Typ $R_{DS(on)}$ = 108mΩ at V_{GS} = 10V, I_D = 25.5A
- Typ $Q_{g(tot)}$ = 45nC at V_{GS} = 10V, I_D = 27A
- UIS Capability
- RoHS Compliant
- Qualified to AEC Q101

Applications

- Automotive Engine Control
- Powertrain Management
- Solenoid and Motor Drivers
- Electronic Steering
- Integrated Starter/Alternator
- Distributed Power Architectures and VRM
- Primary Switch for 12V Systems

MOSFET Maximum Ratings

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain to Source Voltage	250	V
V_{GS}	Gate to Source Voltage	±30	V
I_D	Drain Current, Continuous (V_{GS} = 10) (Note 1)	25.5	A
	Drain Current, Pulsed	See Figure 4	
E_{AS}	Single Pulse Avalanche Energy (Note 2)	972	mJ
P_D	Power Dissipation	417	W
	Rate above 25°C	3.3	W/°C
T_J, T_{STG}	Operating and Storage Temperature	-55 to + 150	°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.3	°C/W
$R_{\theta JA}$	Maximum Thermal Resistance, Junction to Ambient (Note 3)	43	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQB27N25TM	FQB27N25TM-F085	TO-263AB	330mm	24mm	800 units
FQI27N25TU	FQI27N25TU-F085	TO-262AB	Tube	N/A	50 units

Notes:

- 1: Current is limited by bondwire configuration.
- 2: Starting T_J = 25°C, L = 4.67mH, I_{AS} = 20.4A, V_{DD} = 100V during inductor charging and V_{DD} = 0V during time in avalanche.
- 3: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design. The maximum rating presented here is based on mounting on a 1 in² pad of 2oz copper.

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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Off Characteristics

$B_{V_{DS}}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$	250	-	-	V
I_{DSS}	Drain to Source Leakage Current	$V_{DS} = 250\text{V}$, $T_J = 25^\circ\text{C}$ $V_{GS} = 0\text{V}$, $T_J = 150^\circ\text{C}$ (Note 4)	-	-	1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 30\text{V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\mu\text{A}$	3.0	4.1	-	V
$R_{DS(on)}$	Drain to Source On Resistance	$I_D = 25.5\text{A}$, $T_J = 25^\circ\text{C}$ $V_{GS} = 10\text{V}$, $T_J = 150^\circ\text{C}$ (Note 4)	-	10	13	$\text{m}\Omega$
				265	310	$\text{m}\Omega$

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$	-	1800	-	pF
C_{oss}	Output Capacitance		-	350	-	pF
C_{rss}	Reverse Transfer Capacitance		-	45	-	pF
R_g	Gate Resistance	$f = 1\text{MHz}$	-	0.82	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	$V_{GS} = 10\text{V}$ to 10V, $I_D = 125\text{A}$	-	45	49	nC
$Q_{g(th)}$	Threshold Gate Charge	$V_{GS} = 10\text{V}$ to 2V, $I_D = 27\text{A}$	-	5.3	4	nC
Q_{gs}	Gate to Source Gate Charge		-	12	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	23	-	nC

Switching Characteristics

t_{on}	Turn-On Time	$V_{DD} = 125\text{V}$, $I_D = 27\text{A}$, $V_{GS} = 10\text{V}$, $R_{GEN} = 25\Omega$	-	-	196	ns
$t_{d(on)}$	Turn-On Delay		-	36	-	ns
t_r	Rise Time		-	122	-	ns
$t_{d(off)}$	Turn-Off Delay		-	81	-	ns
t_{f}	Fall Time		-	60	-	ns
t_{off}	Turn-Off Time		-	-	164	ns

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Voltage	$I_{SD} = 25.5\text{A}$, $V_{GS} = 0\text{V}$	-	-	1.5	V
		$I_{SD} = 12.75\text{A}$, $V_{GS} = 0\text{V}$	-	-	1.25	V
t_{rr}	Reverse--Recovery Time	$I_F = 27\text{A}$, $dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	205	238	ns
Q_{rr}	Reverse--Recovery Charge	$V_{DD} = 200\text{V}$	-	1.8	2.3	nC

Notes:

4: The maximum value is specified by design at $T_J = 150^\circ\text{C}$. Product is not tested to this condition in production.

Typical Characteristics

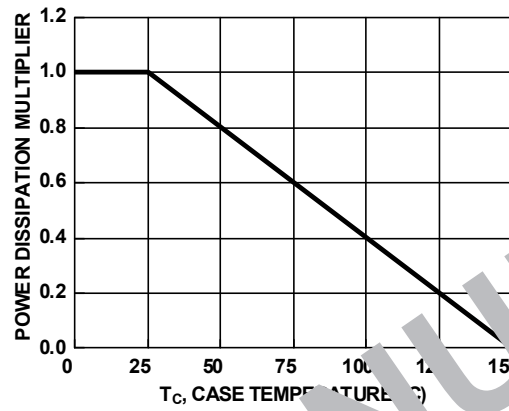


Figure 1. Normalized Power Dissipation vs. Case Temperature

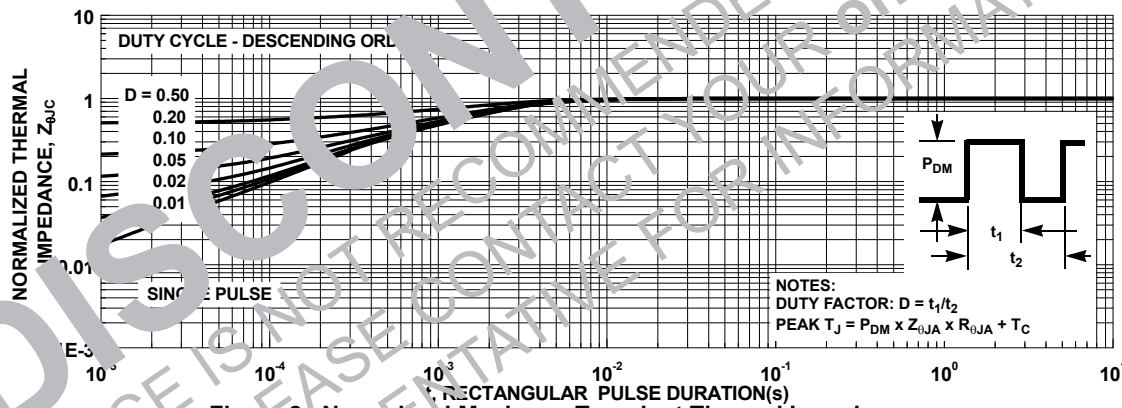


Figure 2. Normalized Maximum Transient Thermal Impedance

Typical Characteristics

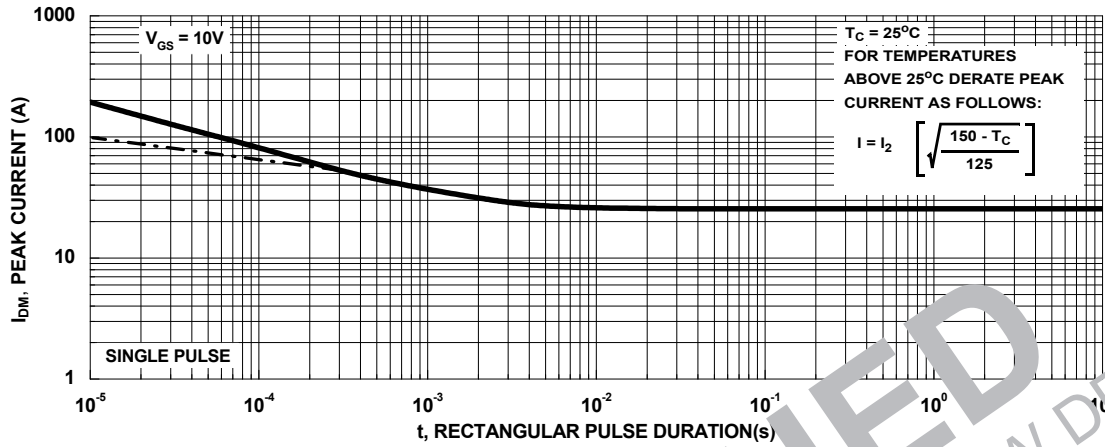


Figure 3. Peak Current Capability

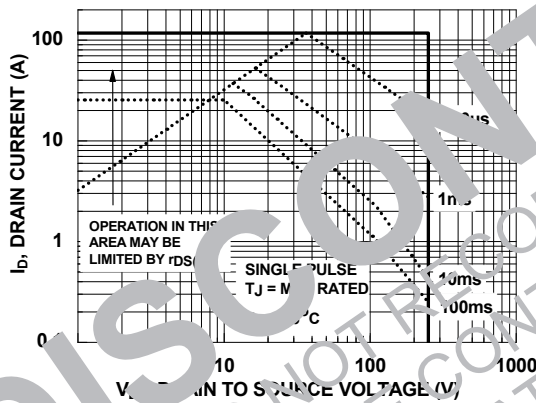
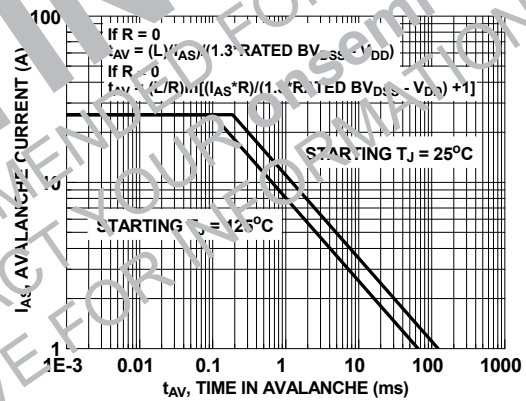


Figure 4. Forward Bias Safe Operating Area



NOTE: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 5. Unclamped Inductive Switching Capability

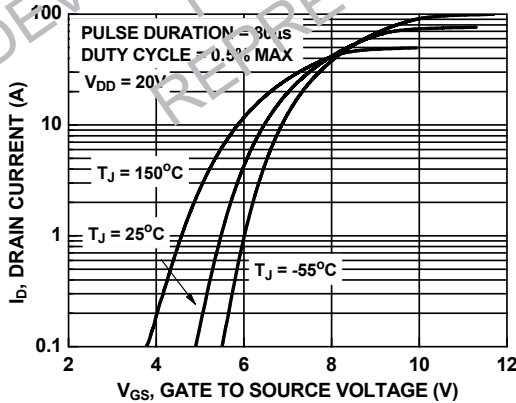


Figure 6. Transfer Characteristics

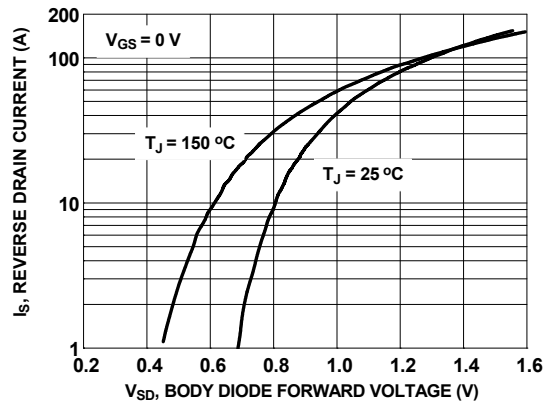


Figure 7. Forward Diode Characteristics

Typical Characteristics

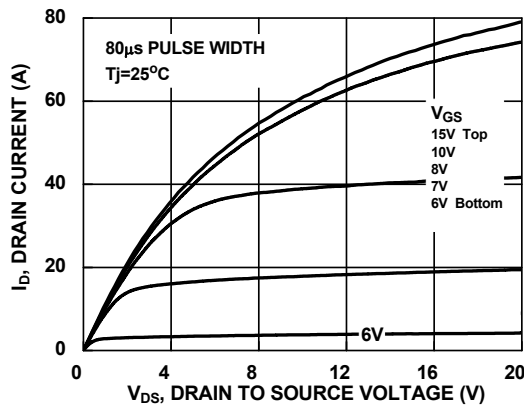


Figure 8. Saturation Characteristics

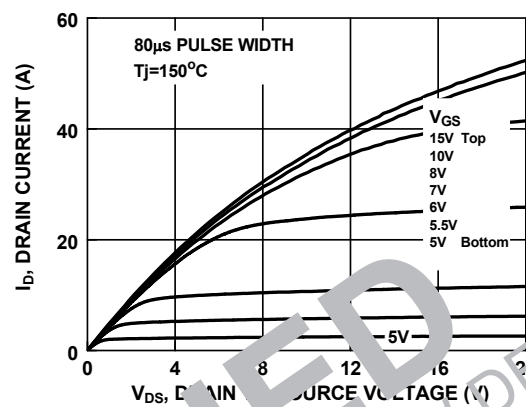


Figure 9. Saturation Characteristics

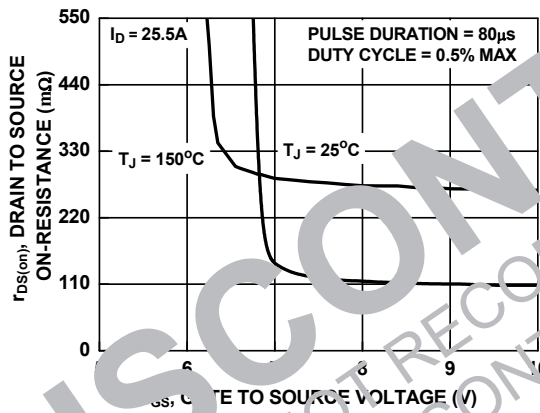


Figure 10. R_{DS(on)} vs. Gate Voltage

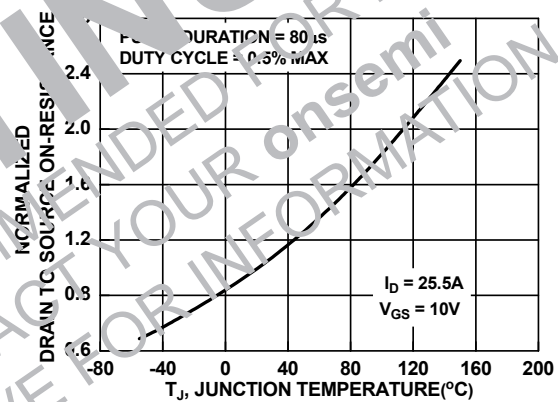


Figure 11. Normalized R_{DS(on)} vs. Junction Temperature

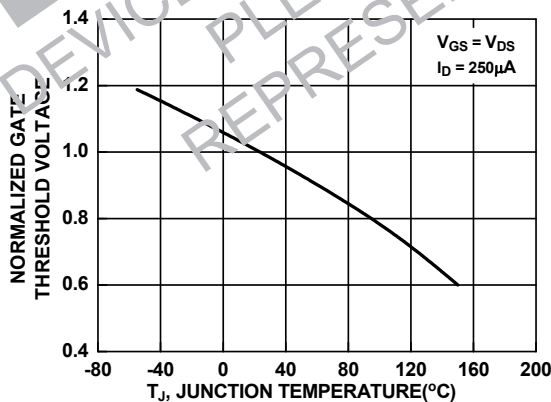


Figure 12. Normalized Gate Threshold Voltage vs. Temperature

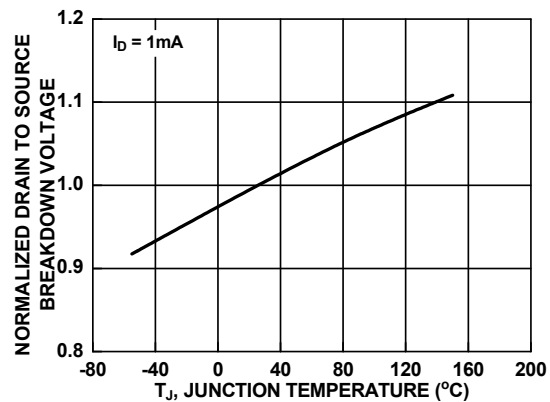


Figure 13. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

Typical Characteristics

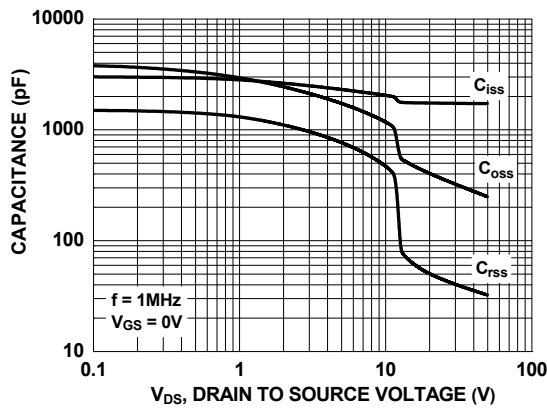


Figure 14. Capacitance vs. Drain to Source Voltage

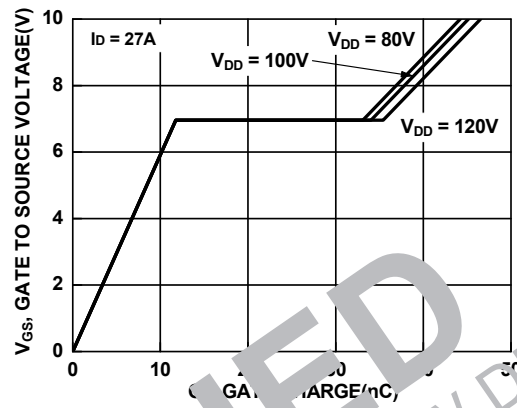



Figure 15. Gate Charge vs. Gate to Source Voltage

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