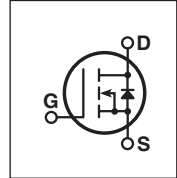
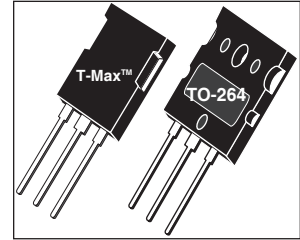




Super Junction FREDFET



- Ultra Low $R_{DS(ON)}$
- Low Miller Capacitance
- Ultra Low Gate Charge, Q_g
- Avalanche Energy Rated
- Extreme dv/dt Rated
- Intrinsic Fast-Recovery Body Diode
- Extreme Low Reverse Recovery Charge
- Ideal For ZVS Applications
- Popular T-MAX™ or TO-264 Package

Unless stated otherwise, Microsemi discrete FREDFETs contain a single FREDFET die. This device is made with two parallel FREDFET die. It is intended for switch-mode operation. It is not suitable for linear mode operation.

MAXIMUM RATINGS

All Ratings: $T_C = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	APT40N60B2CF(G)_LCF(G)	UNIT
V_{DSS}	Drain-Source Voltage	600	Volts
I_D	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	40	Amps
	Continuous Drain Current @ $T_C = 100^\circ\text{C}$	26	
I_{DM}	Pulsed Drain Current ^①	80	
V_{GS}	Gate-Source Voltage Continuous	± 30	Volts
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	417	Watts
	Linear Derating Factor	3.33	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	$^\circ\text{C}$
T_L	Lead Temperature: 0.063" from Case for 10 Sec.	260	
dv/dt	Drain-Source Voltage slope ($V_{DS} = 480\text{V}$, $I_D = 40\text{A}$, $T_J = 125^\circ\text{C}$)	80	V/ns
I_{AR}	Avalanche Current ^⑦	20	Amps
E_{AR}	Repetitive Avalanche Energy ^⑦	1	mJ
E_{AS}	Single Pulse Avalanche Energy ^④	690	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0\text{V}$, $I_D = 500\mu\text{A}$)	600			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance ^② ($V_{GS} = 10\text{V}$, $I_D = 20\text{A}$)			0.110	Ohms
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 600\text{V}$, $V_{GS} = 0\text{V}$)			4.2	μA
	Zero Gate Voltage Drain Current ($V_{DS} = 600\text{V}$, $V_{GS} = 0\text{V}$, $T_C = 150^\circ\text{C}$)			3400	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$)			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 2\text{mA}$)	3	4	5	Volts

 CAUTION: These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

Microsemi Website - <http://www.microsemi.com>

"COOLMOS™" comprise a new family of transistors developed by Infineon Technologies AG. "COOLMOS" is a trademark of Infineon Technologies AG."

DYNAMIC CHARACTERISTICS

APT40N60B2CF(G)_LCF(G)

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1 \text{ MHz}$		5040		pF
C_{oss}	Output Capacitance			1365		
C_{rss}	Reverse Transfer Capacitance			80		
Q_g	Total Gate Charge ^③	$V_{GS} = 10V$ $V_{DD} = 300V$ $I_D = 40A @ 25^\circ C$		185		nC
Q_{gs}	Gate-Source Charge			36		
Q_{gd}	Gate-Drain ("Miller") Charge			115		
$t_{d(on)}$	Turn-on Delay Time	RESISTIVE SWITCHING $V_{GS} = 15V$ $V_{DD} = 380V$ $I_D = 40A @ 25^\circ C$ $R_G = 1.8\Omega$		12		ns
t_r	Rise Time			15		
$t_{d(off)}$	Turn-off Delay Time			60		
t_f	Fall Time			6.4		
E_{on}	Turn-on Switching Energy ^⑥	INDUCTIVE SWITCHING @ 25°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 40A, R_G = 5\Omega$		725		μJ
E_{off}	Turn-off Switching Energy			365		
E_{on}	Turn-on Switching Energy ^⑥	INDUCTIVE SWITCHING @ 125°C $V_{DD} = 400V, V_{GS} = 15V$ $I_D = 40A, R_G = 5\Omega$		1195		
E_{off}	Turn-off Switching Energy			440		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			40	Amps
I_{SM}	Pulsed Source Current ^① (Body Diode)			80	
V_{SD}	Diode Forward Voltage ^② ($V_{GS} = 0V, I_S = -40A$)			2.4	Volts
dv/dt	Peak Diode Recovery dv/dt ^⑤			40	V/ns
t_{rr}	Reverse Recovery Time ($I_S = -40A, di/dt = 100A/\mu s$)	$T_j = 25^\circ C$		195	ns
		$T_j = 125^\circ C$		290	
Q_{rr}	Reverse Recovery Charge ($I_S = -40A, di/dt = 100A/\mu s$)	$T_j = 25^\circ C$		1.8	μC
		$T_j = 125^\circ C$		3.5	
I_{RRM}	Peak Recovery Current ($I_S = -40A, di/dt = 100A/\mu s$)	$T_j = 25^\circ C$		17	Amps
		$T_j = 125^\circ C$		22	

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.30	$^\circ C/W$
$R_{\theta JA}$	Junction to Ambient			31	

- ① Repetitive Rating: Pulse width limited by maximum junction temperature
- ② Pulse Test: Pulse width < 380 μs , Duty Cycle < 2%
- ③ See MIL-STD-750 Method 3471
- ④ Starting $T_j = +25^\circ C, L = 13.80mH, R_G = 25\Omega, \text{Peak } I_L = 10A$
- ⑤ dv/dt numbers reflect the limitations of the test circuit rather than the device itself. $I_S \leq -I_D 40A, di/dt \leq 700A/\mu s, v_R \leq 480V, T_j \leq 125^\circ C$
- ⑥ E_{on} includes diode reverse recovery. See figures 18, 20.
- ⑦ Repetitive avalanche causes additional power losses that can be calculated as $P_{AV} = E_{AR} \cdot f$

Microsemi reserves the right to change, without notice, the specifications and information contained herein.

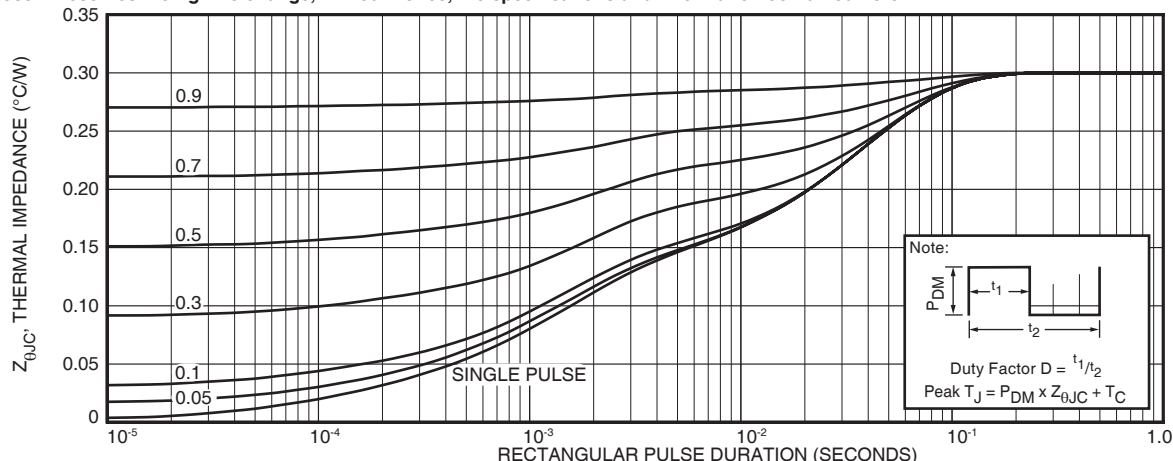


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

Typical Performance Curves

APT40N60B2CF(G)_LCF(G)

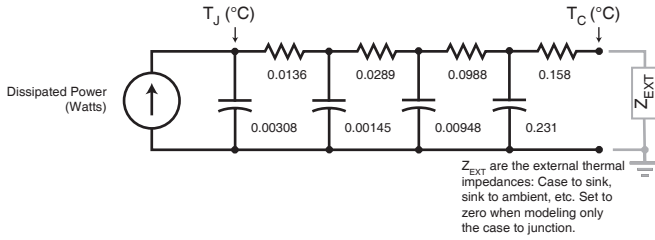


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

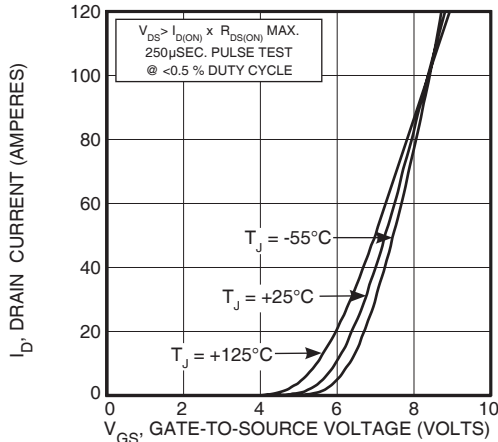


FIGURE 4, TRANSFER CHARACTERISTICS

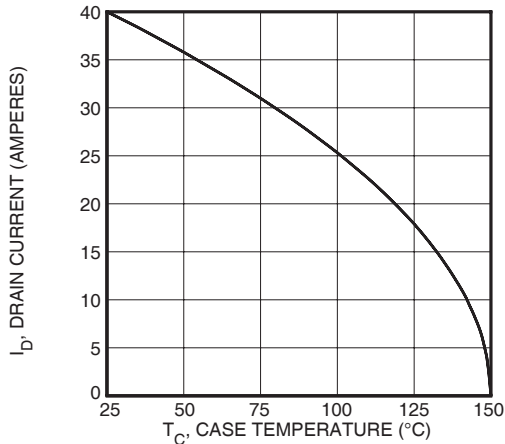


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

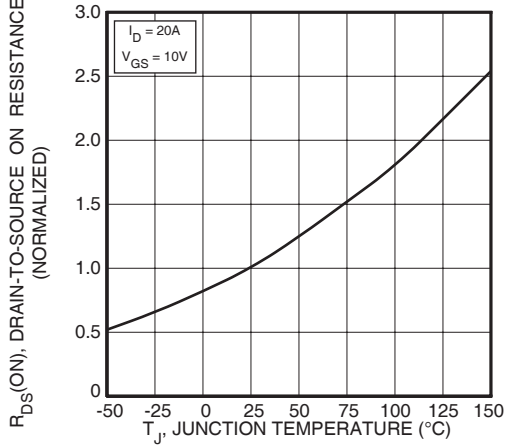


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

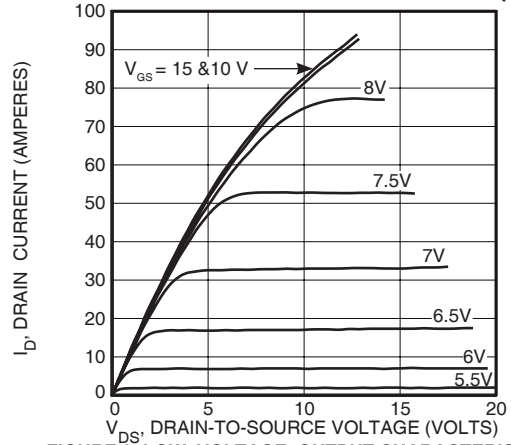


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

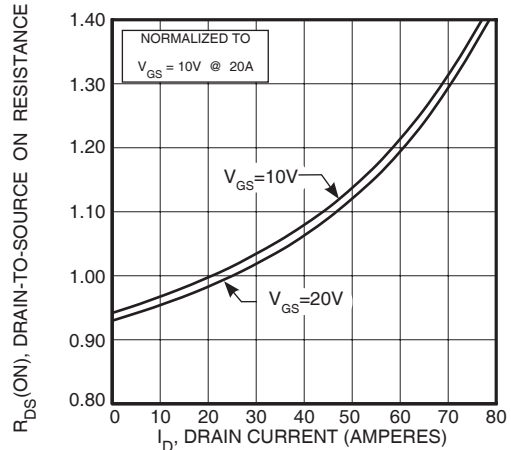


FIGURE 5, $R_{DS}(ON)$ vs DRAIN CURRENT

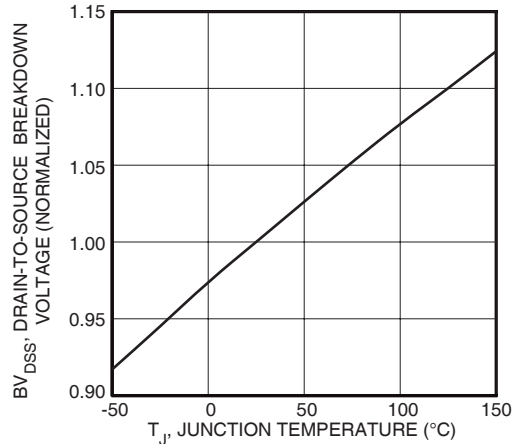


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

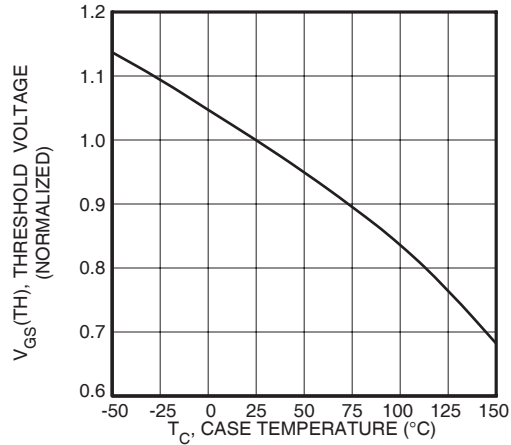


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

I_D, DRAIN CURRENT (AMPERES)

Graph removed

V_{DS}, DRAIN-TO-SOURCE VOLTAGE (VOLTS)
FIGURE 10, MAXIMUM SAFE OPERATING AREA

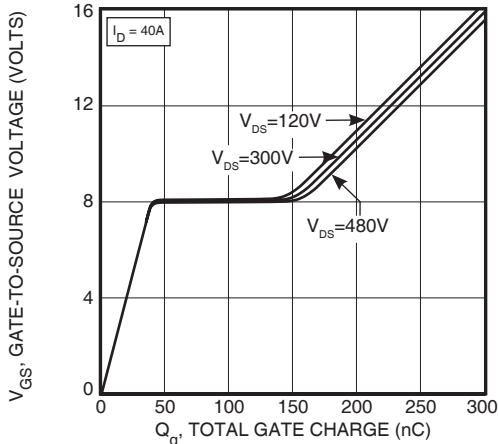


FIGURE 12, GATE CHARGE vs GATE-TO-SOURCE VOLTAGE

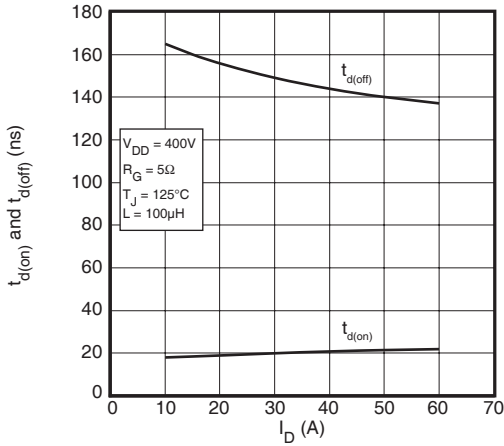


FIGURE 14, DELAY TIMES vs CURRENT

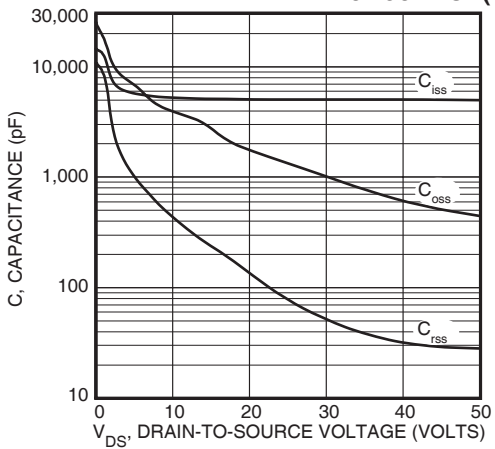
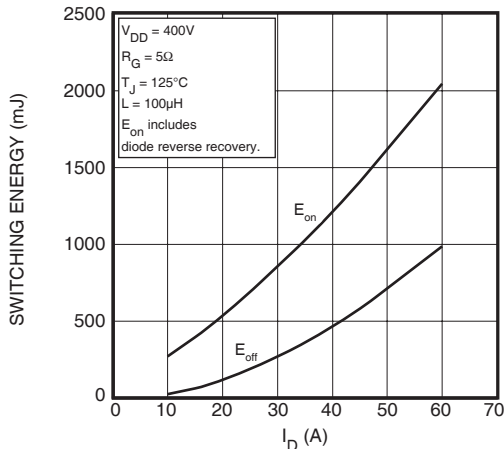


FIGURE 16, SWITCHING ENERGY vs CURRENT

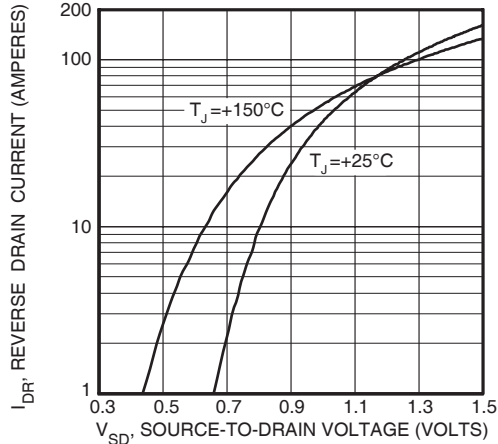


FIGURE 17, SWITCHING ENERGY VS. GATE RESISTANCE

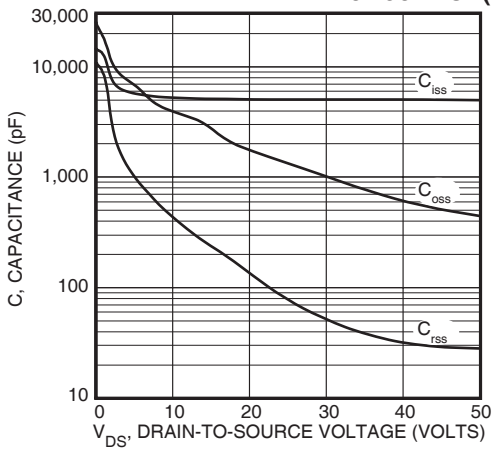
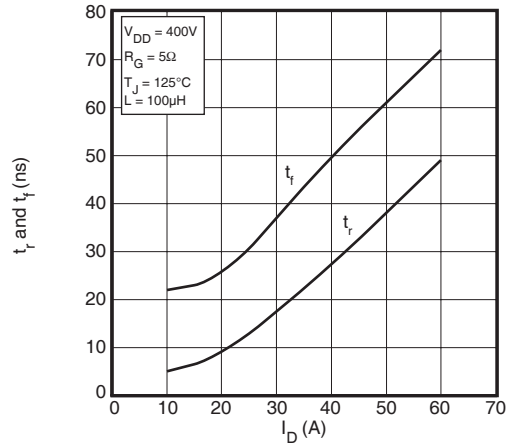


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

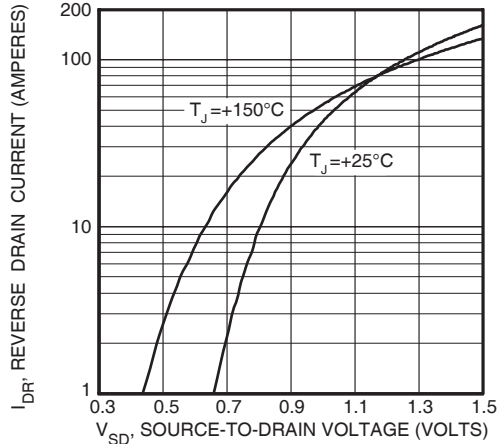


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

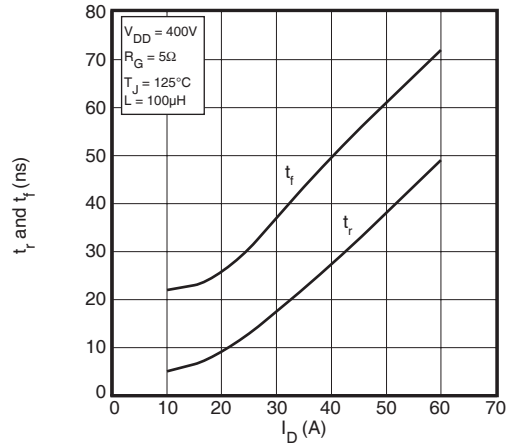


FIGURE 15, RISE AND FALL TIMES vs CURRENT

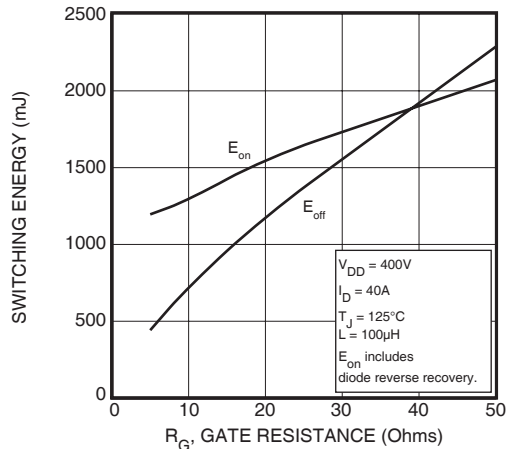


FIGURE 17, SWITCHING ENERGY VS. GATE RESISTANCE

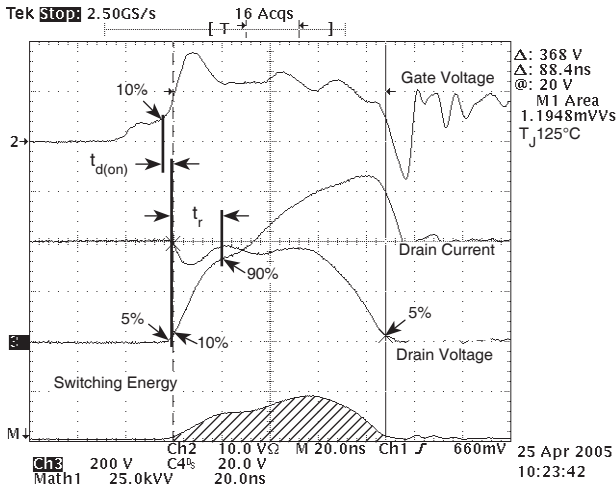


Figure 18, Turn-on Switching Waveforms and Definitions

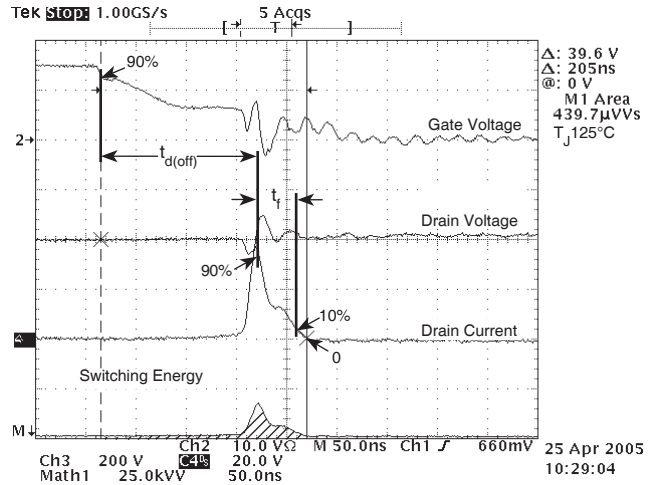


Figure 19, Turn-off Switching Waveforms and Definitions

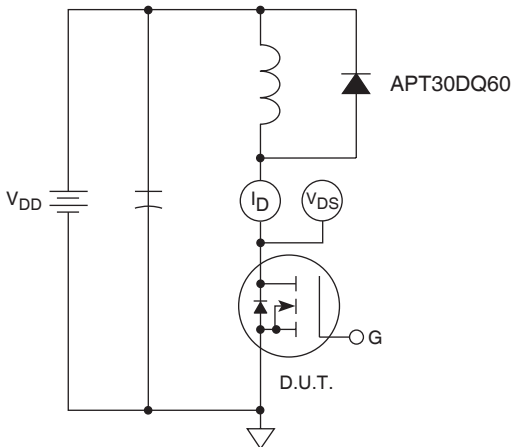
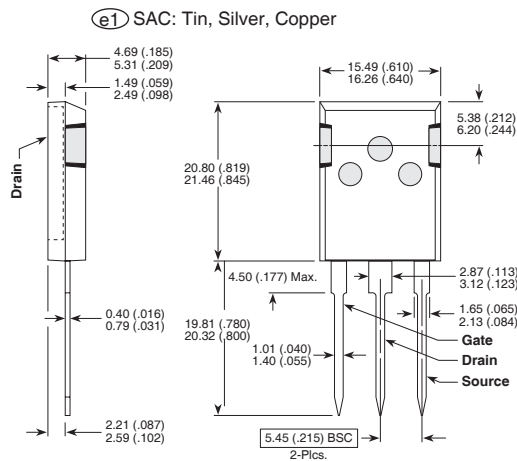


Figure 20, Inductive Switching Test Circuit

T-MAX™ (B2) Package Outline (B2CF)



TO-264 (L) Package Outline (LCF)

