

FDR8702H

20V N & P-Channel PowerTrench® MOSFET

General Description

These N & P-Channel 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.

Applications

DC/DC converter
Power management

Features

- N channel $R_{DS(ON)} = 38 \text{ m}\Omega @ V_{GS} = 4.5 \text{ V}$
3.6 A, 20V $R_{DS(ON)} = 54 \text{ m}\Omega @ V_{GS} = 2.5 \text{ V}$
- P channel $R_{DS(ON)} = 80 \text{ m}\Omega @ V_{GS} = -4.5 \text{ V}$
 $-2.6 \text{ A}, -20\text{V}$ $R_{DS(ON)} = 110 \text{ m}\Omega @ V_{GS} = -2.5 \text{ V}$
- Fast switching speed.
- High performance trench technology for extremely low $R_{DS(ON)}$



Absolute Maximum Ratings

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

Symbol	Parameter	Ratings		Units
		Q1 (N)	Q2 (P)	
V_{DSS}	Drain-Source Voltage	20	-20	V
V_{GSS}	Gate-Source Voltage	± 12	± 8	V
I_D	Drain Current— Continuous (Note 1a)	3.6	-2.6	A
	— Pulsed	15	-10	
P_D	Power Dissipation for Single Operation (Note 1a)	0.8		W
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150		$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	146	$^\circ\text{C/W}$
		76 (Note 1b)	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	40	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
.8702	FDR8702H	13"	12mm	2500 units

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

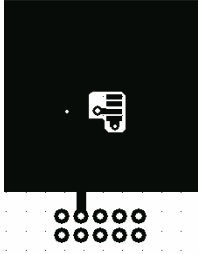
Symbol	Parameter	Test Conditions	Q	Min	Typ	Max	Units
Off Characteristics							
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ $V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	Q1 Q2	20 -20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Ref to 25°C $I_D = -250\ \mu\text{A}$, Ref to 25°C	Q1 Q2		36 -15		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}$ $V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$	Q1 Q2			1 -1	μA
I_{GSS}	Gate-Body Leakage	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$ $V_{GS} = \pm 8\text{ V}, V_{DS} = 0\text{ V}$	Q1 Q2			± 100 ± 100	nA
On Characteristics							
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ $V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	Q1 Q2	0.6 -0.4	0.8 -0.7	1.5 -1.6	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Ref to 25°C $I_D = -250\ \mu\text{A}$, Ref to 25°C	Q1 Q2		-2 2.5		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 4.5\text{ V}, I_D = 3.6\text{ A}$ $V_{GS} = 2.5\text{ V}, I_D = 3.1\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 3.6\text{ A}, T_J = 125^\circ\text{C}$	Q1		31 42 41	38 54 58	m Ω
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -4.5\text{ V}, I_D = -2.6\text{ A}$ $V_{GS} = -2.5\text{ V}, I_D = -2.2\text{ A}$ $V_{GS} = -4.5\text{ V}, I_D = -2.6\text{ A}, T_J = 125^\circ\text{C}$	Q2		66 85 83	80 110 108	m Ω
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 4.5\text{ V}, V_{DS} = 5\text{ V}$ $V_{GS} = -4.5\text{ V}, V_{DS} = -5\text{ V}$	Q1 Q2	10 -10			A
g_{FS}	Forward Transconductance	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ $V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	Q1 Q2		15 9		S
R_G	Gate Resistance	$V_{GS} = 15\text{ mV}, f = 1.0\text{ MHz}$	Q1 Q2		1 4.8		Ω
Dynamic Characteristics							
C_{iss}	Input Capacitance	For Q1: $V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Q1 Q2		650 607		pF
C_{oss}	Output Capacitance	For Q2: $V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Q1 Q2		170 165		pF
C_{riss}	Reverse Transfer Capacitance	For Q2: $V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Q1 Q2		80 60		pF
Switching Characteristics (Note 2)							
$t_{d(on)}$	Turn-On Delay Time	For Q1: $V_{DS} = 10\text{ V}, I_D = 1\text{ A},$ $V_{GS} = 4.5\text{ V}, R_{GEN} = 6\ \Omega$	Q1 Q2		8 12	16 22	ns
t_r	Turn-On Rise Time		Q1 Q2		9 11	18 20	ns
$t_{d(off)}$	Turn-Off Delay Time	For Q2: $V_{DS} = -10\text{ V}, I_D = -1\text{ A},$ $V_{GS} = -4.5\text{ V}, R_{GEN} = 6\ \Omega$	Q1 Q2		16 26	29 42	ns
t_f	Turn-Off Fall Time		Q1 Q2		7 8	14 16	ns
Q_g	Total Gate Charge	For Q1: $V_{DS} = 10\text{ V}, I_D = 3.6\text{ A},$ $V_{GS} = 4.5\text{ V}$	Q1 Q2		7 6	10 8	nC
Q_{gs}	Gate-Source Charge		Q1 Q2		1.3 1.2		nC
Q_{gd}	Gate-Drain Charge	For Q2: $V_{DS} = -10\text{ V}, I_D = -2.6\text{ A},$ $V_{GS} = -4.5\text{ V}$	Q1 Q2		2.2 1.6		nC

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

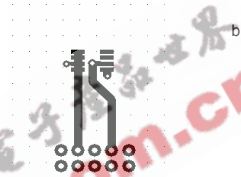
Symbol	Parameter	Test Conditions	Q	Min	Typ	Max	Units
Drain-Source Diode Characteristics							
I_S	Maximum Continuous Drain-Source Diode Forward Current		Q1			0.7	A
			Q2			-0.7	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 0.7\text{ A}$, Note 2 $V_{GS} = 0\text{ V}, I_S = -0.7\text{ A}$, Note 2	Q1		0.7	1.2	V
			Q2		-0.7	-1.2	
t_{rr}	Reverse Recovery Time	For Q1: $I_F = 3.6\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$	Q1		16		ns
			Q2		22		
I_{rm}	Maximum Reverse Recovery Current	For Q1: $I_F = 3.6\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$	Q1		0.6		A
			Q2		0.7		
Q_{rr}	Reverse Recovery Charge	For Q2: $I_F = -2.6\text{ A}, dI_F/dt = 100\text{ A}/\mu\text{s}$	Q1		5		nC
			Q2		8		

Notes:

1. $R_{\theta JA}$ 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 $R_{\theta CA}$ is determined by the user's board design.



a) 76°C/W when mounted on a 1in^2 pad of 2 oz copper



b) 146°C/W when mounted on a minimum pad of 2 oz copper

Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width < $300\mu\text{s}$, Duty Cycle < 2.0%

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Typical Characteristics : Q1

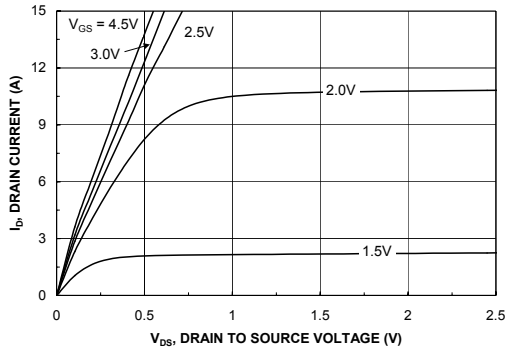


Figure 1. On-Region Characteristics.

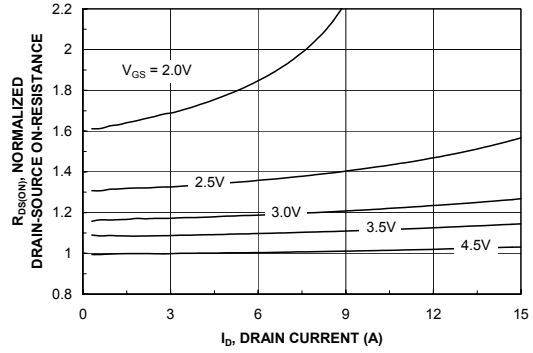


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

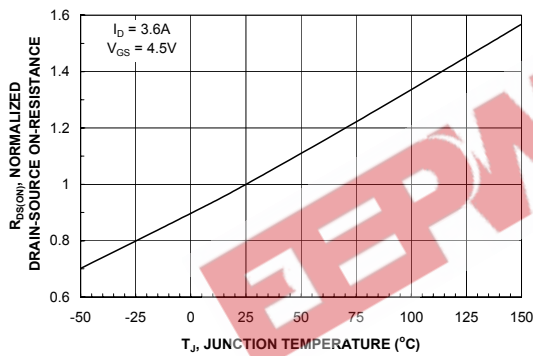


Figure 3. On-Resistance Variation with Temperature.

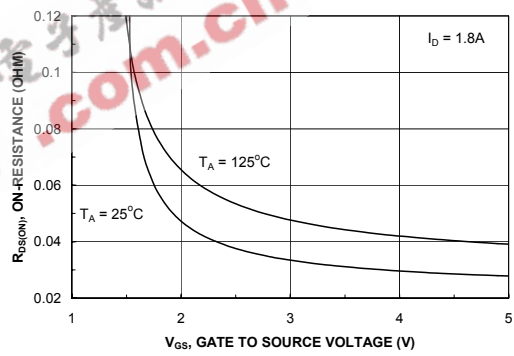


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

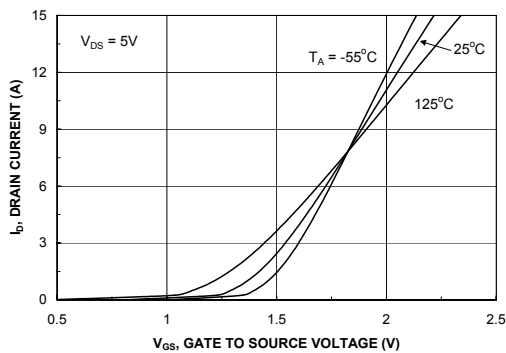


Figure 5. Transfer Characteristics.

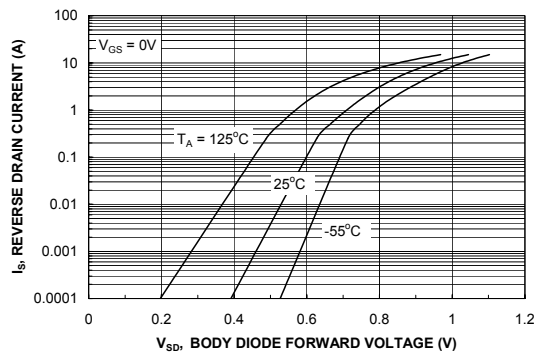


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics : Q1

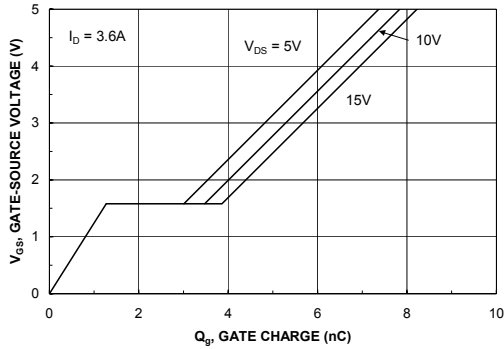


Figure 7. Gate Charge Characteristics.

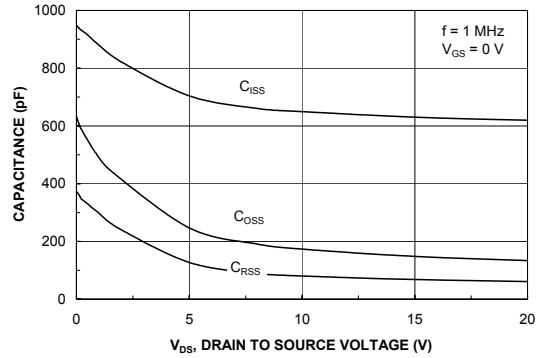


Figure 8. Capacitance Characteristics.

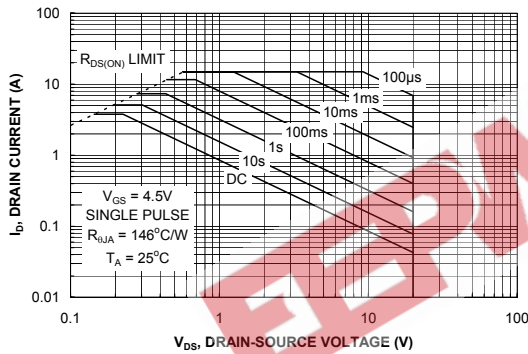


Figure 9. Maximum Safe Operating Area.

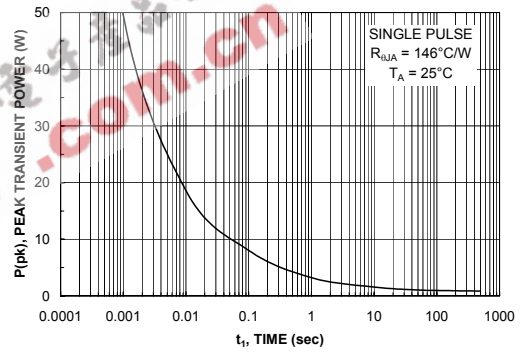


Figure 10. Single Pulse Maximum Power Dissipation.

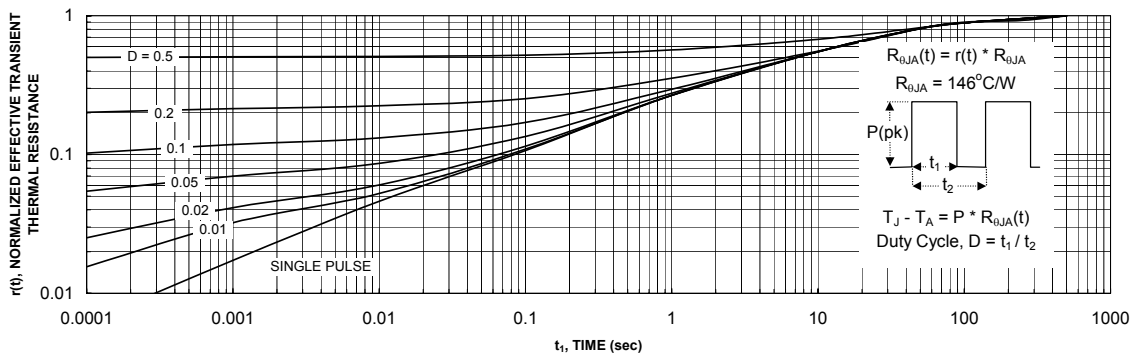


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1a.
Transient thermal response will change depending on the circuit board design.

Typical Characteristics : Q2

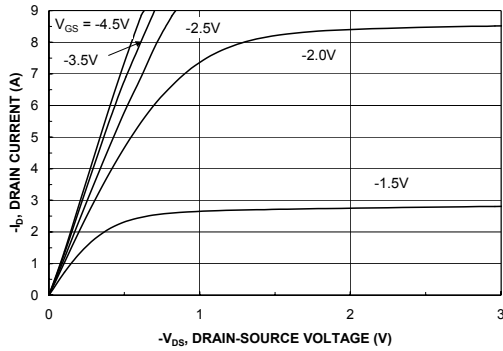


Figure 12. On-Region Characteristics.

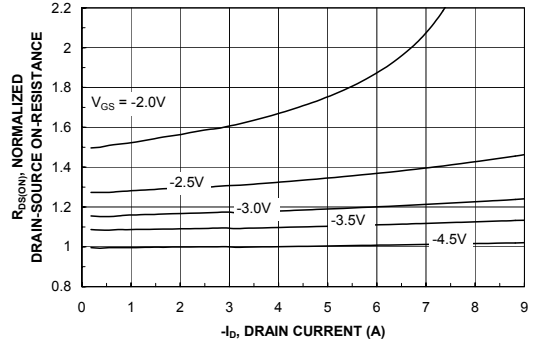


Figure 13. On-Resistance Variation with Drain Current and Gate Voltage.

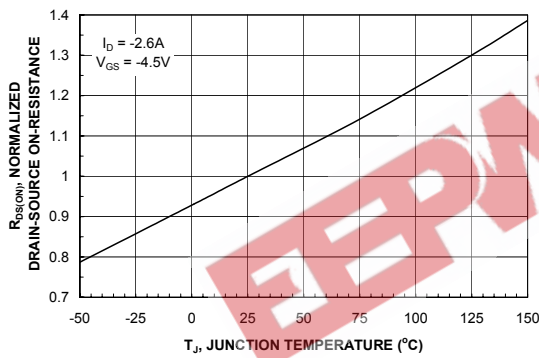


Figure 14. On-Resistance Variation with Temperature.

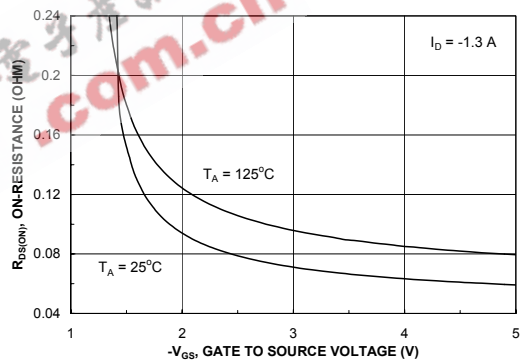


Figure 15. On-Resistance Variation with Gate-to-Source Voltage.

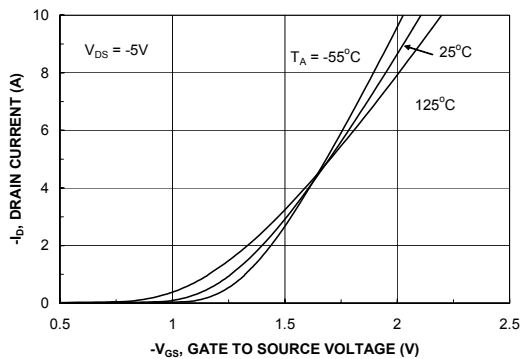


Figure 16. Transfer Characteristics.

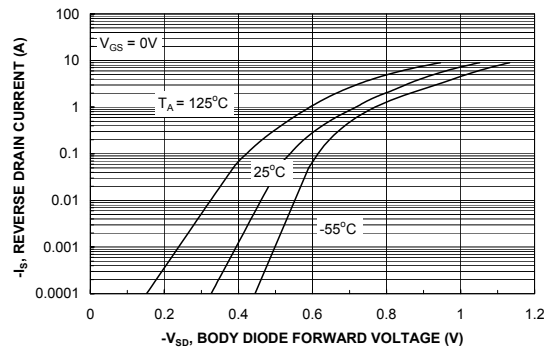


Figure 17. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics : Q2

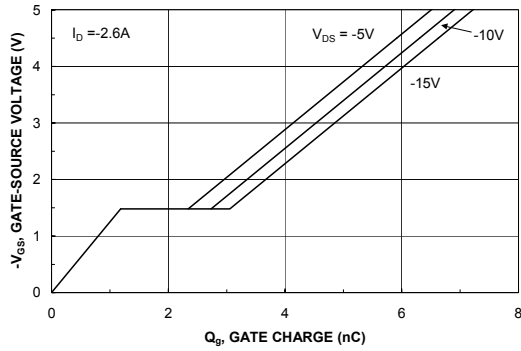


Figure 18. Gate Charge Characteristics.

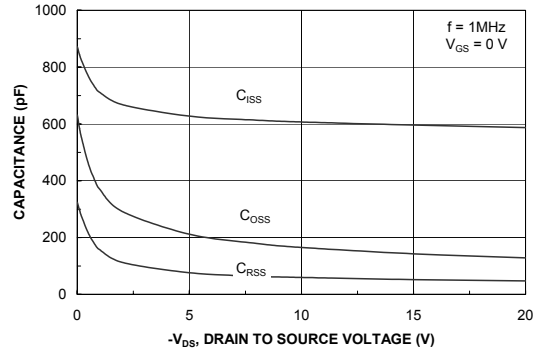


Figure 19. Capacitance Characteristics.

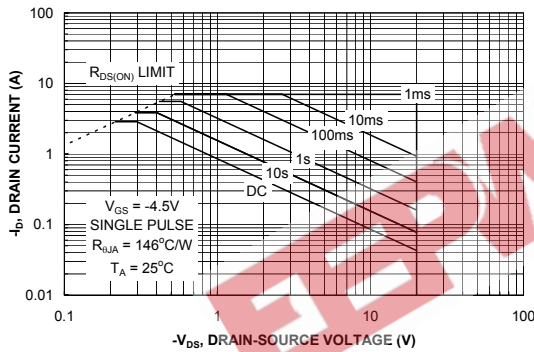


Figure 20. Maximum Safe Operating Area.

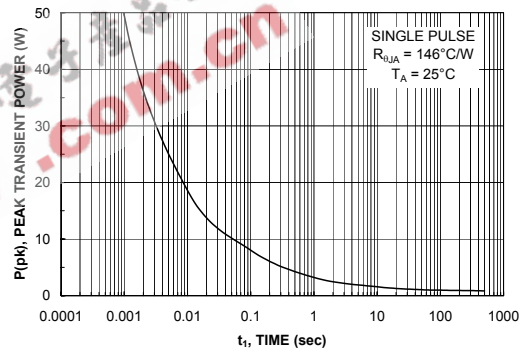


Figure 21. Single Pulse Maximum Power Dissipation.

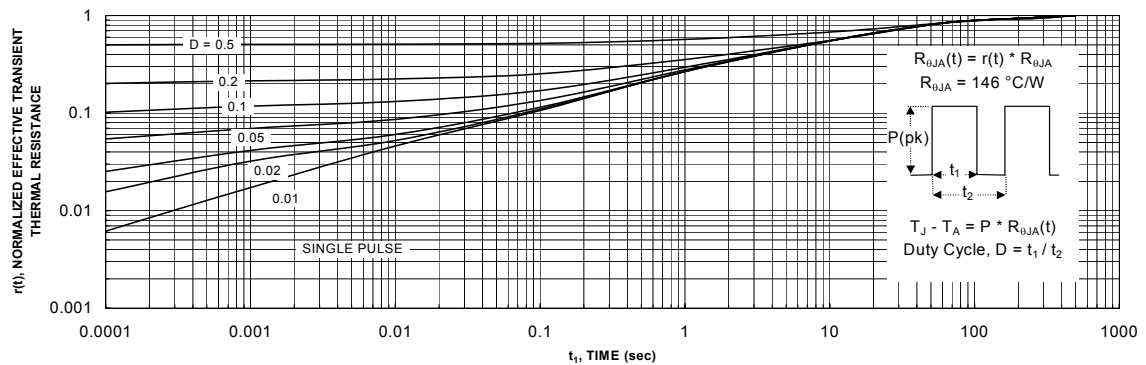


Figure 22. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1a.
Transient thermal response will change depending on the circuit board design.

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