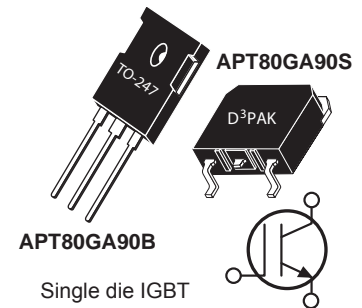



High Speed PT IGBT

POWER MOS 8® is a high speed Punch-Through switch-mode IGBT. Low E_{off} is achieved through leading technology silicon design and lifetime control processes. A reduced $E_{off} - V_{CE(ON)}$ tradeoff results in superior efficiency compared to other IGBT technologies. Low gate charge and a greatly reduced ratio of C_{res}/C_{ies} provide excellent noise immunity, short delay times and simple gate drive. The intrinsic chip gate resistance and capacitance of the poly-silicone gate structure help control di/dt during switching, resulting in low EMI, even when switching at high frequency.



FEATURES

- Fast switching with low EMI
- Very Low E_{off} for maximum efficiency
- Ultra low C_{res} for improved noise immunity
- Low conduction loss
- Low gate charge
- Increased intrinsic gate resistance for low EMI
- RoHS compliant 

TYPICAL APPLICATIONS

- ZVS phase shifted and other full bridge
- Half bridge
- High power PFC boost
- Welding
- UPS, solar, and other inverters
- High frequency, high efficiency industrial

Absolute Maximum Ratings

| Symbol | Parameter | Ratings | Unit |
|----------------|-----------------------------------------------------------------|-------------|------|
| V_{ces} | Collector Emitter Voltage | 900 | V |
| I_{C1} | Continuous Collector Current @ $T_c = 25^\circ\text{C}$ | 145 | A |
| I_{C2} | Continuous Collector Current @ $T_c = 100^\circ\text{C}$ | 80 | |
| I_{CM} | Pulsed Collector Current ¹ | 239 | |
| V_{GE} | Gate-Emitter Voltage ² | ±30 | V |
| P_D | Total Power Dissipation @ $T_c = 25^\circ\text{C}$ | 625 | W |
| SSOA | Switching Safe Operating Area @ $T_j = 150^\circ\text{C}$ | 239A @ 900V | |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to 150 | °C |
| T_L | Lead Temperature for Soldering: 0.063" from Case for 10 Seconds | 300 | |

Static Characteristics

$T_J = 25^\circ\text{C}$ unless otherwise specified

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---------------|-------------------------------------|-------------------------------------------------------|-----|-----|------|------|
| $V_{BR(CEs)}$ | Collector-Emitter Breakdown Voltage | $V_{GE} = 0V, I_C = 1.0mA$ | 900 | | | V |
| $V_{CE(on)}$ | Collector-Emitter On Voltage | $V_{GE} = 15V, I_C = 47A$ | | 2.5 | 3.1 | |
| | | $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ | | 2.2 | | |
| $V_{GE(th)}$ | Gate Emitter Threshold Voltage | $V_{GE} = V_{CE}, I_C = 1mA$ | 3 | 4.5 | 6 | |
| I_{CES} | Zero Gate Voltage Collector Current | $V_{CE} = 900V, V_{GE} = 0V$ | | | 250 | µA |
| | | $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ | | | 1000 | |
| I_{GES} | Gate-Emitter Leakage Current | $V_{GS} = \pm 30V$ | | | ±100 | nA |

Thermal and Mechanical Characteristics

| Symbol | Characteristic | Min | Typ | Max | Unit |
|-----------------|----------------------------------------------------|-----|-----|-----|--------|
| $R_{\theta JC}$ | Junction to Case Thermal Resistance | - | - | 0.2 | °C/W |
| W_T | Package Weight | - | 5.9 | - | g |
| Torque | Mounting Torque (TO-247 Package), 4-40 or M3 screw | | | 10 | in·lbf |

Dynamic Characteristics

T_J = 25°C unless otherwise specified

APT80GA90B_S

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|-------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|------|
| C _{ies} | Input Capacitance | Capacitance V _{GE} = 0V, V _{CE} = 25V f = 1MHz | | 4560 | | pF |
| C _{oes} | Output Capacitance | | | 411 | | |
| C _{res} | Reverse Transfer Capacitance | | | 62 | | |
| Q _g ³ | Total Gate Charge | Gate Charge V _{GE} = 15V V _{CE} = 450V I _C = 47A | | 200 | | nC |
| Q _{ge} | Gate-Emitter Charge | | | 30 | | |
| Q _{gc} | Gate- Collector Charge | | | 72 | | |
| SSOA | Switching Safe Operating Area | T _J = 150°C, R _G = 4.7Ω ⁴ , V _{GE} = 15V, L = 100uH, V _{CE} = 900V | 239 | | | A |
| t _{d(on)} | Turn-On Delay Time | Inductive Switching (25°C) V _{CC} = 600V V _{GE} = 15V I _C = 47A R _G = 4.7Ω ⁴ T _J = +25°C | | 18 | | ns |
| t _r | Current Rise Time | | | 29 | | |
| t _{d(off)} | Turn-Off Delay Time | | | 149 | | |
| t _f | Current Fall Time | | | 85 | | |
| E _{on2} | Turn-On Switching Energy | | | 1652 | | |
| E _{off} ⁶ | Turn-Off Switching Energy | | 1389 | | μJ | |
| t _{d(on)} | Turn-On Delay Time | Inductive Switching (125°C) V _{CC} = 600V V _{GE} = 15V I _C = 47A R _G = 4.7Ω ⁴ T _J = +125°C | | 18 | | ns |
| t _r | Current Rise Time | | | 31 | | |
| t _{d(off)} | Turn-Off Delay Time | | | 192 | | |
| t _f | Current Fall Time | | | 128 | | |
| E _{on2} | Turn-On Switching Energy | | | 2813 | | |
| E _{off} ⁶ | Turn-Off Switching Energy | | | 2082 | | |

1 Repetitive Rating: Pulse width and case temperature limited by maximum junction temperature.

2 Pulse test: Pulse Width < 380μs, duty cycle < 2%.

3 See Mil-Std-750 Method 3471.

4 R_G is external gate resistance, not including internal gate resistance or gate driver impedance. (MIC4452)

5 E_{on2} is the clamped inductive turn on energy that includes a commutating diode reverse recovery current in the IGBT turn on energy loss. A combi device is used for the clamping diode.

6 E_{off} is the clamped inductive turn-off energy measured in accordance with JEDEC standard JESD24-1.

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

Typical Performance Curves

APT80GA90B_S

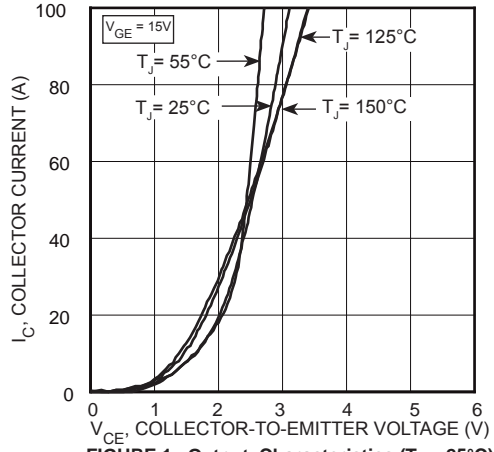


FIGURE 1, Output Characteristics ($T_J = 25^\circ\text{C}$)

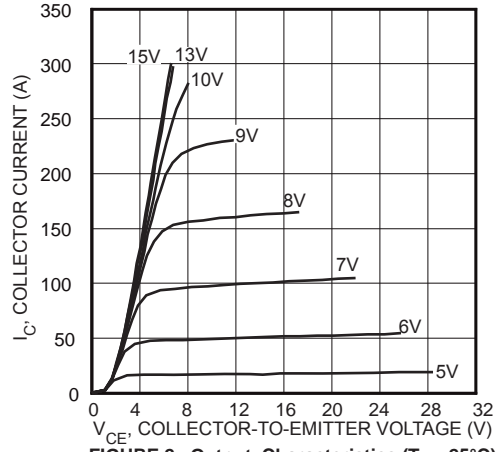


FIGURE 2, Output Characteristics ($T_J = 25^\circ\text{C}$)

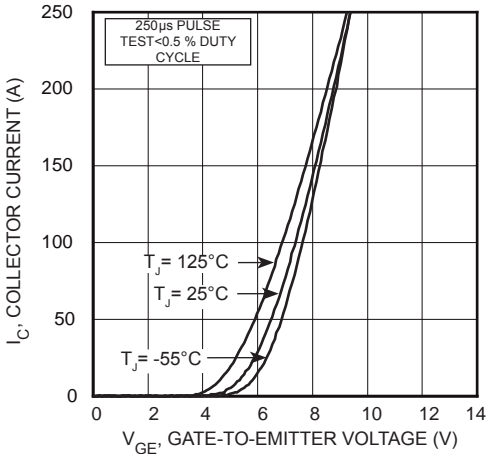


FIGURE 3, Transfer Characteristics

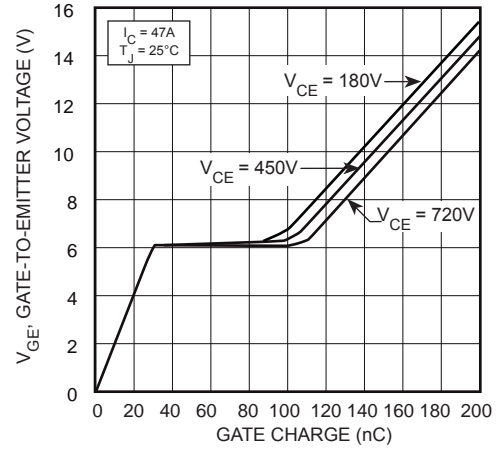


FIGURE 4, Gate charge

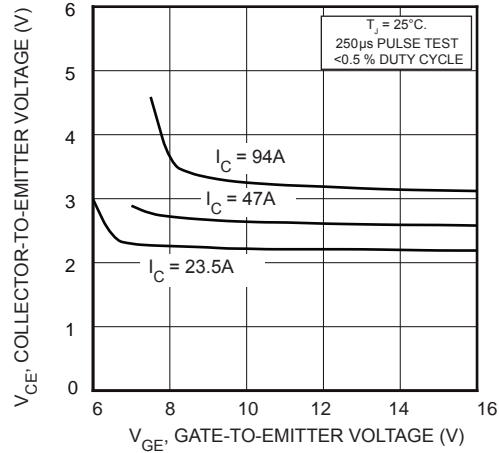


FIGURE 5, On State Voltage vs Gate-to-Emitter Voltage

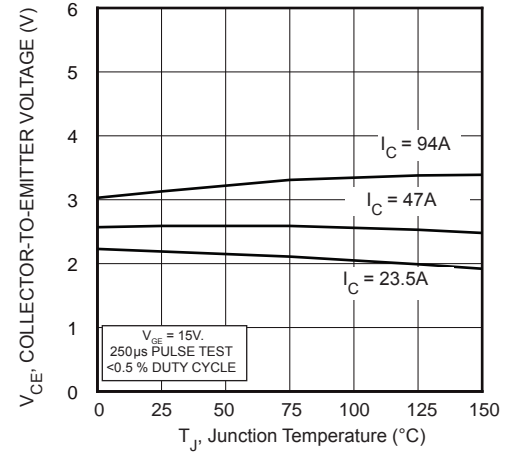


FIGURE 6, On State Voltage vs Junction Temperature

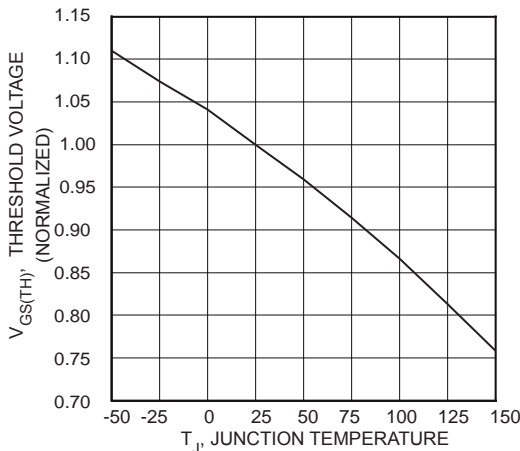


FIGURE 7, Threshold Voltage vs Junction Temperature

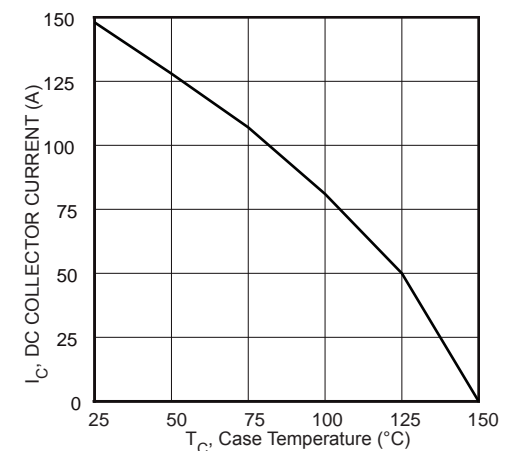


FIGURE 8, DC Collector Current vs Case Temperature

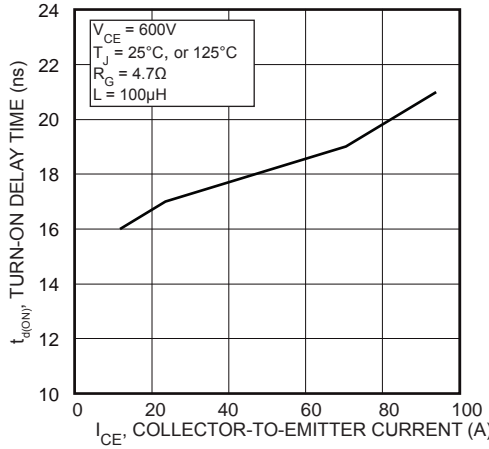


FIGURE 9, Turn-On Delay Time vs Collector Current

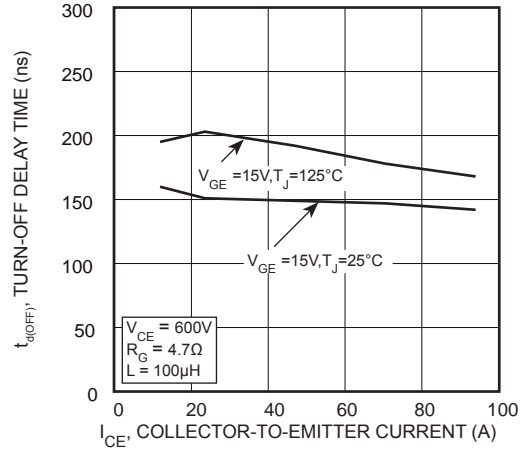


FIGURE 10, Turn-Off Delay Time vs Collector Current

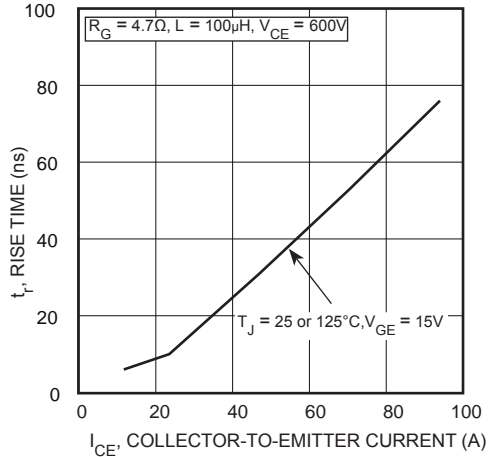


FIGURE 11, Current Rise Time vs Collector Current

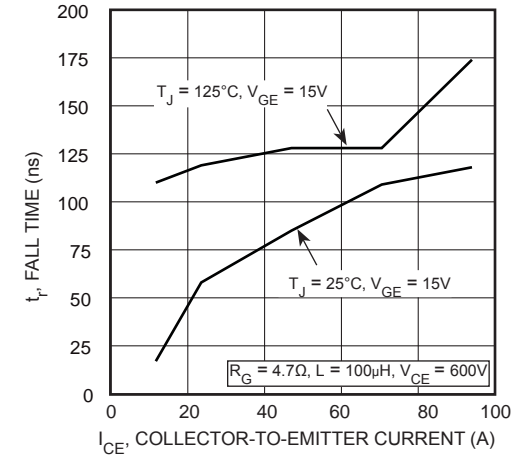


FIGURE 12, Current Fall Time vs Collector Current

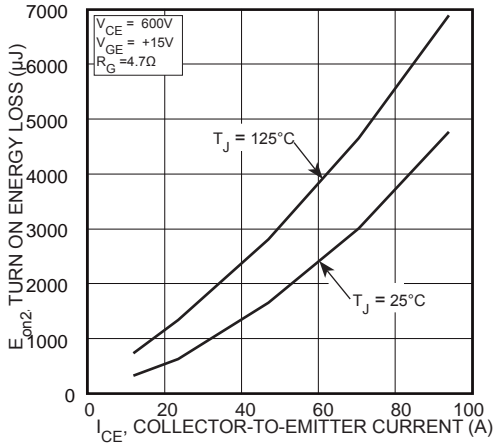


FIGURE 13, Turn-On Energy Loss vs Collector Current

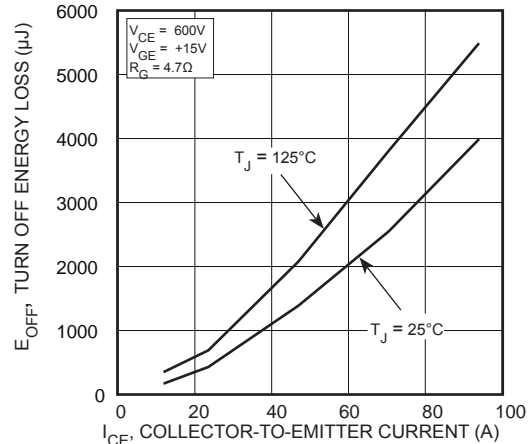


FIGURE 14, Turn-Off Energy Loss vs Collector Current

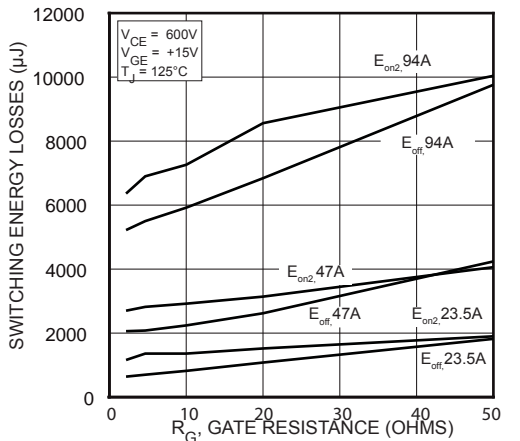


FIGURE 15, Switching Energy Losses vs Gate Resistance

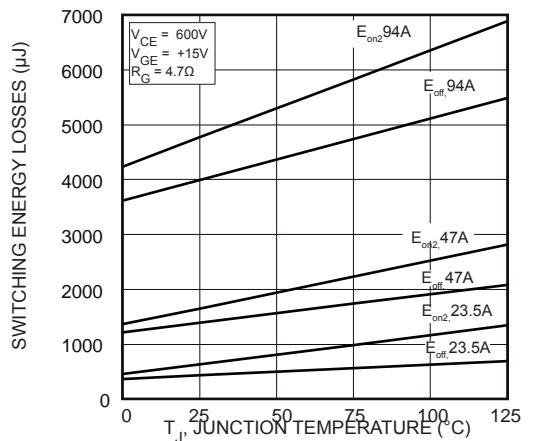


FIGURE 16, Switching Energy Losses vs Junction Temperature

Typical Performance Curves

APT80GA90B_S

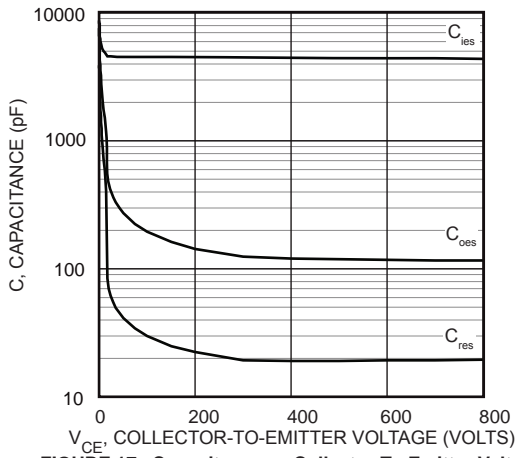


FIGURE 17, Capacitance vs Collector-To-Emitter Voltage

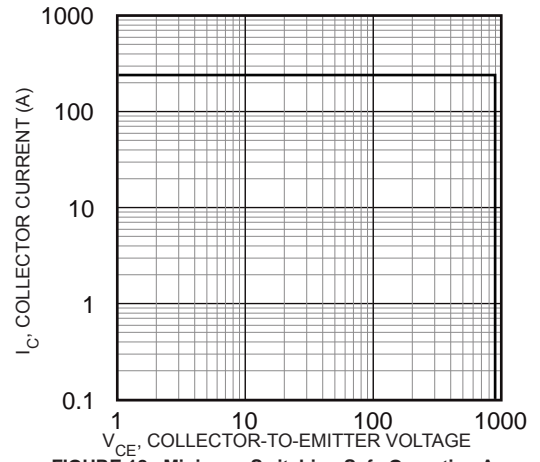


FIGURE 18, Minimum Switching Safe Operating Area

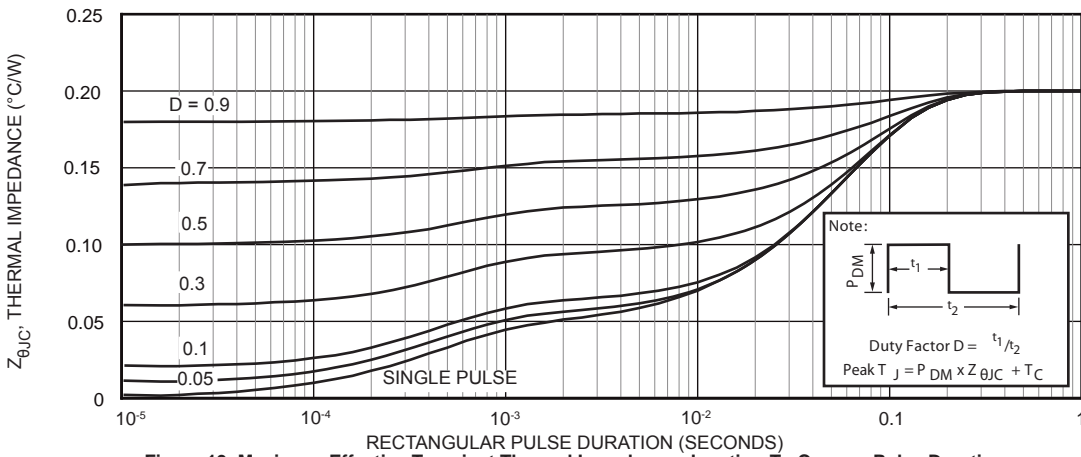


Figure 19, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration