

# FDS4895C

## Dual N & P-Channel PowerTrench<sup>®</sup> MOSFET

### General Description

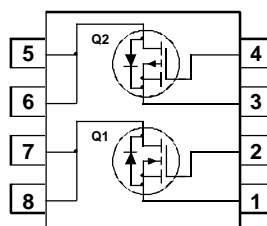
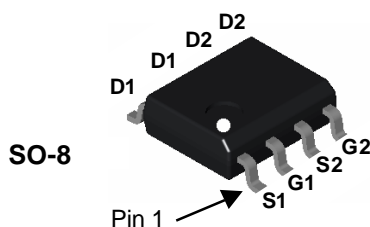
These dual N- and P-Channel enhancement mode power field effect transistors are produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize on-state resistance and yet maintain superior switching performance.

### Application

- Motor Control
- DC/DC conversion

### Features

- **Q1:** N-Channel  
5.5A, 40V  $R_{DS(on)} = 39m\Omega @ V_{GS} = 10V$   
 $R_{DS(on)} = 57m\Omega @ V_{GS} = 7V$
- **Q2:** P-Channel  
-4.4A, -40V  $R_{DS(on)} = 46m\Omega @ V_{GS} = -10V$   
 $R_{DS(on)} = 63m\Omega @ V_{GS} = -4.5V$
- High power and handling capability in a widely used surface mount package



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

Symbol	Parameter	Q1	Q2	Units
$V_{DSS}$	Drain-Source Voltage	40	40	V
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	$\pm 20$	V
$I_D$	Drain Current - Continuous (Note 1a)	5.5	-4.4	A
	- Pulsed	20	-20	
$P_D$	Power Dissipation for Dual Operation	2		W
	Power Dissipation for Single Operation (Note 1a)	1.6		
	(Note 1b)	1		
	(Note 1c)	0.9		
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150		$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	78	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	40	

### Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS4895C	FDS4895C	13"	12mm	2500 units

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

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
<b>Off Characteristics</b>							
$BV_{DSS}$	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	40 -40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$ $I_D = -250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	Q1 Q2		42 -40		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 32\text{ V}, V_{GS} = 0\text{ V}$ $V_{DS} = -32\text{ V}, V_{GS} = 0\text{ V}$	Q1 Q2			1 -1	$\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$	All			100	nA
$I_{GSSR}$	Gate-Body Leakage, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$	All			-100	nA
<b>On Characteristics (Note 2)</b>							
$V_{GS(th)}$	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	2 -1	3.7 -1.7	5 -3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$ $I_D = -250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	Q1 Q2		-8 4		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 5.5\text{ A}$	Q1		32	39	m $\Omega$
		$V_{GS} = 7\text{ V}, I_D = 4.8\text{ A}$			42	57	
		$V_{GS} = 10\text{ V}, I_D = 5.5\text{ A}, T_J = 125^\circ\text{C}$			49	64	
		$V_{GS} = -10\text{ V}, I_D = -4.4\text{ A}$ $V_{GS} = -4.5\text{ V}, I_D = -3.8\text{ A}$ $V_{GS} = -10\text{ V}, I_D = -4.4\text{ A}, T_J = 125^\circ\text{C}$	Q2		37 50 55	46 63 73	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 5.5\text{ A}$	Q1		10		S
		$V_{DS} = -10\text{ V}, I_D = -4.4\text{ A}$	Q2		12		
<b>Dynamic Characteristics</b>							
$C_{iss}$	Input Capacitance	Q1 $V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	Q1		410		pF
			Q2		1050		
$C_{oss}$	Output Capacitance	Q2	Q1		97		pF
			Q2		140		
$C_{rss}$	Reverse Transfer Capacitance	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	Q1		47		pF
			Q2		70		
$R_G$	Gate Resistance	$V_{GS} = 15\text{ mV}, f = 1.0\text{ MHz}$	Q1		2		$\Omega$
			Q2		9		

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

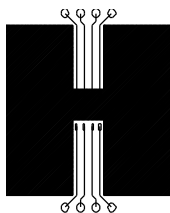
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
<b>Switching Characteristics</b> (Note 2)							
$t_{d(on)}$	Turn-On Delay Time	Q1 $V_{DD} = 20\text{ V}, I_D = 1\text{ A},$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\ \Omega$	Q1		9	18	ns
			Q2		12	22	
$t_r$	Turn-On Rise Time		Q1		4	8	ns
			Q2		15	27	
$t_{d(off)}$	Turn-Off Delay Time	Q2 $V_{DD} = -20\text{ V}, I_D = -1\text{ A},$ $V_{GS} = -10\text{ V}, R_{GEN} = 6\ \Omega$	Q1		18	32	ns
			Q2		45	72	
$t_f$	Turn-Off Fall Time		Q1		3	6	ns
			Q2		18	32	
$Q_g$	Total Gate Charge	Q1 $V_{DS} = 20\text{ V}, I_D = 5.5\text{ A}, V_{GS} = 10\text{ V}$	Q1		7	10	nC
			Q2		20	28	
$Q_{gs}$	Gate-Source Charge	Q2 $V_{DS} = -20\text{ V}, I_D = -4.4\text{ A}, V_{GS} = -10\text{ V}$	Q1		2.4		nC
			Q2		3		
$Q_{gd}$	Gate-Drain Charge		Q1		2		nC
			Q2		4		

**Drain-Source Diode Characteristics**

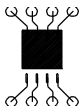
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 1.3\text{ A}$ (Note 2)	Q1		0.7	1.2	V
		$V_{GS} = 0\text{ V}, I_S = -1.3\text{ A}$ (Note 2)	Q2		-0.7	-1.2	
$t_{rr}$	Diode Reverse Recovery Time	Q1 $I_F = 5.5\text{ A}, d_F/d_t = 100\text{ A}/\mu\text{s}$	Q1		21		nS
			Q2		24		
$Q_{rr}$	Diode Reverse Recovery Charge	Q2 $I_F = -4.4\text{ A}, d_{IF}/d_t = 100\text{ A}/\mu\text{s}$	Q1		12		nC
			Q2		12		

**Notes:**

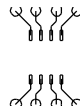
1.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a)  $78^\circ\text{W}$  when mounted on a  $0.5\text{ in}^2$  pad of 2 oz copper



b)  $125^\circ\text{W}$  when mounted on a  $.02\text{ in}^2$  pad of 2 oz copper



c)  $135^\circ\text{W}$  when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

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

Typical Characteristics: Q1 (N-Channel)

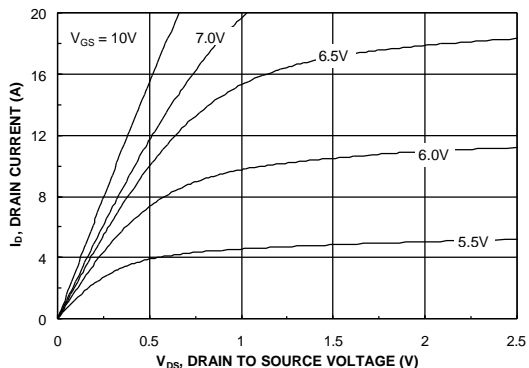


Figure 1. On-Region Characteristics.

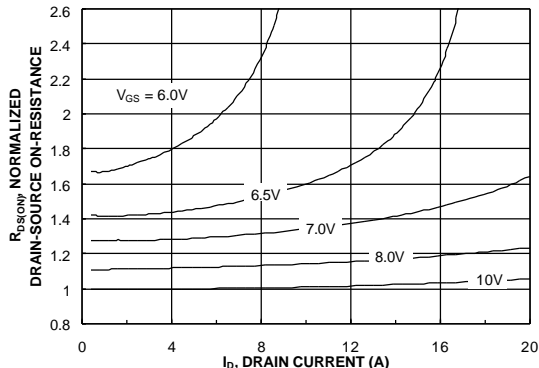


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

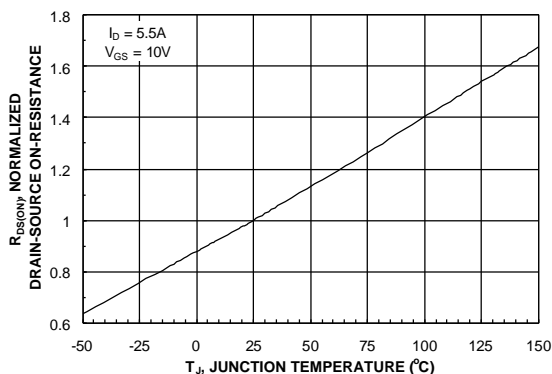


Figure 3. On-Resistance Variation with Temperature.

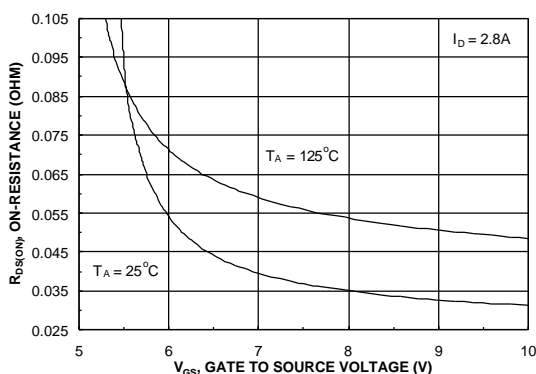


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

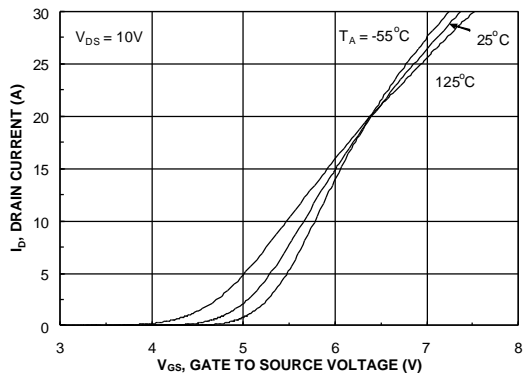


Figure 5. Transfer Characteristics.

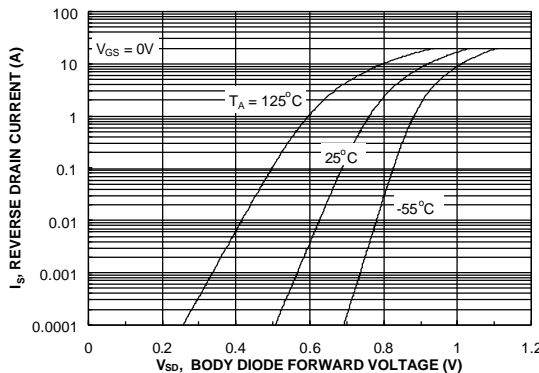


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics: Q1 (N-Channel)

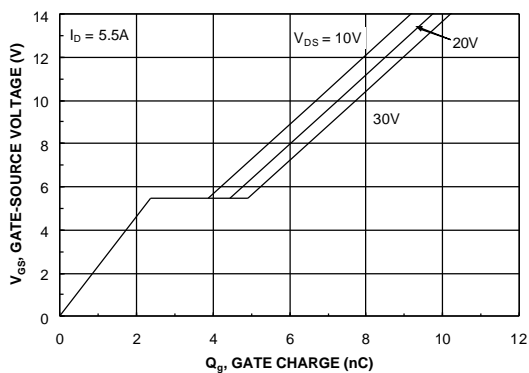


Figure 7. Gate Charge Characteristics.

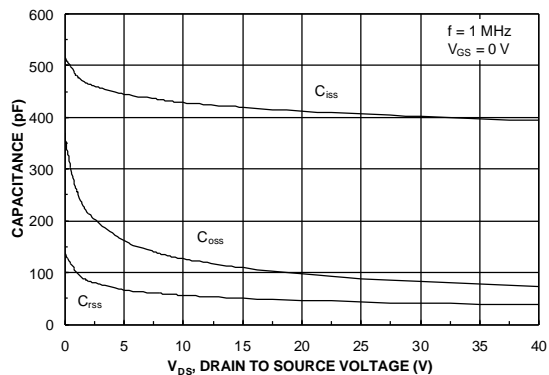


Figure 8. Capacitance Characteristics.

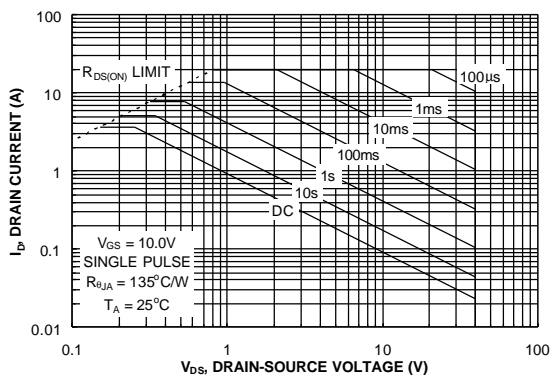


Figure 9. Maximum Safe Operating Area.

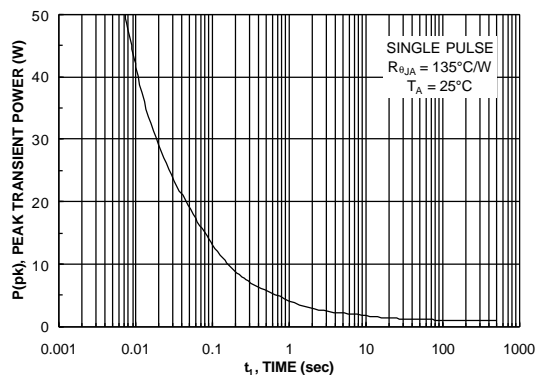


Figure 10. Single Pulse Maximum Power Dissipation.

Typical Characteristics: Q2 (P-Channel)

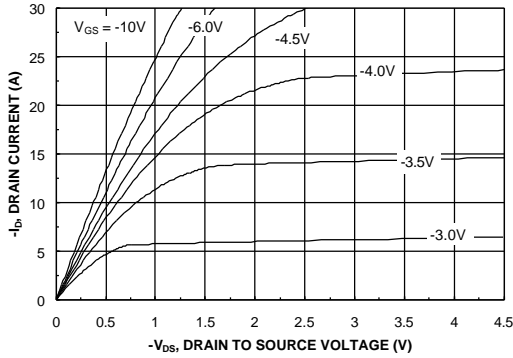


Figure 11. On-Region Characteristics.

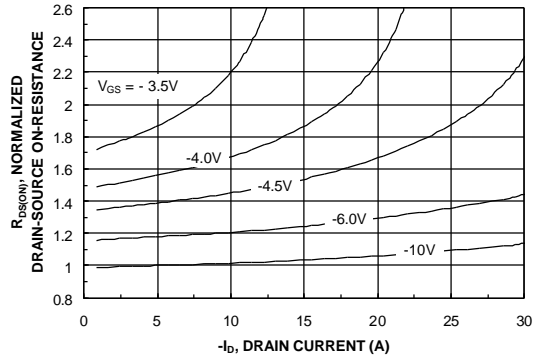


Figure 12. On-Resistance Variation with Drain Current and Gate Voltage.

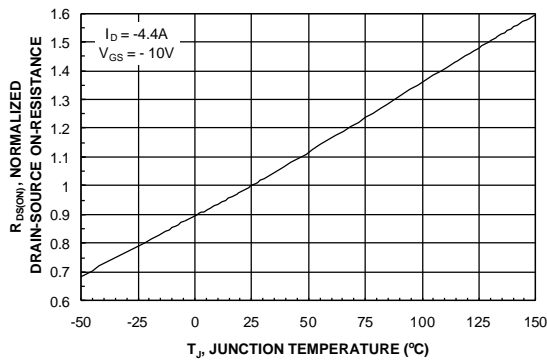


Figure 13. On-Resistance Variation with Temperature.

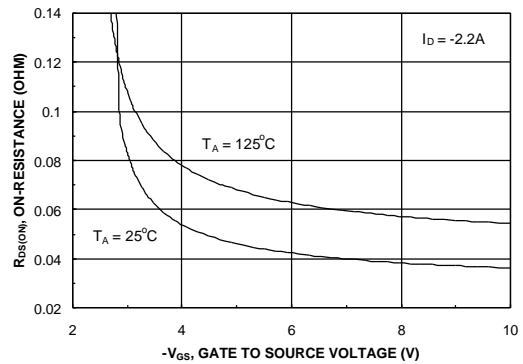


Figure 14. On-Resistance Variation with Gate-to-Source Voltage.

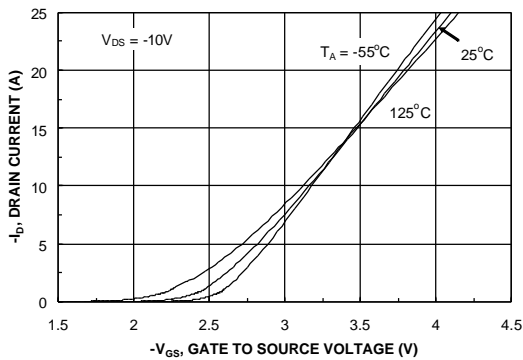


Figure 15. Transfer Characteristics.

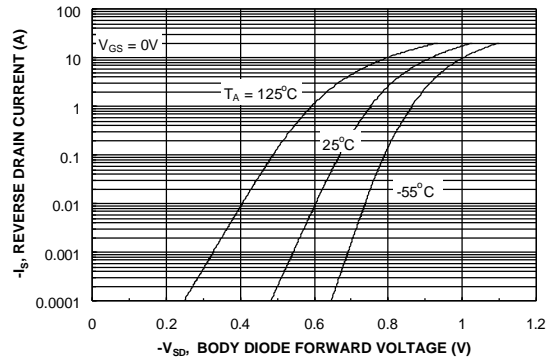


Figure 16. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics: Q2 (P-Channel)

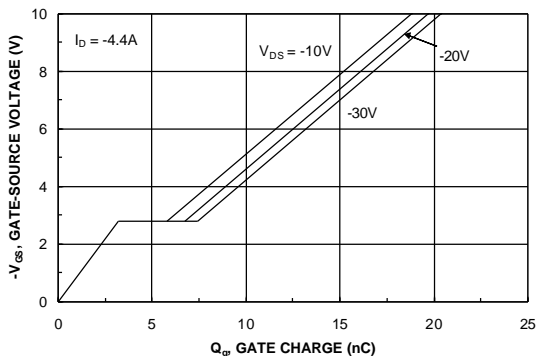


Figure 17. Gate Charge Characteristics.

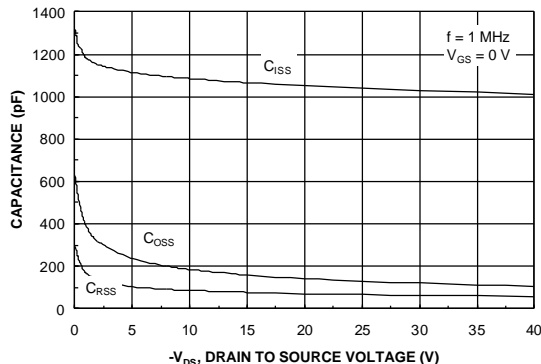


Figure 18. Capacitance Characteristics.

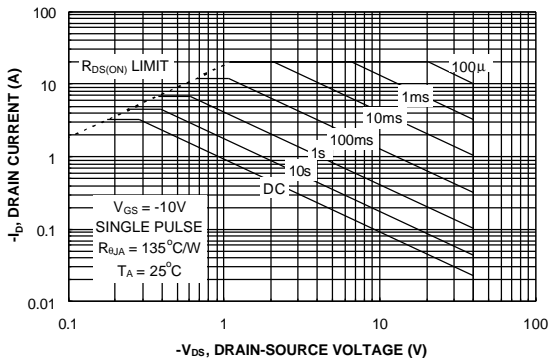


Figure 19. Maximum Safe Operating Area.

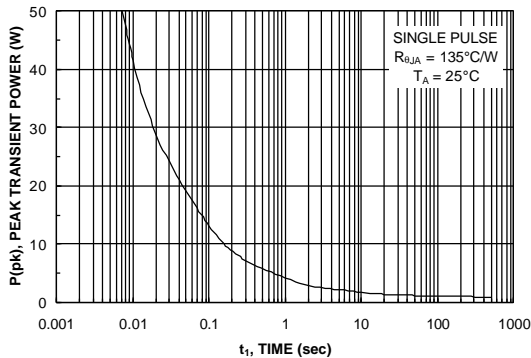


Figure 20. Single Pulse Maximum Power Dissipation.

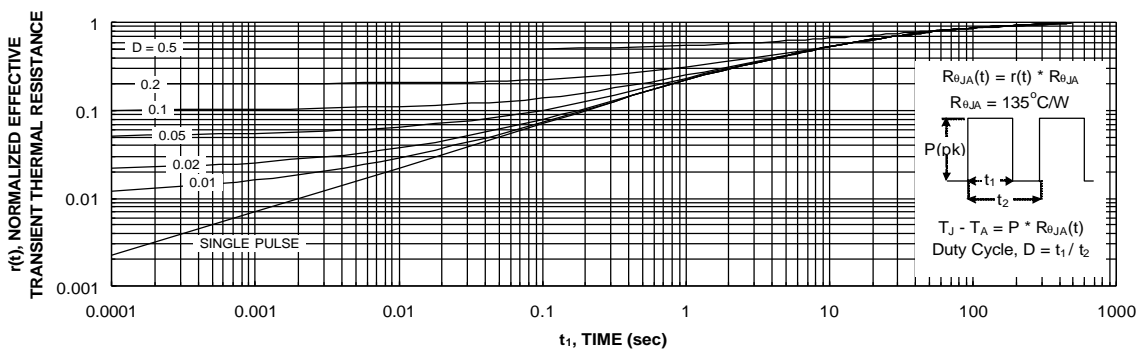


Figure 21. Transient Thermal Response Curve.

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

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EnSigna™	ImpliedDisconnect™	OCXPro™	SILENT SWITCHER®	Wire™
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		PowerEdge™	SuperSOT™-6	

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